DRAFT
ENVIRONMENTAL ASSESSMENT
FOR THE
VIDAL SOLAR INTERCONNECTION PROJECT
DOE/EA-2170

Prepared for:

U.S. Department of Energy
Western Area Power Administration
Desert Southwest Region

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CHAPTER 1.0 – INTRODUCTION

1.1 PROJECT BACKGROUND

The Western Area Power Administration's (WAPA) Proposed Action consists of responding to a large generator interconnection request from CDH Vidal, LLC, the Proponent for the Vidal Energy Project, an approximately 160-megawatt (MW) nameplate capacity photovoltaic (PV) and battery energy storage system (BESS) facility proposed near the town of Vidal, in San Bernardino County, California (CA) on 1,090 acres of privately-owned lands. The Vidal Energy Project would include solar panels, access roads, and an underground electrical collection system, while the BESS would provide energy to the system at times when the solar generation system is offline. The solar project is proposed to be connected to WAPA's electrical transmission system via a new 161-kilovolt (kV) substation, looping into WAPA's existing Headgate Rock-Blythe (HDR-BLY) 161-kV transmission line (see Figure 1 in Appendix A), which crosses the southeastern corner of the proposed Vidal Energy Project. Although WAPA's new switchyard would be operated at 161-kV, it is anticipated to be built to 230-kV standards. WAPA's 52-mile HDR-BLY transmission line, which is part of WAPA's Parker-Davis Project transmission system and consists of wooden H-frame and three pole structures, runs generally northeast-to-southwest on privately owned lands, Colorado River Indian Tribes (CRIT) lands, and lands administered by the Bureau of Land Management (BLM) within an existing right-of-way (ROW)..

On May 26, 2019, the Proponent submitted its large generator interconnection request to WAPA. WAPA made a determination to prepare an Environmental Assessment (EA) for the Proposed Action in accordance with the Department of Energy (DOE) National Environmental Policy Act (NEPA) implementing procedures (10 Code of Federal Regulations [CFR] 1021). Actions that require an EA include those that entail the "establishment and implementation of contracts, policies, marketing and allocation plans related to electric power that involve (1) the interconnection of, or acquisition of power from, new generation resources that are equal to or less than 50 average megawatts." The Proposed Action fits this action classification because given the project's expected capacity factor, it is anticipated to produce energy over the course of a year equivalent to a project with an average power generation capacity of 50 MW or less.

As background, Proponent believes the Vidal Energy Project would help meet customer demand for clean, cost effective, renewable energy. The State of California has an aggressive Renewables Portfolio Standard (RPS) Program consistent with the timeline established by Senate Bill 100 (De León, also known as the "California Renewables Portfolio Standard Program: emissions of greenhouse gases") as approved by the California legislature and signed by Governor Brown in September 2018, which increases total renewable energy capacity to 60 percent in by 2030 from 50 percent currently and establishes a goal of 100 percent renewable energy capacity by 2045. Additionally, California's goal is to reduce greenhouse gas (GHG) emissions consistent with the timeline established in 2006 under California Assembly Bill 32, the Global Warming Solutions Act of 2006, which requires the California Air Resources Board to reduce statewide emissions of GHGs to at least the 1990 emissions level by 2020. This timeline was updated in 2016 under Senate Bill 32, which requires that statewide GHG emissions are reduced to at least 40 percent below the statewide GHG emissions limit by 2030. The Vidal Energy Project would help the State support the RPS Program to reach GHG emissions goals. The project was approved by San Bernardino County in December 2023, which completed an Environmental Impact Report (EIR) pursuant to the California Environmental Quality Act (CEQA) evaluating environmental impacts from the construction, operation, and decommissioning of the project. The EIR included an evaluation of interconnection facilities and work to be completed as part of WAPA's Proposed Action.

Since WAPA's Proposed Action and Vidal Energy Project are not located on federal public lands, they are not subject to the California Desert Conservation Area Plan of 1980 (as amended) or Desert Renewable Energy Conservation Plan in accordance with Title 43 CFR 1610.5-3. San Bernardino County has determined the Vidal Energy Project to be in conformance with the County's General Plan.

Although the Vidal Energy Project has been permitted by San Bernardino County and is entirely located on private lands, this EA is analyzing the impacts of the solar project alongside the effects of WAPA's Proposed Action as part of a comprehensive analysis.

All Figures, Tables, Glossary, and List of Abbreviations and Acronyms for this EA are located in Appendix A. The San Bernardino County Final EIR for the Vidal Energy Project is available online at www.sbcounty.gov/uploads/LUS/Desert/Vidal%20Energy%20Project_Public%20FEIR.pdf.

1.2 PURPOSE AND NEED

WAPA is the lead Federal agency in the NEPA, the National Historic Preservation Act (NHPA) Section 106, and the Endangered Species Act Section 7 processes. WAPA is a federal power-marketing agency within the U.S. DOE) that owns, operates, and maintains transmission lines and associated facilities in accordance with the Federal Power Act Sections 210 to 213, and its Open Access Transmission Service Tariff (OATT). WAPA's OATT is filed with the Federal Energy Regulatory Commission (FERC). WAPA's purpose and need is to respond to the Proponent's large generator interconnection request in accordance with its Large Generator Interconnection Procedures pursuant to its OATT and the Federal Power Act. WAPA is required to verify that such requests do not degrade system reliability and safety, or adversely affect service to existing customers. WAPA conducts feasibility, system, and facility studies to determine the transmission system upgrades or additions necessary to meet these requirements and accommodate the proposed interconnection. Under WAPA's OATT, interconnections are offered to all eligible customers on a first-come, first-served basis, subject to an environmental review under NEPA.

This EA, which is the responsibility of WAPA, is a concise public document that serves to:

- Provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact (FONSI);
- Aid WAPA's compliance with NEPA when no EIS is necessary; and
- Facilitate preparation of an EIS if one is necessary (40 CFR § 1508.9).

Based on the analysis contained in this EA, weighing how each alternative meets the purpose and need, WAPA will determine whether the proposed interconnection to the Vidal Solar Project requires an EIS, or if a FONSI can be prepared.

1.3 SCOPING

Public scoping for WAPA's Proposed Action was initiated on January 12, 2022. WAPA held a 30-day scoping period that ended on February 17, 2022. Scoping letters were mailed to interested parties, including adjacent landowners, to inform them of WAPA's Proposed Action and the Vidal Energy Project, notify them of the scoping period and request input on the proposed EA.

Additionally, in compliance with Section 106 of the National Historic Preservation Act, Letters were sent on September 2, 2021 to the following five Native American tribes: Chemehuevi Indian Tribe, Colorado

River Indian Tribes, Fort Mojave Indian Tribe, Quechan Tribe of the Fort Yuma Reservation, and Twenty-Nine Palms Band of Mission Indians.

WAPA accepted scoping comments via telephone, email, and U.S. mail. WAPA received a total of 12 submittals, some of which included multiple comments on environmental resources or topics for analysis. Submittals were received from 11 individuals, and one tribe (Colorado River Indian Tribes). In total, 15 specific comments were identified from the 12 submittals. Comments concerned a range of environmental and impact analysis issues. Topics addressed in these comments ranged from requesting more information regarding the project and project location, land being for sale, property value. Individual and business comments also expressed general support for and opposition to the Proposed Project Other topics raised in the comments included access to cultural resources, socioeconomics, and the NEPA process.. The Scoping Report is included in Appendix B.

The original project scope involved upgrading WAPA's communication equipment along the entire 52-mile HDR-BLY transmission line by replacing the overhead grounding wire with fiber optic cable. However, after further coordination, the Proponent determined that microwave communication would be used instead, eliminating the need for fiber optic upgrades between the Headgate Rock and Blythe Substations. As a result, the Project no longer included installing 52 miles of overhead fiber optic cable along the transmission line. Re-initiation of the public scoping process was deemed unnecessary since the Project footprint was reduced from the original scope. A new interconnection request submittal to WAPA was not required.

CHAPTER 2.0 – PROPOSED ACTION AND ALTERNATIVES

2.1 WAPA'S PROPOSED ACTION

WAPA's Proposed Action consists of responding to a large generator interconnection request and, if approved, entering into an interconnection agreement with the project Proponent. To interconnect the Vidal Energy Project to WAPA's transmission system, WAPA would have to construct, operate, maintain, and, ultimately, decommission, a new switchyard, up to five acres in area, and associated interconnection facilities to loop in the new switchyard to WAPA's existing HDR-BLY 161-kV transmission line (Figure 1 in Appendix A).

Underground fiber would be installed from the control building to the take-off structure. Optical Ground Wire (OPGW) would be installed from the take-off structure, along the new overhead approach spans, then coiled up at an existing structure. Additionally, an existing transmission structure may need to be replaced. All new facilities and work activities would take place within the 1,090-acre Vidal Energy Project area evaluated in San Bernardino County's EIR. The use of Project area in the EA refers to the 1,090 acres that includes WAPA's Proposed Action.

2.2 VIDAL ENERGY PROJECT FACILITIES

While Vidal Energy Project facilities are not part of WAPA's Proposed Action, they are described in this EA to aid the analysis. The Proponent proposes to build, operate, maintain, and decommission the Vidal Energy Project, shown on Figure 1 (Appendix A). The Vidal Energy Project includes the following components:

- Access roads
- Electrical infrastructure
- PV assembly and installation
- Substation construction
- Interconnection, and battery storage
- Stringing/pulling new circuit on existing infrastructure of generation interconnect (gen-tie) line
- Electrical and communication system installation
- PV commissioning

2.3 VIDAL ENERGY PROJECT LOCATION

The Vidal Energy Project site is located approximately 2.5 miles southeast of Vidal, an unincorporated area of San Bernardino County (County) that is located just east of U.S. Route 95, just north of the Riverside County border, and just west of the Colorado River Figure 1 in Appendix A). The Vidal Energy Project site encompasses 1,090 acres within 23 privately-owned parcels (and WAPA's Proposed Action would take place within the southeastern corner of the solar project footprint.

2.4 SCHEDULE

If a FONSI were to be issued by WAPA, the work described in the Proposed Action would be completed within 1-2 years following issuance of the FONSI.

Proponent anticipates a commercial operation date for the Vidal Energy Project in the second quarter of 2026. To meet this operation date, construction would begin no later than the fourth quarter of 2024 and is expected to take 10 to 14 months to complete, with an additional one to two months for testing. All construction would occur between the hours of 7:00 a.m. and 7:00 p.m. every day, except for Sunday and federal holidays.

2.5 PROJECT IMPLEMENTATION

This Section describes the construction, operations and maintenance (O&M), and decommissioning activities for WAPA's Proposed Action and Proponent's Vidal Energy Project. WAPA's Proposed Action would result in permanent disturbance of up to five acres for the new switchyard, all within the 1,090-acre Vidal Energy Project area assessed in San Bernardino County's Environmental Impact Report (County 2022a).

2.5.1 Proposed Action: WAPA Interconnection Construction, Operations and Maintenance, and Decommissioning

Construction

Construction Work Areas, Staging Areas, and Site Preparation

During construction, WAPA would permanently remove vegetation from up to five acres for the siting of the switchyard. All disturbance would occur within the footprint of the Vidal Energy Project.

WAPA would also need to perform enhancements at the Headgate Rock and Blythe substations, to the extent of upgrading the terminals where the transmission line terminates. In addition, to meet relay protection and control requirements, WAPA would install a new microwave path which would connect WAPA's new switchyard to the Vidal Energy Project substation. No new permanent ground disturbance would be associated with these activities. WAPA would replace insulators on HDR-BLY structure 25/2 to accommodate the interconnection, but replacement of insulators would not require any new ground-disturbing activities.

Construction Equipment and Workforce

WAPA estimates construction on the Proposed Action would require an eight-person workforce. WAPA would use the following construction equipment:

- 1 crane (8 hours/day for 5 days),
- 1 tractor/loader/backhoe (8 hours/day for 5 days),
- 1 pole delivery truck (8 hours or 1 day),
- 1 auger (8 hours/day for 5 days),
- 1 concrete truck (up to two trips),
- 1 grader (8 hours or 1 day),
- 1 water truck (8 hours/day for 15 days), and
- 1 bucket truck (8 hours or 1 day).

Staging Areas

Temporary staging areas will be contiguous with the staging areas for the proposed Vidal Energy Project.

Restoration

Following construction, temporary disturbance areas would be reclaimed in accordance with WAPA construction standards (WAPA 2021: Section 13.4, Landscape Preservation).

Operations and Maintenance

Routine Site Inspections and Maintenance

WAPA would incorporate the inspection of the new structures and associated improvements into its existing inspection program. WAPA conducts aerial inspections of its systems up to four times a year and ground inspections up to once a year. WAPA uses the inspection reports to prioritize any needed repairs. WAPA dispatches six- to nine-person crews to make repairs, as needed, to maintain the reliability and safety of the bulk electric system.

WAPA operates and monitors its electrical power systems 24 hours a day, 7 days a week via a fiber-optic, microwave, and radio network connected to its operations centers. If a sustained fault is detected, switches will automatically de-energize the affected equipment. WAPA would inspect the equipment and manually return it to operation only when safe.

During O&M, ongoing but temporary impacts to vegetation would occur as a result of ground-disturbing maintenance activities and vegetation clearing beneath the gen-tie line, around the three-pole transmission structures associated with the interconnection, and within the switchyard.

Decommissioning

WAPA would re-evaluate the need for the project-related transmission system upgrades if Proponent's facility is decommissioned after the Vidal Energy Project's operational life of up to 35 years. Materials that could not be recycled would be disposed of at an approved landfill. WAPA would restore disturbed areas to preconstruction conditions, where feasible.

Decommissioning would result in the same impacts as construction, and WAPA would reclaim the area associated with its interconnection switchyard. WAPA would store equipment or materials for decommissioning within Proponent's facility staging areas.

2.5.2 Vidal Energy Project Construction, Operations and Maintenance, and Decommissioning

Construction

The construction of the Vidal Energy Project would last approximately 10 to 14 months, occurring between the hours of 7:00 a.m. and 7:00 p.m. every day except Sundays and Federal holidays in accordance with County noise standards. Construction would be comparable to other renewable energy projects and can be divided into the following components:

- Access Roads,
- Electrical infrastructure,
- PV assembly and installation,
- Substation construction,
- Construction, interconnection, and battery storage,
- Stringing/pulling new circuit on existing infrastructure of gen-tie line,
- Electrical and communication system upgrades, and
- PV commissioning.

The various elements of the Vidal Energy Project would be constructed concurrently on the property. Construction is anticipated to commence in the fourth quarter of 2024. Onsite workforce is expected to average 220 workers per day with a peak of up to 495 workers.

Construction activities would be expected to include site preparation, fencing, mowing, excavation, grading, trenching/underground work, pile driving, system installation, testing, and cleanup. Site preparation and construction would be in accordance with all federal, state, and County zoning codes and requirements. Noise-generating construction activities would be limited to the construction hours noted above. All stationary equipment and machines with the potential to generate a substantial increase in noise or vibration levels would be located away from noise receptors to the extent practicable. The contractor would conduct construction activities in such a manner that the maximum noise levels at the affected buildings would not exceed established noise levels.

Operation and Maintenance

Upon completion of the construction and testing phases, the Vidal Energy Project would be operated during daylight hours. Up to 8 to 12 full-time and/or part-time staff would be required for operation, inspection, security, maintenance, and system monitoring purposes. Effective facility operations would be ensured by the following or similar activities:

- Liaison and remote monitoring,
- Administration and reporting,
- Semi-annual and annual services,
- Remote operations of inverters,
- Site security and management,
- Additional communication protocol,
- Repair and maintenance of solar facilities, substations, microwave tower, and other Vidal Energy Project facilities, and
- Periodic (up to twice per year) panel washing.

The PV arrays would produce electricity passively with minimal maintenance requirements. It is anticipated that panels would be washed up to two times a year, using the same water source used during the construction phase. The water source would likely be purchased from a local supplier using groundwater wells. This groundwater is suitable as a primary supply for panel washing but may not be suitable for potable use.

All new infrastructure would be fenced to help prevent access by the public. Gates would be installed at the roads entering the site. Limiting access to the site would be necessary both to ensure the safety of the public and to protect the equipment from potential theft and vandalism.

Project Decommissioning

The proposed Vidal Energy Project has an anticipated operational life of up to 35 years, after which Proponent may choose to update site technology and recommission, or to decommission the site and remove the systems and their components. All decommissioning and restoration activities would adhere to the requirements of the appropriate governing authorities and in accordance with all applicable federal, state, and County regulations.

2.6 NO ACTION ALTERNATIVE

The No Action Alternative provides a baseline against which the impacts of WAPA's Proposed Action can be compared. Under the No Action Alternative:

- WAPA would not approve the interconnection request, would not enter into an interconnection agreement, and would not implement Project-related transmission system upgrades, additions, or configurations; and
- Proponent would not develop the proposed Vidal Energy Project.

2.7 ALTERNATIVES CONSIDERED BUT NOT FURTHER EVALUATED

2.7.1 WAPA Proposed Action Alternatives

WAPA considered alternatives to the work described in the Proposed Action. WAPA considered installing new fiber optic line along the entire 52-mile HDR-BLY transmission line, which would have required numerous "pull sites" and additional ground disturbances both within and outside of the existing WAPA right-of-way. This would have resulted in potential additional impacts to sensitive vegetation and cultural resources. As such, WAPA's Proposed Action, which includes the installation of wireless communication infrastructure in lieu of new fiber optic lines, is anticipated to have fewer impacts to sensitive resources relative to the considered fiber optic alternative.

No other feasible alternatives have been identified; therefore, this Draft EA only considers WAPA's Proposed Action and the No Action Alternative.

2.7.2 Vidal Energy Project Alternatives Considered

Prior to submitting the interconnection request, Proponent considered multiple factors in the evaluation of potential project locations, including proximity to the HDR-BLY 161-kV transmission line, contiguous parcel(s) of private lands suitable for solar resource development and with low resource value, proximity to existing transportation and utility infrastructure, and proximity to developed areas to minimize materials transportation and workforce commute. Based on these and other development factors, Proponent acquired the proposed 1,090-acre site for development in December 2018.

San Bernardino County's Environmental Impact Report for the Vidal Energy Project evaluated three alternatives to the solar project as proposed by the Proponent: 1) a No Project Alternative, 2) a Reduced Acreage Alternative, and 3) an Offsite Alternative. Under the County's No Project Alternative, the Proponent would not construct a PV and BESS facility. Under the Reduced Acreage Alternative, the Vidal Energy Project site would be reduced by 177 acres and the Project's renewable energy generation capacity would be reduced by approximately 25 percent due to the installation of fewer PV panels. Under the Offsite Alternative, the Vidal Energy Project would be redesigned and relocated to a different site which is designated as a Development Focus Area (DFA) for renewable energy in the Desert Renewable Energy Conservation Plan (DRECP).

The County determined that the No Project Alternative would be considered the environmentally superior alternative, as it would avoid or reduce all of the potential impacts associated with construction and operation of the Vidal Energy Project. However, in accordance with CEQA Guidelines, a secondary alternative was chosen since the No Project Alternative was environmentally superior. The Reduced Acreage Alternative was conservatively considered as the environmentally superior alternative because it would incrementally reduce certain impacts due to the reduced footprint. However, the County determined that the Vidal Energy Project as proposed would not result in any significant and unavoidable impacts as defined by CEQA, so environmental impacts would be less-than-significant for all resource areas under either the project as proposed or the Reduced Acreage Alternative. Further, the County determined that the Reduced Acreage Alternative would attain most of the Project objectives, although it would not do so to the same extent as the Project. The County determined that the Reduced Acreage Alternative would leave underutilized land that has been planned for a solar energy facility. The Reduced Acreage Alternative would also contribute less to assisting California reach its renewable energy generation goals under SB 100. The County concluded that the Reduced Acreage and Offsite Alternatives would not significantly reduce solar project impacts.

2.8 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

WAPA developed a list of past, present, and reasonably foreseeable future actions that, when combined with impacts from WAPA's Proposed Action, would have a potential for impacts resulting in cumulative effects (Table 1 of Appendix A). . Since planned projects are not always carried to completion, the window for future reasonably foreseeable projects was projected only for those projects anticipated to have on-site impacts within 10 years.

CHAPTER 3.0 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This chapter describes the affected environment and the environmental impacts of WAPA's Proposed Action alongside impacts from the Vidal Energy Project, and No Action Alternative on the resources identified for analysis. The resource issues addressed in this EA were developed using comments received from the public, tribes, and agencies during internal and external scoping. Resource issues considered but dismissed from further analysis are described in Section 3.3 and Table 4 in Appendix A.

3.2 IMPACT ANALYSIS METHODOLOGY

The affected environment for each resource consists of the physical area that bounds the environmental, economic, or cultural resources of interest that would likely be impacted by the alternatives. The affected environment is described for each resource analyzed based on primary and secondary data sources, and for some resources, field observations. The affected environment also serves as the baseline from which to evaluate likely changes, or impacts resulting from WAPA's Proposed Action alongside the Vidal Energy Project, and the No Action Alternative.

Environmental consequences, or impacts, were defined as modifications to the affected environment brought about by implementing WAPA's Proposed Action and the Vidal Energy Project, or the No Action Alternative. Impacts can be beneficial or adverse, result from the action directly or indirectly, can be temporary, long-term, permanent, or cumulative in nature, and described in intensity as negligible, minor, moderate, and major. The impact terminology used throughout this analysis are defined in Table 3 Appendix A. The impact analysis was conducted on either a quantitative or qualitative basis, depending on available data or the nature of the impact, and the severity of impact is established in the context of the affected environment. A direct and indirect analysis area is provided for each resource in the sections below.

To determine cumulative effects that would result from implementing WAPA's Proposed Action and Vidal Energy Project or the No Action Alternative, WAPA reviewed the known past, present, and reasonably foreseeable future proposed projects in the vicinity of the Vidal Energy Project area (Table 1 in Appendix A), which includes the area within which WAPA's Proposed Action would occur, and considered their temporary and long-term incremental effects on the local environment. The geographic analysis area considered for cumulative effects varies by resource issue.

The impacts of implementing WAPA's Proposed Action and the Vidal Energy Project are presented in totality, followed by separate presentation of impacts specific to each element. It is assumed for this analysis that the Proponent would construct the Vidal Energy Project, including the battery storage system; therefore, total impacts would be representative of the full construction and operation of the Vidal Energy Project, in addition to WAPA's Proposed Action. Further, it is assumed that the Vidal Energy Project would be constructed during the same time period as construction activities associated with WAPA's Proposed Action, in order to provide a worse case estimate of combined impacts.

3.3 RESOURCES CONSIDERED BUT NOT FURTHER EVALUATED

Resource issues dismissed from further evaluation—either because they are not present in the area to be disturbed or because only negligible impacts would occur—are described briefly in Table 4 of Appendix A. Resources for which only negligible impacts would occur were evaluated in San Bernardino County's EIR, which evaluated impacts from both the Vidal Energy Project and WAPA's Proposed Action, and the EIR's findings are briefly summarized in Table 4 of Appendix A.

3.4 AIR QUALITY

This section analyzes impacts of WAPA's Proposed Action alongside the Vidal Energy Project, and the No Action Alternative on the air quality issues identified during scoping, including air pollutant emissions from vehicles and equipment, and fugitive dust. Air pollutants tend to disperse into the atmosphere, becoming more spread out as they travel away from a source of pollution, and therefore cannot be confined within defined boundaries, such as the boundary of the Project area or county lines. Because of the nature of air pollutants, the air quality analysis area for direct and indirect effects extends 5 kilometers (3.1 miles) in all directions beyond the Project boundaries.

3.4.1 Affected Environment

The Project site is located within the San Bernardino County portion of the Mojave Desert Air Basin (MDAB). The MDAB is an assemblage of mountain ranges interspersed with long broad valleys that often contain dry lakes. Many of the lower mountains which dot the vast terrain rise from 1,000 to 4,000 feet above the valley floor. Prevailing winds in the MDAB are out of the west and southwest. These prevailing winds are due to the proximity of the MDAB to coastal and central regions and the blocking nature of the Sierra Nevada Mountains to the north; air masses pushed onshore in southern California by differential heating are channeled through the MDAB. The MDAB is separated from the southern California coastal and central California valley regions by mountains (highest elevation approximately 10,000 feet), whose passes form the main channels for these air masses. The Mojave Desert is bordered in the southwest by the San Bernardino Mountains, separated from the San Gabriel Mountains by the Cajon Pass (4,200 feet). A lesser channel lies between the San Bernardino Mountains and the Little San Bernardino Mountains (the Morongo Valley).

Project Area

Pollutants of concern include ozone (O_3), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb). These pollutants are discussed below. In California, sulfates, vinyl chloride, hydrogen sulfide, and visibility-reducing particles are also regulated as criteria air pollutants. Results from local air quality monitoring stations are provided in Table 6 of Appendix A.

The Blythe Station is located approximately 33 miles south of the Project area at 495 W Murphy Street, Blythe, the Joshua Tree Station is located approximately 80 miles west of the Project area at Cottonwood Campground, the Niland Station is located approximately 84 miles southwest of the Project area at 7711 English Road, Niland, and the Palm Springs Station is located approximately 119 miles west of the Project area at 590 Racquet Club Avenue, Palm Springs. The monitoring data is presented in Table 6 of Appendix A and shows the most recent three years of monitoring data from the California Air Resources Board (CARB). Ozone was measured at the Blythe Station, NO_2 was measured at the Palm Springs Station, PM_{10} was measured at the Niland Station, and $PM_{2.5}$ was measured at the Joshua Tree Station.

<u>Ozone</u>

The State 1-hour and 8-hour concentration standards for ozone have not been exceeded over the past three years at the Blythe Station. The Federal 8-hour ozone standard has not been exceeded over the past three years at the Blythe Station.

Ozone is a secondary pollutant as it is not directly emitted. Ozone is the result of chemical reactions between other pollutants, most importantly hydrocarbons and NO_2, which occur only in the presence of bright sunlight. Pollutants emitted from upwind cities react during transport downwind to produce the oxidant concentrations experienced in the area. Many areas of Southern California contribute to the ozone levels experienced at this monitoring station, with the more significant areas being those directly upwind.

Nitrogen Dioxide

Most nitrogen dioxide, like ozone, is not directly emitted into the atmosphere but is formed by an atmospheric chemical reaction between nitric oxide (NO) and atmospheric oxygen. NO and NO_2 are collectively referred to as NOx and are major contributors to ozone formation. High concentrations of NO_2 can cause breathing difficulties and result in a brownish-red cast to the atmosphere with reduced visibility. There is some indication of a relationship between NO_2 and chronic pulmonary fibrosis. Some increase in bronchitis in children (2 and 3 years old) has also been observed at concentrations below 0.3 parts per million (ppm) by volume.

The Palm Springs Station did not record an exceedance of either the Federal or State 1-hour NO_2 standards for the last three years.

Particulate Matter

The State 24-hour concentration standard for PM_{10} has been exceeded between 7 and 66 days each year over the past three years at the Niland Station. Over the past three years the Federal 24-hour standard for PM_{10} has been exceeded between 1 and 10 days each year of the past three years at the Niland Station. The annual PM_{10} concentration at the Niland Station has exceeded the State standard for the past three years and has not exceeded the Federal standard for the past three years.

Over the past three years the 24-hour concentration standard for $PM_{2.5}$ has been exceeded between 0 and 2 days each year over the past three years at the Joshua Tree Station. No data was available for the annual $PM_{2.5}$ concentration standards at the Joshua Tree Station. There does not appear to be a noticeable trend for PM_{10} or $PM_{2.5}$ in either maximum particulate concentrations or days of exceedances in the area. Particulate levels in the area are due to natural sources, grading operations, and motor vehicles.

According to the EPA, some people are much more sensitive than others to breathing fine particles (PM_{10} and $PM_{2.5}$). People with influenza, chronic respiratory and cardiovascular diseases, and the elderly may suffer worsening illness and premature death due to breathing these fine particles. People with bronchitis can expect aggravated symptoms from breathing in fine particles. Children may experience decline in lung function due to breathing in PM_{10} and $PM_{2.5}$. Other groups considered sensitive are smokers and people who cannot breathe well through their noses. Exercising athletes are also considered sensitive because many breathe through their mouths during exercise.

Methodology and Assumptions

To determine air quality related impacts, the Vidal Energy Project was modeled using CalEEMod Version 2020.4.0. The CalEEMod program uses the EMFAC2017 computer program to calculate the emission rates specific for the Mojave Desert portion of San Bernardino County for employee, vendor, and haul truck vehicle trips and the OFFROAD2011 computer program to calculate emission rates for heavy equipment operations. EMFAC2017 and OFFROAD2011 are computer programs generated by CARB that calculates composite emission rates for vehicles. Emission rates are reported by the program in grams per trip and grams per mile or grams per running hour.

The Project characteristics in CalEEMod were set to a Project location of the Mojave Desert portion of San Bernardino County, a Climate Zone of 10, utility company of Southern California Edison, and an opening year of 2023 was utilized in this analysis. In addition, the EMFAC off-model adjustment factors for gasoline light duty vehicle to account for the SAFE Vehicle rule was selected in the CalEEMod model run.

3.4.2 Environmental Consequences

No Action

Under the No Action Alternative, WAPA's Proposed Action would not be developed and there would be no Project-related emissions; therefore, there would be no impacts to air quality in the analysis area.

WAPA's Proposed Action

The WAPA's Proposed Action would not result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is non-attainment under an applicable Federal or State ambient air quality standard. The Proposed Action involves the construction, operation, and decommissioning of an electrical switchyard and enhancements to two substations.

During construction, WAPA would create temporary air pollutant emissions from equipment exhaust, vehicle exhaust from travel to and from the Project site, and fugitive dust from soil disturbance. The highest criteria pollutant emissions produced by construction of WAPA's interconnection facilities are CO, NOx, and PM_{10}. The greatest contributor to these pollutants is the exhaust emissions from on-road construction equipment and worker commuting. Based on estimates from similar projects and review of San Bernardino County's annual emissions, WAPA would not exceed MDAMD pollutant emission thresholds as provided on Table 4.2-4 in the EIR and any increase would be temporary. As such, the projected emission estimate for each pollutant from the construction of the transmission interconnect is negligible in comparison to the county's annual emissions. Emissions from the construction period would be temporary and transient in nature and would have negligible impacts on air quality. Construction of the WAPA transmission interconnect is therefore not expected to cause an exceedance of the NAAQS.

During operations, WAPA would create emissions from inspection activities such as exhaust from on-road inspection vehicles and fugitive dust from travel on paved and unpaved roads. Emissions from operations and maintenance would not exceed MDAMD pollutant emission thresholds as shown on Table 4.2-5 in the EIR. Impact on air quality from operation of the transmission interconnect is negligible. Therefore, operation of the transmission interconnect would not cause an exceedance of the NAAQS.

During decommissioning, WAPA would create the same or less emissions as during construction; therefore, impacts to air quality from decommissioning the transmission interconnect would be less than or equal to the construction impacts.

Vidal Energy Project

<u>Construction Emissions</u>

Construction of the Vidal Energy Project would result in the temporary addition of pollutants to the local air basin caused by on-site sources (i.e., off-road construction equipment, soil disturbance, and volatile organic compounds (VOC) off-gassing) and off-site sources (i.e., on-road haul trucks, vendor trucks, and worker vehicle trips). Construction emissions can vary substantially from day to day, depending on the level of activity, the specific type of operation, and for dust, the prevailing weather conditions. Construction activities for the Vidal Energy Project are anticipated to start in the fourth quarter of 2024 and would last approximately 10 to 14 months. Annual construction-related criteria pollutant emissions from the Vidal Energy Project are shown below in Table 7 of Appendix A and the CalEEMod modeling results are provided in Appendix C.

Table 7 of Appendix A shows that none of the analyzed criteria pollutants emissions would exceed the MDAQMD annual thresholds during construction of the Vidal Energy Project. Therefore, impacts from air quality emissions from construction of the Vidal Energy Project would be short-term and minor..

Operation Emissions

The Vidal Energy Project involves development of a 160-MW photovoltaic solar energy facility and substation with an energy storage system. Operation of the Vidal Energy Project would generate VOC, NOx, CO, sulfur oxides (SOx), PM_{10}, and $PM_{2.5}$ emissions from mobile sources, including vehicle trips from maintenance vehicles. Pollutant emissions associated with long-term operations were quantified using CalEEMod modeling software. Because the Vidal Energy Project would have no major stationary emissions sources and a relatively low number of employees traveling to the facility site, operation of the Vidal Energy Project would result in substantially lower emissions than Project construction. The annual operations-related criteria pollutant emissions from the Vidal Energy Project are shown below in Table 8 of Appendix A and the CalEEMod results are provided in Appendix C.

Table 8 of Appendix A shows that none of the analyzed criteria pollutants emissions would exceed the MDAQMD annual emissions thresholds during operation of the Vidal Energy Project. Therefore, impacts from operations would be minor and no conservation measures are required.

Cumulative Impacts

The analysis area for cumulative effects was expanded to 15 miles around the Project area to account for a wider scope of regional air quality impacts that could cumulatively overlap with WAPA's Proposed Action. Cumulative effects to air quality from the actions and projects listed in Table 1 of Appendix A would occur as a result of emissions from Off-Highway Vehicle (OHV) and construction vehicle use. During construction or implementation, these projects would result in emissions from equipment exhaust, vehicle exhaust, and fugitive dust. Additionally, operations activities associated with transmission system maintenance would also result in emissions from the same sources (equipment, vehicles, and fugitive dust). These types of activities would be expected to have minimal emissions relative to existing county-level emissions inventory. Cumulatively, the long-term impact on air quality would be negligible.

3.5 BIOLOGICAL RESOURCES - VEGETATION

This section analyzes impacts of WAPA's Proposed Action alongside the Vidal Energy Project, and the No Action Alternative on the biological resource issues identified during scoping, including impacts to general vegetation and special status plants. Additional information is considered in the Biological Technical Study (Appendix D).

WAPA studied a 5-mile radius around the Project area for direct, indirect, and cumulative impacts to biological resources. This analysis area provides context for potential impacts and matches the occurrence records for special status species in the California Natural Diversity Database. Site visits documented habitat conditions within and in the vicinity of the Project area, and a description of conditions specific to the Project area is included in Appendix D. These conditions were used to determine the habitat present, and if habitats present could support listed threatened, endangered, and/or special status species.

3.5.1 Affected Environment

The affected environment for both the Vidal Energy Project and WAPA's Proposed Action, as it relates to biological resources, are contiguous; therefore, the affected environment section is discussed together.

Six vegetation communities, in addition to Bare Ground and Developed areas, are within the Vidal Energy Project and WAPA survey area: Blue Palo Verde – Ironwood Woodland, Creosote Bush Scrub, Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance, Disturbed Creosote Bush Scrub, Disturbed, and Tamarisk Thickets. The dominant vegetation community within the Project area is Creosote Bush Scrub, with two large washes dominated by Blue Palo Verde – Ironwood Woodland. Mapped vegetation communities within the Vidal Energy Project area are depicted in Table 9 of Appendix A.

Methodology and Assumptions

Literature Review

Prior to performing the reconnaissance-level survey and rare plant focused surveys, existing documentation relevant to the Project area was reviewed. The most recent records of the California Natural Diversity Database (CNDDB) managed by the CDFW (CDFW 2020), the USFWS database – Carlsbad office (USFWS 2020b), the National Wetlands Inventory (NWI; USFWS 2020a), the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (USDA 2020), and the California Native Plant Society's Electronic Inventory (CNPSEI) of Rare and Endangered Vascular Plants of California (CNPS 2020) were reviewed for the following quadrangles containing and surrounding the Project area: Vidal Junction, Parker NW, Vidal, and Parker SW California United States Geological Survey (USGS) 7.5-minute quadrangles. These databases contain records of reported occurrences of federally and state listed endangered or threatened species, proposed endangered or threatened species, California Species of Special Concern (SSC), or otherwise sensitive species or habitats that may occur within or in the immediate vicinity of the Project. Maps of sensitive species occurrences within 5 miles of the Project area is included as Figure 4 of Appendix A.

Preliminary Jurisdictional Delineation

A desktop assessment was conducted of available data prior to the biological reconnaissance survey in the field. Once completed, a preliminary delineation was performed within the Project area. A general assessment of waters potentially regulated by the U.S. Army Corps of Engineers (USACE), California Regional Water Quality Control Board (RWQCB), and California Department of Fish and Wildlife (CDFW) was conducted for the survey area.

Pursuant to Section 404 of the Clean Water Act, USACE regulates the discharge of dredged and/or fill material into waters of the United States. The State of California (State) regulates discharge of material into waters of the State pursuant to Section 401 of the Clean Water Act and the California Porter-Cologne Water Quality Control Act (California Water Code, Division 7, §13000 et seq.). Pursuant to Division 2, Chapter 6, Sections 1600-1602 of the California Fish and Wildlife Code, CDFW regulates all diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake, which supports fish or wildlife.

Field verification of all USFWS National Wetland Inventory (NWI) drainages (USFWS 2022a) were conducted for the survey area. Active channels and drainages were mapped by identifying clear evidence of hydrology including sediment deposition, shelving, drift deposits, and destruction of vegetation. These characteristics were used to inventory the active channels and drainages during the surveys. A Supplement Delineation was conducted in December 2023 (Appendix E) that verified the original jurisdictional delineation.

Reconnaissance-level survey

A reconnaissance-level survey was conducted within the Project area to identify the potential for occurrence of sensitive species, vegetation communities, and habitats that could support sensitive wildlife species. The survey was conducted on foot throughout the Vidal Energy Project area between 0630 and 1620 hours on April 23, 2020.. All plant and wildlife species and vegetation communities observed were recorded.

Weather conditions during the survey included temperatures ranging from 80 to 101 degrees Fahrenheit, with no cloud cover and no precipitation. Wind speeds ranged between 0 and 10 miles per hour (mph) Photographs of the Project area were recorded to document existing conditions (Appendix D).

All plant species and vegetation communities observed within the Project area during the reconnaissance-level surveys were recorded. Vegetation communities within the Project area were then identified, qualitatively described, and mapped onto an aerial photograph. The vegetation communities are described following A Manual of California Vegetation, 2nd edition (Sawyer et al. 2009). Plant nomenclature follows that of The Jepson Manual, Second Edition (Baldwin et al. 2012).

Focused plant survey

A focused plant survey was conducted within the Project Area on May 4 through May 8, 2020 to identify and record occurrences of any of the seven rare plants identified in literature searches as having potential to occur on or within 5 miles of the Vidal Energy Project, in advance of construction. The survey was conducted in accordance with the Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened and Endangered Plants and Natural Communities (CDFW 2000), and within the blooming period for four of the seven sensitive plant species identified as having potential to occur on or within the Project vicinity including chaparral sand-verbena (*Abronia villosa*), Alverson's foxtail cactus (*Coryphantha vivipara alversonii*), glandular ditaxis (*Ditaxis claryana*), Abrams' spurge (*Euphorbia abramsiana*), winged cryptantha (*Cryptantha holoptera)*, Torrey's box-thorn(*Lycium torreyi*), and Hall's tetracoccu *(Tetracoccus hallii*)s. The survey was conducted outside the bloom period for three of the seven species, glandular ditaxis (typically blooms October through March), Abrams' spurge (typically blooms September through November), and winged cryptantha (typically blooms from March through April); for these species, surveyors focused on identifying vegetative characteristics and any floral remains. Although winged cryptantha blooms from March through April, this species, even if not in bloom, would have been conspicuous in early May. Furthermore, no Johnstonella or unidentified Cryptantha species were observed during the focused plant survey, and therefore this species is considered unlikely to occur Vidal Energy Project area. It should be noted that one occurrence of saguaro cactus (*Carnegiea gigantea*) was observed; however, it was concluded that the observance was not natural as it was located near a residence to the north of the Project site.

Weather conditions during the five-day survey included temperatures ranging from 62 to 107 degrees Fahrenheit, wind speeds ranging from 0 to 3 mph, 0 to 60 percent cloud cover, and no precipitation.

Vegetation Communities

Proposed Action and the Vidal Energy Project

Six vegetation communities in addition to Bare Ground and Developed areas were mapped within the Project area: Blue Palo Verde – Ironwood Woodland, Creosote Bush Scrub, Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance, Disturbed Creosote Bush Scrub, Disturbed, and Tamarisk Thickets. The dominant vegetation community within the Project area is Creosote Bush Scrub, with two large washes dominated by Blue Palo Verde – Ironwood Woodland. The following summarizes the principal characteristics of the vegetation communities observed within the Project area during the biological reconnaissance survey. Vegetation communities were mapped in the field and are included in Figure 2 in Appendix A.

Table 9 in Appendix A summarizes the vegetation communities within the Project area and the acreage of each community.

Blue Palo Verde – Ironwood Woodland

Blue Palo Verde - Ironwood Woodland as described by Sawyer et al. (2009), is dominated by blue palo verde (Parkinsonia florida), ironwood, or smoke tree (Psorothamnus spinosa) less than 60 feet in height. The tree canopy is continuous to open where shrubs are common, and seasonal annuals are present in the herbaceous layer. Blue Palo Verde – Ironwood Woodland habitat occurs along desert arroyo margins, seasonal watercourses and washes, bottomlands, middle and upper bajadas and alluvial fans, and lower slopes that are occasionally flooded or saturated at elevations between 30 and 1,600 feet above mean sea level (amsl). Blue Palo Verde – Ironwood Woodland is consistent with Desert Dry Wash Woodland as described by Holland (1986).

Blue Palo Verde – Ironwood Woodland is present within the Project area along two large washes that generally flow from west to east in the northern and central portions of the Project area. In addition, this habitat is associated with a number of smaller drainages along the southern border of the Project area. Plant species found in the Project area are typical of this vegetation community include white bur-sage (Ambrosia dumosa), cheesebush (*Ambrosia salsola* var. *salsola*), sweetbush (*Bebbia juncea* var. *aspera*), silver cholla (*Cylindropuntia echinocarpa*), brittlebush (*Encelia farinosa*), desert lavender (*Condea emoryi*), creosote bush, Anderson's wolfberry (*Lycium andersonii*), and cat's claw (*Senegalia greggii*). There are 81.44 acres of Blue Palo Verde – Ironwood Woodland in the Project area.

Creosote Bush Scrub

Creosote Bush Scrub as described by Sawyer et al. (2009) consists of widely spaced shrubs less than 10 feet in height dominated by creosote bush or co-dominant with white bur-sage, cheesebush, and/or brittlebush, frequently with bare ground between shrubs. Growth occurs from winter to early spring if rainfall is sufficient. Ephemeral herbs typically flower from late February to March. Creosote Bush Scrub can be found on alluvial fans, bajadas, upland slopes, and minor intermittent washes with well-drained secondary soils and sometimes desert pavement at elevations between 245 and 4,256 feet amsl. Creosote Bush Scrub is consistent with the Sonoran Creosote Bush Scrub and Mojave Creosote Bush Scrub communities as described by Holland (1986).

Creosote Bush Scrub habitat is located in the northeastern portion of the Project area that was previously used for dry-land and irrigated farming and contains a high amount of non-native species; however, the level of disturbance and non-native species cover does not rise to the level of being considered a disturbed form of this habitat. Plant species found within the Project area that are typical of this vegetation community include: cheesebush, sweetbush, pencil cholla (*Cylindropuntia ramosissima*), silky dalea (*Dalea mollissima*), barrel cactus (*Echinocactus polycephalus*), brittlebush, and bush encelia (*Encelia frutescens*). Emergent trees or tall shrubs may be present at low cover. There are 913.57 acres of Creosote Bush Scrub within the Project area.

A disturbed form of this habitat is located in proximity to two now-abandoned residential areas. This vegetation type has been disturbed by human activities such as off-road vehicle use, the introduction of non-native species, past development, compaction, and/or littering; and it is considered of lower quality than the Creosote Bush Scrub habitat described above. Non-native, weedy species found in these areas include Saharan mustard, foxtail brome (*Bromus rubens*), and Mediterranean schismus (*Schismus barbatus*). A total of 30.75 acres of Disturbed Creosote Bush Scrub is located within the Project area.

Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance

The Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance as described by Sawyer et al. (2009) can be found in broad alluvial fans and lower slopes in the desert and are associated with areas of desert pavement. The ground surface is sandy and gravelly mixed alluvium, with various rocks and gravel along with interstitial fine sediments. The herb layer is sparse to intermittent, and the non-vascular (cryptogamic crust) layer is sparse to intermittent. The shrub layer is often sparse or non-existent. Rigid spineflower (*Chorizanthe rigida*) and/or hairy desert sunflower (*Geraea canescens*) is characteristically present in the herbaceous layer. Rigid Spineflower – Hairy Desert Sunflower Desert

Pavement Sparsely Vegetated Alliance is consistent with Sonoran Desert Scrub or Mojave Creosote Bush Scrub communities as described by Holland (1986).

Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance is present within the Project primarily along the western edge of the Project area and within 0.5 mile of Highway 95. Plant species found on the Project site typical of this vegetation community include rigid spineflower with lesser amounts of trailing windmills (*Allionia incarnata*), Saharan mustard, foxtail brome, primrose (*Camissonia* spp.), pincushion (*Chaenactis* spp.), spurge (*Euphorbia* spp.), brittle spineflower (*Chorizanthe brevicornu*), cryptantha (*Cryptantha* spp.), and common Mediterranean grass (*Schismus* spp.). Shrub cover is very sparse, if present at all, and when present includes bur-sage, desert holly (*Atriplex hymenelytra*), silver cholla, brittlebush sunflower, white rhatany (*Krameria grayi*), creosote, beavertail cactus (*Opuntia basilaris*), and/or honeysweet (*Tidestromia suffruticosa*). There are 20.26 acres of this vegetation type located within the Project area.

Tamarisk Thickets

Tamarisk Thickets as described by Sawyer et al. (2009) can be located in a variety of riparian and upland areas and is generally dominated by any number of tamarisk species. Tamarisk are known to be strongly phreatophytic (deep rooted) and they often supplant native vegetation following a major disturbance. Soil is usually sandy or gravelly in braided washes or intermittent streams, often in areas where high evaporation increases the stream's salinity. Tamarisk Thickets is consistent with the Tamarisk Scrub community described by Holland (1986).

Tamarisk Scrub is present as a windbreak along the northern and western edges of a former agricultural area in the central portion of the Project area. Plant species found within the Project area typical of this vegetation community include a nearly monotypic makeup dominated by Mediterranean tamarisk (*Tamarix ramosissima*) with scattered annual species including schismus, Sahara mustard, and cryptantha along the periphery of the habitat. There are 1.53 acres of Tamarisk Thickets within the Project area.

Disturbed

Areas classified as Disturbed habitat tend to be dominated by pioneering herbaceous species that readily colonize disturbed ground and that are typically found in temporary, often frequently disturbed habitats (Barbour et al. 1999) and that have a high percentage of non-native weedy species (i.e., greater than 25 percent of the species cover). The soils in Disturbed areas are typically characterized as heavily compacted or frequently disturbed. The vegetation in these areas is adapted to living in compacted soils where water does not readily penetrate the soil. Plant species found within the Project area typical of this vegetation community include non-native annual species such as Arabian schismus, Mediterranean schismus, sand peppergrass (*Lepidium lasiocarpum* subsp. *lasiocarpum*), and Sahara mustard. This habitat is associated with areas along the extreme western edge of the Project area along Highway 95 as well as within a previous agricultural area within the central portions of the Project area. There are 24.95 acres of Disturbed habitat within the Project area.

Bare Ground

Bare Ground areas are devoid of vegetation. These areas are generally associated with the existing dirt access roads located throughout the Project area. A total of 16.61 acres of Bare Ground are located within the Vegetation Survey Area.

Developed

Developed areas are areas that have been altered by humans and now display man-made structures such as houses, paved roads, buildings, parks, and other maintained areas.

Developed areas are present within the cProject area and are associated with existing residential structures located along the western edge and eastern-central portions of the Project area. There are 1.79 acres of Developed areas within the Project area.

Special Status Species

Several factors are taken into consideration when determining the significance of biological resources (wildlife, plants, habitats, etc.). The factors include the listing status of a species (federal, state) which identifies the weighted legal protection afforded a species, whether critical habitat for a species is present, the regional scarcity of a species, and other legal protections in place for species not formally listed but considered unique or rare, such as those species afforded protection under CEQA or considered species of concern by the CDFW. Plant species in California are also ranked by the California Native Plant Society according to a hierarchy of rarity or threat of extinction. This combined evaluation of factors determines the potential significance of impacts to a species/population. The complete list of abbreviations associated with species occurrence/ranking is described below.

In addition, Table 10 of Appendix A provides the criteria used to determine the likelihood of special status species to potentially occur within the Survey Area and proposed Project site.

The following information is a list of abbreviations used to help determine the significance of biological sensitive resources potentially occurring on the Project area.

<u>California Rare Plant Rank (CRPR)</u>

List 1A Plants presumed extinct in California.
List 1B Plants rare and endangered in California and throughout their range.
List 2 Plants rare, threatened, or endangered in California but more common elsewhere in their range.
List 3 Plants about which we need more information; a review list.
List 4 Plants of limited distribution; a watch list.

<u>CRPR Extensions</u>

0.1 Seriously endangered in California (greater than 80 percent of occurrences threatened/high degree and immediacy of threat).
0.2 Fairly endangered in California (20-80 percent occurrences threatened).
0.3 Not very endangered in California (less than 20 percent of occurrences threatened).

Sensitive Plants

<u>Proposed Action and the Vidal Energy Project</u>

Current database searches (CDFW 2020; CNPS 2020) resulted in a list of seven sensitive plant species documented to occur within 5 miles of the Project area (CNDDB and USFWS data; Figure 3 in Appendix **A**) and within the quadrangles (California Native Plant Society Electronic Inventory (CNPSEI) data) containing and surrounding the Project area. Factors used to determine the potential for occurrence included the quality of habitat, level of anthropogenic influence, elevation, and soils present. In addition, the location of prior CNDDB records of occurrence were used as additional data, but as the CNDDB is a positive-sighting database, these data were used only in support of the analysis from the previously identified factors. Of the seven special status plant species evaluated for their potential occurrence in the c Project area, no species had a High potential to occur, two species had a Moderate potential to occur, four species had a Low potential to occur, and one species was considered to be Absent from the site. None of the four species evaluated as having potential to occur in the Project area, and that would have been blooming and conspicuous at the time of the focused plant survey, were observed during the survey and are therefore considered Absent in the Project area. One additional species, Utah vine milkweed (*Funastrum utahense*; CRPR 4.2), was not identified in the literature searches but was observed in the original Project area during the focused plant survey; however, it is located within the Survey Area 500-foot buffer. None of the sensitive plant species with potential to occur are federally or state listed species.

These sensitive plant species, their current status, and potential for occurrence are summarized below. A complete table of sensitive plant species potentially occurring in the Project area including bloom periods and habitat requirements is included as Appendix D. A list of all plant species observed during the reconnaissance-level and focused plant survey is provided in Appendix D.

The following four species are considered Absent from the coProject area, as they were not observed when the plants would have been in bloom and conspicuous within the Project area during surveys:

- Alverson's foxtail cactus – CRPR List 4.3,
- chaparral sand-verbena – CRPR List 1B.1,
- Hall's tetracoccus – CRPR List 4.3, and
- Torrey's box-thorn – CRPR List 4.2.

The following species was observed within the original Project area during the focused plant survey; however, after Project design revisions, it is now located within the Survey Area 500-foot buffer and is considered Absent in the Project area:

- Utah vine milkweed – CRPR 4.2

The following species has a Low potential to occur in the Project area, as the environmental conditions required by the species is of low quality. Furthermore, while this species blooms from March through April, this species, even if not in bloom, would have been conspicuous in early May and no Johnstonella species or unidentified Cryptantha species were identified; therefore, this species has a Low potential to occur:

- winged cryptantha – CRPR List 4.3

The following two plant species have a Moderate potential to occur in the Project area, as the environmental conditions needed for the species exist marginally:

- Abrams' spurge – CRPR List 2B.2 and
- glandular ditaxis – CRPR List 2B.2

All sensitive plant species having a Moderate or higher potential to occur in the Project area are described below.

Abrams' spurge is a prostrate annual herb in the Euphorbiaceae family that occurs in sandy flats of Mojavean Desert scrub and Sonoran Desert scrub. This species blooms from September to November. It can be found at elevations between -15 and 4,300 feet amsl. Moderate to high-quality Creosote Bush Scrub is present, and this species has been recorded within 3 miles of the Project area.

Glandular ditaxis is a perennial herb in the Euphorbiaceae family that occurs in sandy soils of Mojavean Desert scrub, Sonoran Desert scrub, and Creosote Bush Scrub. This species typically blooms from October to March. It can be found at elevations between 0 and 1,525 feet amsl. Moderate to high-quality Creosote Bush Scrub is present in the Project area, and this species has been recorded within 3 miles of the site.

General Plants

Proposed Action and the Vidal Energy Project

A total of 136 plant species were observed during the reconnaissance-level survey and the focused plant survey. Plant species observed during the survey efforts were representative of the existing site conditions. A solitary Utah vine milkweed (CRPR 4.2) was observed in the northwestern portion of the Project area during the focused plant survey. No other sensitive plant species or sensitive vegetation communities were observed during the survey efforts. A complete list of plants observed is provided in Appendix D.

Delineation Results

The Survey Area contains primarily alluvial fan systems consisting of braided channels, individual drainage channels, erosional channels, and man-made berms. Drainages found within the Survey Area are potentially subject to jurisdiction by the CDFW, and RWQCB. As discussed in the Supplemental Delineation (Appendix E), due to the arid environmental conditions of the Survey Area, where most rain events are flashy in nature, all drainages observed were ephemeral and are presumed to be exempt from potential federal jurisdiction. The active channels throughout the Survey Area consisted of alluvial sediment comprised of sand and gravel deposits. The active channels and drainages mapped exhibited clear evidence of hydrology including sediment deposition, shelving, drift deposits, and destruction of vegetation. These characteristics were used to inventory the active channels and drainages during the surveys.

The widths of the Ordinary High Water Mark (OHWM) and bank features were similar due to the erosion of banks in a vertical formation; therefore, the OHWM measurements were measured as the same width as the banks throughout the Survey Area.

3.5.2 Environmental Consequences

No Action

Selection of the No Action Alternative, as described in Section 2.6, would not result in implementation of WAPA's Proposed Action; potential effect to vegetation resources would not occur.

WAPA's Proposed Action

Under WAPA's Proposed Action, construction of a new switchyard would cause approximately 5 acres of permanent ground disturbance. The only vegetation community impacted would be Creosote Bush Scrub; no sensitive plant species or communities would be impacted by WAPA's Proposed Action.

Temporary impacts in areas adjacent to the new switchyard may include trimming or crushing of vegetation. Areas of temporary disturbance would be reclaimed by regrading so that surfaces drain naturally, blend with the natural terrain, and are left in a condition that would facilitate natural revegetation. However, desert ecosystems can take from 70 to over 200 years to recover from disturbance, so these reclaimed areas will not provide pre-construction habitat values within the timeframe of this analysis (Abella 2010).

Ground-disturbing activities can create conditions that would increase the potential for introduction and/or establishment of nonnative plants. As part of the Proposed Action, WAPA would comply with all Federal, State, and local weed control regulations, and implement construction standards (WAPA 2021: Section 13.6, Weed Control Standards) such as maintaining vehicles and equipment free of mud and vegetation debris when transporting between sites and using only certified weed-free mulches and native seed mixes for reclamation.

Activities associated with O&M would be infrequent and may cause limited ground disturbance or vegetation removal. Decommissioning would be confined to areas already disturbed during construction and would not lead to any additional ground disturbance. A detailed description of the WAPA facilities and all construction, O&M, and decommissioning activities is provided in Section 2.1.

Vidal Energy Project

Vegetation Communities

Six vegetation communities are present within the proposed Project area: Blue Palo Verde – Ironwood Woodland, Creosote Bush Scrub, Disturbed Creosote Bush Scrub, Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance, Tamarisk Thickets, and Disturbed. Bare ground and developed areas were also identified within the Project area. Temporary impacts to native vegetation communities are assumed to be due to crushing and not full removal of the plants. If full uprooting of plants is necessary (e.g., due to grading or recontouring) these impacts will be considered permanent and vegetation impacts will be updated accordingly. Temporary and permanent impacts to each vegetation community within the Project area are provided in Table 11 in Appendix A. A map showing vegetation communities in the Project boundary is provided as Figure 2 in Appendix A.

Blue Palo Verde – Ironwood Woodland is generally of moderate to high quality within the major washes of Drainage 4 and Drainage System 5; however, exotic plant species do occur throughout this community. Removal of exotic plant species within this community may be considered suitable on-site, but out-of-kind conservation. Based on current Project design, approximately 1.29 acres of temporary impacts and 1.68 acres of permanent impacts to this community are anticipated.

Creosote Bush Scrub is generally of moderate to high quality with low plant density overall. Large areas of bare ground separate individual creosote bush shrubs with only limited plant species being located within the bare ground matrix of the habitat. In other areas Creosote Bush Scrub habitat is denser and more diverse. Areas with disturbed creosote scrub have high amounts of non-native, weedy species including Saharan mustard, foxtail brome, and Mediterranean schismus and are considered low quality habitat. Based on current Project design, approximately 563.64 acres of temporary impacts and 325.62 acres of permanent impacts to Creosote Bush Scrub habitat and approximately 18.63 acres of temporary impacts and 8.92 acres of permanent impacts to Disturbed Creosote Bush Scrub habitat are anticipated.

Rigid Spineflower – Hairy Desert Sunflower Sparsely Vegetated Desert Pavement Alliance habitat areas are associated with locations that appear to experience ephemeral water infiltration and support a higher level of herbaceous species than surrounding areas. A fair amount of invasive and non-native species are present in this habitat and it is therefore considered moderate quality habitat. Invasive Sahara mustard populations can be addressed through targeted hand weeding efforts between when the plant bolts and when it goes to seed. Based on current Project design, approximately 11.96 acres of temporary impacts and 8.30 acres of permanent impacts to this community are anticipated.

Tamarisk Thickets is a non-native community composed primarily of invasive tamarisk species and aside from being potential nesting habitat for some opportunistic bird species, this community does not contribute positively to the overall health and quality of the environment. Tamarisk competes for water in drainage features and changes the natural chemistry of the soil (salt-saturated) that inhibits the survival of native species. The presence of tamarisk decreases the habitat value of area. Enhancement by removal of this species within the Project area will provide higher biological value and increase the native species composition. Based on current Project design, approximately 1.10 acres of temporary impacts and 0.43 acres of permanent impacts to this community are anticipated.

Disturbed habitat is also present in the Project area. The soils in Disturbed areas are typically characterized as heavily compacted or frequently disturbed. The vegetation in these areas is adapted to living in compact soils where water does not readily penetrate the soil. Plant species found within the Project area typical of this vegetation community include non-native annual species such as Arabian schismus (*Schismus arabicus*), Mediterranean schismus, sand peppergrass, and Sahara mustard. Care should be taken when working in disturbed habitats or other weedy areas so as not to spread weeds off site to adjacent native habitats. The presence of Disturbed habitats decreases the habitat value of area. Enhancement by removal of exotic species within the Project area will provide higher biological value and increase the native species composition. Based on current Vidal Energy Project design, approximately 14.73 acres of temporary impacts and 10.20 acres of permanent impacts to this community are anticipated.

None of the vegetation communities present in the Project area are considered sensitive vegetation communities; however, several desert shrub and tree species are protected under the San Bernardino County Development Code Desert Native Plant Protection Section 88.01.060. Tree and shrub species present on site that may require a permit for removal include:

- Dalea spinosa (smoke tree), all species of the genus Prosopis (mesquites) with stems greater than 2 inches in diameter or greater than 6 feet in height.
- Creosote Rings, 10 feet or greater in diameter.
- Any part of any of the following species, whether living or dead: Olneya tesota (desert ironwood), all species of the genus Prosopis (mesquites), all species of the genus Cercidium (synonym: Parkinsonia, palo verde).

The majority of individuals of these species exist within the large wash systems of Drainage 5 within Blue Palo Verde – Ironwood Woodland habitat, and Creosote Bush Scrub within Drainage 6 which will be largely avoided by the current Vidal Energy Project design. It is recommended that species that may require a County permit for removal be assessed during pre-construction surveys to determine how many will require conservation prior to the start of construction.

<u>Sensitive Plants</u>

The results of the focused plant survey were negative for the seven rare plant species identified in the literature search as having potential to occur within the Project area; however, Utah vine milkweed, a species that was not identified in the literature search was observed in the Survey Area buffer but was not identified in the Project area during the 2020 effort. The focused plant survey was conducted outside of the blooming period for three of the seven species, glandular ditaxis (typically blooms October through March), Abrams' spurge (typically blooms September through November), and winged cryptantha (typically blooms from March through April). For these species, surveyors focused on identifying vegetative characteristics and any floral remains; however, it is unlikely that any vegetative or floral remains of Abrams' spurge would have been observed due to its late-season bloom period. Due to drought in the spring/summer of 2020, this species is not expected to emerge in fall of 2020. This species was not observed during visits to known populations (reference sites) in the area in October of 2020. Although winged cryptantha blooms from March through April, this species, even if not in bloom, would have been conspicuous in early May. Furthermore, no Johnstonella or unidentified Cryptantha species were observed during the focused plant survey, and therefore this species is considered to have Low potential to occur in the Project area. As winged cryptantha is a CRPR 4 species, and has Low potential to occur, no focused survey during its bloom period will be conducted for this species.

Cumulative Impacts

As discussed above in Section 3.5.1, the analysis area has been affected by past and current land use practices, some of which have resulted in the loss or degradation of vegetation and habitat and contributed to current conditions. When considering other reasonably foreseeable projects within the analysis area (see Table 1 of Appendix A), the majority are limited in new ground disturbance, are located within existing facilities, or are not expected to result in adverse impacts to biological resources that would contribute to an adverse cumulative impact. The majority of the projects are on federal lands and would be subject to compliance with federal laws including, but not limited to, the NEPA, Endangered Species Act (FESA), and BLM management guidance for special status species, which would reduce the potential for adverse cumulative impacts.

Reasonably foreseeable future actions Table 1 of Appendix A – No. 10 Routine Transmission Inspections; No. 11 Past/Present Dispersed Recreation OHV Travel on BLM Lands) would likely result in the loss and/or degradation of vegetation and habitat within the analysis area. Routine transmission line inspections and OHV activities could result in temporary disturbance to the same vegetation communities disturbed by WAPA's Proposed Action; however, both would likely use established roads and would not involve vegetation removal. As the cumulative area of disturbance for both projects are relatively small when considered in terms of the expanses of similar habitat available adjacent to the Project area, the projects would not result in long-term adverse cumulative impacts to vegetation communities or populations of special status species.

3.6 BIOLOGICAL RESOURCES – WILDLIFE

This section analyzes impacts of WAPA's Proposed Action alongside the Vidal Energy Project, and the No Action Alternative on the biological resource issues identified during scoping, including impacts to wildlife. Additional information is considered in the Biological Technical Study (Appendix D). WAPA completed Section 7 of the Endangered Species Act consultation with the USFWS for the Proposed Action.

3.6.1 Affected Environment

The affected environment for both the Vidal Energy Project and the WAPA Proposed Action, as it relates to biological resources, are contiguous; therefore, the affected environment section is discussed together.

Methodology and Assumptions

Literature Review

Prior to performing the reconnaissance-level survey; jurisdictional waters delineation; and desert tortoise (*Gopherus agassizii*), burrowing owl (*Athene cunicularia*) surveys, existing documentation relevant to the Project area was reviewed. The most recent records of the California Natural Diversity Database (CNDDB) managed by the CDFW (CDFW 2020), the USFWS database – Carlsbad office (USFWS 2020b), the National Wetlands Inventory (NWI; USFWS 2020a), the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (USDA 2020), and the California Native Plant Society's Electronic Inventory (CNPSEI) of Rare and Endangered Vascular Plants of California (CNPS 2020) were reviewed for the following quadrangles containing and surrounding the Project area: Vidal Junction, Parker NW, Vidal, and Parker SW California United States Geological Survey (USGS) 7.5-minute quadrangles. These databases contain records of reported occurrences of federally and state listed endangered or threatened species, proposed endangered or threatened species, California Species of Special Concern (SSC), or otherwise sensitive species or habitats that may occur within or in the immediate vicinity of the Project. A map of sensitive species occurrences within 5 miles is included as Figure 3 of Appendix A.

Reconnaissance-level survey

A reconnaissance-level survey was conducted within the Project area to identify the potential for occurrence of sensitive species, vegetation communities, and habitats that could support sensitive wildlife species. The survey was conducted on foot throughout the Project area between 0630 and 1620 hours on April 23, 2020 and between 0600 and 1700 hours May 2 through May 5, 2022. All plant and wildlife species and vegetation communities observed within the Project area were recorded.

Desert Tortoise and Burrowing Owl Surveys

Desert tortoise and burrowing owl surveys were conducted over a 5-day period from May 11 through 15, 2020, in accordance with the USFWS Mojave Desert Tortoise Pre-project Survey Protocol (USFWS 2018), the CDFW Staff Report on Burrowing Owl Mitigation (CDFW 2012). The desert tortoise survey and one round of burrowing owl surveys were conducted concurrently within the approximately 1,090-acre Project area. The burrowing owl survey included a 500-foot survey buffer around the Project area (where feasible), in accordance with CDFW protocol. Buffer areas not accessible for surveys on foot included a private landowner (APN: 064709108) along the northern boundary of the Project, and Colorado River Indian Reservation Lands (APN: 064706107) located at the eastern boundary of the Project.

These surveys were required to determine if desert tortoises and burrowing owls are present within the Project area and, if present, estimate the amount of incidental take of these species. Based on the minimum survey effort recommended in each Recovery Unit, the Project falls within the Colorado Desert and required a full coverage survey: 10-meter-wide belt transects for full coverage. The surveys were conducted when desert tortoises are most active: April through May and/or September through October when temperatures are below 95 degrees Fahrenheit.

Details were recorded on habitat conditions, number of each species identified, and abundance (if present); estimated number of tortoises (greater than or equal to 180-millimeter midline carapace length) within the action area (USFWS protocol takes into account the fact that not all tortoises within the action area are observed by the surveyors). All sign of desert tortoise (including live tortoises, shell, bones, scutes, limbs, scat, burrows, pallets, tracks, eggshell fragments, courtship rings, drinking sites, and mineral licks) and burrowing owl (including live burrowing owls, burrows, whitewash, prey remains, pellets, scratch marks, and feathers) were recorded on data sheets and with GPS units.

Weather conditions during the five-day survey included temperatures ranging from 66 to 102 degrees Fahrenheit, wind speeds ranging from 0 to 10 mph, 0 to 20 percent cloud cover, and no precipitation.

Special Status Species

Several factors are taken into consideration when determining the significance of biological resources (wildlife, plants, habitats, etc.). The factors include the listing status of a species (federal, state) which identifies the weighted legal protection afforded a species, whether critical habitat for a species is present, the regional scarcity of a species, and other legal protections in place for species not formally listed but considered unique or rare, such as those species afforded protection under CEQA or considered species of concern by the CDFW. Plant species in California are also ranked by the California Native Plant Society according to a hierarchy of rarity or threat of extinction. This combined evaluation of factors determines the potential significance of impacts to a species/population. The complete list of abbreviations associated with species occurrence/ranking is described below.

Table 10 in Appendix A provides the criteria used to determine the likelihood of special status species to potentially occur within the Survey Area and Project area.

The following information is a list of abbreviations used to help determine the significance of biological sensitive resources potentially occurring on the proposed Project area.

Federal

FE	Federally listed; Endangered
FT	Federally listed; Threatened
FC	Federal Candidate for listing

State

ST	State listed; Threatened
SE	State listed; Endangered
RARE	State-listed; Rare (Listed “Rare” animals have been redesignated as Threatened, but Rare plants have retained the Rare designation.)
SSC	State Species of Special Concern
WL	CDFW Watch List

Sensitive Wildlife

<u>Proposed Action and the Vidal Energy Project</u>

A current database search (CDFW 2020; USFWS 2020) resulted in a list of 21 federally and/or state listed endangered or threatened, SSC, or otherwise sensitive wildlife species documented to occur within the quadrangles containing and surrounding the Project area. After a literature review, reconnaissance-level survey, and desert tortoise and burrowing owl focused surveys, it was determined that nine sensitive wildlife species are considered Absent, six species have a Low potential to occur, and seven species have a Moderate potential to occur in the Project area. One species, yellow warbler (Setophaga petechia, SSC), was not identified in the literature searches but was observed foraging outside the Project area boundary but inside the 500-foot buffer during the burrowing owl survey; therefore, this species is considered to have a Moderate potential to occur in the Project area for forage (no suitable nesting habitat). Three additional species, loggerhead shrike (*Lanius ludovicianus*; SSC), osprey (Pandion haliaetus; WL), and black-tailed gnatcatcher (*Polioptila melanura*; WL), were not identified in the literature searches but were observed or detected in the Project area during survey efforts; osprey was migrating through the area (no nesting habitat or foraging opportunities in the Project area), and loggerhead shrike and black-tailed gnatcatcher have nesting and foraging habitat on site and are therefore considered Present in the Project area.

These sensitive wildlife species, their current status, and potential for occurrence are summarized below. Factors used to determine potential for occurrence included the quality of habitat, the location of prior CNDDB records of occurrence in relation to the Project area, and connectivity of the Project area with sensitive species habitat. A complete table of sensitive wildlife species and their potential to occur in the Project area, including habitat requirements, is included in Appendix D. A list of all wildlife species observed or detected during all survey efforts is provided in Appendix D.

The following nine sensitive wildlife species are considered Absent from the Project area due to lack of suitable habitat present, because the species falls outside the elevation range, no suitable habitat is present, or no evidence of this species was observed during the survey efforts on the Project area.

- California black rail (*Laterallus jamaicensis coturniculus*) – ST,
- California leaf-nosed bat (*Macrotus californicus*) – SSC,
- cave myotis (*Myotis velifer*) – SSC,
- desert tortoise (*Gopherus agassizii*) – FT, ST,

- long-billed curlew (*Numenius americanus*) – WL,
- razorback sucker (*Xyrauchen texanus*) – FE, SE,
- Townsend's big-eared bat (*Corynorhinus townsendii*) – SSC,
- western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) – FT, SE, and
- Yuma Ridgway's rail (*Rallus obsoletus yumanensis*) – FE, ST.

The following six sensitive wildlife species have a Low potential for occurrence in the Project area due to low quality and disturbed suitable habitat.

- Arizona Bell's vireo (*Vireo bellii arizonae*) – SE,
- Bendire's thrasher (*Toxostoma bendirei*) – SSC,
- northern cardinal (*Cardinalis cardinalis*) – WL,
- prairie falcon (*Falco mexicanus*) – WL,
- southwestern willow flycatcher (*Empidonax traillii extimus*) – FE, SE, and
- yellow-breasted chat (*Icteria virens*) – SSC.

The following seven sensitive wildlife species have a Moderate potential for occurrence in the Project area due to marginal habitat and environmental and food source conditions.

- American badger (*Taxidea taxus*) – SSC,
- burrowing owl (*Athene cunicularia*) – SSC,
- Costa's hummingbird (*Calypte costae*),
- crissal thrasher (*Toxostoma crissale*) – SSC,
- Le Conte's thrasher (*Toxostoma lecontei*) – SSC,
- Gila woodpecker (*Melanerpes uropygialis*) – SE, and
- yellow warbler – SSC.

The following three sensitive wildlife species were detected during survey efforts and are therefore considered Present in the Project area.

- black-tailed gnatcatcher – WL,
- loggerhead shrike – SSC, and
- osprey (migrating through) – WL.

Species determined to have Moderate potential to occur or that are considered present in the Project area, are described below. The California SSC is a designation assigned by CDFW for those species, subspecies, or populations of animals that have exhibited declines and threats to their viability. The parenthesis designates what season is of concern for the species and when they are protected. Bird species that migrate to and breed in California have signifiers in parenthesis including "nesting". These birds are not typically found in California outside the breeding season.

American Badger. The American badger is a California Species of Special Concern. This carnivorous species ranges over most of the western United States and upper midwestern United States south into central Mexico. In California, the badger may occupy a variety of habitats, especially grasslands, savannas, sandy soils, and deserts. It prefers friable soils for burrowing and relatively open, uncultivated ground. Prey items include pocket gophers and ground squirrels (Jameson and Peeters 1988). The American badger may weigh up to 11.4 kilograms or 25 pounds and is easily recognized by its overall silver-gray coloration, white stripe on top of its head, white cheeks, and black feet with noticeably long front claws. It is a heavy-bodied animal that is stout and flattened. The American badger is chiefly nocturnal, but it is often seen by day as well. It gives birth to one to four young from March to April (Jameson and Peeters 1988). Threats to this species include habitat loss due to agriculture, housing and other land conversions, and illegal hunting. Suitable habitat for this species is present throughout the Project area; therefore, the potential for occurrence is Moderate.

Burrowing Owl. The burrowing owl is a California Species of Special Concern. It is broadly distributed across the western United States, with populations in Florida and Central and South America. The burrowing owl breeds in open plains from western Canada and the western United States, Mexico through Central America and into South America to Argentina (Klute et al. 2003). This species inhabits dry, open, native or non-native grasslands, deserts, and other arid environments with low-growing and low-density vegetation (Ehrlich et al. 1988). It may occupy golf courses, cemeteries, road rights-of way, airstrips, abandoned buildings, irrigation ditches, and vacant lots with holes or cracks suitable for use as burrows (TLMA 2006). Burrowing owls typically use burrows made by mammals such as California ground squirrels (*Spermophilus beecheyi*), foxes, or badgers (Trulio 1997). When burrows are scarce, the burrowing owl may use man-made structures such as openings beneath cement or asphalt pavement, pipes, culverts, and nest boxes (TLMA 2006). Burrowing owls often are found within, under, or in close proximity to man-made structures. Prey sources for this species include small rodents; arthropods such as spiders, crickets, centipedes, and grasshoppers; smaller birds; amphibians; reptiles; and carrion. Threats to the burrowing owl include loss of nesting burrows, habitat loss, and mortality from motor vehicles.

Costa's hummingbird. Costa's hummingbird is a USFWS bird of conservation concern for nesting. It is most common in Southern California, but also breeds locally along the western edge of the San Joaquin Valley (McCaskie et al. 1979), the eastern edge of the Sierra Nevada north through Inyo County and is known to occur regularly in Monterey and Siskiyou counties in the spring and summer months (McCaskie et al. 1988). During winter, Costa's hummingbird is largely restricted to the southern coast, but also winters in southern deserts (Garrett and Dunn 1981). Costa's hummingbird is a small hummingbird; the male having iridescent purple crown and flared gorget (patch of color on the throat), and the female having either a small throat patch of metallic purple feathers (Baltosser 1987), or and entirely white throat and underparts (Baltosser 2020). This species primarily occupies desert washes, the edges of desert and valley foothill riparian, coastal and desert scrub, desert succulent shrub, lower-elevation chaparral, and palm oasis habitats (Garrett and Dunn 1981). Costa's hummingbird feeds on a variety of herbaceous and woody plants for flower nectar and will also eat small insects and spiders (Garrett and Dunn 1981). It will nest in wide variety of trees, cacti, shrubs, woody forbs, and sometimes vines (Bent 1940). Alteration of natural habitats is a major concern for this species, and its most serious threat may be the clearing of desert scrub for agriculture and flood control, and the conversion of natural habitats to forage for cattle grazing (Yetman and Burquez 1994). No historical records for this species have been documented within 5 miles of the Project area; however, this species was found on the USFWS Environmental Conservation Online System. Habitat for this species is found primarily within the larger drainage systems within the Project area that will be avoided. Therefore, the potential for this species is Moderate.

Crissal Thrasher. The crissal thrasher is a California Species of Concern. It is widely distributed from southeastern California and southwestern Utah to Central America, inhabiting desert washes and riparian thickets in the Colorado River and Rio Grande valleys and their tributaries in southwestern North America. To the south and southeast within its range it can be found on brushy plains, in foothill scrub, or in open piñon-oak-juniper woodlands where there is a shrubby understory. The crissal thrasher is mostly insectivorous but may eat seeds, fruits, and berries (e.g., juniper berries) outside the summer season. It is a relatively large, grayish-brown songbird with a long, graduated tail and a rusty colored crissal (the area surrounding the cloacal opening). It has a long, decurved bill. Loss of habitat to clearing for agriculture or urban and suburban development threatens some populations. Other possible factors affecting this species include grazing of arid lands and off-road vehicle use (Cody 1999). Suitable nesting and foraging habitat for this species is present throughout the desert washes that cross through the Project area; therefore, the potential for occurrence is Moderate.

Le Conte's thrasher. Le Conte's thrasher is a California Species of Concern and a USFWS bird of conservation concern. It occurs in deserts of the southwest United States, southwestern Utah, southern Arizona, and northwestern Mexico (Weigand and Fitton 2008). The Le Conte's thrasher is a medium-sized songbird with a long dark tail, black decurved bill, and a plain grayish or sandy-colored body. It is distinguished from other thrashers by its unspotted breast, deep buff crissum, dark eye, and dark tail that contrasts sharply with its body. Habitat includes open desert wash, desert scrub, alkali desert scrub, desert succulent shrub habitats, and Joshua tree habitat with scattered shrubs. Le Conte's thrashers forage as generalists on bare ground and in vegetation litter under shrubs by scratching the soil and overturning objects (Weigand and Fitton 2008). In some parts of its range, this thrasher has lost extensive habitat to development and where irrigated lawns, groves, and fields have been created over valuable xeric habitat. Development, wild burros, off-road vehicle recreation, and invasive plant species threaten this species (Weigand and Fitton 2008). Although there are no reported occurrences within 5 miles of the Project area, suitable habitat is found within and adjacent to the Project area. In addition, a thrasher species was briefly observed outside of the eastern Project area boundary in flight. Therefore, the potential for this species is Moderate.

Gila Woodpecker. The Gila woodpecker is a state listed Endangered species. It is a permanent resident of the lower Colorado River and Imperial Valley of southeastern California, throughout central Arizona and southwestern New Mexico, and south into northeastern Mexico. Physical characteristics include a tan to brown head and underparts, yellow-tinged belly, and black and white bar patterns on the back. The Gila woodpecker inhabits dry subtropical forests, riparian woodlands, and deserts with large cacti or tree species suitable for nesting. Habitats include saguaro desert, desert washes, riparian woodlands, and residential areas, including orchards and vineyards (Bancroft 1929; Price et al. 1995). Near Brawley, California, it is found primarily in date palm groves and ranch yards (Garrett and Dunn 1981). It is omnivorous; and its diet may include insect larvae, insects, cactus fruits, and berries. The disappearance of this species from much of Imperial Valley during the latter half of the twentieth century may have been connected to the clearing of riparian woodlands and to nest-site competition with European starlings (Sturnus vulgaris; Edwards and Schnell 2000; Bancroft 1929; Price et al. 1995). Suitable habitat for this species is present throughout the desert washes within the Vidal Energy Project area; therefore, the potential for occurrence is Moderate.

Yellow Warbler. The yellow warbler (nesting) is a California Species of Special Concern. Its breeding range includes most of North America from northern Alaska and northern Canada to the southern United States and Mexico. Wintering birds occur from Mexico to Peru. The plumage includes a yellow breast with varying chestnut streaking in males; crown, back, and wings are yellowish olive green; and the warbler has a faint and indistinct white eye ring. Breeding habitats include wet areas, such as riparian woodlands, orchards, gardens, swamp edges, and willow thickets. Most breeding habitats generally contain medium to high-density tree and shrub species with ample early successional understories. In migration, it may occur in other habitats, including early seral riparian habitats. It is almost entirely insectivorous but also eats a few berries. Populations are in decline in California due to habitat loss, grazing of riparian understories, and brood parasitism by the brown-headed cowbird (*Molothrus ater*; Lowther et al. 1999). This species was observed foraging outside the Project boundary but inside the 500-foot buffer near the eastern edge of the Project area during the burrowing owl survey, likely migrating through the area (nesting and forage habitat exists along the Colorado River). As such, this species has Moderate potential to occur in the Project area for forage.

Black-tailed Gnatcatcher. The black-tailed gnatcatcher is a CDFW Watch List species. It is a permanent resident of low deserts in the southwest United States and northern Mexico (Grinnell and Miller 1944; Bent 1949). Habitats include mixed desert scrub, creosote scrub, mesquite scrub, dry washes, and desert ravines. This small songbird is characterized by its gray coloration along the back, white coloration below, and a black tail with white edges. During the breeding season, males develop black caps. It is an active, insectivorous species that gleans insects and their larvae from twigs and branches. It has also been known to consume spiders and a few seeds. The primary threat to the existence of this species lies in the conversion of its native desert habitats as a result of urban sprawl (Farquhar and Ritchie 2020). This species was detected during the reconnaissance-level survey within the 500-foot survey buffer on the eastern and western ends of the northern portion of the site and at the center of the site near Citrus Ranch Road and is considered Present in the Project area.

Loggerhead Shrike. The loggerhead shrike (nesting) is a California Species of Special Concern. Its range includes most of the United States from southern Canada to southern Mexico. The U.S. population is largely resident to the south and migratory to the north, but migrants and residents frequently overlap throughout its range. It is recognized by its black facial mask and overall gray, black, and white color pattern. It has a relatively big head and a hook-tipped bill not unlike that of a small raptor. Habitats may include oak savannas, open chaparral, desert washes, juniper woodlands, Joshua tree woodlands, and other semi-open areas. It can occupy a variety of semi-open habitats with scattered trees, large shrubs, utility poles, and other structures that serve as lookout posts while it searches for potential prey. Loggerhead shrikes prefer dense, thorny shrubs and trees, brush piles, and tumbleweeds for nesting (Seattle Audubon Society 2022). Both adults gather nesting materials, including twigs, grass, hair, feathers, and green vegetation; but only females build the cup-shaped nests. Females lay between five and six eggs, which are incubated for 15 to 17 days; and nestlings will leave the nest after 17 to 20 days but will not fly for another week (Seattle Audubon Society 2022). The loggerhead shrike is a carnivorous species that preys primarily upon insects but also takes lizards, mice, birds, carrion, and other opportunistic prey. This bird has a habit of caching its food for later consumption by impaling its prey on thorns, sharp twigs, or barbed wire; hence the term “butcher bird.” Habitat loss and pesticides are the two dominant factors in the decline of this species (Ehrlich et al. 1988; Scott and Morrison 1990). This species was detected during the reconnaissance-level survey along the southern edge of the northern portion of the site, at the center of the site near Citrus Ranch Road, and in the eastern buffer along the southern portion of the site and is considered Present in the Project area.

Osprey. The osprey (nesting) is a California Watch List species. The species is found on every continent except for Antarctica. Although this species may breed in many areas of its summer range, it breeds primarily from the northern United States up through Canada and into Alaska. Most of the North American population winters south of the United States in Central and South America, as well as along the Pacific and Caribbean coasts of Mexico. Wintering grounds also include coastal California and southeastern California. The osprey is a large raptor with a white belly and chest and black back and wings. Its forehead and crown are white with a thick black eye stripe that extends down onto the back. This raptor species forages primarily on fish and is strongly associated with open water throughout its range. It builds a large nest of twigs, sticks, moss, and other materials high on a tree or artificial structure and may use it for several seasons. Osprey populations have increased greatly since the ban of agricultural DDT, although shooting, electrocution at power lines, and habitat degradation still pose threats to populations (The Cornell Lab of Ornithology 2012). This species was observed during the reconnaissance-level survey near the northwest corner of the Project Area west of Citrus Ranch Road and is considered Present in the

Project area; however, the species is presumed to have been migrating through the area (nesting and forage habitat exists along the Colorado River) as the Project area does not support fish, which are a necessary food source for the species.

Desert Tortoise, Burrowing Owl, and Desert Kit Fox

No live desert tortoises, active desert tortoise burrows, or other desert tortoise sign (i.e., shell, bones, scutes, limbs, scat, pallets, tracks, eggshell fragments, courtship rings, drinking sites, and mineral licks) were identified in the Survey Area during desert tortoise surveys. One potential desert tortoise burrow was observed in the survey buffer near the southwest corner of the Project; however, the burrow was filled with spider webs and appeared to have been in disuse for some time. No live burrowing owls were observed within the Survey Area during the burrowing owl surveys; however, three potential burrowing owl burrows with sign including cough pellets and/or whitewash were observed within the Project area, and one potential burrowing owl burrow and one potential burrowing owl cough pellet were identified within the 500-foot survey buffer near the northeastern portion of the Project area. This burrow appeared old, and the single sun-bleached pellet found at the burrow entrance did not contain insect fragments typical of burrowing owl pellets, but the size and shape suggested that it may be from a burrowing owl.

Five active desert kit fox (non-sensitive) burrow/burrow complexes were identified within the Project area during the desert tortoise and burrowing owl surveys. These burrows had fresh sign including scat, tracks, and/or prey remains (e.g., rodent tails) on the burrow apron or in the vicinity, indicating recent use.

General Wildlife

Proposed Action and the Vidal Energy Project

A total of 47 wildlife species were observed or detected during the reconnaissance-level survey and desert tortoise and burrowing owl surveys. Wildlife species observed or detected during the survey efforts were characteristic of the existing site conditions. Below is a summary of the general wildlife observed on site. A complete list of wildlife observed is provided in Appendix D.

Mammals observed or detected on site included black-tailed jackrabbits (*Lepus californicus*), desert kit fox, desert woodrats (*Neotoma lepida*), white-tailed antelope ground squirrels (*Ammospermophilus leucurus*), mule deer (*Odocoieus hemionus*), and wild burro (*Equus asinus*). Desert kit fox and desert woodrats were not visually observed; however, five active kit fox burrow complexes and several desert woodrat dens were observed in the Project area.

Birds commonly observed or detected on site included red-tailed hawks, mourning doves, lesser nighthawks, common ravens (Corvus corax), verdins, northern mockingbirds (*Mimus polyglottos*), phainopeplas (*Phainopepla nitens*), black-throated sparrows (*Amphispiza bilineata*), house finches (*Haemorhous mexicanus*), and several flycatcher species. One barn owl (*Tyto alba*) and one great horned owl (Bubo virginianus) were also observed during survey efforts.

Reptiles commonly observed on site included desert iguanas (*Dipsosaurus dorsalis*), common zebra-tailed lizards (*Callisaurus draconoides*), Great Basin whiptails (*Aspidoscelis tigris tigris*), and rattlesnakes including Colorado desert sidewinders (*Crotalus cerastes laterorepens*) and Mohave rattlesnakes (*Crotalus scutulatus*).

Other Unique Features / Resources

Critical Habitat

Critical Habitat is defined as areas of land, water, and air space containing the physical and biological features essential for the survival and recovery of endangered and threatened species. Designated Critical Habitat includes sites for breeding and rearing, movement or migration, feeding, roosting, cover, and shelter. Designated Critical Habitats require special management and protection of existing resources, including water quality and quantity, host animals and plants, food availability, pollinators, sunlight, and specific soil types. Designated Critical Habitat delineates all suitable habitat, occupied or not, that is essential to the survival and recovery of the species. According to the USFWS Critical Habitat WebGIS map, the Project area does not fall within any designated Critical Habitat (USFWS 2020). Critical Habitat for razorback sucker and western yellow-billed cuckoo is present within 0.5 mile of the Project area to the east, and Critical Habitat for desert tortoise is present within 3 miles of the Project area to the northeast.

Wildlife Movement Corridors

Wildlife corridors are defined as areas that connect suitable habitat in a region otherwise fragmented by rugged terrain, changes in vegetation, or human disturbance. Natural features, such as canyons, drainages, ridgelines, or areas with dense vegetation cover can provide corridors for wildlife travel. Wildlife corridors are important to mobile species because they provide access to individuals to find shelter, mates, food, and water; allow the dispersal of individuals away from high population density areas; and allow immigration and emigration of individuals to other populations, providing for gene flow between populations. Two large washes present on site (Drainages 4 and 5) are wildlife corridors providing a migration pathway for small to large mammal species (e.g., black-tailed jackrabbits, desert kit fox, mule deer, and wild burro) from the surrounding areas including the Turtle Mountains and Whipple Mountains to water sources such as the Colorado River. As an example, potential mule deer scat was found in two locations in the northern wash (Drainage 5) within the Project area, suggesting that larger mammals utilize the washes for movement corridors. In a conversation that occurred during the survey efforts, the son of the previous landowner indicated that large mammals use the northern wash to access the Colorado River. However, Proposed Action and Vidal Energy Project facilities and access roads have been designed to avoid these large washes. They will not be impacted and will be left in place to allow surface flow and migration of wildlife through the site.

3.6.2 Environmental Consequences

Based on the results of the surveys completed for the Project, potential project related risks associated with construction, O&M, and decommissioning of the WAPA Proposed Action and Vidal Energy Project would include collision with overhead electric lines and other features, electrocution, loss of foraging habitat, nest site disturbance, and disturbance due to ongoing human presence at the facility

No Action

Selection of the No Action Alternative, as described in Section 2.6, would not result in implementation of WAPA's Proposed Action; potential effects to wildlife resources would not occur.

WAPA's Proposed Action

Terrestrial Species

Ground-disturbing activities associated with construction are potential sources of direct mortality and injury to terrestrial wildlife. Impacts from equipment and vehicles can occur for slower moving species and species that have subsurface burrows. Mammals (including desert kit fox) and reptiles are susceptible to visual and noise disturbances caused by the presence of humans and construction equipment and the generation of dust. Loss of burrows due to construction, ground vibration, or avoidance behavior would cause wildlife to search for and/or dig new burrows. Construction, O&M, and decommissioning of the WAPA Proposed Action could directly impact wildlife by causing wildlife to alter foraging and breeding behavior. For example, increased noise as a result of construction could result in wildlife temporarily avoiding the general area surrounding the proposed Project. If trash is left out, species such as desert kit fox and common raven could be attracted to the area. Ravens and other predators may be attracted to elevated structures associated with the proposed Project such as perimeter fencing, gen-tie line poles, and the switchyard structures.

Terrestrial wildlife occurring in and around the Project area would also be indirectly impacted. The removal and/or modification of natural vegetation communities would reduce forage, shelter, and nesting opportunities to wildlife including multiple special status wildlife species. The long-term loss and/or degradation of up to five acres of wildlife habitat could cause wildlife to rely more on habitat in surrounding areas. The vegetation within the WAPA Proposed Action is common to the region and the area does not contain any sensitive, unique, or notable areas of ecological importance to terrestrial species.

Ground-disturbing activities during construction, O&M, and decommissioning could increase the spread of noxious/invasive weeds, which could potentially out-compete existing annual vegetation and therefore, could indirectly and adversely affect the quality of terrestrial wildlife habitat and forage. Compliance with weed control regulations and implementation of construction standards would reduce the potential spread of noxious/invasive weeds.

During construction and decommissioning, hazardous waste (solid and liquid) could be generated at the site. Exposure to hazardous waste could be a direct source of wildlife mortality and/or injury through the poisoning of individuals. Spills of hazardous material could also indirectly adversely impact wildlife if the spill of the hazardous material results in the loss of natural vegetation community. The containment and disposal of hazardous waste as outlined in a Spill Prevention and Emergency Response Plan developed by the construction contractor for the Project would reduce the likelihood that substantial spills would adversely affect terrestrial wildlife (including special status species) or habitat.

In summary, there would be negligible localized, short- and long-term, direct and indirect, adverse impacts to general and special status terrestrial species due to the construction, O&M, and decommissioning of the WAPA Proposed Action. There would be a temporary loss of approximately 50 acres and permanent loss of up to five acres of wildlife habitat associated with the implementation of the WAPA Proposed Action. The loss of wildlife habitat would result in the potential localized loss of shelter, nesting habitat, and forage for general and special status terrestrial wildlife species.

<u>Avian and Bat Species</u>

Direct effects to general and special status avian and bat species could result from collisions with or electrocution by overhead transmission lines. Vulnerability to collision with overhead transmission lines depends on many factors including flight behavior and maneuverability, topography, weather, and power line design and placement. Bird collision with power lines has been documented for decades and risk of collision is considered highest in areas where birds congregate, such as power lines that bisect daily flight paths to meadows, wetlands, and river valleys (APLIC 2012). Given that no new transmission lines or additional pole structures would be installed, and only minimal interconnection infrastructure would be constructed in order to interconnect the proposed Project, it is unlikely to increase in-air collisions. The existing lines have been in place for many years and foraging flight patterns have most likely adapted to the vast size of the utility infrastructure. To further reduce the risk of avian collisions, line marking devices would be installed, as needed, on the transmission lines to make the wires more visible to flying birds (APLIC 2012).

Power lines are present in many avian habitats and may result in the electrocution of raptors and other bird species (APLIC 2006; Lehman et al. 2010, and references therein). The potential for electrocutions depends on the arrangement and spacing of energized and grounded components of poles and towers that are sometimes used for perching, nesting, and other activities (APLIC 2006). However, nearly all electrocutions occur on smaller, more tightly spaced residential and commercial electrical distribution lines that are less than 69-kV (APLIC 2006). To protect avian species from electrocution, APLIC (2006) established guidelines for electric line design. Incorporating appropriate measures into the transmission line interconnection would minimize electrocution risk (refer to Appendix I).

There is the potential for bird and bat species to use the Project area for foraging and for nesting for some bird species. Ground-disturbing activities associated with construction and decommissioning are potential sources of direct mortality and injury to ground-nesting birds, particularly the western burrowing owl. Vehicles and equipment can also impact any subsurface burrows. Loss of burrows due to construction, ground vibration, or avoidance behavior would cause owls and other ground-nesting birds to search for new burrows. Other birds would be susceptible to noise disturbance, potentially resulting in alteration of foraging and/or nesting behaviors.

There is also potential for disturbance of bird nests during the construction and decommissioning phase of WAPA's Proposed Action due to noise, vegetation removal, and ground leveling. However, the WAPA Proposed Action would occupy a very small area and the vegetation within the site is common in the region. The Project area is not located in a sensitive, unique, or notable area of ecological importance to avian and bat species. Impacts to vegetation and presence of humans and machinery would deter most avian and bat species from the interconnection area. However, most bird and bat species would return to the area after construction if suitable habitat and foraging opportunities exist.

Additional artificial light sources associated with the operation of the switchyard could attract insects and result in concentrated foraging by avian and bat species that feed on insects nocturnally. Artificial lighting also has the potential to adversely affect migration patterns of general and special status avian and bat species that move through the area.

In summary, there would be negligible, localized, short- and long-term, direct and indirect, adverse impacts to general and special status avian and bat species due to the WAPA Proposed Action. The loss of foraging and nesting habitat from the WAPA Proposed Action would result in general and special status avian species having to rely more on habitat outside of the Project's footprint until the area has been restored. Mortality of general and special status avian and bat species may result from collision with or electrocution by overhead transmission lines.

Implementation of the avoidance and minimization measures provided in Appendix I shall reduce the impacts to minor.

Vidal Energy Project

<u>Terrestrial Species</u>

This Vidal Energy Project would result in a total of approximately 1,090 acres of disturbance, of which approximately 360 acres would be permanently disturbed. To prepare the site for construction, the land would be cleared and graded. Site grading would only occur as needed to accommodate the laydown of materials at the staging area, solar panel and underground collection line installation, and construction of the access roads and the substation. A detailed description of the Vidal Energy Project facilities and all construction, O&M, and decommissioning activities is provided in sections 2.1 and 2.2.

Ground-disturbing activities associated with construction are potential sources of direct mortality and injury to terrestrial wildlife. Impacts from equipment and vehicles can occur for slow-moving species and species that have subsurface burrows. Mammals (including desert kit fox) and reptiles are susceptible to visual and noise disturbances caused by the presence of humans and construction equipment and the generation of dust. Such disturbances could cause terrestrial wildlife to alter foraging and breeding behavior and avoid suitable habitat.

Terrestrial wildlife occurring in and around the Project area would also be indirectly impacted. The solar site would be disturbed during construction and decommissioning of the solar facility. The removal and/or modification of natural vegetation communities would reduce forage, shelter, and nesting opportunities to wildlife including multiple special status wildlife species. To reduce impacts, the Vidal Energy Project would minimize land disturbance in natural drainage systems (including access road crossings).

The long-term loss and/or degradation of approximately 360 acres of wildlife habitat could cause terrestrial wildlife to rely more on habitat in surrounding areas. Construction, O&M, and decommissioning of the solar facility could directly and adversely impact wildlife by causing wildlife to alter foraging and breeding behavior.

Additionally, removal of resources would add pressure on the food resources in adjacent areas. Ground disturbing activities during construction, O&M, and decommissioning could increase the spread of noxious/invasive weeds, which could potentially out-compete existing annual vegetation. Compliance with weed control regulations and implementation of construction standards would reduce impacts from nonnative plants.

During construction, hazardous waste (solid and liquid) could be generated at the site. Exposure to hazardous waste could be a direct source of wildlife mortality and/or injury through the poisoning of individuals. Spills of hazardous material could also indirectly adversely impact wildlife if the spill of the hazardous material results in the loss of natural vegetation community. The containment and disposal of hazardous waste as outlined in a Spill Prevention and Emergency Response Plan developed by the construction contractor for the Project would reduce the likelihood that substantial spills would adversely affect wildlife.

In summary, there would be minor, localized, short- and long-term, direct and indirect, adverse impacts to general and special status terrestrial species due to the construction, O&M, and decommissioning of the Vidal Project facilities. There would be a temporary loss of approximately 1,090 acres and permanent loss of approximately 360 acres of habitat as a result of the Vidal Energy Project. The loss of wildlife habitat would result in a loss of shelter, nesting habitat, and forage, and would result in general and special status terrestrial species having to rely on habitat outside of the Vidal Energy Project footprint until restoration has been completed.

Avian and Bat Species

Solar energy facilities deployed at utility scales may pose a collision risk to birds, as birds may collide with transmission lines, solar towers, and migrating birds may perceive the reflective surfaces of solar panels as bodies of water and collide with the structures as they attempt to land on these panels. This is especially common in solar energy facilities that utilize heliostats, which are mirrors that concentrate solar energy into a centrally located tower. Most avian collisions at solar energy facilities occur with these heliostats. The solar facility proposed in the Vidal Energy Project will not utilize heliostats and will instead employ PV arrays which reduces the risk of collisions due to limiting the number of reflective surfaces that may be attractive to birds. Furthermore, unlike solar energy facilities that utilize heliostats or wind energy farms that have mobile wind turbines, PV arrays and associated transmission towers are static and highly visible which further reduces the risk for avian collisions.

Avian collisions have also been attributed to habitat loss, which has been specifically observed at solar energy facilities where burrowing owl habitat was impacted. Although no burrowing owls were observed during the surveys, suitable burrowing owl habitat was observed within the V Project area. However, the Vidal Energy Project is not anticipated to result in substantial loss of burrowing owl habitat and the high visibility of the solar panels reduces the potential for burrowing owl collisions. In addition, the solar energy facility will be further surrounded by fencing. Burrowing owls spend most of their time on the ground, on perches, or flying low to the ground and are more likely to utilize the fencing as a perch rather than collide with infrastructure.

To address avian concerns pertaining to collisions, the Project would comply with the Avian Powerline Interaction Committee (APLIC) 2012 Guidelines for overhead utilities, as appropriate, to minimize avian collisions with transmission facilities. Further, a Worker Response Reporting System (WRRS) be implemented. A WRRS will provide a means for recording and collecting information on incidental bird and bat species found dead or injured within the Project area by site personnel. The WRRS would be used by site personnel who discover bird and bat carcasses during construction and routine maintenance activities. Site personnel would be provided a set of standardized instructions to follow in response to wildlife incidents in the Project.

In accordance with the WRRS, during construction, site personnel shall notify the Project Biologist to collect the following data on the incidentally detected avian wildlife: species, date, time, location (e.g., nearest Project structure), and how the animal died, if known. Results shall be reported to the CDFW on an annual basis unless listed species are involved. During operations, site personnel shall collect the same information provided above and shall notify CDFW on an annual basis unless listed species are involved. If a listed species is found dead or injured, CDFW shall be notified immediately. In the event of an injury, CDFW shall be contacted for instruction on how to handle the situation. Workers will be trained on the WRRS during the Worker Environmental Awareness Program. The WRRS shall be used for the life of the Vidal Energy Project. A Project Biologist shall be on retainer throughout the construction period, and one should be available during the life of the Project to assist in avian identifications, data collection, identify cause of death or injury, and implement the WRRS.

In summary, there would be negligible, localized, short- and long-term, direct and indirect, adverse impacts to general and special status avian and bat species due to the Vidal Energy Project. The loss of foraging and nesting habitat would result in general and special status avian species having to rely more on habitat outside of the Vidal Energy Project's footprint until the area has been restored.

Implementation of the avoidance and minimization measures provided in Appendix I shall reduce the impacts to minor.

Cumulative Impacts

The types of projects or actions within the 3-mile cumulative effects study area that could contribute to impacts to general and special status wildlife species include OHV use and routine transmission inspections and maintenance, in addition to the previously identified reasonably foreseeable future actions. Livestock grazing, as well as wildlife movement, may spread invasive plants and alter the cover and composition of plant communities used by wildlife. In combination, past, present, and reasonably foreseeable future actions would result in long term, direct and indirect, minor impacts to special status species the majority of the CESA would have measures implemented by the BLM to minimize potential effects to these special status species and their respective habitats.

In the long-term, both the WAPA Proposed Action and Vidal Energy Project would have adverse, localized, direct and indirect, minor effects to general and special status wildlife species and their habitats. These long-term effects would be reduced gradually over time as natural recovery of plant composition and cover occurs during the O&M phase and again following decommissioning of the Vidal Energy Project. Cumulatively, the effects of the WAPA Proposed Action and the Vidal Energy Project, when combined with past, present, and reasonably foreseeable future actions, would result in minor to moderate cumulative impacts to general and special status wildlife species within the 3-mile CESA due to the potential for further habitat loss, degradation, and fragmentation. The WAPA Proposed Action and the Vidal Energy Project would have a minor contribution to the cumulative effect on general and special status wildlife.

3.7 CULTURAL RESOURCES

This section analyzes impacts of WAPA's Proposed Action alongside the Vidal Energy Project, and the No Action Alternative on the cultural resource issues identified during scoping. Of primary concern to this analysis are the potential impacts to historic properties, i.e., resources which are listed in or eligible for listing in the National Register of Historic Places (NRHP) as defined by the implementing regulations (36 CFR 800) of the NHPA. Projects occurring on federal lands are subject to compliance with federal laws including the NHPA. Federal agencies are required to consult about any adverse effects and ways to avoid, minimize, or mitigate adverse effects. WAPA has completed Section 106 of the National Historic Preservation Act consultation with SHPO for the Proposed Action.

The cultural resources analysis area for direct impacts is the Project area; the analysis area for indirect and cumulative impacts is a 3-mile radius around the Project area. These analysis areas were selected to represent the area in which archaeological sites may be impacted as a result of implementing WAPA's Proposed Action and the Vidal Energy Project.

3.7.1 Affected Environment

Existing Conditions

The Project site is located in southeastern San Bernardino County, along the western margin of the Colorado River Indian Tribes Reservation, immediately adjacent to the Colorado River, approximately 41 miles north of Blythe and 58 miles south of Needles, California. This area is located within the northernmost section of the Sonoran Desert physiography, near its intersection with the Mojave Desert. At this location, the Mojave Desert encompasses a thin wedge of Sonoran Desert extending along the Colorado River, stretching only a few miles west of the river. The Sonoran Desert is composed of several subregion deserts for which this aspect is defined as part of the Colorado Desert.

Cultural Setting

As one of the first researchers in the Southern California deserts, Malcolm Rogers and his cultural chronologies have influenced and confounded subsequent researchers for decades. Rogers (1966) was among the first to synthesize and propose a regional overview; but because he frequently added new data to his thesis, several revisions—often contrary to a previous iteration—were produced (Warren 1984; Weide 1976; Schaefer 1994; Hall 2000). Rogers proposed a sequence beginning with the San Dieguito Complex, which he subdivided into San Dieguito I, II, and III. This cultural complex spanned from 11000 to 9000 before present (B.P.). After a 2000-year hiatus, the Amargosa Complex (Amargosa I–III) followed, dating from 7000 to 1950 B.P. Rogers then proposed the introduction of Basketmaker III and Pueblo II Periods, dating from 1950 to 1450 B.P. This was then followed by Prehistoric Yuman and Shoshonean Groups from approximately 1450 to 450 B.P., and then by the Paiute and Mojave groups after 450 B.P.

<u>Mojave Desert</u>

The Mojave Desert cultural sequence had been divided into five major periods by Warren (1984:413-424) and Warren and Crabtree (1986). This sequence includes Lake Mojave, Pinto, Gypsum, Saratoga Springs, and Shoshonean/Protohistoric periods. Warren (1984:413) describes the Lake Mojave period, from 10000 to 7000 B.P., as being "a generalized hunting and gathering subsistence system." The Pinto Period which follows, dating approximately from 7000 to 4000 B.P., is defined by its characteristic Pinto-style projectile point as well as by scrapers and knives. Warren also suggested that this period lacked ground stone implements. Schroth [1994:79], however, states "Ground stone, principally cobble manos and block metates, are present at 16" of 22 Pinto-period sites in the Pinto Basin. Campbell and Campbell (1935:28-29) also noted ground stone at Pinto Basin sites, though they could not necessarily place these within the Pinto-period. Nevertheless, Campbell and Campbell noted that given the numerous associations of ground stone within these sites they could not disclaim their contemporaneity with the other Pinto-period artifacts. These factors suggest that Pinto-period occupation comprised small bands of people, as evidenced by the non-intensive seasonal encampments that date to this period. By 4000 B.P. Humboldt Concave Base, Gypsum Cave, Elko Eared, and Elko Corner-notched projectile points are evident in the archaeological record. Additionally, ground stone tools suggest a shift toward a changing economy based on processing hard seed goods.

Indications of long-range trade or travel are also suggested, based on coastal California shell ornaments (Warren 1984:419). By 1450 B.P. use of ground stone and bow and arrow technologies suggests further shifts in desert adaptations. With the introduction of the Rose Spring and Eastgate projectile points through much of the desert region and brownware and buffware ceramics as well as Cottonwood and Desert Side-notched projectile points in the southern desert region, Warren proposed the Saratoga Springs Period. Dating from 1450 to 750 B.P. this period is characterized by "more complex settlement-subsistence system with large permanent villages" (Warren 1984:424) and increased long-distance networks. Warren further suggests that the artifact types associated with the Saratoga Springs Period see continued use through the Shoshonean/Protohistoric time period, from 750 B.P. up to the historic period.

Following on from Warren, Sutton (1996:225-240) presents a slightly altered chronology for the Mojave Desert region. Though claims for a very early "Pre-Projectile Point" occupation of the desert region have been made (Simpson 1958; Davis et al. 1980), Sutton suggests that evidence for these claims is wanting. The first clearly definable period of occupation occurs during the Paleoindian Period. Dating from 12,000 to 10,000 B.P, the Paleoindian Period is characterized by Clovis, or Clovis-style, fluted points, which have been associated with the Big Game Hunting Tradition. Sutton notes, however, that while taking megafauna may have been the primary subsistence strategy, smaller game as well as vegetal foods would have also been procured. Sutton's Pre-Projectile Period cultural sequence is followed by Warren's outline for the Lake Mojave, Pinto, and Gypsum Periods. Sutton nuances Warren's Saratoga Springs Period with his own Rose Springs Period. Dating from 1450 to 950 B.P., the Rose Spring Period follows the Gypsum Period and is characterized by Rose Springs and Eastgate projectile points. These point types—indicating use of bow and arrow technologies along with the use of ground stone tools, imported marine shell artifacts and obsidian, and evidence of more developed middens within sites—suggest more intensive and extensive use of desert resources. Sutton's Late Prehistoric Period, from 950 B.P. to contact, is an extension of the previous Rose Springs Period with a continuation of similar subsistence strategies, but with a replacement of projectile point forms with Cottonwood Triangular and Desert Side-notched points and the introduction of ceramic technology.

Like others, Hall (2000:14-16) suggests a five-stage chronology. Hall begins with the Lake Mojave Period beginning around 10,000 B.P. and extending to 7500 B.P. Hall suggests that during this period the Mojave Desert region was occupied by small bands of hunters and gatherers. Great Basin stemmed points and flaked stone crescents mark this period (Hall 2000:14). Continuing on into the Pinto Period (approximately 7500 B.P. to 4500 B.P.), these mobile bands evidenced an intensified occupation with the advent of ground stone tools, a reliance on large and small game, and an assortment of vegetal resources. Long-range travel or trade is also noted for this period, as illustrated by the presence of Olivella sp. spire-lopped beads in archaeological sites.

Following a brief hiatus, a culture adopting a different strategy emerges. Hall (2000:16) describes the Newberry Period, dating from 4000 to 1450 B.P., as one which has "geographically expansive land-use pattern[s]…involving small residential groups moving between select localities." As with the Pinto Period, there is evidence of long-distance trade or travel, along with a diffusion of trait characteristics from other groups. Defining artifact types from this period include Elko and Gypsum contracting stem points and split oval beads. Hall then adopts Warren's Saratoga Springs Period (1450 to 750 B.P) and adds a Tecopa Period (750 B.P to contact) as defining the last 1500 years of cultural development. Like Warren's Saratoga Springs Period, Hall (2000:17) notes an apparent restriction in geographic use area as a consequence of an increasing population. Anasazi grayware ceramics and Rose Springs and Eastgate projectile points are characteristic artifact types for the period. The Tecopa Period sees a continuation of similar patterns noted during the Saratoga Springs Period; and, like Sutton's Late Period, Cottonwood Triangular and Desert Side-notched projectile points replace earlier iterations. Furthermore, buff and brownwares are introduced into the archaeological record, as well as beads of steatite, glass, and Olivella sp., including Thin Lipped, Tiny Saucer, Cupped, and Cylinder styles.

Colorado Desert

Schaefer (1994), using numerous northern Colorado Desert area studies, presents a four-period cultural sequence. Incorporating Rogers' earlier definition of the Malpais Pre-Projectile Period (Rogers 1939:6-7), Schaefer identifies a Paleoindian Period, dating prior to 10,000 B.P. and lasting to 8000 B.P. It is characterized by settlements atop mesas and terraces occupied by small, mobile bands of hunters and gatherers who subsisted on small and large game and a variety of vegetal materials. Key indicators of this period include cleared circular areas in the desert gravels, sometimes called "house sites" or "sleeping circles" (Rogers 1939:6-7; 1966:45-47); gravel pictographs of both the rock alignment and intaglio type (Rogers 1939:9-16); and very simple stone tools.

Schaefer next describes an Early Archaic Period dating from 8000 B.P. to 4000 B.P. and a Late Archaic Period dating from 4000 to 1450 B.P. Both periods appear to have been thinly populated with a population decline beginning in the Early Archaic. Both periods indicated highly flexible group sizes that practiced a seasonally adjusted settlement pattern based on available food resources. Ground stone tool production and use greatly expands during this period. In a work presented by Altschul (1994:27-23), Schaefer elaborates on these periods, shifting the time frame out to 10,000 B.P. and 1350 B.P. and inserting a Middle Archaic Period. While both Early and Late Archaic periods are indicated by low population densities, Schaefer suggests that the Middle Archaic witnessed a population increase. Based on interpretations of increased projectile point variability, some have suggested that social group membership, resource competition, and development of defenses along territorial borders were taking place during this period. Following a return to warmer and drier conditions, the Late Archaic Period appears to indicate a return to small, mobile groups focusing on ground stone technology and seasonally available resources. Characteristic artifact types include large spear and dart points, basketry, nets, traps, split-twig figurines (which were also noted in Warren's Gypsum Period), and other perishable items (Altschul 1994:29).

Schaefer's last cultural phase, the Late Prehistoric, has been termed the Patayan and has been subdivided into Patayan I, II, and III. Particular characteristic features of this period are the use of ceramic technology, cremation funerary patterns, and an extensive trail system. Schaefer dates Patayan I from 1150 to 900 B.P., noting that people organized in small mobile groups along the Lower Colorado River and utilized a Hohokam-style tool kit. The Patayan II Period is dated from 900 to 450 B.P. and is notable for the infilling of Lake Cahuilla. The lake encouraged population shifts toward the floodplain and along the western and eastern regions of the desert. Ceramic production also shifted from the Lower Colorado River toward a more local manufacture. Subsequent desiccation of Lake Cahuilla (Altschul 1994:30) marks the Patayan III Period (approximately 450 B.P. to historic times). Populations return to the Lower Colorado River as small, mobile bands subsisting on seasonal hunting and gathering as well as on small-scale agriculture. During this period contact with European explorers is made, giving rise to the Protohistoric Period.

3.7.2 Environmental Consequences

Methodology and Assumptions

An archaeological literature review and cultural resources inventory survey were conducted for the Project. A Cultural Resources Report was prepared for the Project in January 2022 (Appendix F). In support of this report, a records search request to the South Central Coastal Information Center (SCCIC) was submitted on July 9, 2020, and cultural resources surveys were completed in July and October 2020. A summary of these efforts has been included below.

Literature Review

A records search request was submitted to the SCCIC at California State University, Fullerton, on July 9, 2020. The records search results were received on August 27, 2020. The records search indicates that three studies have taken place within the proposed Project site, and three studies are located within a 1.0-mile radius of the Project site.

Assembly Bill 52

Assembly Bill 52 (AB 52) is part of CEQA, requiring public agencies to consult with California Native American tribes during the environmental review process to address potential impacts on tribal cultural resources. For further information regarding the Project's tribal consultation process, refer to Section 4.4 Tribal Consultation.

Field Survey

A survey of the Project site was conducted over the course of three weeks in two separate rotations. The first rotation occurred from July 27 to July 31, 2020 with qualified archaeologists. The second rotation occurred between October 5 and October 14, 2020. The Project area was surveyed at 15-meter intervals, and crews were equipped with sub-meter accurate Global Positioning Systems (GPS) units for recording spatial data and to document the survey area and all findings through ArcGIS Collector and Survey 123. A prior visit for the targeted plant and desert tortoise surveys earlier in the year, identified approximately 15 historic-period and prehistoric-period resources. All these possible resources were revisited by the cultural resources survey teams.

The archaeologists examined exposed ground surface for artifacts (e.g., flaked stone tools, tool-making debris, milling tools, ceramics), ecofacts (e.g., marine shell and bone), soil discoloration that might indicate the presence of a cultural midden, and features indicative of the former presence of structures or buildings (e.g., standing exterior walls, postholes, foundations) or historic debris (e.g., metal, glass, ceramics). Ground disturbances such as burrows were visually inspected for archaeological resources. In addition, previously identified possible historic properties were visited and photographed for inclusion in this report. These properties were assessed in the field and through post-field analysis of historic aerial photographs.

Tribal Resources Identified

Chambers Group submitted a request for a search of the Sacred Lands Files (SLF) housed at the California Native American Heritage Commission (NAHC) on July 9, 2020. The results of the search were returned on July 10, 2020, and were positive, indicating that sacred areas are known within or around the Project site that may be impacted by Project development. The NAHC response included a recommendation to reach out to the Chemehuevi Indian Tribe for more information. The NAHC provided contact information for the Chemehuevi and seven other tribes that may have information on cultural resources on the Project site.

WAPA also submitted a request to the NAHC on August 9, 2021, and received a response on September 2, 2021 with the same information that Chambers Group received in July 2020. WAPA contacted seven Indian tribal governments (see Section 4.4 for list) by letter during the EA scoping period regarding the Proposed Action and on January 21, 2022, invited tribal participation in the NHPA process and to determine if tribes had concerns or issues regarding tribal resources. WAPA initiated consultation with these Indian tribes on the basis of proximity of ancestral lands to the project area or previous stated interest.

No Action

Under the No Action Alternative, the Project would not be developed and would not require ground disturbance; therefore, there would be no impacts to cultural resources in the analysis areas.

Proposed Action

Construction activities that disturb or excavate soils may impact unidentified cultural resources by destroying intact archaeological features of deposits. Construction activities that modify the slope of the natural terrain or compact soils have potential to increase erosion, which might affect the integrity of cultural resources. Because construction activities would comply with regulations regarding the control of stormwater discharges, there is only minor potential for increased soil erosion to damage cultural resources. Such secondary impacts would likely be confined to the immediate vicinity of construction zones.

Ground disturbance activities associated with construction of the WAPA Proposed Action would be limited to disturbance associated with construction, operation, and decommissioning of the switchyard. As discussed above, no ground disturbance from WAPA's Proposed Action would occur within the site boundary or within 65 feet of the site boundary of known NRHP-eligible, recommended-eligible, or indeterminate sites. Through advanced design, the disturbance footprint for the WAPA Proposed Action will be refined based on the results of the field survey such that these resources are avoided.

Ground disturbing activities associated with O&M and decommissioning of the WAPA Proposed Action would be confined to areas in the disturbance footprint created during construction of the proposed Project facility. No additional impacts on cultural resources are expected from O&M or decommissioning activities. Therefore, no impacts on NRHP-eligible, or indeterminate cultural resources are expected from construction, O&M, or decommissioning activities associated with the WAPA Proposed Action.

The Vidal Energy Project

During the literature search Chambers Group found that none of the reported studies within the Vidal Energy Project site, or within a 1.0-mile radius of the Project site, resulted in the identification of cultural resources within the Project footprint. One unreported study resulted in the identification of a road segment (P-36-024757) along the eastern margin of US 95, which is directly connected to a longer dirt road that crosses through the east-west axis of the northern third of the Vidal Energy Project site. No indication as to the status of this road segment on the CRHR is given. Two other resources were identified outside the Vidal Energy Project site. These include a prehistoric lithic reduction station, which was destroyed during a geological testing program, and three prehistoric sleeping circles, the current status of which are unknown.

As a result of the cultural resources survey of the project footprint, a total of 63 resources were identified. These include 22 historic-period resources, 31 prehistoric resources, and 11 prehistoric isolates.

According to the Cultural Resources Report, the Vidal Energy Project footprint exhibits three primary eras of use. The earliest is the prehistoric period. The many archaeological sites and isolated artifacts recorded across the Vidal Energy Project site illustrate a pattern of repeated, extensive use of the area by prehistoric Native American populations. The middle period of use within the Vidal Energy Project site is represented by sites that date to the early twentieth century. Calzona Mine Road runs through the Project site and is indicated on a 1911 USGS map. Although the mine itself is not within the Vidal Energy Project site, an artifact scatter was identified adjacent to the road which has historic-period tools indicative of mining activities. The last period of use is representative of World War II and post-war developments. The Vidal

Energy Project site may have been subjected to use by General George Patton's Desert Training Center – California/Arizona Maneuver Area (DTC). The Project site does not have evidence of any camp areas or other major maneuver areas documented in the region; however, the southern portion of the Project site has many tracks that appear to have been made from tracked vehicles.

In addition, the remains of at least two homesteads from the historic era are still present on the Vidal Energy Project site. The oldest one is visible on 1947 historic aerials and may have pre-dated DTC use of the area. The second homestead dates to approximately 1953 and appears to have been abandoned by the 1980s, based on aerial photograph evidence.

Out of the 52 cultural sites recorded, 11 are proposed as not eligible for inclusion on the National Register and therefore would require no further work. Eight sites were identified as potentially eligible for inclusion on the National Register; however, field efforts sufficiently documented these resources, and no further work is recommended. Six prehistoric archaeological sites were recommended for evaluation under the California Archaeological Resource Identification and Data Acquisition Program (CARIDAP), or similar such program for sparse lithic scatters, thus streamlining and reducing the evaluation effort.

For the remaining 27 sites, Project engineers would review the site locations and determine if avoidance of these sites is possible in accordance with Cultural Resources conservation measures included in Appendix I. Any site that can be avoided will not require evaluation. For sites that cannot be avoided, an Archaeological Testing and Evaluation plan should be prepared for agency review and approval.

Cumulative Impacts

Most of the past, present, and future projects listed in Table 1 of Appendix A are limited in ground disturbance, within existing facilities, not located in close proximity to the Project area, or not expected to result in adverse impacts to cultural resources that would contribute to an adverse cumulative impact.

3.8 SOCIOECONOMICS

This section analyzes impacts of WAPA's Proposed Action alongside the Vidal Energy Project, and the No Action Alternative on the socioeconomic issues identified during scoping including impacts to the local community from employment, tax benefits to the area, and impacts to property values. The socioeconomic analysis area for direct, indirect, and cumulative impacts is San Bernadino County, including the Big River Census Designated Places (CDPs) located approximately 8.5 miles east of Vidal. Vidal has a population of 14 with the median age of 64 (Zip Codes 2024). In 2022, Big River has an estimated population of 6,500 with a median age of 32.3 (U.S. Census Bureau 2022). This analysis area was selected to represent the areas in which employment and taxes may be impacted from construction, operations, and decommissioning. The analysis area is the residential area in and around the unincorporated community of Vidal where localized impacts to property values would be expected to occur.

3.8.1 Affected Environment

The Vidal Energy Project site and WAPA's Proposed Action are located within the Desert Region's East Desert Fundamental Community planning area of the County. The County's Zoning Map identifies the zoning of the Vidal Energy Project and WAPA's Proposed Action site as Resource Conservation (RC; County Zoning Map). The RC land use zoning district provides sites for open space and recreational activities, single-family homes on very large parcels, and similar and compatible uses. Commercial renewable energy facilities are an allowable land use within the RC land use zoning district (County Development Code 2007).

Existing development in the area includes rural access roads and scattered rural residences. Current land use within the Vidal Energy Project site includes one rural residence and several WAPA towers.

Employment

Labor force and employment rates for the population 16 years and over in the analysis area are presented in Table 12. Employment rates have been increasing in the County and remaining stable in the Big River CDP.

Tax Revenues

State property tax in California is assessed by county treasurers, and San Bernardino County is the property tax assessor for the analysis area. Federal lands are not subject to state property taxes. The amount of property tax assessed on privately held lands is calculated based on property value, including the value of the land and improvements on the property. Property is also classified according to its value (i.e., residential, commercial, agricultural, etc.). In general, revenue from property tax collections helps fund state and local government budgets. Counties use their allocation of property taxes to fund county services, including operating budgets, school and fire districts, court systems, sheriff's departments, transportation projects, and emergency services.

The San Bernardino County Tax Collector Division is responsible for billing and collecting secured, unsecured, and supplemental property taxes, transient occupancy tax (TOT), racehorse tax, as well as various special assessments for all taxing entities within San Bernardino County. San Bernardino County property tax revenue and other fees collected in 2022 was $3.5 billion. (County 2022b)

Property Values

Property values and marketability of properties in the Big River area are dependent in part on the rural community setting of the area, which includes access to and views of open space. Existing development in the area includes rural access roads and scattered rural residences. Current land use within the Vidal Energy Project site includes one rural residence and several WAPA towers.

According to the U.S. Census Bureau's American Community Survey, median home values for owner-occupied housing units and owner-occupied mobile homes in the Big River CDP have been increasing since 2010. The median home value of owner-occupied housing units in the Big River CDP was estimated to be $128,200 in 2022, a 63% increase from the median home value of $78,500 in 2017 (U.S. Census Bureau 2022).

3.8.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, WAPA would not approve the interconnection request, would not enter into an interconnection agreement, and would not implement project-related transmission system upgrades, additions, or configurations. The Proponent would not develop the proposed Vidal Energy Project, and there would be no changes in employment, tax revenue, or property values; therefore, there would be no impact to the analysis area for socioeconomic issues identified during scoping.

Proposed Action and the Vidal Energy Project

Employment

Construction workers are expected to include existing WAPA employees, Vidal Energy Project construction crews, and/or another selected contractor. Operations and maintenance would be carried out by existing WAPA maintenance employees. Employment during decommissioning would be similar to construction and it is anticipated that WAPA and or its selected contractor would perform the decommissioning. The WAPA Proposed Action and the Vidal Energy Project construction and decommissioning activities would have a short-term beneficial impact to socioeconomics from onsite crews using local services and employment. During operations, , it is assumed that there would be no positive impact on socioeconomics because it is assumed that local community members would not be part of operations personnel.

Tax Revenues

WAPA's Proposed Action would not impact the property tax revenue or sales and use taxes from the construction, operations, or decommissioning of the transmission line interconnection. The Vidal Energy Project construction and operations would have a minor beneficial impact on property tax revenues and sales and use taxes. Taxes associated with construction-related expenditures and sales and use taxes for goods and services would result in a minor, short-term benefit to the local economy during construction. A minimal number of operations-related expenditures would occur over the 35-year operational lifespan of the facility. Decommissioning would have similar short-term benefits to sales and use taxes and property taxes as construction and would eventually be readjusted to reflect the vacant land.

Property Values

Impacts to property values from the development of utility-scale solar facilities are dependent on multiple factors, including proximity to the facility, perceptions related to the presence of renewable energy, impacts to the rural setting, and changes in environmental quality. Individual perceptions towards the presence of renewable energy may influence a prospective buyer's assessment of property value (DOE and WAPA 2019).

As discussed in Section 3.9 Visual Resources below, the Vidal Energy Project and WAPA's Proposed Action area are adjacent to regional transmission lines supported by H-frame wood pole structures. Thus, WAPA's Proposed Action and the Vidal Energy Project are consistent with existing views in the surrounding area. Additionally, the introduction of facility components would not substantially obstruct or interrupt views of surrounding mountainous terrain. All occupied residences, as well as U.S. Route 95, are located west of the proposed Vidal Energy Project between the mountain foothills and the Project. As provided in Section 3.3 Resources Considered but Not Further Analyzed, the noise and traffic generated by the facility would be negligible. WAPA's Proposed Action facilities would not impact property values. The Vidal Energy Project facility may have a short-term, adverse impact on property values nearest to the facility during the higher-impact phases of facility construction and decommissioning; however, a long-term decline in property values is not expected to occur from the presence and operation of WAPA's Proposed Action alongside of the Vidal Energy Project because it would not create adverse change to the rural setting, environmental quality or adjacent to residential property.

Environmental Justice

Low-income and minority populations are present within the vicinity of the Project area, details are provided in the EPA EJScreen Community Report located in Appendix K (USEPA 2022). No adverse impacts would disproportionately burden minority or low- income populations. The Proposed Action and the Vidal Energy Project would have a minor impact on the identified tribal resources of vegetation, wildlife, and visual setting; however, these impacts would be minor, and similar vegetation communities and habitat types occur in abundance throughout the analysis area.

Cumulative Impacts

Construction and operations associated with the cumulative actions listed in Table 1 of Appendix A may have similar short- and long-term socioeconomic impacts on employment, tax revenues, and property values to those of WAPA's Proposed Action and the Vidal Energy Project. WAPA's Proposed Action and the Vidal Energy Project construction-related effects would include short-term, beneficial increases in area employment and tax revenues, and short-term, adverse impacts on property values. Because the long-term socioeconomic impacts of WAPA's Proposed Action and the Vidal Energy Project are negligible, a perceptible cumulative change in socioeconomic conditions in the analysis area is unlikely.

3.9 VISUAL RESOURCES

The term "visual resources" broadly refers to the composite of basic terrain, geologic, and hydrologic features, vegetative patterns, and built features that influence the visual appeal of an existing landscape, and the extent to which the WAPA Proposed Action, Vidal Energy Project, and No Action Alternative would modify or change the landscape. Visual impacts can be difficult to assess and define due to its inherent subjectivity. This section describes the existing context of the visual environment and assesses the potential impacts from the WAPA Proposed Action alongside the Vidal Energy Project and the No Action Alternative within the visual resource impact analysis area, including impacts to residential areas near the Project area and impacts to views from US 95 and SR 62. The analysis area for direct and indirect impacts is a five-mile radius around the Project area, which is roughly the distance from which a casual observer could distinguish the elements of the PV solar array, ancillary facilities, and interconnection.

3.9.1 Affected Environment

Project Area

Regional Setting

The County of San Bernardino Countywide Plan provides policies that serve to meet the County's comprehensive long-term goals for the future. The Natural Resources Element of the Countywide Plan provides goals and guidance for the protection of natural resources including the visual resources associated with natural and open space areas (County 2020). The County includes three distinct geographic regions, the Mountain Region, the Valley Region, and the Desert Region. The Project area is located in the Desert Region of the County, which is situated been the San Bernardino and San Gabriel Mountain Ranges, with features including mountains, alluvial fans, playas, basins, plateaus, and dunes (County 2019).

Surrounding Area

The surrounding area is generally flat and defined by an arid landscape, consisting of mainly undeveloped and vacant land. Existing development in the area includes rural access roads and scattered rural residences. No established residential communities are directly adjacent to the Project area beyond abandoned, dilapidated residences. Other than sparse vegetation, the only natural visual resources present include distant views of the mountain foothills.

<u>WAPA's Proposed Action and Vidal Energy Project</u>

The Project area is located within the Vidal Wash and Upper Parker Valley-Colorado River watersheds. Vegetation characteristic of Vidal Wash and the major wash to the north includes Blue Palo Verde-Ironwood Woodland, with banks dominated by blue palo verde, ironwood, and creosote. Other minor drainages present in the Project site are primarily located within Creosote Bush Scrub habitat with bank vegetation typical of this community. Existing development in the area includes rural access roads and scattered rural residences. Current land use within the Project area includes one rural residence and several WAPA towers.

Disturbed areas of the c Project area show evidence of previous agricultural use. These areas are mainly concentrated along the western edge of the Project area along Highway 95 and in central portions of the site immediately west and east of Citrus Ranch Road. Several small, developed areas are also present throughout the Project Area that include man-made structures, basins (grow crop circles for wind avoidance), abandoned structures and barbed-wire fences, cattle watering holes (concrete), or paved areas. Evidence of continual site disturbance, such as OHV activity and illegal dumping is also present throughout the Project area. Extensive OHV tracks traversing the site can be seen on aerial imagery and were observed on the ground during the survey efforts.

<u>Scenic Vistas</u>

Scenic vistas are typically expansive views from elevated areas. They may or may not be part of a designated scenic overlook or other area providing a static vista view of a landscape. The Project site is located in a rural portion of San Bernardino County and is not located within an area containing a scenic vista designated by the County's General Plan. While there are scenic vistas in the desert regions, including views across desert landscapes, toward mountains, ridgelines, and rock formations, no designated scenic views, scenic vistas, or scenic resources are known to occur in the vicinity of the Project area (County 2020a)

<u>Scenic Highways</u>

The Project area is located directly east of U.S. Route 95, the nearest paved road; and is approximately 6.2 miles south of Highway 62, a County Scenic Route, and Eligible State Scenic Highway.

<u>Visual Quality</u>

Vividness

The flat terrain, as well as the texture and color of the desert vegetation are generally consistent. The flat alluvial plan includes exposed soils that are tan in color, with similarly earth-toned low desert shrubs and grasses. The Project area landscape is primarily undeveloped with development in the area including rural access roads and scattered rural residences. The Project area includes several WAPA towers, which are relatively orderly and are aligned along other linear landscape features such as roads. The Project area is also adjacent to regional transmission lines supported by H-frame wood pole structures. The scale of the WAPA electrical towers in the area make these features the most visible features throughout the landscape, and reduce the overall vividness of the Project area. Vividness of the landscape is considered low.

Intactness

The Project area is generally a rural desert landscape and includes primarily undeveloped land, U.S. Highway 95, WAPA transmission towers, dirt roadways, and various rural residential properties. The intactness of the existing landscape is moderately low due to the existing infrastructure within the viewshed.

Unity

The WAPA transmission towers traverse the western edge of the flat desert landscape in the Project area. While moderately contrasting in form, line, and color with the surrounding vegetation and terrain, the towers tend to recede into the background landscape somewhat with increased distance from receptors. For example, for motorists traveling on U.S. Route 95 the WAPA towers would be visible, but the scale of the features is reduced due to the presence of mountainous terrain in the background viewing distance. The visual prominence of the towers increases with proximity; the line and color of the towers increasingly contrast with background terrain. Visual unity of the landscape is moderately low.

Viewer Response

The potential for viewers in the Project area is moderate, as the nearest paved road to the Project site is U.S. Route 95 directly to the west; and the Project area would have moderately high visibility from this highway. No existing residents are within the viewshed of the Project area and the Project area is not within the viewshed of any designated scenic vistas.

Viewer Groups

Viewer groups that would be afforded views of WAPA's Proposed Action and the Vidal Energy Project are primarily motorists and residents. Local residents, although not within the immediate viewshed of the Project area, would experience views of the solar and energy storage site from the local public roads when driving to their homes. Local roads surrounding the Project area include U.S. Route 95, as well as dirt roads including Old Parker Road and Citrus Ranch Road. The two dirt roads have a low levels of use and provide direct access to rural residences. U.S. Route 95 has a higher level of use with an average annual daily traffic of 900 vehicles per day (Caltrans 2019) and provides regional access to a greater volume of motorists.

Motorists traveling on U.S. Route 95 would have a direct view of the solar and energy storage facilities. Motorists traveling on the highway include people living in the Vidal Junction area, including at the Colorado River Indian Reservation, and tourists who travel to the area to see the desert. Average annual daily traffic on U.S. Route 95 is approximately 900 vehicles per day (Caltrans 2019).

Nighttime Lighting

The Project area and surrounding area are generally devoid of significant nighttime lighting sources. Existing light sources in the area consist primarily of lighting associated with the scattered rural residences. No streetlights exist along the perimeter roadways, including Old Parker Road and Citrus Ranch Road; and streetlights are not installed along U.S. Route 95.

Methodology and Assumptions

<u>Viewshed Analysis</u>

The viewshed is generally the area that is visible from an observer's viewpoint and includes the screening effects of intervening vegetation and/or physical structures. A topographic viewshed analysis was conducted for the Project to illustrate the geographic extent of potential views of the Project area and to comply with San Bernardino County Code Section 82.19.040. The topographic viewshed analysis for the

Project is shown below in Figures 3-7 through 3-10. The viewshed analysis indicates that the Project site is only distantly visible from the nearest roadways. Generally, the Project area would be most visible from viewpoints within 1 mile; site visibility diminishes as distance increases and view angle decreases.

Key Observation Points (KOPs)

Three KOPs were selected as representative vantage points in the landscape that offer motorists, including local residents traveling on area roadways, views of the proposed solar and energy storage site. The locations of identified KOPs are shown in Figure 5 of Appendix A. Factors considered in the selection of KOPs included proximity to the solar and energy storage site, view angle, viewer concentration, view duration and frequency, and the amount of the Project site that would be visible. One KOP was selected from Old Parker Road and Desert Ranch Road, in the vicinity of a nearby rural residence, with the other two KOPs selected from U.S. Route 95 immediately to the west of the Project area. More distant viewing locations were not selected as KOPs as the visual details of WAPA's Proposed Action and the Vidal Energy Project components would not be highly visible or prominent.

Additional character photos were taken of the existing conditions of the Project area. These character photos were taken from elected locations to support the discussion on existing visual setting and the analysis of potential visual impacts associated with WAPA's Proposed Action and the Vidal Energy Project.

Visual Simulations

The visual simulations were developed using the following methodology: KOPs are identified, and several photos are collected at each KOP looking towards the proposed Project site. Photos are collected with a professional grade digital single-lens reflex (DSLR) camera. Each photo has direction, latitude, longitude, and elevation recorded to the metadata. A virtual camera is created with Autodesk 3DS Max and the settings of the virtual camera are modified to match that of the physical DSLR camera used to collect the photos.

The virtual camera in Autodesk 3DS Max is aligned to the photograph using existing terrain data (LiDAR, Topographic) and other key features within the field of view. Once the virtual camera is aligned and settings adjusted to match the DSLR camera settings, materials, sun system and shadows are implemented. The Vidal Energy Project design and 3D model is imported, or modeled in Autodesk 3DS Max, based on provided engineering design files.

The virtual camera is then rendered, using a physics-based render engine (V-Ray) that calculates complex light bounces, reflection, and refraction of materials. The rendered image is embedded into the matching photo, then atmospherics, blur and film grain are applied to the rendered elements to match the photo. The finished simulation will depict accurate scale, size, and placement of the 3D elements, based on the best available data during the visual simulation development.

Figure 6 of Appendix A shows KOP 1 with views facing southeast from Desert Ranch Road and Old Parker Road, with the Existing Conditions showing low-lying vegetation, the dirt road, and WAPA power poles in the distance. KOP1 provides a view of the Vidal Energy Project from users accessing Desert Ranch Road and Old Parker Road. A residence is located approximately 1,600 feet from the KOP and 1,500 feet from the nearest Project boundary line. The Proposed Conditions show that the Vidal Energy Project structures would be very distantly visible, with most of the structures not being perceptible at this distance. Figure 7 of Appendix A shows KOP 2 with views facing southeast from U.S. Route 95, with the Existing Conditions showing an existing structure, with distant views of a mountain ridge in the background. The Proposed Conditions shows that the solar panels will be visible from U.S. Route 95 and the battery storage facility will be less visible due to the distance from the KOP. Lastly, Figure 8 of Appendix A shows KOP 3 facing northeast from U.S. Route 95 at the border of San Bernardino and Riverside Counties, with pole structures, signage, and power lines visible in the foreground and a mountain ridge in the background. The Proposed Conditions shows that the solar panels will be visible from U.S. Route 95 but will be at the same height as the low-lying vegetation.

Visual Change Analysis

The existing view photographs were compared to the simulated views to define the degree of visual change and visual impacts to the Vidal Project. The anticipated degree of viewer sensitivity (i.e., low, moderate, or strong) is disclosed for each KOP. Factors considered in determining degree of contrast include distance, view angle, view exposure, relative size or scale, and spatial relationships.

Glint and Glare Review

Potential glint and glare conditions were evaluated through a review of the *Utility-Scale Solar Energy Facility Visual Impact Characterization and Mitigation Study Project Report* published by the Argonne National Laboratory, which evaluates visual impacts for different types of solar projects (Sullivan and Abplanalp 2013). The glint and glare analysis discussed in Impact 4.1.5 (d) below includes a review of a similar single-axis PV solar project in southern Nevada.

3.9.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, WAPA would not approve a large generator interconnection request or construct any Proposed Action transmission system upgrades, and Proponent would not construct the Vidal Energy Project. Therefore, no new disturbance to the characteristic landscape would occur, and no new elements or patterns would be introduced to the Project area. Therefore, there would be no impact on the casual viewer. The No Action Alternative would not result in any impacts.

WAPA's Proposed Action

Under WAPA's Proposed Action, construction, O&M, and decommissioning activities would take place in, and directly adjacent to, the Vidal Energy Project. Construction of a new switchyard would cause approximately 5 acres of permanent impact. The existing visual character and scenic quality would be affected during construction by the generation of fugitive dust, movement of equipment and vehicles in and out of the WAPA Proposed Action area, and the presence of construction cranes, transmission line stringing, material stockpiles, and staging areas. The construction activities would introduce forms, lines, colors, and textures that would temporarily attract attention and create a noticeable contrast with the existing setting of the Project area.

WAPA would install, maintain, and decommission an interconnection on the existing HDR-BLY 161-kV transmission line, which would not require any additional pole structures. Activities associated with O&M would be infrequent and would not draw attention from the casual observer. Decommissioning would be confined to areas already disturbed during construction and would not have any additional impacts. These activities would be noticeable from the casual observer due to color and form contrast with the existing cultural modifications.

There would be approximately 5 acres of impacted landscape under the WAPA Proposed Action that would slightly reduce the quality of visual resources or the visual character of the existing environment associated with modification to the existing landscape by the new switchyard. The magnitude of change in landscape character associated with the WAPA Proposed Action would be minimal due to the proximity of the Vidal Energy Project to existing regional transmission lines supported by H-frame wood pole structures and proximity to the Vidal Energy Project facilities. The WAPA Proposed Action would be visible and may attract attention from Highway 95. Therefore, there would be short- and long-term, minor impacts on views within five miles of the WAPA Proposed Action. There would be a minor change in the characteristic landscape and a minor change in the scenic quality of the Project area from the construction, O&M, and decommissioning of the WAPA Proposed Action. Project lighting at the substation would normally be off unless activated by onsite personnel.

The Vidal Energy Project

Under the Vidal Energy Project, the existing visual character and scenic quality would be affected during construction by the generation of fugitive dust, movement of equipment and vehicles in and out of the Vidal Energy Project area and stockpiling of materials. The construction activities would introduce forms, lines, colors, and textures that would temporarily attract attention and create strong contrast with the existing setting. Vegetation clearing and grading would expose lighter color soils and create a more uniform landform in the cleared and graded areas for the PV solar panel array, the substation, staging areas, underground electrical collection system trenches, and new access roads. The construction-related impacts would range from a minor to moderate degree of change in the characteristic landscape visible by the casual observer depending on the viewing distance, type of construction activity taking place, and time of day. The magnitude of change to the landscape character and scenic quality of the Project area would introduce elements not currently present in the area. The scale of the PV solar panel array in the landscape within the Project area would attract attention, create a detectable change in the landscape character, and result in a strong level of visual contrast in terms of form, line, texture, and color within the Project area. The access roads would be similar to existing features already present within the area and would most likely not attract attention.

The Vidal Energy Project site has views of mountain foothills to the southeast; however, the solar equipment proposed to be constructed on the Vidal Energy Project site is all low-profile, including PV modules mounted on fixed-tilt foundations or tracker units and associated electrical equipment that would display a height of approximately 12 feet. The Vidal Energy Project would also include overhead collection lines, access roads, and a 6-foot chain-link perimeter fence. Although the Vidal Energy Project would alter the existing character of the site, the introduction of Vidal Energy Project components would not substantially obstruct or interrupt views of surrounding mountainous terrain. All occupied residences, as well as U.S. Route 95, are located west of the Vidal Energy Project between the foothills and the Vidal Energy Project. Additionally, the Vidal Energy Project site is adjacent to regional transmission lines supported by H-frame wood pole structures. Thus, the Vidal Energy Project is consistent with existing views in the surrounding area. The County is divided into Mountain Regions, Valley Regions, and Desert Regions according to the Countywide Policy Plan. The Vidal Energy Project site is within the Desert Regions of the County. While there are scenic vistas in the desert regions, including views across desert landscapes, toward mountains, ridgelines, and rock formations, no designated scenic views, scenic vistas, or scenic resources are known to occur in the vicinity of the Vidal Energy Project (County 2020a). Additionally, construction of the Vidal Energy Project would not entail the removal of trees, rock outcroppings, and/or historic buildings, as these features do not occur on the Vidal Energy Project site.

Existing views and the analysis of visual change are described below for representative local roads surrounding the site. The location and view direction of each of the KOP photos are shown on Figure 5 of Appendix A. Existing simulated KOP figures are provided in Figures 6 through 8 in Appendix A. The proposed solar and energy storage facility would introduce solar PV panels, buildings, and other ancillary components to a primarily undeveloped high desert landscape. The proposed panels would be approximately a maximum of 18 feet above grade at the tallest point and approximately 2 feet above the grade at the lowest point.

Foreground Views of the Vidal Energy Project

KOP 2 and KOP 3 represent views of the solar and energy storage facility from U.S. Route 95, just west of the Project site (less than 0.25 mile), with KOP 2 north of Lye Road and KOP 3 south of Lye Road. This portion of U.S. Route 95 has a volume of approximately 900 average daily trips. The Vidal Energy Project site is in the immediate foreground, and the visual simulation represents the change in visual quality at a close viewing distance. As shown, the solar arrays would be visible in the foreground with views partially obstructed by existing desert shrubs and trees. The solar equipment proposed to be constructed on the Vidal Energy Project site is all low-profile, including PV modules mounted on fixed-tilt foundations or tracker units and associated electrical equipment that would display a height of approximately 12 feet. The Vidal Energy Project would also include overhead collection lines, access roads, and a 6-foot chain-link perimeter fence. The battery storage facilities and substation are not visible from any of the KOP vantage points. The mountain ridgelines would continue to be visible in the background, similar to existing conditions. The level of visual change would be moderate, as the solar panels would be the predominant features. The solar panels would have a uniform color, texture, and form, which would moderately contrast with the color and form of the desert vegetation and landscape. The existing scenic quality of the area is moderately low due to the existing visual encroachments including existing dirt roads and utility lines. The moderate level of visual change on the landscape in an area with moderately low visual quality would result in minor impacts on visual quality.

Middleground Views of the Project

The middleground view of the Vidal Energy Project from Old Parker Road is represented by KOP 1. The Vidal Energy Project facilities would be indistinct and not visually prominent in the middleground view. Vidal Energy Project components would appear low to the ground and less discernable in the middleground views. The Vidal Energy Project facilities would become visually imperceptible at the distance and viewing angle of KOP 1. Intervening topography and vegetation would provide some screening of the solar facilities. The Vidal Energy Project would appear as a series of flat, greyish horizontal forms from KOP 1, and the mountains and desert vegetation would remain visually prominent. The use of non-galvanized steel and other non-reflective materials would reduce the potential for reflectivity and would result in a low level of change from the existing environment. The Vidal Energy Project elements would only be slightly noticeable in the middleground of KOP 1 due to the contrast in color with the surrounding desert landscape; however, the Vidal Energy Project would result in a low level of visual change from views on Old Parker Road.

Nighttime Lighting

Construction

Construction of the Vidal Energy Project is anticipated to occur during daytime hours as permitted by the County of San Bernardino. However, if necessary and approved by the County, nighttime construction activities could occur, which may involve the use of temporary construction lighting equipment. Construction lighting is meant to be bright, and any such lighting may be visible for a great distance from nearby residences and roadways where there is an absence of intervening vegetation and topography. The use of any bright construction lighting would be temporary during the construction phase and would only occur if nighttime work was approved by the County. Any construction lighting would be directed away from adjacent residences and toward active construction areas.

Operation and Maintenance

The Vidal Energy Project would have lighting installed at the primary access gates to the site, within the battery storage containers, and around the onsite substation. Project lighting would be shielded and directed downward to minimize light trespass onto surrounding properties; and lighting within the battery storage containers would be motion-activated.

In addition, nighttime lighting associated with the proposed solar and energy storage Project would be subject to County approval and compliance with County requirements. As summarized in the Regulatory Setting, County Ordinance No. 3900 regulates glare, outdoor lighting, and night sky protection; and County Development Code Section 83.07.040, Glare and Outdoor Lighting, regulates outdoor lighting practices geared toward minimizing light pollution, glare, and light trespass; conserving energy and resources while maintaining nighttime safety, visibility, utility, and productivity; and curtailing the degradation of the nighttime visual environment. Proposed lighting would be shielded and directed downward, and motion-activated lighting would normally be turned off unless needed for nighttime emergency work, consistent with County requirements.

<u>Glint and Glare</u>

Solar PV Panels

The Vidal Energy Project would use darkly colored matte PV solar panels featuring an anti-reflective coating. Photovoltaic solar panels are designed to be highly absorptive of light that strikes the panel surfaces, generating electricity rather than reflecting light. The solar panels are also designed to track the sun to maximize panel exposure to the sun, which would direct the majority of any reflected light back toward the sun in a skyward direction. PV panels have a lower index of refraction/reflectivity than common sources of glare in residential environments. The glare and reflectance levels of panels are further reduced with the application of anti-reflective coatings. PV suppliers typically use stippled glass for panels as the “texturing” of the glass to allow more light energy to be channeled/transmitted through the glass while weakening the reflected light. With the application of anti-reflective coatings and use of modern glass technology, Project PV panels would display overall low reflectivity.

The PV solar panels would be angled perpendicular to the east-west direction of the sun and are designed to track the position of the sun throughout the day to maximize panel exposure if a tracking system is used. Alternatively, the panels could be installed on a fixed-tilt system and would face to the south. The greatest potential for light reflection to reach viewer locations would occur with a tracking system when the panels would be angled toward the horizon at sunrise and sunset. During these periods, the solar panels would be tilted approximately 10 degrees below a horizontal plane in the direction of the sun. Unabsorbed light would reflect at approximately 20 degrees above the opposite horizon.

The solar power and energy storage facility would be located in a broad flat valley. Potential viewers of the facility primarily include motorists on U.S. Route 95 and residents, who would be less than 20 degrees above the facility. Motorists and residents would not be exposed to the glare at sunrise or sunset due to the low viewing angle. Motorists and residents may perceive indirect glare as an increase in color contrast in the early morning hours when the darkly colored PV panels could appear as lightly colored or while. However, this indirect glare would be brief and would not cause a nuisance to motorists or residents.

The Vidal Energy Project would also be designed to ensure consistency with San Bernardino County Code Section 84.29.040, which requires solar energy facilities to be designed to preclude daytime glare on any abutting residential land use zoning district, residential parcel, or public right-of-way. The solar PV panels would not create a substantial source of glare due to the use of anti-reflective coating on the panels and the elevation of potential receptors relative to the facility.

Metallic Electrical Equipment, Power Poles, and Buildings

Vidal Energy Project facilities, including the gen-tie line, battery storage facilities, and on-site substation, would be constructed with metallic components, which could introduce new sources of glare compared to the undeveloped area. Any glare associated with the proposed facilities would be minor and highly scattered because the metallic components would be separated geographically and would not concentrate potential glare in any area. In addition, for the metallic components, the Vidal Energy Project would include use of non-galvanized steel or other similar materials to reduce glint and glare. The new overhead conductor and steel support structures installed for the on-site substation and gen-tie line would reflect approximately the same level of light as the existing transmission line facilities in the Project area. The facilities would not involve concentrated light reflection that would become a nuisance or adversely affect daytime views.

Summary

There would be approximately 5 acres of impacted landscape under the Vidal Energy Project that would reduce the overall scenic quality associated with cultural modification by the proposed solar facility and ancillary components. The magnitude of change in landscape character associated with the Vidal Energy Project would be minor to moderate due to the scale of the PV solar panel array in comparison to the surrounding landscape, low vegetation, and nearby and adjacent built structures. Although the Project would alter the existing character of the site, the introduction of Project components would not substantially obstruct or interrupt views of surrounding mountainous terrain. All occupied residences, as well as U.S. Highway 95, are located west of the Project between the mountain foothills and the Vidal Energy Project. Additionally, the Project site is adjacent to regional transmission lines supported by H-frame wood pole structures. Therefore, the Vidal Energy Project is consistent with existing views in the surrounding area.

The Vidal Energy Project site is generally flat and contains no significant geologic features or vegetation unique to the area that could be considered scenic. Elements of the projects would be visible for motorists traveling along U.S. Route 95, including solar racks, perimeter fencing, access roads, and overhead collection lines, but this route is not a County- or State-designated scenic highway. The closest eligible State scenic highway is Interstate 40 from Barstow to Needles, approximately 50 miles north of the Project site (Caltrans 2019); therefore, the Vidal Energy Project and Proposed Action would not be visible within this viewshed. Additionally, construction would not entail the removal of trees, rock outcroppings, and/or historic buildings, as these features do not occur on the site.

Compliance with Renewable Energy & Conservation Element Policies RE-4.1 and RE-4.4 and implementation of the design elements, BMPs, and conservation measures described in Appendix I would minimize impacts to visual resources during construction, O&M, and decommissioning of the Vidal Energy Project. Therefore, no additional measures to avoid and/or minimize impacts are required.

Cumulative Impacts

No Action Alternative

Under the No Action Alternative, WAPA would not approve a large generator interconnection request or construct any Project-related transmission system upgrades, and Proponent would not construct the proposed Project. Therefore, no new disturbance to the characteristic landscape would occur, and no new elements or patterns would be introduced to the Project area. Therefore, there would be no impact on the casual viewer.

There would be no contribution to cumulative impacts to visual resource because the No Action Alternative would not result in any impacts. As such, the No Action Alternative is not analyzed for cumulative impacts to visual resources.

<u>WAPA's Proposed Action and the Vidal Energy Project</u>

The analysis below focuses on cumulative impacts to the local and regional viewshed results from development within approximately 40 miles of the Project area, as many of the related projects are located over 100 miles away, and therefore would not contribute to a cumulatively considerable visual or aesthetic impact due to intervening topography or geographic separation. The following cumulative projects are proposed in the regional vicinity of WAPA's Proposed Action and the Vidal Energy Project:

- Parker Blythe No. 2 161-kV Transmission Line Rebuild
- Bouse-Kofa 161-kV Rebuild
- Parker-Davis Transmission System Routine Operation and Maintenance Project and Proposed Integrated Vegetation Management Program

WAPA's Proposed Action transmission line rebuild or maintenance projects would not contribute to cumulative aesthetic impacts with the Vidal Energy Project because the visual elements of those separate projects are existing features in the environment and would also appear visually distinct and unrelated to the Vidal Energy Project.

Scenic Vistas

The Vidal Energy Project is not located within a designated scenic vista. The closest cumulative project to the Vidal Energy Project is the Parker Blythe No. 2 161-kV Transmission Line Rebuild, located 8 miles southwest of the Vidal Energy Project. The impact on views of the open landscape and mountains surrounding the proposed Project would not be cumulative because no cumulative projects would impact views of the surrounding mountains and terrain. No cumulative impact on scenic vistas would occur.

Scenic Highways

No State-designated scenic highways are located in proximity to WAPA's Proposed Action or the Vidal Energy Project; therefore, no cumulative impact would occur on a State-designated scenic highway.

Visual Quality

The local cumulative impact on visual quality would be minor because all three of the cumulative projects in the general vicinity are existing projects and impacts during construction would be temporary. The Proposed Action rebuild of the transmission lines and the maintenance of the transmission system would not introduce new features that would cause cumulative impacts, considering the addition of the Vidal Energy Project. Travelers on the highways would already be used to seeing the transmission lines that are undergoing upgrades and maintenance, so the cumulative projects would not add new visual features once construction is completed. In addition, the local and regional cumulative impact on visual quality would be minor because views of the cumulative projects from the Project area would generally be screened by intervening topography and vegetation.

Light and Glare

San Bernardino County is known for its dark skies. All of the cumulative projects would be subject to the County's outdoor lighting ordinance, which would limit the amount of lighting that would be introduced to the area and restrict the type of lighting that could be used. The cumulative impact on the night sky would be minor due to the conformance with the County's lighting ordinance. The cumulative projects would not introduce new sources of glare that would be directed into any area. No cumulative glare impact would occur.

Summary

Cumulatively, effects of the WAPA Proposed Action and the Vidal Energy Project, when combined with past, present, and reasonably foreseeable future actions, would result in long-term, direct and indirect, minor cumulative impacts to the visual resources within the analysis area. The WAPA Proposed Action and the Vidal Energy Project would have a minor contribution to the cumulative effects to visual resources because of the scale and proximity to existing built structures. Visual resource impacts created by the solar facility would be largely reversible with decommissioning of the Vidal Energy Project at the end of its useful life and restoration of the landscape.

CHAPTER 4.0 – COORDINATION AND CONSULTATION

4.1 FEDERAL AGENCIES

- U.S. Army Corps of Engineers
- U.S. Bureau of Land Management
- U.S. Department of Defense
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service

4.2 STATE AGENCIES

- Arizona State Historic Preservation Office
- California State Historic Preservation Office
- California Department of Fish and Wildlife
- Colorado River Regional Water Quality Control Board

4.3 COUNTY GOVERNMENT

- San Bernardino County

4.4 TRIBAL

- Chemehuevi Indian Tribe
- Colorado River Indian Tribes
- Fort Mojave Indian Tribe
- Quechan Tribe of the Fort Yuma Reservation
- Twenty-Nine Palms Band of Mission Indians

CHAPTER 5.0 – APPLICABLE LAWS, REGULATIONS, AND OTHER REQUIREMENTS

Federal, State, and local agencies have jurisdiction over certain aspects of the proposed interconnection and solar facility. Major Federal, State, and local agencies and their respective permit/authorizing responsibilities are summarized in Table 1.

Table 1. Permit/Authorizing Responsibilities

Permit/Authorization	Agency with Jurisdiction or Responsibility for Compliance
Interconnection/Transmission Service Agreement	WAPA
NEPA	WAPA
Clean Air Act	WAPA
Easement Grants and Road Crossing Permits	San Bernardino County
Zoning Ordinances / Conditional Use Permit	San Bernardino County
NHPA	WAPA; SHPO
Native American Graves Protection and Repatriation Act	WAPA
American Indian Religious Freedom Act	WAPA
Construction Stormwater Permit	Colorado River Regional Water Quality Control Board
Pesticide General Permit	Colorado River Regional Water Quality Control Board
Clean Water Act Compliance	U.S. Army Corps of Engineers; Colorado River Regional Water Quality Control Board
California Fish and Game Code Compliance	California Department of Fish and Wildlife
Safety Plan	San Bernardino County Fire Department and San Bernardino County Planning Department
Migratory Bird Treaty Act	USFWS; WAPA
Bald and Golden Eagle Protection Act	USFWS; WAPA
Endangered Species Act	USFWS; WAPA
Executive Order 13690 (Federal Flood Risk Management)	WAPA
Executive Order 119088 (Floodplain Management)	WAPA

CHAPTER 6.0 – ENVIRONMENTAL ASSESSMENT PREPARERS AND CONTRIBUTIONS

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CHAPTER 7.0 – LITERATURE CITED

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APPENDIX A – Tables and Figures

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Table 1. Past, Present, and Reasonably Foreseeable Future Action

Number	Project Name	Description	Location	Approximate Distance from Project Site	Status
16	Parker-Blythe No. 2 161-kV Transmission Line Rebuild	WAPA's Parker-Blythe No. 2 161-kV transmission line was originally built in 1969. The wood pole structures are degrading and require replacement to comply with NERC reliability standards.	Within WAPA's ROW on land administered by BLM, Colorado River Indian Tribes (CRIT), CA State Lands Commission, and WAPA.	8 miles	Present, construction is expected to begin in the fall of 2025 and be complete in summer 2029.
	Headgate Rock-Blythe 161-kV Transmission Line Rebuild	WAPA's Headgate Rock-Blythe 161-kV transmission line was originally built in 1948. The wood pole structures are degrading and require replacement to comply with NERC reliability standards.	Within WAPA's ROW on land administered by BLM and CRIT, Arizona and California.	Within Project area	WAPA is conducting preliminary studies to identify alternatives for rebuilding the transmission line. Construction is preliminarily estimated to begin in 2029.
Approved Projects					
2	Bouse-Kofa 161-kV Transmission Line Rebuild	WAPA's Bouse-Kofa 161-kV transmission line was originally built in the 1950s as part of the Parker-Gila 161-kV Transmission Line. WAPA is currently replacing the wood pole structures to comply with NERC reliability standards and reconductoring the line to fix clearance violations and obtain the required line rating.	Within WAPA's ROW between WAPA's Bouse and Kofa Substations on land administered by BLM, Arizona State Land Department, and Department of Defense.	10 miles	Present, expected to be complete in January 2025.
3	Parker-Davis Transmission System Routine Operation	WAPA conducts routine operations and maintenance and implements an integrated	WAPA's Parker-Davis Transmission System (The Parker-Davis	Within Project area	Past, Present, and Future

Number	Project Name	Description	Location	Approximate Distance from Project Site	Status
	and Maintenance Project and Proposed Integrated Vegetation Management Program (WAPA 2015)	vegetation management program on the Parker-Davis Transmission System.	Transmission system includes 1,534 miles of transmission line throughout Arizona, Nevada, and California).		
4	Routine Transmission inspections	WAPA conducts inspections of transmission facilities by helicopter as well as ground patrols four times per year to maintain system reliability.	WAPA's Parker-Davis Transmission System throughout Arizona, Nevada, and California.	N/A*	Past, Present, and Future
5	Past/Present Dispersed Recreation OHV Travel on BLM lands	Public recreation opportunities in designated areas.	BLM lands within Project area.	N/A*	Past, Present, and Future

Table 2. Resource Issues Carried Forward for Analysis

Issue Topic	Analysis Issues
Air Quality	• Fugitive dust emissions • Other vehicle and equipment emissions • Impacts to air quality standards
Biological Resources, including vegetation and special status species	• Vegetation loss • Impacts to special status species and habitat • Impacts to avian species, including migratory
Cultural Resources	• Impacts to prehistoric or historic cultural resources
Visual Resources	• Impacts to residential areas near the project • Impacts to views from nearby roads
Socioeconomics	• Impacts to area employment • Housing • Impacts to property values • Tax benefits to area

Table 3. Impact Analysis Terminology

Impact Category	Terminology	Definition
Type	Beneficial	A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
	Adverse	A negative change that moves the resource away from a desired condition or detracts from its appearance or condition.
	Direct	An effect on a resource which is caused by the action and occurs at a particular time and place.
	Indirect	An effect on a resource which is caused by the action and is later in time or farther removed in distance but is still reasonably foreseeable.
	Cumulative	Impacts to resources which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.
Duration	Short-term/ Temporary	Impact occurring during the construction period (4–6 months) or for a limited time thereafter (generally less than 1 or 2 years).
	Long-term/ Permanent	Impact lasts beyond the construction period, and the resources may not regain their pre- construction conditions for a longer period of time.
Intensity	Negligible	Impact at the lowest levels of detection with barely measurable consequences.
	Minor	Impact is measurable or perceptible, with little loss of resource integrity and changes are small, localized, and of little consequence.
	Moderate	Impact is measurable and perceptible and would alter the resource but not modify overall resource integrity, or the impact could be mitigated successfully in the short term.
	Major	Impacts would be substantial, highly noticeable, and long term.

Table 4. Resource Issues Dismissed from Further Evaluation

Issue Topic	Analysis Issues
Military and Civilian Aviation	Page 4.1-19 of the EIR for the Vidal Energy Project provides a more detailed discussion of the glint and glare impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes less than significant impacts is incorporated by reference here. Of primary concern for military and civilian aviation in the vicinity of the Vidal Energy Project area is the potential for glare from the PV solar array. Potential glint and glare conditions were evaluated through a review of the Utility-Scale Solar Energy Facility Visual Impact Characterization and Mitigation Study Project Report published by the Argonne National Laboratory, which evaluates visual impacts for different types of solar projects (Sullivan and Abplanalp 2013). The Vidal Energy Project would use darkly colored matte PV solar panels featuring an anti-reflective coating. Photovoltaic solar panels are designed to be highly absorptive of light that strikes the panel surfaces, generating electricity rather than reflecting light. The solar panels are also designed to track the sun to maximize panel exposure to the sun, which would direct the majority of any reflected light back toward the sun in a skyward direction. PV panels have a lower index of refraction/reflectivity than common sources of glare in residential environments. The glare and reflectance levels of panels are further reduced with the application of anti-reflective coatings. PV suppliers typically use stippled glass for panels as the “texturing” of the glass to allow more light energy to be channeled/transmitted through the glass while weakening the reflected light. With the application of anti-reflective coatings and use of modern glass technology, Vidal Energy Project PV panels would display overall low reflectivity and therefore no impacts are anticipated to military and civilian aviation. Although new overhead transmission structures are included as part of WAPA’s Proposed Action, these structures are not expected to impact military or civilian airspace.
Agriculture / Prime and Unique Farmlands	Pages 6-4 to 6-5 of the EIR for the Vidal Energy Project provide a more detailed discussion of agricultural impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes no impacts is incorporated by reference here. The entirety of Vidal Energy Project site, including the area to be impacted by WAPA’s Proposed Action, is vacant desert land with scattered abandoned residences nearby. According to the Department of Conservation’s Important Farmland Finder, no Prime Farmland, Unique Farmland, or Farmland of Statewide Importance is designated within the Vidal Energy Project site (DOC 2020) and the closest designated farmland is approximately 20 miles to the south. No impacts to agriculture or prime/unique farmlands would occur. The Farmland Mapping and Monitoring Program study area uses soil surveys developed by the US Department of Agriculture (DOC 2024); therefore, the lack of important farmland also indicates there is no US Department of Agriculture prime or unique farmland at the Vidal Project Site.

Issue Topic	Analysis Issues
Climate Change	Pages 4.6-1 to 4.6-20 of the EIR for the Vidal Energy Project provide a more detailed discussion of climate change resulting from the emissions of greenhouse gas impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes less than significant impacts is incorporated by reference here. Climate change is a global issue that results from several factors, including, but not limited to, the release of greenhouse gases (GHGs), land use management practices, and the albedo effect, or reflectivity of various surfaces (including reflectivity of clouds). Specific to the Proposed Action and Vidal Energy Project, GHGs would be produced and emitted by various sources during the development and operational phases of transmission lines and utility-scale solar facilities. The primary sources of GHGs associated with transmission lines and substations are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) from fuel combustion in construction and maintenance vehicles and equipment, as well as operational emissions of sulfur hexafluoride (SF_6) associated with potential leakage from gas-insulated circuit breakers at the substation. Construction of the Proposed Action and Vidal Energy Project would result in temporary activity and minor levels of GHG emissions, which would cease after the construction period. During operations, periodic operations and maintenance would generate negligible GHG emissions. Overall emissions from construction and operation of the Proposed Action and Vidal Energy Project would be minimal in comparison to global GHG emissions. The addition of up to 160 MW nameplate capacity of renewable energy that would be developed as part of the Vidal Energy Project would result in an overall net benefit to GHG emissions, because no fuel is burned, and no air emissions are produced in the process of generating electricity from photovoltaic sources. Furthermore, this fossil fuel–less energy generation means there are also no GHG emissions due to the extraction of fossil fuel. San Bernardino County's EIR estimated that the Vidal Energy Project and Proposed Action would create 1,426.62 metric tons of CO2-equivalents per year, which would be off-set by the Vidal Energy Project's renewable energy production. The EIR confirmed that the Vidal Energy Project and Proposed Action would not generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment and confirmed that the projects would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.
Fire and Fuels Management	Pages 6-20 to 6-22 of the EIR for the Vidal Energy Project provide a more detailed discussion of Wildfire impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes less than significant impacts is incorporated by reference here. Vegetation under the Vidal Energy Project's solar panels and around the interconnection facilities associated with WAPA's Proposed Action would be cleared to reduce wildfire hazard. Conservation measures and emergency preparedness measures would be implemented during construction and operation to reduce fire potential. San Bernardino County's EIR confirmed that the Vidal Energy Project and Proposed Action would not expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires.
Geology and Mineral Resources	Pages 6-13 to 6-14 of the EIR for the Vidal Energy Project provide a more detailed discussion of the mineral resource impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes no impacts is incorporated by reference here. There are no mineral resources within the Vidal Energy Project area, including the area to be occupied by WAPA's Proposed Action. On page 4.5-9 of the San Bernardino County's EIR described that without appropriate conservation the Vidal Energy Project and Proposed Action have the potential to result in impacts to geological resources associated with unanticipated discovery of paleontological resources. As described in the conservation measures in Section 2.6, any impacts associated with paleontological discoveries will be minimized. Therefore, the Vidal Energy Project and Proposed Action would have no adverse effects to mineral resources and negligible effects to geological resources.

Issue Topic	Analysis Issues
Groundwater	Pages 6-11 to 6-13 of the EIR for the Vidal Energy Project provide a more detailed discussion of groundwater impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes less than significant impacts is incorporated by reference here. Water demand during construction is estimated at a total of 10 to 15 acre-feet, which would be trucked in or obtained from a local purveyor. Regardless of source, most (89 percent) of the ground surface within the Project area would be permeable, and operational water use would be small, estimated at approximately 1 acre-foot per year or less. The small amount of water to be used and the large amount of permeable surface within the Project Site would not deplete groundwater supplies or interfere substantially with groundwater recharge such that a net deficit in aquifer volume or a lowering of the local groundwater table level would result. Therefore, impacts to groundwater would be negligible.
Indian Trust Assets	Indian Trust Assets are legal assets associated with rights or property held in trust by the United States for the benefit of federally recognized Indian Tribes or individual tribal members. The United States, as trustee, protects and maintains the specific rights reserved by, or granted to, Indian Tribes or individuals by treaties, statutes, and executive orders. There are no known Indian Trust Assets within the Vidal Energy Project area, including the area to be occupied by WAPA's Proposed Action, therefore there would be no adverse effects to any Indian Trust Asset.
Livestock Grazing / Rangeland Health / Wild Horses and Burros	Grazing occurs and wild horses and burros may be present on BLM lands in the vicinity of the Vidal Energy Project area. However, the nearest BLM Herd Management Area, the Chemehuevi Herd Management Area, is located on BLM lands north of U.S. 62, approximately 5 miles to the north. No grazing allotments are in the vicinity. The Proposed Action and Vidal Energy Project would not displace livestock, wild horses, or burros during construction, operations, or decommissioning. No adverse impact on livestock/wild horses and burros would occur.

Issue Topic	Analysis Issues
Intentional Destructive Acts	Neither the Vidal Energy Project nor the Proposed Action present a likely target for an act of terrorism or sabotage, with an extremely low probability of attack. The DOE requires that NEPA documents explicitly address potential environmental consequences of intentional acts of destruction (DOE 2006). The purpose is to inform the decision maker and the public about chances that reasonably foreseeable accidents associated with proposed actions and alternatives could occur, and their potential adverse consequences. Reasonably foreseeable means events that may have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is with the rule of reason or reasonably foreseeable (40 CFR § 1502.22). This includes determining the appropriate level of detail for analysis based on the type of project, level of risk, and sensitivity for releasing information to the public. The addition of the interconnection and associated facilities (i.e., the switchyard) as part of WAPA's Proposed Action would continue to support the reliability of delivering electricity in the vicinity because if one line is impacted, the other adjacent line could potentially still be available to continue the delivery of electricity. Vandalism and intentional acts of destruction (sabotage) of the proposed facility and related interconnection are unpredictable events. The chances of such acts occurring would be reduced by the limited access and remote nature of the area. In addition, WAPA inspects their transmission lines and substations on a regular O&M schedule for any signs of sabotage or vandalism and takes immediate action if a potential hazard is found. The potential for serious injury resulting from vandalism is negligible; therefore, impacts would be less than significant. The public should call 1-800-209-8962 should any suspicious activity be seen in the project area or its immediate vicinity, or if anyone is seen: • Shooting at WAPA's insulators, power lines, transmission towers or substation equipment; • Dumping waste or other materials on WAPA's property; • Vandalizing WAPA's property, buildings, and vehicles; • Stealing WAPA equipment, supplies, tools, or materials; or • Harming WAPA staff. No additional detailed analysis in the EA is warranted because the impacts would be negligible.
Invasive and Noxious Weeds	Some invasive and/or noxious weeds are present in previously disturbed areas within the Vidal Energy Project area, including along existing roads and drainages (see Section 3.5), although the area to be impacted by WAPA's Proposed Action exists within an undisturbed area with a low likelihood of invasive/noxious weeds. Vegetation would be cleared prior to construction, as described in Chapter 2. Ground-disturbing activities can create conditions that could increase the potential for introduction and/or establishment of nonnative plants. However, because WAPA and the Proponent would comply with all federal, state, and local weed control regulations, and conservation measures would be implemented as described in Section 2.6, the potential for spread of invasive and/or noxious weeds would be very low resulting in negligible impacts associated with invasive and noxious weeds.

Issue Topic	Analysis Issues
Land Use	Page 6-13 of the EIR for the Vidal Energy Project provide a more detailed discussion of land use impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes less than significant impacts, is incorporated by reference here. WAPA's Proposed Action and the Vidal Energy Project would occur solely on private land and as such only San Bernardino County's land use plans apply. Neither project would conflict with any applicable land use plan, policy, or regulation of an agency adopted for the purpose of avoiding or mitigating an environmental effect. San Bernardino County's current General Plan land use designation for the area is Resource Conservation (RC), which allows development of electrical power generation facilities with a Conditional Use Permit (CUP). A CUP that includes conditions of approval has already been issued to the Vidal Energy Project, and this CUP also covers all activities associated with WAPA's Proposed Action. Therefore, impacts to land use would be negligible.
Recreation	Page 6-17 of the EIR for the Vidal Energy Project provide a more detailed discussion of the recreational impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes less than significant impacts is incorporated by reference here. Recreation opportunities exist on BLM lands in the vicinity although no formal recreation opportunities exist on the private property within – the Vidal Energy Project area. Neither WAPA's Proposed Action nor the Vidal Energy Project would impact recreational opportunities in the vicinity of the Project area.
Environmental Justice	Low-income and minority populations are present within the vicinity of the Project area (USEPA 2022); however, no adverse impacts would disproportionately burden minority or low- income populations. The Proposed Action would have a minor impact on the identified tribal resources of vegetation, wildlife, and visual setting; however, these impacts would be minor, and similar vegetation communities and habitat types occur in abundance throughout the analysis area.
Wildlife, excluding special status species	Pages 4.3-1 to 4.3-21 of the EIR for the Vidal Energy Project provide a more detailed discussion of the biological resource impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes less than significant impacts to wildlife excluding special status species, is incorporated by reference here. General wildlife (e.g., lizards, coyote, rabbits) in the Vidal Energy Project area and vicinity would be negligibly impacted by construction, operation, and decommissioning of the project, similar to those impacts described for special status species in Section 3.5. Similar habitat types occur in abundance on the undeveloped public lands surrounding the Vidal Energy Project area and wildlife would continue to be able to use these areas during and after construction.
Special Management Areas, including Wilderness and Areas of Critical Environmental Concern	The closest BLM Area of Critical Environmental Concern (ACEC), the Chuckwalla to Chemehuevi Tortoise Linkage, is located near the Vidal Energy Project area's western boundary but is separated by U.S. 95. This ACEC is even further from the area to be impacted by WAPA's Proposed Action, which is located within the southeastern portion of the Vidal Energy Project area. The nearest Wilderness area is more than 35 miles west of the Vidal Energy Project area. There are no special designation areas within the Vidal Energy Project area boundaries. Construction, operation, and decommissioning activities would not occur in the ACEC, and since no tortoise or their sign have been observed within the Vidal Energy Project Area, the Proposed Action and Vidal Energy Project would not block or interfere with the natural movements or behaviors of tortoises or other wildlife using the ACEC. Therefore, neither the Vidal Energy Project nor WAPA's Proposed Action would adversely impact special management areas.
Wild and Scenic River	As described on pages 4.3-16 of the Biological Section of the EIR the Vidal Project, the Project is located within the Vidal Wash. The Vidal Wash drains into the Colorado River. Although California does have rivers included in the National Wild and Scenic Rivers System, the Vidal Wash is not listed nor is the Colorado River (https://www.rivers.gov/california). Based on the Vidal Energy Project location, the Wild and Scenic River analysis is not necessary because there is no reasonable expectation of any impact by the Project on a Wild and Scenic River direct or indirect.

Issue Topic	Analysis Issues
Surface Waters, including floodplains and wetlands	Pages 4.3-16 to 4.3-17 and pages 6-11 to 6-12 of the EIR for the Vidal Energy Project provide a more detailed discussion of the jurisdictional waters and surface water impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes less than significant with mitigation (conservation). a According to the Federal Emergency Management Agency (FEMA) Flood Map Service Center, the Vidal Energy Project area is not located within a special flood hazard area and is designated as Zone D. Zone D is designated for areas where there are possible but undetermined flood hazards (FEMA 2022). There are no wetlands in the Vidal Energy Project area (Federal Emergency Management Agency [FEMA] 2022; USFWS 2022a and Appendix E). Although rarely if ever containing surface water, there are six drainages located within the Vidal Energy Project site, which make up 136 acres of ephemeral wash features potentially under the jurisdiction of the State of California, of which roughly 25 acres may be impacted by the Vidal Energy Project. Roughly 500 linear feet of these ephemeral washes would be impacted by WAPA's Proposed Action. A supplemental delineation was completed in December 2023 and provided in Appendix E. The supplemental delineations support the original delineations results completed for the Vidal Energy Project that all water features are ephemeral washes that are not relatively permanent, and thus not subject to federal jurisdiction. Nevertheless, as discussed in Section 2.6, the Vidal Energy Project has been designed to avoid the two largest ephemeral wash drainages, thereby ensuring that the drainages' function as wildlife corridors is not adversely affected. As described in the conservation measures in Section 2.6, any impacts to state jurisdictional ephemeral washes would be mitigated. Any impacts to CDFW jurisdictional waters would require a Section 1602 Streambed Alteration Agreement from the CDFW. Since no Section 404 permit is required, Section 401 of the Clean Water Act is not applicable; however, Waste Discharge Requirements (WDRs), or a waiver of WDRs, may be required by the Regional Water Quality Control Board. A conservation plan would be submitted for agency approval with each of the permit application packages. Although roughly 25 acres of State waters could be impacted by the Vidal Energy Project and Proposed Action, acquisition of required permits and implementation of the conservation measures in Section 2.6 would ensure impacts are negligible.

Issue Topic	Analysis Issues
Public Health and Safety	Pages 4.7-1 to 4.7-15 of the EIR for the Vidal Energy Project provide a more detailed discussion of the hazards and hazardous material impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes less than significant impacts is incorporated by reference here. Workers would be exposed to noise and exhaust from motorized equipment and vehicles during construction, O&M, and decommissioning of the WAPA Proposed Action and Vidal Energy Project. The use of hearing protection and operation of equipment in well-ventilated areas would minimize effects to operator health. It is unlikely that the public would be at risk from any construction, O&M, or decommissioning activities given public access to the construction area would be precluded, the nearest sensitive receptor is an unoccupied home located approximately 740 feet west of the Vidal Energy Project Site on the west side of U.S. Route 95, and the closest occupied residence is located over 1,600 feet to the north along Old Parker Road (County 2022a*)*. The Vidal Energy Project would be required to comply with all applicable design codes and implement a plans to minimize risks to workers and public alike, such as spill prevention and emergency response plans, hazardous materials management plans, fire management plans, and health and safety programs. WAPA would be required to comply with all FERC standards for large generator interconnections. San Bernardino County's EIR confirmed that the Vidal Energy Project and Proposed Action would not create a significant hazard to the public or the environment through the release of hazardous materials, would not emit hazardous emissions or handle materials within one-quarter mile of an existing or proposed school, and would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. Therefore, the potential risk to worker and public health during construction, O&M, and decommissioning would be negligible for the WAPA Proposed Action and Vidal Energy Project. No additional detailed analysis in the EA is warranted.
Transportation	Pages 4.9-1 to 4.9-10 of the EIR for the Vidal Energy Project provide a more detailed discussion of the transportation impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes less than significant impacts is incorporated by reference here. Primary access to the Vidal Energy Project site would be via U.S Route 95 directly onto a new project-controlled dirt access road on the west side of the site. Access to WAPA's facilities installed under the Proposed Action would occur by travelling through the Vidal Energy Project site, or by utilizing existing access along WAPA's established transmission right-of-way. A 26-foot-wide perimeter access road would be constructed surrounding the Project site. Additional 20-foot-wide internal maintenance roads would be located throughout the Project site. All new access roads would be designed in compliance with the SBCFD Fire Code to ensure accessibility for the fire department and emergency vehicles. Internal access roads would be cleared and compacted for equipment and emergency vehicle travel and access to the solar blocks and BESS. During construction, the WAPA Proposed Action and Vidal Energy Project would result in a minor, short-term increase in traffic on U.S. Route 95 in the immediate vicinity of the construction area as equipment is transported to the site. Delays may occur during delivery of large equipment, such as the substation components; however, deliveries would be directed to the laydown areas within the site to minimize traffic delays on local roadways or at intersections, even during peak construction. There will be no road closures required and delays are not expected to impede the existing use of U.S. 95. Impacts to transportation from O&M activities would be negligible and would not impact traffic flow on local roadways as the solar site would only be visited once per week, on average. San Bernardino County's EIR confirmed that the Vidal Energy Project and Proposed Action would not conflict with a program, plan, ordinance, or policy addressing the circulation system, nor would the projects result in vehicle miles traveled that exceed an applicable threshold of significance. No additional detailed analysis in the EA is warranted.

Issue Topic	Analysis Issues
Noise	Pages 4.8-1 to 4.8-18 of the EIR for the Vidal Energy Project provide a more detailed discussion of the noise impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes less than significant is incorporated by reference here. While the Project is located within the Resource Conservation land use zoning district, Section 83.01.080 of the County's Development Code sets an exterior noise limit for residential noise sensitive land uses of 55 dBA Leq for daytime hours of 7 a.m. to 10 p.m. and 45 dBA Leq during the noise sensitive nighttime hours of 10 p.m. to 7 a.m. The cumulative noise level increase, created from a project, would range from 0 to 7 dBA for the added Project sound of 51-65 dBA Leq based on the existing (ambient) noise levels in the project vicinity (FTA 2006). **Construction:** The nearest occupied sensitive receptor is an existing residence located over 1,600 feet to the north from the boundary of the Vidal Energy Project and over 6,700 feet from the area of the Proposed Action. Noise levels from construction equipment for both the Vidal Energy Project and Proposed Action have the potential to exceed 80 dBA. At over 1,600 feet to the nearest residence, noise levels due to construction would be reduced a minimum of 30 dBA and would not contribute to the overall ambient noise levels because the lowest added sound to create an increase would be 51 dBA. Therefore, no impacts are anticipated, and no conservation measures are required during construction of the Vidal Energy Project or Proposed Action. In addition, construction noise levels are considered exempt if activities occur within the hours specified in the County of San Bernardino Development Code, Section 83.01.080 of 7:00 a.m. to 7:00 p.m., except Sundays and Federal holidays. No construction activity is planned outside these hours Additionally, all equipment would be properly fitted with mufflers. **Operation:** Based on empirical data, the manufacturer specifications, and distances to the property lines the cumulative noise levels from the operating battery energy storage systems, transformers, and inverters at the Vidal Energy Project were found to meet the most restrictive nighttime standard of 45 dBA at the nearest property lines. Additionally, the noise levels of the transformers, inverters, substation, and multiple PV tracker motors were combined and propagated out to the worst-case property lines at a common location. The result of the propagated cumulative noise levels is 38 Dba Leq at the property line. Therefore, the Vidal Energy Project or Proposed Action will meet the daytime standard of 55 dBA at the nearest property lines. Additionally, the nearest occupied sensitive receptor is the existing residence located over 1,600 feet to the north along Old Parker Road. Therefore, no impacts at the adjacent property lines and the existing residence are anticipated and no conservation measures are required. San Bernardino County's EIR confirmed that the Vidal Energy Project and Proposed Action would not generate a substantial temporary or permanent increase in ambient noise levels in excess of established standards, nor would they result in generation of excessive groundborne noise levels or vibration. Therefore, impacts associated with noise are negligible.

Issue Topic	Analysis Issues
Soils	Pages 4.5-8 to 4.5-9 of the EIR for the Vidal Energy Project provide a more detailed discussion of the soil erosion and topsoil loss impacts of the Vidal Energy Project and the Proposed Action. That discussion, which concludes less than significant with mitigations (conservation) is incorporated by reference here. The WAPA Proposed Action and Vidal Energy Project would have negligible long-term adverse impacts to soil resources. Onsite soils generally consist of medium dense to very dense sand with varying amounts of silt and gravel. Impacts to soils from the WAPA Proposed Action and Vidal Energy Project, including soil compaction and soil erosion by wind and water, would mainly occur from construction and decommissioning and would result in short-term, minor, adverse impacts. San Bernardino County's EIR determined that without appropriate conservation the Vidal Energy Project and Proposed Action have the potential to result in soil erosion or the loss of topsoil, although with appropriate conservation these impacts were determined to be less than significant. These conservation measures are detailed in Section 2.6 to minimize impacts to soil erosion, hydrology, and water quality. Additionally, during O&M activities, maintenance vehicles would be restricted to designated roads. With the implementation of BMPs, including those for stormwater, erosion, and fugitive dust control, impacts to soils would be minimized. All development associated with the WAPA Proposed Action and Vidal Energy Project would be subject to compliance with the requirements set forth in the National Pollutant Discharge Elimination System (NPDES) Storm Water General Construction Permit (Order No. 99- 08-DWQ) for construction activities. Compliance with the CBC and the NPDES would minimize effects from erosion and ensure consistency with Colorado River Regional Water Quality Control Board requirements, which establish water quality standards for the groundwater and surface water of the region. Impacts associated with soils are negligible. No additional detailed analysis in the EA is warranted.

Table 5. State and Federal Criteria Pollutant Standards

Air Pollutant	Concentration / Averaging Time		Most Relevant Effects
	California Standards	Federal Primary Standards	
Ozone (O_3)	0.09 ppm / 1-hour 0.07 ppm / 8-hour	0.070 ppm, / 8-hour	(a) Pulmonary function decrements and localized lung edema in humans and animals; (b) Risk to public health implied by alterations in pulmonary morphology and host defense in animals; (c) Increased mortality risk; (d) Risk to public health implied by altered connective tissue metabolism and altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans; (e) Vegetation damage; and (f) Property damage.
Carbon Monoxide (CO)	20.0 ppm / 1-hour 9.0 ppm / 8-hour	35.0 ppm / 1-hour 9.0 ppm / 8-hour	(a) Aggravation of angina pectoris and other aspects of coronary heart disease; (b) Decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (c) Impairment of central nervous system functions; and (d) Possible increased risk to fetuses.
Nitrogen Dioxide (NO_2)	0.18 ppm / 1-hour 0.030 ppm / annual	100 ppb / 1-hour 0.053 ppm / annual	(a) Potential to aggravate chronic respiratory disease and respiratory symptoms in sensitive groups; (b) Risk to public health implied by pulmonary and extra-pulmonary biochemical and cellular changes and pulmonary structural changes; and (c) Contribution to atmospheric discoloration.
Sulfur Dioxide (SO_2)	0.25 ppm / 1-hour 0.04 ppm / 24-hour	75 ppb / 1-hour 0.14 ppm/annual	(a) Bronchoconstriction accompanied by symptoms which may include wheezing, shortness of breath and chest tightness, during exercise or physical activity in persons with asthma.
Suspended Particulate Matter (PM_{10})	50 µg/m^3 / 24-hour 20 µg/m^3 / annual	150 µg/m^3 / 24-hour	(a) Exacerbation of symptoms in sensitive patients with respiratory or cardiovascular disease; (b) Declines in pulmonary function growth in children; and (c) Increased risk of premature death from heart or lung diseases in elderly.
Suspended Particulate Matter ($PM_{2.5}$)	12 µg/m^3 / annual	35 µg/m^3 / 24-hour 12 µg/m^3 / annual	
Sulfates	25 µg/m^3 / 24-hour	No Federal Standards	(a) Decrease in ventilatory function; (b) Aggravation of asthmatic symptoms; (c) Aggravation of cardio-pulmonary disease; (d) Vegetation damage; (e) Degradation of visibility; and (f) Property damage.
Lead	1.5 µg/m^3 / 30-day	0.15 µg/m^3 / 3- month rolling	(a) Learning disabilities; and (b) Impairment of blood formation and nerve conduction.
Visibility Reducing Particles	Extinction coefficient of 0.23 per kilometer - visibility of ten miles or more due to particles when relative humidity is less than 70 percent.	No Federal Standards	Visibility impairment on days when relative humidity is less than 70 percent.

Source: http://www.arb.ca.gov/research/aaqs/aaqs2.pdf

Table 6. Local Area Air Quality Monitoring Summary

Pollutant (Standard)	Year[1]		
	2018	2019	2020
Ozone:[1]			
Maximum 1-Hour Concentration (ppm)	0.067	0.064	0.066
Days > CAAQS (0.09 ppm)	0	0	0
Maximum 8-Hour Concentration (ppm)	0.060	0.059	0.053
Days > NAAQS (0.070 ppm)	0	0	0
Days > CAAQs (0.070 ppm)	0	0	0
Nitrogen Dioxide:[2]			
Maximum 1-Hour Concentration (ppb)	42.5	41.4	47.4
Days > NAAQS (100 ppb)	0	0	0
Inhalable Particulates (PM_{10}) :[23]			
Maximum 24-Hour National Measurement (ug/m^3)	331.5	155.7	239.8
Days > NAAQS (150 ug/m^3)	10	1	1
Days > CAAQS (50 ug/m^3)	7	49	66
Annual Arithmetic Mean (AAM) (ug/m^3)	47.5	32.1	35.6
Annual > NAAQS (50 ug/m^3)	No	No	No
Annual > CAAQS (20 ug/m^3)	**Yes**	**Yes**	**Yes**
Ultra-Fine Particulates ($PM_{2.5}$):[4]			
Maximum 24-Hour National Measurement (ug/m^3)	34.1	21.6	47.4
Days > NAAQS (35 ug/m^3)	0	0	**2**
Annual Arithmetic Mean (AAM) (ug/m^3)	ND	ND	ND
Annual > NAAQS and CAAQS (12 ug/m^3)	ND	ND	ND

Notes: Exceedances are listed in **bold.** CAAQS = California Ambient Air Quality Standard; NAAQS = National Ambient Air Quality Standard; ppm = parts per million; ppb = parts per billion; ND = no data available.

[1] Data obtained from the Blythe Station.

[2] Data obtained from the Palm Springs Station.

[3] Data obtained from the Niland Station.

[4] Data obtained from the Joshua Tree Station.

Source: http://www.arb.ca.gov/adam/

Table 7. Construction-Related Air Pollutant Emissions

Construction Year	Pollutant Emissions[1] (tons per year)					
	VOC	NOx	CO	SO_2	PM10	PM2.5
2022	0.49	2.92	4.5	<0.01	0.65	0.77
2023	0.11	0.53	1.02	<0.01	0.05	0.07
MDAMD Thresholds	**25**	**25**	**100**	**25**	**15**	**12**
Exceeds Thresholds?	No	No	No	No	No	No

Notes:
[1] Construction based on adherence to fugitive dust suppression requirements from MDAQMD Rule 403.2.
Source: CalEEMod Version 2020.4.0.

Table 8. Operations-Related Air Pollutant Emissions

Emissions Source	Pollutant Emissions tons per year)					
	VOC	NOx	CO	SO_2	PM10	PM2.5
Area Sources[1]	4.19	<0.01	<0.01	0.00	<0.01	<0.01
Energy Sources[2]	0.00	0.00	0.00	0.00	0.00	0.00
Mobile Sources[3]	0.01	0.02	0.12	<0.01	0.03	<0.01
Total Emissions	**4.2**	**0.02**	**0.12**	**<0.01**	**0.03**	**<0.01**
MDAMD Thresholds	**25**	**25**	**100**	**25**	**15**	**12**
Exceeds Thresholds?	No	No	No	No	No	No

Notes:
[1] Area sources consist of emissions from consumer products, hearths, architectural coatings, and landscaping equipment.
[2] Energy usage consist of emissions from natural gas usage (no natural gas would be utilized by the Vidal Energy Project).
[3] Mobile sources consist of emissions from vehicles and road dust.
Source: CalEEMod Version 2020.4.0.

Table 9. Vegetation Communities within the Combined Project Area

Vegetation community	Project area (acres)
Blue Palo Verde – Ironwood Woodland	81.44
Creosote Bush Scrub	913.57
Disturbed Creosote Bush Scrub	30.75
Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance	20.26
Tamarisk Thickets	1.53
Disturbed	24.95
Total Vegetation Communities	***1,072.50***
Bare Ground	16.61
Developed	1.79
Total	**1,090.90**

Table 10. Criteria for Evaluating Sensitive Species Potential for Occurrence (PFO)

PFO*	Criteria
Absent:	Species is restricted to habitats or environmental conditions that do not occur within the Project Area.
Low:	Historical records for this species do not exist within the immediate vicinity (approximately 5 miles) of the Project Area, and/or habitats or environmental conditions needed to support the species are of poor quality.
Moderate:	Either a historical record exists of the species within the immediate vicinity of the Project Area (approximately 5 miles) and marginal habitat exists within the Project Area, or the habitat requirements or environmental conditions associated with the species occur within the Project Area, but no historical records exist within 5 miles of the Project Area.
High:	Both a historical record exists of the species within the Project Area or its immediate vicinity (approximately 5 miles), and the habitat requirements and environmental conditions associated with the species occur within the Project Area.
Present:	Species was detected within the Project Area at the time of the survey.

*PFO: Potential for Occurrence

Table 11. Temporary and Permanent Impacts to Vegetation Communities

Vegetation Community	Project Area Temporary Impacts (acres)	Project Area Permanent Impacts (acres)	Project Area Total Impacts (acres)
Blue Palo Verde – Ironwood Woodland	1.29	1.68	2.97
Creosote Bush Scrub	563.64	325.62	889.26
Disturbed Creosote Bush Scrub	18.63	8.92	27.55
Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance	11.96	8.30	20.26
Tamarisk Thickets	1.10	0.43	1.53
Disturbed	14.73	10.20	24.93
Total Vegetation Communities	***611.35***	***355.15***	***966.50***
Bare Ground	12.40	4.16	16.20
Developed	1.17	0.62	1.79
Total	**624.56**	**359.93**	**984.49**

Table 12 Analysis Area Labor Force and Employment Rate (Population 16 Years and Over), 2017 and 2022

Analysis Area	Labor Force 2017	Employment Rate 2017	Labor Force 2022	Employment Rate 2022	Employment Rate Percent Change from 2018 to 2022
San Bernardino County	1,652,005	60.1	1,701,389	62.9	+2.8
Big River CDP	934	43.5	867	43.4	-0.1

Source: U.S. Census Bureau, American Community Survey 5-Year Estimates (U.S. Census Bureau 2022)

Table 13. Policy Plan Consistency Associated with Aesthetics

Policy Plan Policies	Consistency with Policy Plan	Analysis
Natural Resources Element		
Goal NR-4 Scenic Resources		
Policy NR-4.1 Preservation of Scenic Resources – We consider the location and scale of development to preserve regionally significant scenic vistas and natural features, including prominent hillsides, ridgelines, dominant landforms, and reservoirs.	Consistent	The Project is not located within an area with any prominent hillsides, ridgelines, dominant landforms, or reservoirs. No scenic vistas would be impacted.
Policy NR-4.2 Coordination with agencies – We coordinate with adjacent federal, state, local and tribal agencies to protect scenic resources that extent beyond the County's land use authority and are important to countywide residents, businesses, and tourists.	Consistent	The Project includes coordination with the appropriate federal, state, local and tribal agencies.
Policy NR-4.3 Off-site signage – We prohibit new off-site signage and encourage the removal of existing off-site signage along or within view of County Scenic Routes and State Scenic Highways.	Consistent	The Project will not include any off-site signage.
Land Use Element		
Goal LU-2 Land Use Mix and Compatibility		
Policy LS-2.3 Compatibility with natural environment – We require that new development is located, scaled, buffered, and designed for compatibility with the surrounding natural environment and biodiversity.	Consistent	The Project will be designed with the intent to be compatible with the surrounding natural environment and biodiversity, with the inclusion of mitigation measures described in Section 2.8, impacts to biological resources would be less than significant.
Renewable Energy and Conservation Element		
Goal RE-4 Environmental Compatibility		
Policy RE-4.1 Apply standards to the design, siting, and operation of all renewable energy facilities that protect the environment, including sensitive biological resources, air quality, water supply and quality, archaeological, paleontological and scenic resources. • RE 4.3.4: Establish inspection protocols and programs to ensure that RE facilities are constructed, operated, and eventually decommissioned consistent with the requirements of the San Bernardino County Code, and in a manner that will not be detrimental to the public health, safety, or welfare.	Consistent	The Project will follow all County standards regarding design, siting, and operation of the renewable energy facility.

Policy Plan Policies	Consistency with Policy Plan	Analysis
Policy RE-4.4 Encourage siting, construction and screening of RE generation facilities to avoid, minimize or mitigate significant changes to the visual environment including minimizing light and glare.	Consistent	The Project will not include significant changes to the visual environment, as the site is only distantly visible from the nearest paved road. In addition, lighting associated with the battery storage portion would be motion-activated and down-shielded.
Goal RE-5 Siting		
Policy RE-5.1 Encourage the siting of RE generation facilities on disturbed or degraded sites in proximity to necessary transmission infrastructure.	Consistent	The Project is sited in proximity to WAPA energy transmission infrastructure and the Project site is disturbed based on previous agricultural use as well as the presence of several small, developed areas and areas used as OHV areas.
Policy RE-5.7 Support renewable energy projects that are compatible with protection of the scenic and recreational assets that define San Bernardino County for its residents and make it a destination for tourists.	Consistent	The Project is not located in the vicinity of any scenic or recreational assets.

Table 14 Glossary

Term	Definition
Anti-reflective Coating	A thin coating of material applied to a solar cell surface that reduces the light reflection and increases light transmission.
Avian Power Line Interaction Committee	Committee that works in partnership with other utilities, resource agencies and the public to develop and provide educational resources, identify and fund research, develop and provide cost-effective management options, and serve as the focal point for avian interaction utility issues.
Census Designated Places	The statistical counterparts of incorporated places and are delineated to provide data for settled concentrations of population that are identifiable by name but are not legally incorporated under the laws of the state in which they are located.
Chemical Suppressant/Tackifier	Chemical-based soil stabilization is intended to counteract the erosive influences of rainfall, snowmelt, and wind on bare soil. The use of tackifiers to prevent the movement of mulch material by wind and rain helps to keep straw and/or other mulches in place, preventing soil erosion.
Clean Air Act	(42 U.S.C. 7401 et seq.) Establishes (1) national air quality criteria and control techniques (Section 7408); (2) NAAQS (Section 7409); (3) State implementation plan requirements (Section 4710); (4) Federal performance standards for stationary sources (Section 4711); (5) National Emission Standards for Hazardous Air Pollutants (NESHAP) (Section 7412); (6) applicability of CAA to Federal facilities (Section 7418), i.e., Federal agency must comply with Federal, State, and local requirements respecting control and abatement of air pollution, including permit and other procedural requirements, to the same extent as any person; (7) Federal new motor vehicle emission standards (Section 7521); (8) regulations for fuel (Section 7545); (9) aircraft emission standards (Section 7571).
Code of Federal Regulations	All Federal regulations in force are published in codified form in the Code of Federal Regulations
Combined Project Area	The Vidal Energy Project and the Proposed Action areas combined
Criteria Air Pollutants	An air pollutant that is regulated by the NAAQS. The EPA must describe the characteristics and potential health and welfare effects that form the basis for setting or revising the standard for each regulated pollutant. Criteria pollutants include sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter.
Cultural Resources	Districts, sites, structures, and objects and evidence of some importance to a culture, a subculture, or a community for scientific, traditional, religious, and other reasons. These resources and relevant environmental data are important for describing and reconstructing past lifeways, for interpreting human behavior, and for predicting future courses of cultural development.
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person

Term	Definition
	undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
Decommissioning	The process to remove the Proposed Project Components, or portions thereof, from service. Decommissioning may include decontamination, dismantling, shipment and final disposition of project components, and site rehabilitation, in compliance with applicable rules and regulations.
Emissions	Pollution discharged into the atmosphere from smoke stacks, other vents, and surface areas of commercial or industrial facilities, residential chimneys, and vehicle exhausts.
Ephemeral Drainage	Drainages that flow for short durations during and after significant rainfall events
Fixed Tilt Foundation	A photovoltaic panel foundation set in at a fixed angle with respect to horizontal,
Flashy Rain Event	A sudden, intense downpour that can lead to rapid surface water runoff, often overwhelming drainage systems and increasing the risk of flash flooding.
Generation Interconnect (Gen-Tie)	These are facilities that connect the original source of electric power (generation) to the transmission system. They are typically less than five miles long.
Habitat Conservation Plan	A planning document designed to accommodate economic development to the extent possible by authorizing the limited and unintentional take of listed species when it occurs incidental to otherwise lawful activities. The plan is designed not only to help landowners and communities but also to provide long-term benefits to species and their habitats.
Key Observation Point	An element of the contrast rating system used by the Bureau of Land Management (BLM) to analyze the potential visual impact of proposed projects and activities. The rating is done from the most critical viewpoints, or Key Observation Points. Factors that should be considered in selecting KOPs are: angle of observation, number of viewers, length of time the project is in view, relative project size, season of use, and light conditions.
Kilovolt	The electrical unit of power that equals 1,000 volts.
Megawatt hour	1,000 kilowatt-hours or 1 million watt-hours
National Ambient Air Quality Standards	Standards defining the highest allowable levels of certain pollutants in the ambient air. Because the EPA must establish the criteria for setting these standards, the regulated pollutants are called criteria pollutants.
Optical Ground Wire	A type of cable that is used in overhead power lines. Such cable combines the functions of grounding and communications.
Particulate matter (PM, PM10, and PM2.5)	Any finely divided solid or liquid material, other than uncombined water. A subscript denotes the upper limit of the diameter of particles included. Thus, PM10 includes only those particles equal to or less than 10 micrometers

Term	Definition
	(0.0004 inch) in diameter; PM2.5 includes only those particles equal to or less than 2.5 micrometers (0.0001 inch) in diameter.
Photovoltaic	Pertaining to the direct conversion of light into electricity.
Photovoltaic Array	An interconnected system of PV modules that function as a single electricity-producing unit. The modules are assembled as a discrete structure, with common support or mounting. In smaller systems, an array can consist of a single module.
Prehistoric	Of, relating to, or existing in times before written history. Prehistoric cultural resources are those that precede written records of the human cultures that produced them.
Renewable portfolio standards	Renewable portfolio standards (RPS are policies designed to increase the use of renewable energy sources for electricity generation. These policies require or encourage electricity suppliers to provide their customers with a stated minimum share of electricity from eligible renewable resources.
Scoping	An early, open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.
Sensitive Species	Those plants and animals for which population viability is a concern, as shown by a significant current or predicted downward trend in populations or density and significant or predicted downward trend in habitat capability.
South Central Coastal Information Center	One of twelve regional Information Centers that comprise the California Historical Resources Information System (CHRIS). CHRIS works under the direction of the California Office of Historic Preservation (OHP) and the State Historic Resources Commission (SHRC). The SCCIC houses information about historical resources (e.g. location, size, age, etc.)
Switchyard	Facility with circuit breakers and automatic switches to turn power on and off on different transmission lines. Switchyards are typically associated with substations.
Threatened Species	Plant and wildlife species likely to become endangered in the foreseeable future.
Tribal Resources	Tribal resources are defined as sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either included or determined to be eligible for inclusion in the California Register of Historical Resources (CRHR) or included in a local register of historical resources.

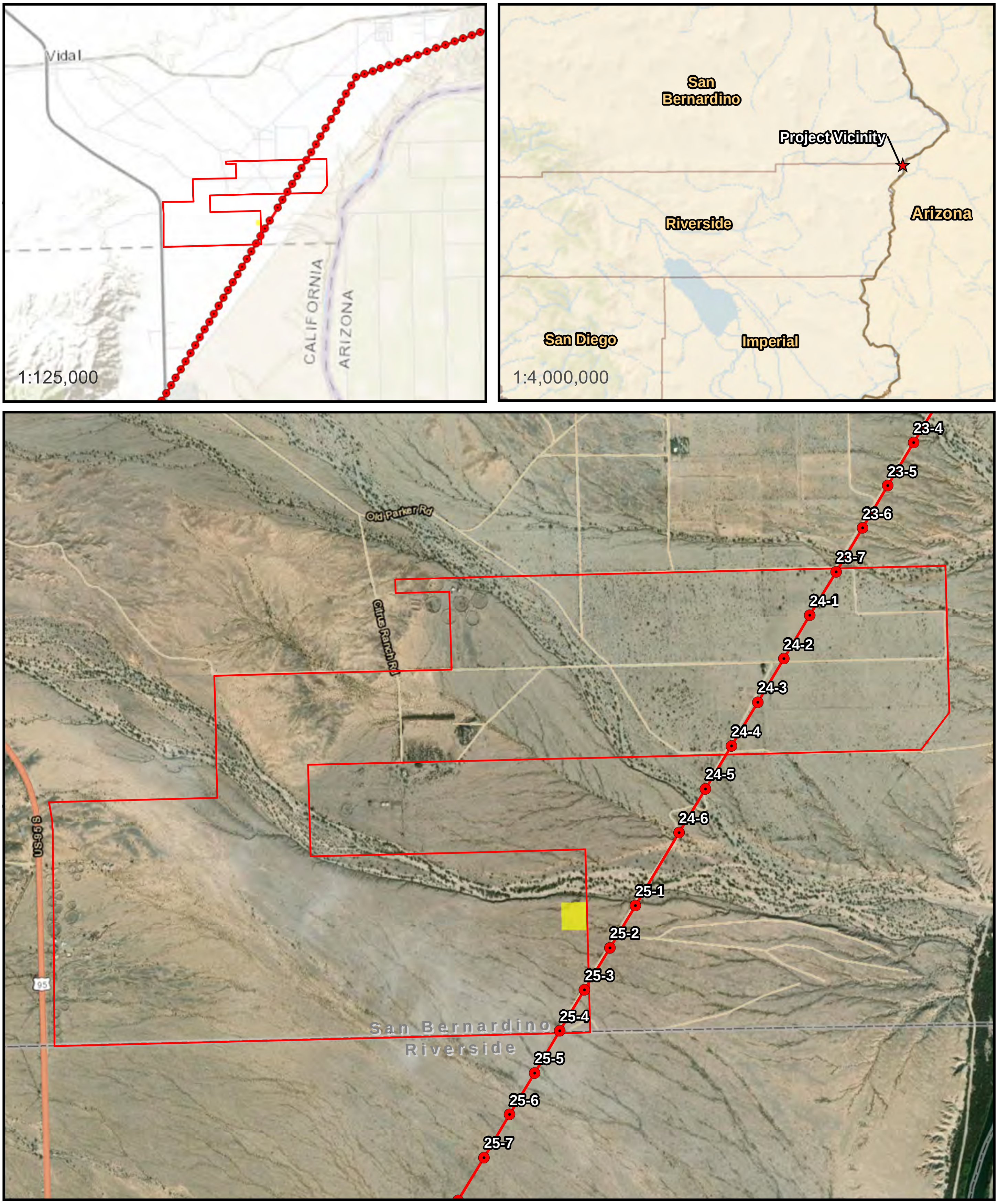
Table 15 Acronyms and Abbreviations

Term	Definition
AC	Alternating Current
APN	Assessor Parcel Number
AQMD	Air Quality Management District
BESS	Battery Energy Storage System
BLM	Bureau of Land Management
B.P.	Before Present
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CNPSEI	California Native Plan Society's Electronic Inventory
CO	Carbon Monoxide
CO_2	Carbon Dioxide
County	San Bernardino County
CRHR	California Register of Historic Resources
CRIT	Colorado River Indian Tribes
CRPR	California Rare Plant Rank
CUP	Conditional Use Permit
CUPA	Certified Unified Program Agencies
DC	Direct Current
DFA	Development Focus Area
DOC	California Department of Conservation
DPM	Diesel Particulate Matter
DRECP	Desert Renewable Energy Conservation Plan
DSLR	Digital Single-Lens Reflex
DTC	Desert Training Center
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EMFAC	Emission Factor Model
EO	Executive Order
EPA or USEPA	United States Environmental Protection Agency
ES	Executive Summary
FE	Federally listed; Endangered
FEMA	Federal Emergency Management Agency

Term	Definition
FERC	Federal Energy Regulatory Commission
FESA	Federal Endangered Species Act
FONSI	A Finding of No Significant Impact
FR	Federal Register
FT	Federally listed; Threatened
FTA	Federal Transit Administration
GHG	Greenhouse Gas
GIS	Geographic Information System
GPS	Global Positioning Systems
KOP	Key Observation Point
kV	Kilovolt
Ldn	Day-Night Average Sound Level
LLG	Linscott, Law & Greenspan, Engineers
LOS	Level of Service
MBTA	Migratory Bird Treaty Act
MDAB	Mojave Desert Air Basin
MDAQMD	Mojave Desert Air Quality Management District
$MMTCO_2e$	Metric Tons of Carbon Dioxide Equivalent
MPH	Miles per Hour
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
N_2O	Nitrous Oxide
NO	Nitric Oxide or Nitrogen Monoxide
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NW	Northwest
NWI	National Wetlands Inventory
O_3	Ozone
O&M	Operations and Maintenance
OATT	Open Access Transmission Service Tariff
OHV	Off-Highway Vehicle
OHWM	Ordinary High-Water Mark
OPGW	Optical Ground Wire

Term	Definition
PM	Particulate Matter
PM2.5	Particulate Matter with diameters equal to or less than 2.5 micrometers
PM10	Particulate Matter with diameters equal to or less than 10 micrometers
ppm	Parts per Million
PRC	Public Resources Code
PRMMP	Paleontological Resources Monitoring and Mitigation Plan
PV	Photovoltaic
Q	Younger Alluvium
Qoa	Older Alluvium
RC	Resource Conservation Zone
RCRA	Resource Conservation and Recovery Act
REA	Risk/Exposure Assessment
RGHGRP	Regional Greenhouse Gas Reduction Plan
ROW	Right-of-Way
RPS	Renewable Portfolio Standards
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SCCIC	South Central Coastal Information Center
SCS	Sustainable Communities Strategy
SHPO	State Historic Preservation Office
SLF	Sacred Lands File
SO_X	Sulfur oxide
SR	State Route
SSC	California State Species of Special Concern
SVP	Society of Vertebrate Paleontology
State	California
SW	Southwest
US	United States of America
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WAPA	Western Area Power Administration
WEAP	Worker Environmental Awareness Program
WRRS	Worker Response Reporting System

Figures



Project Boundary
Proposed Project Substation
Structures
Transmission Line

N

0 750 1,500 3,000
Feet

Figure 1
Project Layout

Page 28

Name: 21232 PLAN Fig 1 Project Location and Vicinity.Mxd
Print Date: 8/14/2024, Author: pcarlos

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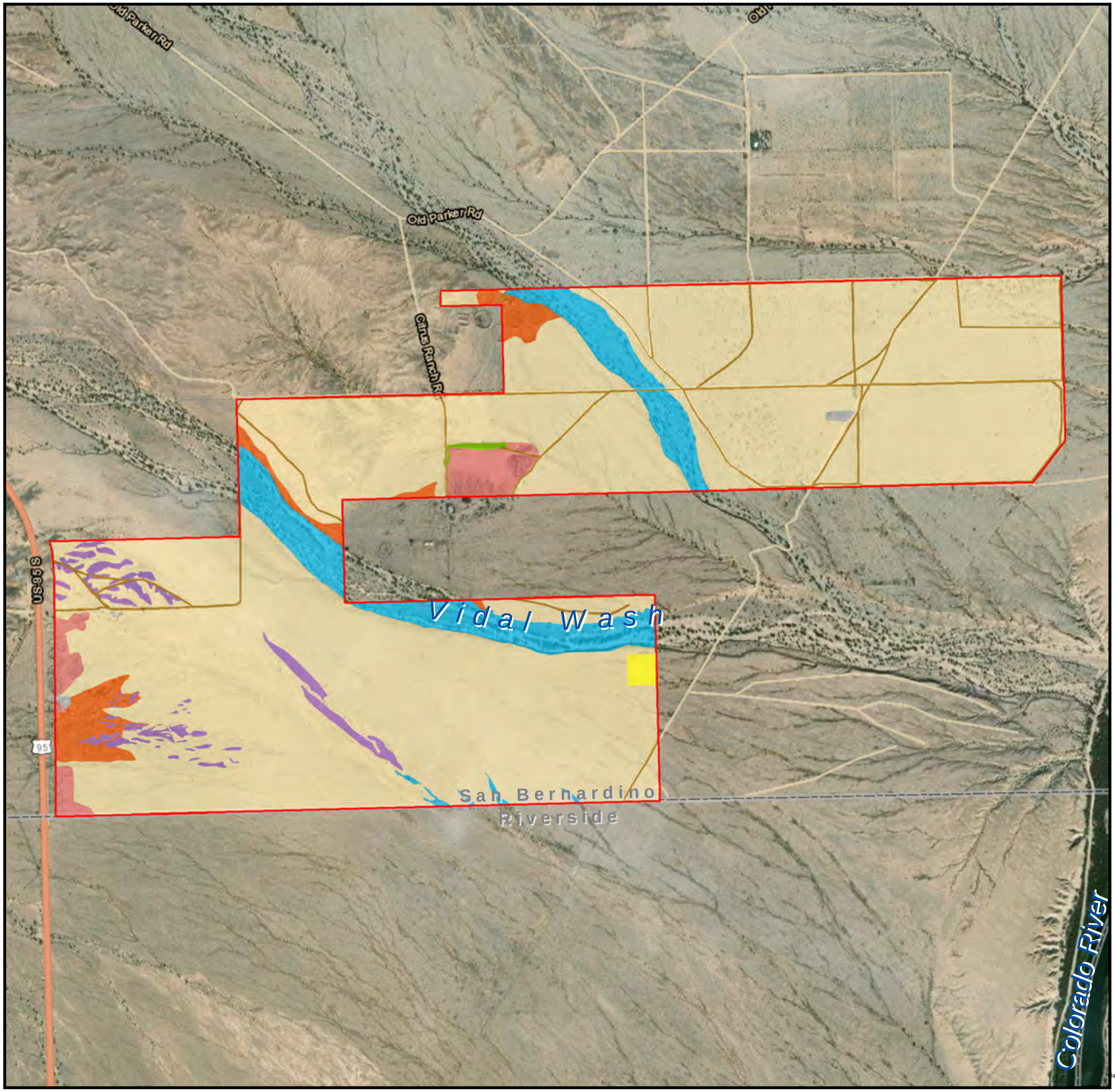
Figure 2
Vegetation Communities within Vidal Energy Project Area



Project Boundary
Proposed Project Substation

Vegetation Communities

Bareground
Blue Palo Verde - Ironwood Woodland*
Creosote Bush Scrub
Disturbed Creosote Bush Scrub
Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance
Developed
Disturbed/Ruderal
Tamarisk Thickets

*Habitat with the potential to contain smoke trees, mesquites, palo verdes, and/or any other species covered under the California Desert Native Plants Act. Individual tree count pending.

Vegetation Community	Acres
Bareground	16.56
Blue Palo Verde - Ironwood Woodland	81.43
Creosote Bush Scrub	913.22
Desert Pavement	20.26
Developed	1.79
Disturbed Creosote Bush Scrub	30.74
Disturbed/Ruderal	24.93
Tamarisk Thickets	1.53
Total	**1090.46**

N

0 1,000 2,000 4,000
Feet

Name: 21232 PLAN Fig 2 Vegetation Communities within Vidal Energy Project Area.Mxd
Print Date: 7/16/2024, Author: pcarlos

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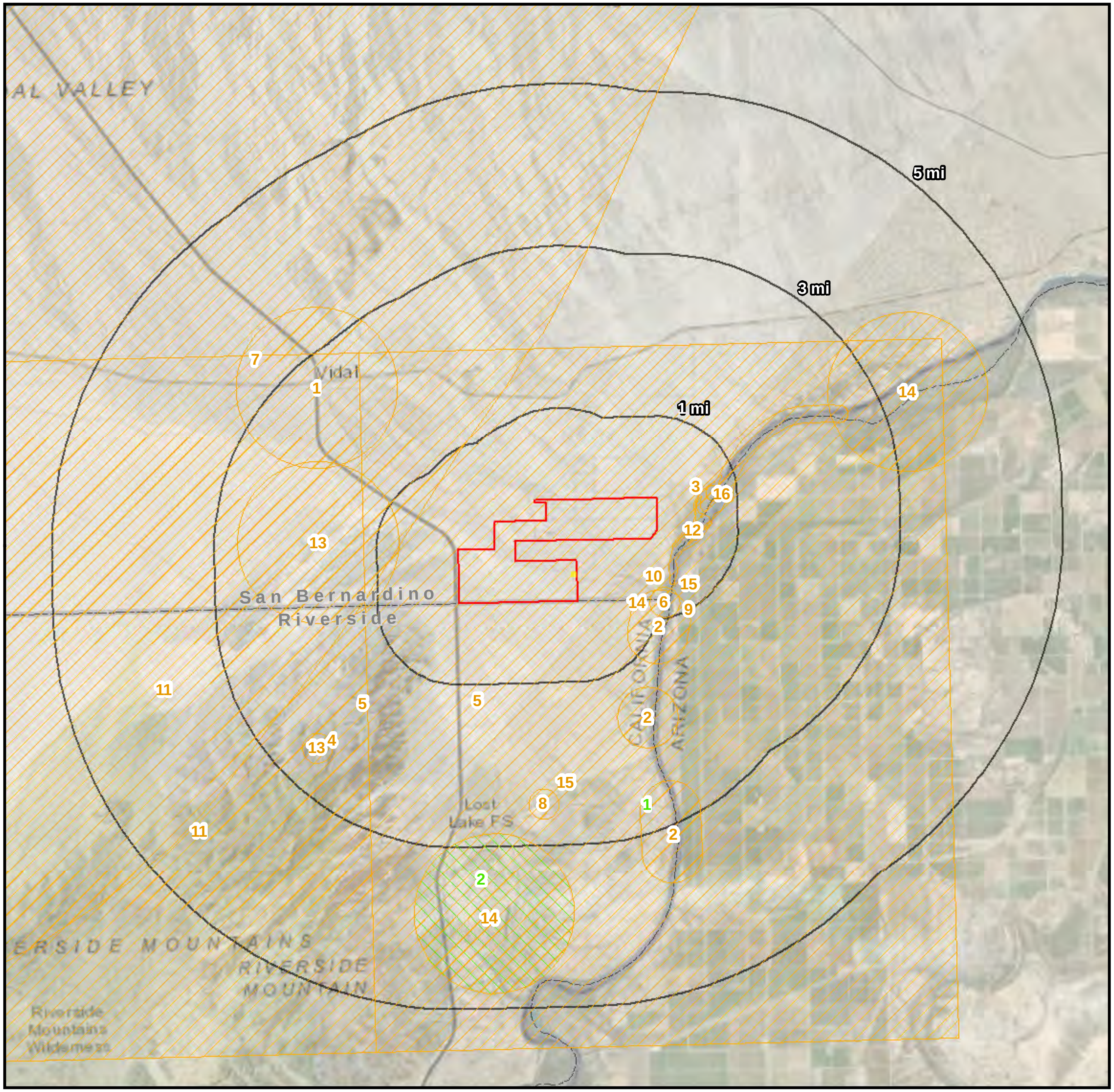
Figure 3
Sensitive Species within 5mi of the Vidal Energy Project Area



Project Boundary

Proposed Project Substation

Distance

Distance

CNDDB Occurrences

Animals

1- American badger
2 - Arizona bell's vireo
3 - California black rail
4 - California leaf-nosed bat
5 - cave myotis
6 - Crissal thrasher
7 - desert tortoise
8 - elf owl
9 - Gila woodpecker
10 - northern cardinal
11 - prairie falcon
12 - razorback sucker
13 - Townsend's big-eared bat
14 - western yellow-billed cuckoo
15 - yellow-breasted chat
16 - Yuma Ridgway's rail

Plants

1 - Abrams' spurge
2 - Alverson's foxtail cactus

N

0 1 2 4

Miles

Name: 21232 PLAN Fig 3 Sensitive Species within 5mi of the Vidal Energy Project Area.Mxd
Print Date: 7/17/2024, Author: pcarlos

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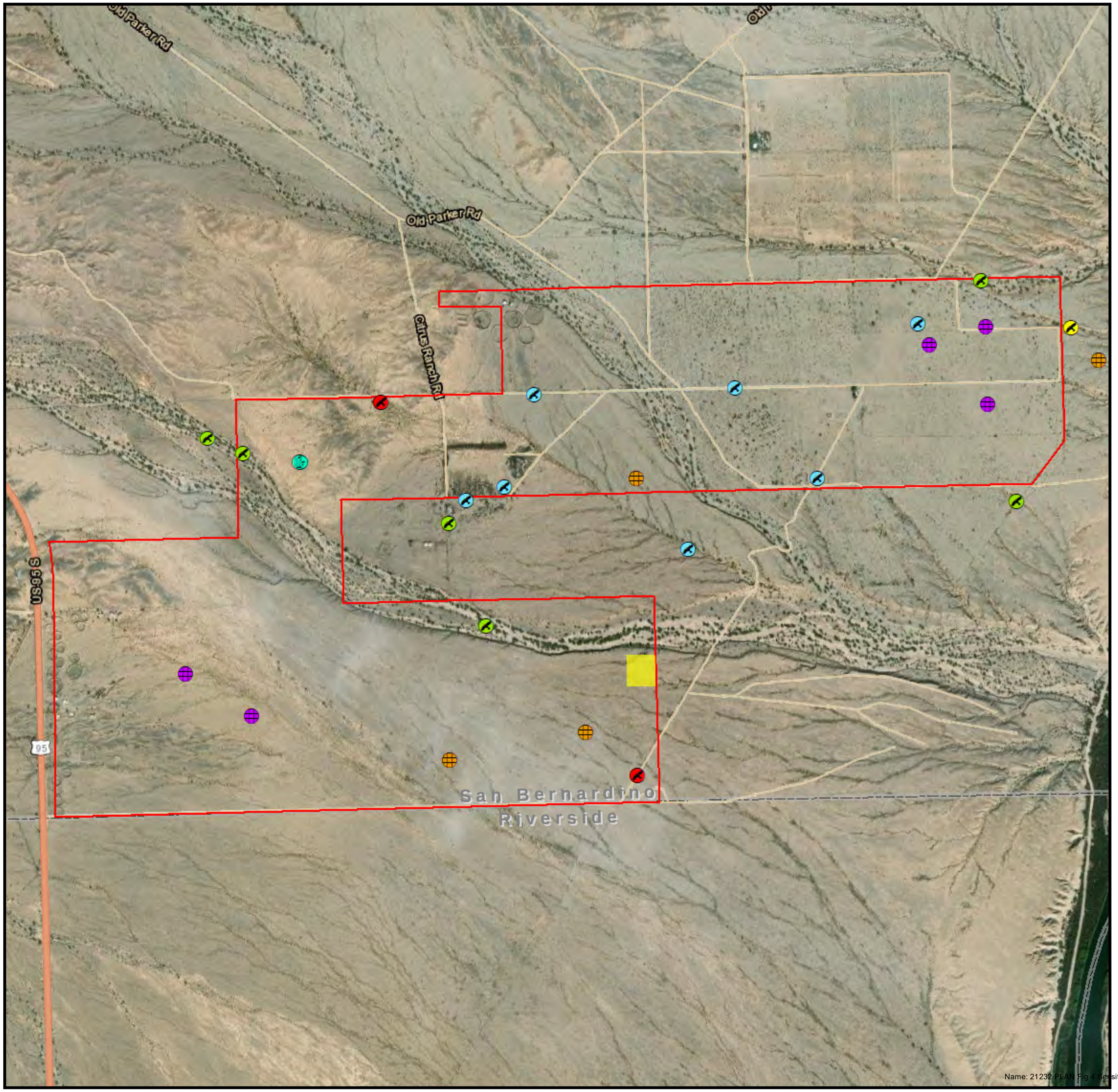
Figure 4
Sensitive Species Observations within Vidal Energy Project Area



Project Boundary

Survey Buffer (500 ft)

Potential Burrowing Owl Burrows w/ Sign

Kit Fox Burrow/ Burrow Complexes w/ Sign

Plants

Utah vine milkweed

Animals

black-tailed gnatcatcher

loggerhead shrike

osprey

yellow warbler

N

0 1,000 2,000 4,000

Feet

Name: 21232 PLAN Fig 4 Sensitive Species Observations within Vidal Energy Project Area.Mxd
Print Date: 7/16/2024, Author: pcarlos

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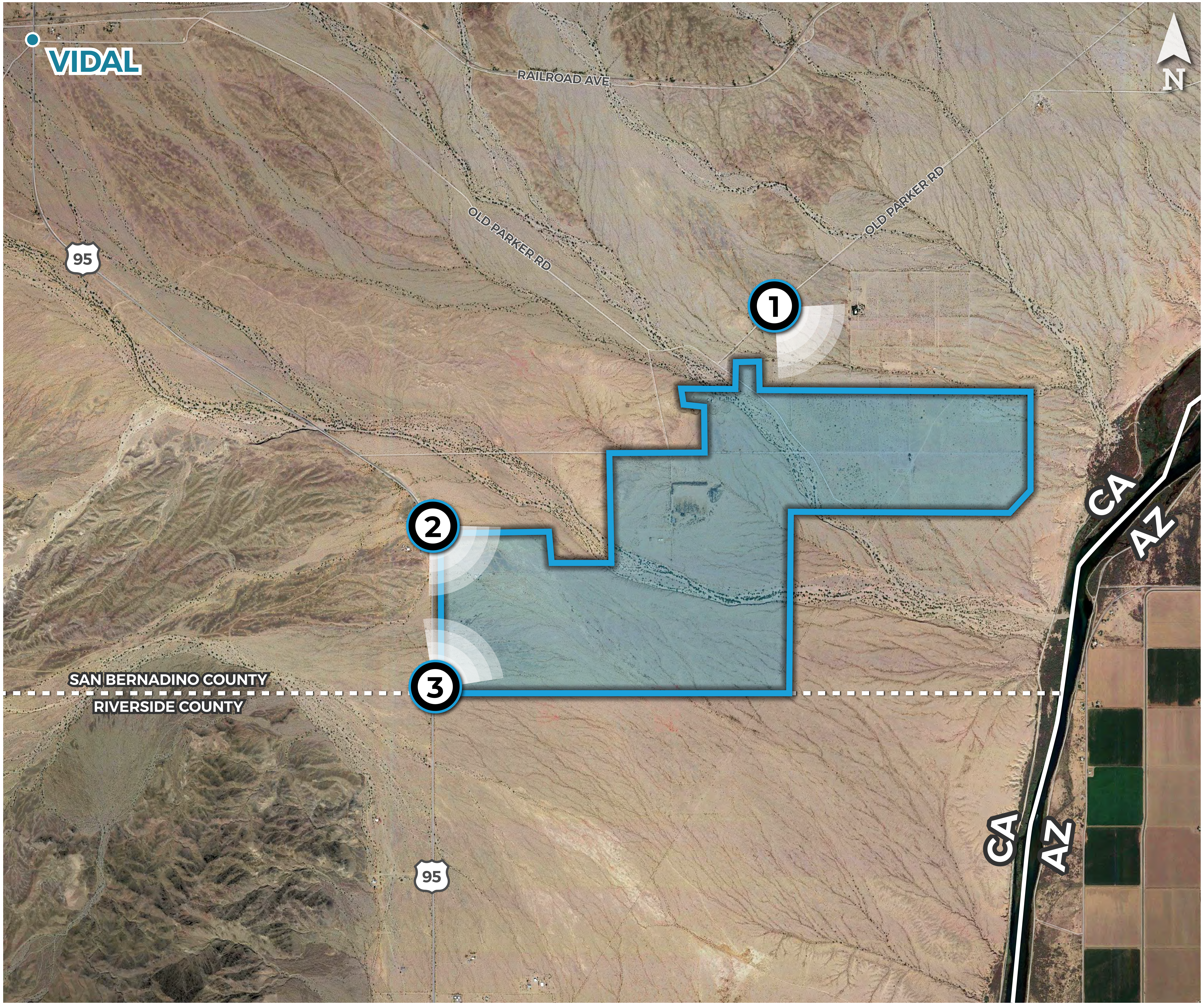

VIDAL SOLAR
ENERGY FACILITY

Figure 5
KOP Overview Map

1 PHOTO VIEWPOINT

MAP DETAIL AREA

PROJECT AREA*

*Does not reflect the current project boundary

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VIDAL SOLAR
ENERGY FACILITY

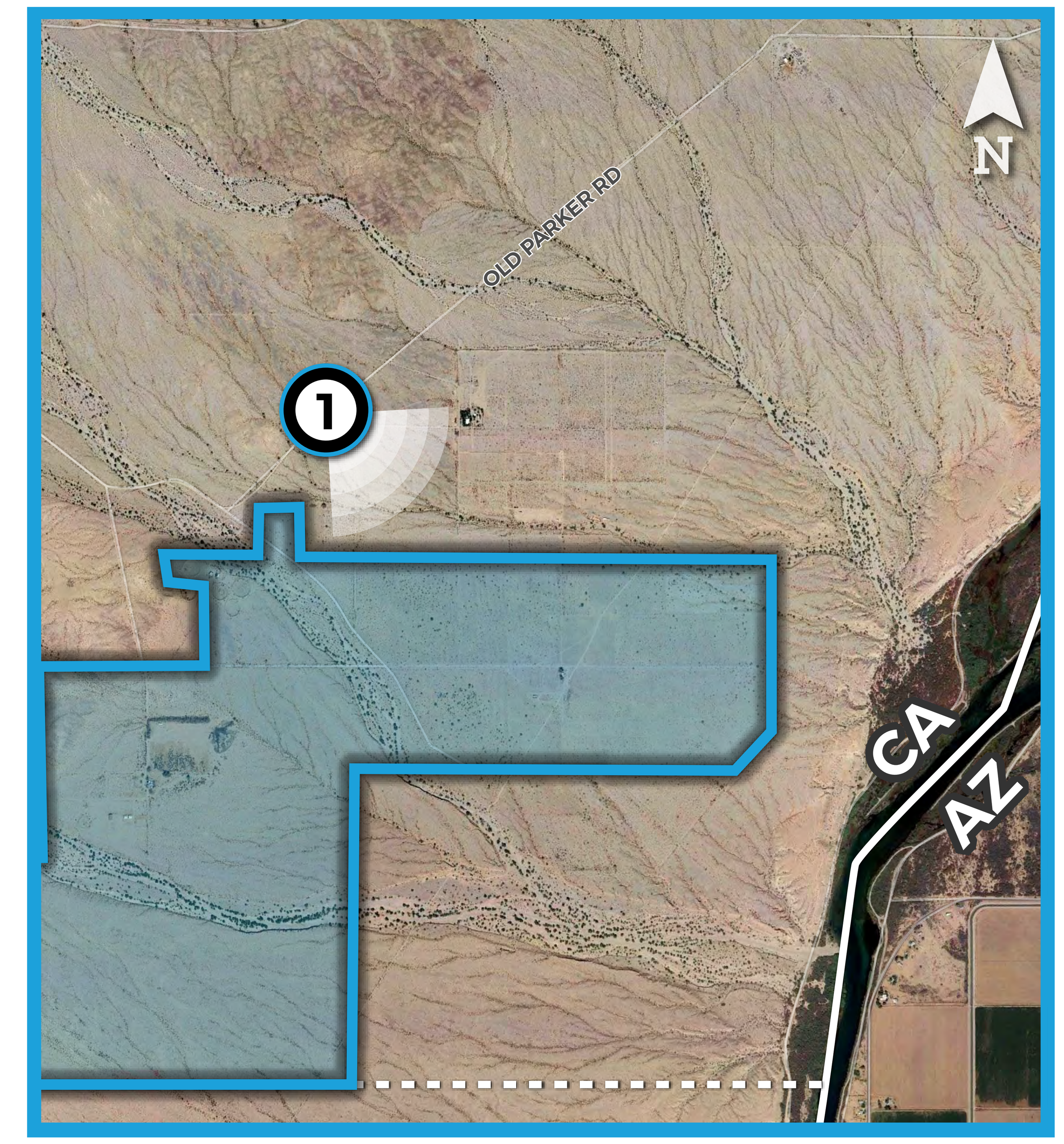
Figure 6 KOP 1

DATE: 6/16/21
TIME: 1:12 PM
DIRECTION: SOUTHEAST

EXISTING CONDITIONS

PROPOSED CONDITIONS

PHOTO SIMULATIONS ARE FOR DISCUSSION PURPOSES ONLY. FINAL DESIGN IS SUBJECT TO CHANGE.



(1) PHOTO VIEWPOINT

PROJECT AREA*

*Does not reflect the current project boundary

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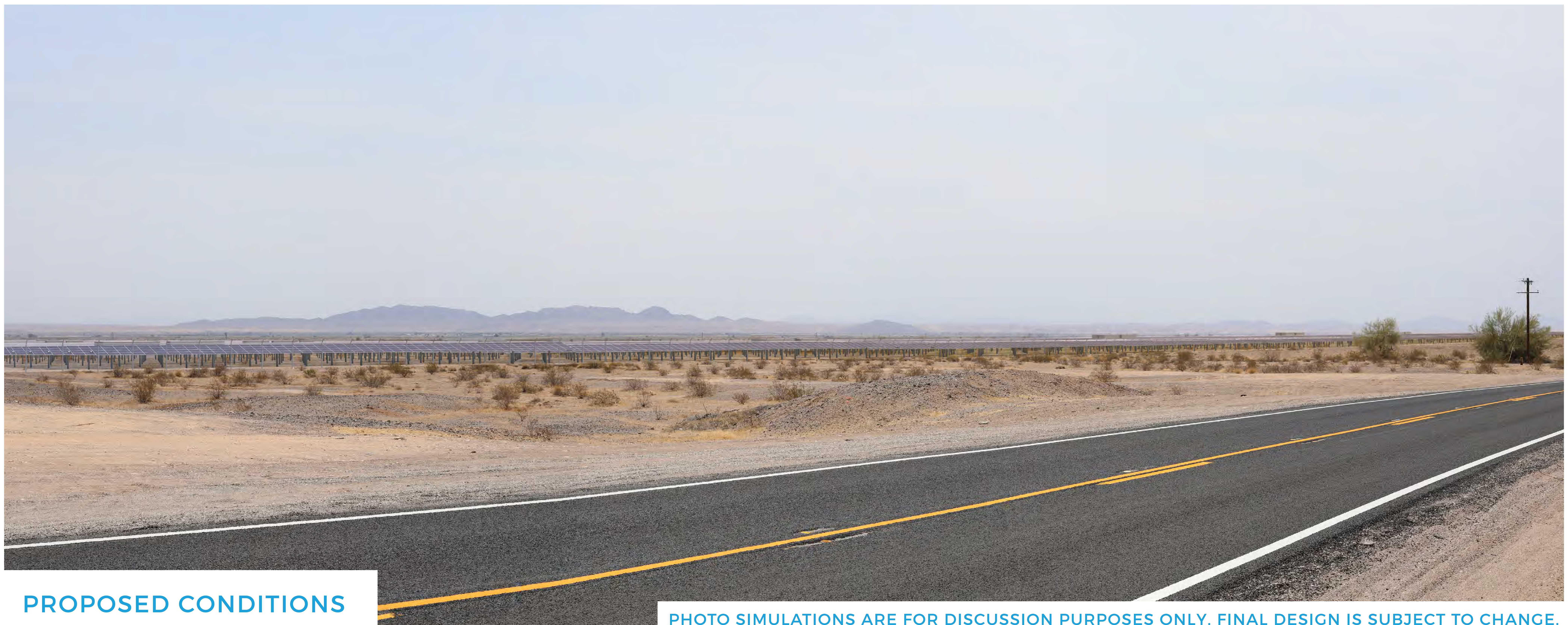
EXISTING CONDITIONS



PROPOSED CONDITIONS

PHOTO SIMULATIONS ARE FOR DISCUSSION PURPOSES ONLY. FINAL DESIGN IS SUBJECT TO CHANGE.

VIDAL SOLAR
ENERGY FACILITY

Figure 7 KOP 2

DATE: 6/16/21
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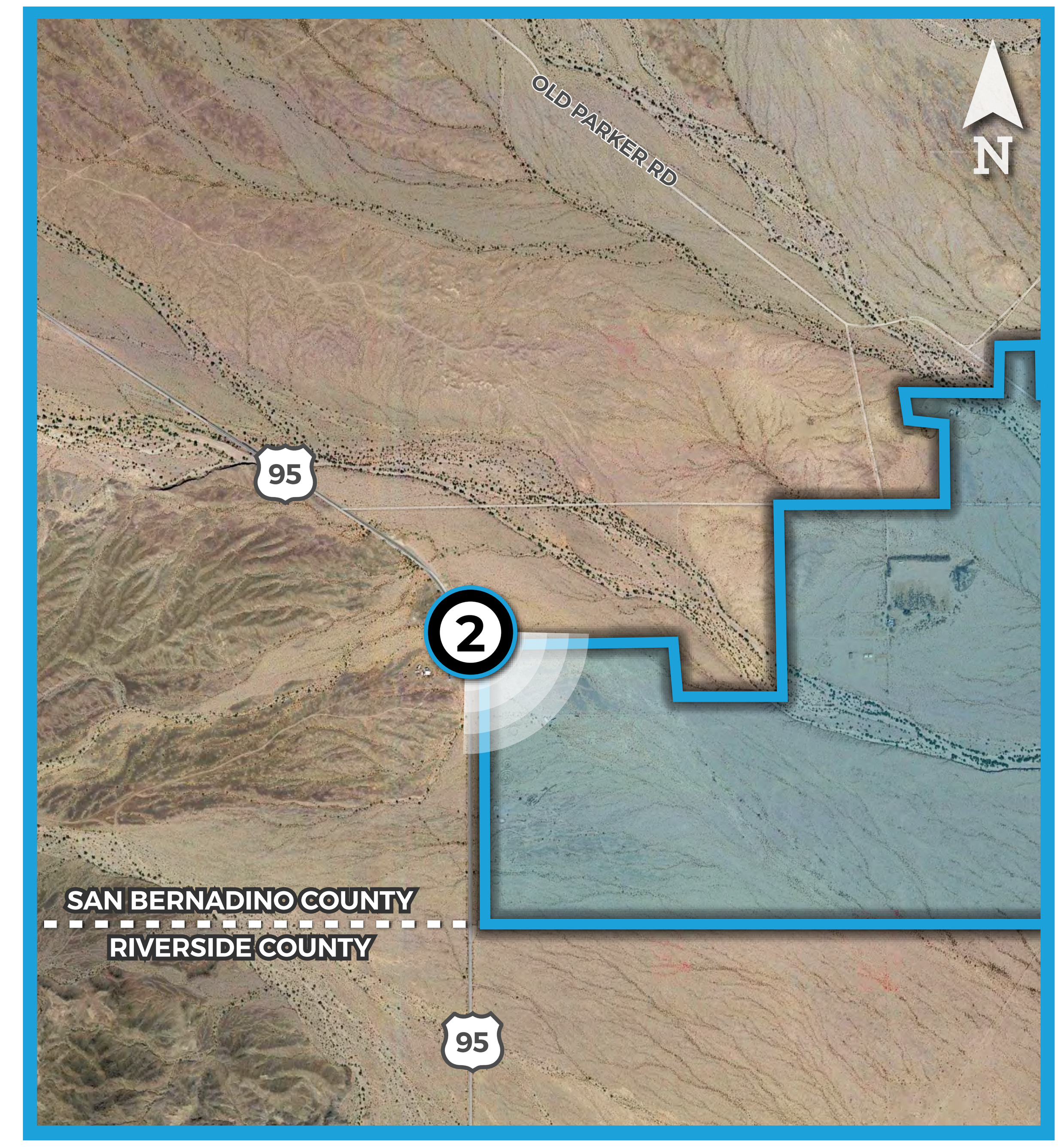
DIRECTION: SOUTHEAST



2 PHOTO VIEWPOINT

PROJECT AREA*

*Does ot reflect the current project boundary

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VIDAL SOLAR
ENERGY FACILITY

Figure 8 KOP 3

DATE: 6/16/21
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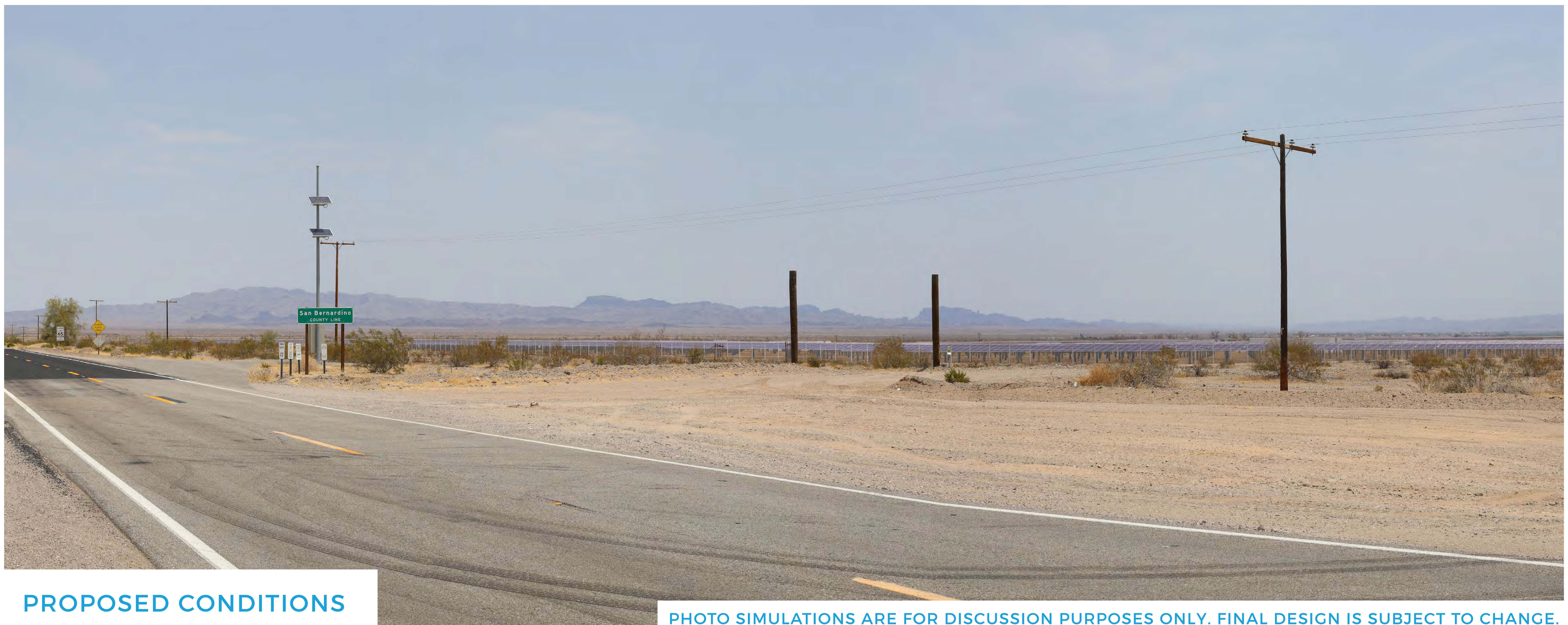
DIRECTION: NORTHEAST

EXISTING CONDITIONS



PROPOSED CONDITIONS

PHOTO SIMULATIONS ARE FOR DISCUSSION PURPOSES ONLY. FINAL DESIGN IS SUBJECT TO CHANGE.

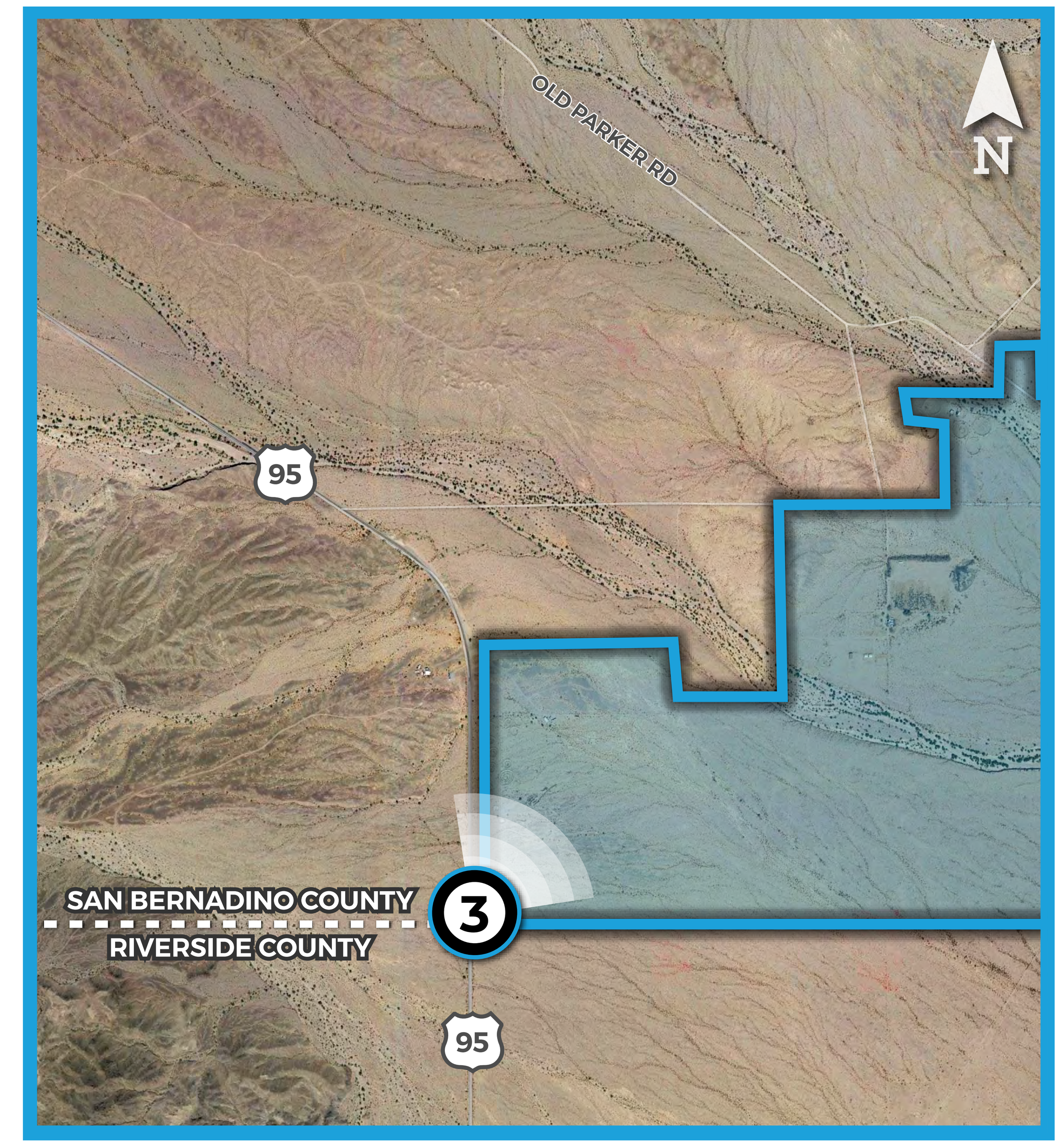


PHOTO VIEWPOINT

PROJECT AREA*

*Does not reflect the current project boundary

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Appendix B – Scoping Summary

REVISED PROPOSED FEDERAL ACTION FOR THE VIDAL SOLAR INTERCONNECTION PROJECT DOE/EA-2170

CHAMBERS GROUP

September 14, 2023

Matt Pollock, NEPA Document Manager
Western Area Power Administration
Desert Southwest Region
Phoenix, Arizona

Subject: Updated National Environmental Policy Act (NEPA) Scoping for the Vidal Solar Interconnection Project

The purpose of this memo is to notify the Western Area Power Administration (WAPA) of a proposed change in scope to the Proposed Federal Action for the Vidal Solar Interconnection Project. The proposed revision to the Proposed Federal Action is a result of ongoing communication and coordination with the WAPA Staff. In short, and further discussed below, the Proposed Federal Action is revised to reflect the use of microwave as the primary form of communication between stations and the elimination of the required fiber optic upgrades between Headgate Rock and Blythe. The revision to the Proposed Federal Action would significantly reduce the requirements of interconnecting with WAPAs electrical transmission system and therefore would significantly reduce the environmental impacts associated with the Proposed Federal Action.

Presented below is an Introduction to the Project, the original Proposed Federal Action, the original Proposed Connected Actions, previous scoping efforts, and the revised Proposed Federal Action and Connected Actions.

Introduction

In October 2021, CDH Vidal LLC requested to interconnect its proposed photovoltaic solar plant, located near Vidal in the County of San Bernardino, California, to the WAPA electrical transmission system via the Headgate Rock-Blythe 161-kilovolt transmission. The transmission line is on lands managed by the Bureau of Land Management (BLM) in an existing right-of-way (ROW) held by WAPA. CDH Vidal LLC proposes to build, operate, and maintain an approximately 160-megawatt photovoltaic solar energy generation facility on up to 1,220 acres of private land. The original Proposed Federal Action and Connected Actions, along with the revised Proposed Federal Action and Connected Actions are described in further detail below.

Original Proposed Federal Action

The original Proposed Federal Action included construction of a new switchyard and associated interconnection facilities adjacent to the proposed Project and to WAPA's existing Headgate Rock-Blythe 161-kV transmission line. WAPA also proposed upgrades to its communication equipment along the entirety of the Headgate Rock-Blythe transmission line by replacing the existing overhead grounding wire with new fiber optic grounding wire.

Under the original Proposed Federal Action, WAPA would build, maintain, and decommission a new, approximately 4.2-acre switchyard and an interconnection looping in the new switchyard to the existing Headgate Rock-Blythe 161 kV transmission line. The interconnection would consist of new three-pole structures (four new poles in total) in the vicinity of existing structures 25/1 and 25/4, located directly adjacent to the south of the proposed Project's new substation. The new three-pole structures would be up to 100 feet tall and made of galvanized steel. Two of the three-pole structures would be constructed within the existing ROW. The two remaining three-pole structures would be constructed just outside of the new switchyard.

Additionally, approximately 52 miles of new 48-strand overhead fiber optic grounding wire would be installed, replacing the existing static wire, on the Headgate Rock-Blythe 161 kV transmission line between the Headgate Rock and Blythe Substations, looped through the WAPA interconnection switchyard. The fiber optic wire would serve as primary and temporary secondary communication until permanent secondary communication facilities are in place, in addition to its role in shielding the energized conductors from lightning strikes. When lightning strikes, the energy from the lightning strike would travel along the overhead grounding wire to a location where the energy from the lightning strike can go to ground and safely dissipate, allowing for the transmission line conductors to remain energized.

Original Proposed Connected Actions

CDH Vidal LLC proposes to build, operate, and maintain an approximately 160-megawatt photovoltaic solar energy generation facility on up to 1,220 acres of private land. These actions are connected actions under the National Environmental Policy Act (NEPA) per 40 CFR § 1508.25 (a)(1), since they "cannot or will not proceed unless other actions are taken previously or simultaneously". Therefore, these connected actions are subject to NEPA review, with WAPA assuming the role of Lead Federal Agency. Each Connected Action is described in further detail below.

Solar Generator and Power Conversion Stations (Inverters)

The Project would utilize up to 160 MW-AC Peak (46 MW-AC Average) PV system blocks to convert solar energy directly to electrical power for export to the electrical grid. The total BESS capacity for the PV site is 640 megawatt hours (MWh). Solar power is generated through PV modules converting sunlight striking the modules directly to low-voltage, direct-current (DC) power, which is subsequently transformed to alternating-current (AC) power via an onsite inverter. The Project would develop modules using either fixed-tilt or tracker technology. Trackers tilt the panels to follow the course of the sun, optimizing the incident angle of sunlight on their surface. The PV panel modules are mounted on steel support posts that are pile-driven into the ground. The arrays are typically placed on an aluminum rail, such that with a maximum tilt of 52 degrees, the top of the array would be a maximum of 18 feet above grade at the tallest point and approximately 2 feet above grade at the lowest point.

The PV modules are made of semiconductor material encapsulated in glass in which the PV effect converts light (photons) into electrical current. PV is best known as a method for generating electric power by using solar cells to convert energy from the sun into electricity. Energy from the sun is transmitted to the Earth as photons, which contain different levels of energy corresponding to different frequencies of the solar spectrum. When a photon is absorbed by a PV cell, the energy of the photon is transferred to an electron in an atom within the PV cell. This added energy allows the electron to escape from the atom to become part of the current in an electrical circuit.

Power conversion stations (PCS), also known as inverters, that would contain at a minimum one inverter and one transformer, would be within the proposed solar arrays located across the Project site. Inverters are typically housed in an enclosed structure that helps to reduce the resulting operational noise levels. In addition, PCS would also be anticipated to include an exhaust fan and a heating, ventilation, and air conditioning (HVAC) system that is typically mounted to the exterior of the enclosure. Noise levels generated by PCS would be associated with operation of the inverters, transformer, exhaust fans, and HVAC systems.

Access and Maintenance Roads

Primary access to the Project site from the regional transportation system would be gained by exiting from U.S. Route 95 directly onto a Project-controlled access road on the west side of the Project site. While existing roads would be used to the greatest extent possible, potential new unpaved roads may need to be constructed off site to serve as access roads from the existing road network to the Project site. Any new road surrounding the Project site would be a minimum of 20 feet wide for fire department and emergency vehicles use. Additional internal maintenance roads would be located throughout the Project site. Spacing between each row of solar panels would depend on final panel type, orientation, and County regulations. Internal access roads would be as wide as 20 feet and would be cleared and compacted for equipment and emergency vehicle travel and access to the solar blocks. These Project site access roads would remain in place for ongoing operations and maintenance activities after construction is completed and would be covered in gravel, or other method to provide commensurate dust control.

Battery Storage

The Project would include a BESS with a capacity of 640 MWh. The BESS would likely consist of containers housing batteries connected in strings and mounted on racks. The container would likely include a transformer and monitoring, lighting, and cooling equipment. However, some BESS equipment (e.g., inverters, auxiliary transformer to control the HVAC system) may be adjacent to the container instead of within it. The Project would use as many as 47 containers, depending on container dimensions. Each container would be up to 80 feet long, 8 feet wide, and 8 feet tall.

There are two different locations and methods of storage proposed for BESS; these include: (1) all BESS containers consolidated within the Project substation area, or (2) BESS equipment distributed throughout the Project's solar arrays by co-locating a single BESS container with each of the Project's block inverters with the BESS and the inverter housed in or near the same container. Method 1, if fully employed, would require approximately 7.1 acres within the Project substation area to house the BESS containers. Using Method 2, the BESS containers would contain batteries only and the inverters would remain central to the solar array blocks. Batteries would be co-located with PV arrays and DC coupled and would share the PV inverters and transformers and have their own DC/DC converter that would either be on its own foundation, on the same skid as the inverters, or in the container with the batteries (depending on the design).

The Project design includes shielded and motion-activated lighting and safety features within each container. The containers are equipped with a door on each end and include fire detection and fire suppression systems. Cables and cooling pipes would pass through the container floor. The container would have unobtrusive external painting that would blend in with the natural terrain and landscape.

Project Substations

The Project would include construction of one substation facility in the southeastern corner of the Project site. The substation would collect the power generated by the PV solar system blocks, transport the power via the underground/overhead power collection system, and then convert the power for transmission in WAPA's overhead 161-kV line. Additionally, the Project would construct a second substation, within the Project footprint, to be utilized by WAPA.

Equipment at the substations would include transformers, bus work, switches, breakers, and all associated equipment required to be compliant with utility grade interconnection services. The substation facilities would house the power generation control and relaying equipment, station batteries, and Supervisory Control and Data Acquisition System (SCADA) and communication systems. The Project substation would be remotely operated and periodically maintained, but would not be permanently staffed. The substation site would be cleared, graded, and graveled. A security fence would be installed around the perimeter for safety and security purposes. The fence would comprise a chain-link fence measuring as high as 6 feet tall, topped with as many as three strands of barbed wire, for a total maximum height of 8 feet. For safety and security purposes, this fence would not be adapted for wildlife movement. Construction and operations of the Project substation would affect approximately 7.5 acres. The BESS may also be co-located within or adjacent to the substation yard.

Previous Scoping Efforts

Previous public scoping for the Project was initiated on January 12, 2022. WAPA held a 30-day scoping period for the Project that ended on February 17, 2022. Scoping letters were mailed to interested parties and adjacent landowners to inform them of the Project, notify them of the scoping period, and request input on the Project. Letters were also sent on September 2, 2021, to the following five Native American tribes: Chemehuevi Indian Tribe, Colorado River Indian Tribes, Fort Mojave Indian Tribe, Quechan Tribe of the Fort Yuma Reservation, and Twenty-Nine Palms Band of Mission Indians.

WAPA accepted scoping comments via telephone, email, and U.S. mail. The Project received a total of 12 submittals. Each submittal may have included multiple comments on environmental resources or topics for analysis. Documents were received from 11 individuals and one tribe (Colorado River Indian Tribes). All documents were unique, no form letters were received. In total, 15 comments were identified from submittals. Comments received concerned a range of environmental and impacts analysis issues relating to the proposed Project. The most common topic was general comments, with a total of seven comments. Two comments requested additional information and one expressed general support for the Project. Other topics raised in the comments included access to cultural resources, socioeconomics, and the NEPA process.

SUMMARY OF COMMENTS FROM INDIVIDUALS AND BUSINESSES

Individuals who submitted comments included concerned citizens and local property owners. Topics addressed in these comments ranged from requesting more information regarding the Project and Project location, land being for sale, and property value. Individual and business comments also expressed general support for as well as opposition to the proposed Project.

SUMMARY OF COMMENTS FROM TRIBES

Comments submitted by the Colorado River Indians Tribes during the scoping period expressed concern for the identification and avoidance of ancestral sites, cultural resources, and prehistoric archaeological sites. The Colorado Indian Tribe also requests a full environmental impact statement be prepared along with a mitigation and treatment plan be prepared prior to construction.

SUMMARY OF INTERNAL AGENCY SCOPING

WAPA invited BLM to be a cooperating agency in the preparation of the Environmental Assessment (EA), because of their jurisdiction by law or special expertise. BLM subsequently declined to be a cooperating agency. WAPA solicited input from internal staff and BLM to assess other agency issues pertaining to the project. No additional internal agency scoping issues were raised during WAPA’s internal scoping meeting, a comprehensive list of resources and resource issues were reviewed for consideration in the EA analysis.

Revised Proposed Federal Action

The revised Proposed Federal Action would require the building, maintenance, and decommissioning of a new, approximately 4.2-acre switchyard and an interconnection looping in the new switchyard to the existing Headgate Rock-Blythe 161 kV transmission line. Underground fiber would be installed from the control building within the Project site to the take-off structure. Optical Ground Wire (OPGW) would be installed from the take-off structure, along the new overhead approach spans, then coiled up at existing structures 25-1 or 25-3.

Revised Proposed Connected Actions

The Proposed Connected Actions, as presented above, would be unchanged as a result of the revised Proposed Federal Action.

Conclusions

The elimination of the communication upgrades and grounding wire from the Proposed Federal Action is due to the establishment of microwave as the primary path of communication between stations. Therefore, the transmission line upgrades required under the original Proposed Federal Action are no longer required for the Project. This significantly reduces the scope of the Proposed Federal Action, while the Proposed Connected Actions would remain unchanged. The result would be significantly reduced overall project footprint and environmental impacts associated with the Project. Additionally, the revisions to the Proposed Federal Action, in our professional opinion, do not warrant a re-opening of the public scoping process due to the reduction in Scope.

Sincerely,

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APPENDIX C – Air Quality and Greenhouse Gas Emissions Impact Analysis, dated July 8, 2022, prepared by Vista Environmental.

AIR QUALITY AND GREENHOUSE GAS EMISSIONS IMPACT ANALYSIS

VIDAL SOLAR PROJECT

COUNTY OF SAN BERNARDINO

Lead Agency:

County of San Bernardino
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Project No. 21137

September 19, 2022

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ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
AQMP	Air Quality Management Plan
BACT	Best Available Control Technology
CAAQS	California Ambient Air Quality Standards
CalEEMod	California Emissions Estimator Model
CalEPA	California Environmental Protection Agency
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CCAA	California Clean Air Act
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CFCs	chlorofluorocarbons
Cf_4	tetrafluoromethane
C_2F_6	hexafluoroethane
C_2H_6	ethane
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
County	County of San Bernardino
CPUC	California Public Utilities Commission
DPM	Diesel particulate matter
EPA	Environmental Protection Agency
ºF	Fahrenheit
FTIP	Federal Transportation Improvement Program
GHG	Greenhouse gas
GWP	Global warming potential
HAP	Hazardous Air Pollutants
HFCs	Hydrofluorocarbons
IPCC	International Panel on Climate Change
LCFS	Low Carbon Fuel Standard

MDAB	Mojave Desert Air Basin
MDAQMD	Mojave Desert Air Quality Management District
$MMTCO_2e$	Million metric tons of carbon dioxide equivalent
MPO	Metropolitan Planning Organization
MSAT	Mobile Source Air Toxics
MWh	Megawatt-hour
NAAQS	National Ambient Air Quality Standards
NO_x	Nitrogen oxides
NO_2	Nitrogen dioxide
OPR	Office of Planning and Research
Pfc	Perfluorocarbons
PM	Particle matter
PM10	Particles that are less than 10 micrometers in diameter
PM2.5	Particles that are less than 2.5 micrometers in diameter
PPM	Parts per million
PPB	Parts per billion
PPT	Parts per trillion
RTIP	Regional Transportation Improvement Plan
RTP	Regional Transportation Plan
SAR	Second Assessment Report
SB	Senate Bill
SCAQMD	South Coast Air Quality Management District
SBCOG	San Bernardino Council of Governments
SCS	Sustainable communities strategy
SF_6	Sulfur Hexafluoride
SIP	State Implementation Plan
SO_x	Sulfur oxides
TAC	Toxic air contaminants
UNFCCC	United Nations' Framework Convention on Climate Change
VOC	Volatile organic compounds

1.0 INTRODUCTION

1.1 Purpose of Analysis and Study Objectives

This Air Quality and Greenhouse Gas (GHG) Emissions Impact Analysis has been completed to determine the air quality and GHG emissions impacts associated with the proposed Vidal Solar project (proposed project). The following is provided in this report:

- A description of the proposed project;
- A description of the atmospheric setting;
- A description of the criteria pollutants and GHGs;
- A description of the air quality and GHG emissions regulatory framework;
- A description of the air quality and GHG emissions thresholds including the California Environmental Quality Act (CEQA) significance thresholds;
- An analysis of the conformity of the proposed project with the Mojave Desert Air Quality Management District's (MDAQMD) air quality strategies;
- An analysis of the short-term construction related and long-term operational air quality and GHG emissions impacts; and
- An analysis of the conformity of the proposed project with all applicable GHG emissions reduction plans and policies.

1.2 Site Location and Study Area

The approximately 1,220-acre project site is located approximately 2.5 miles southeast of the Town of Vidal, an unincorporated area of San Bernardino County (County) that is located just east of U.S. Route 95, just north of the Riverside County border, and just west of the Colorado River. The project location and vicinity map is shown in Figure 1.

Sensitive Receptors in Project Vicinity

The nearest sensitive receptor to the project site is an unoccupied home that is located as near as 740 feet west of the project site and is located on the west side of U.S. 95. The location of the nearest unoccupied home is shown in Figure 2. The nearest occupied residence is the existing residence located over 1,600 feet to the north along Old Parker Road.

1.3 Proposed Project Description

The proposed project consists of the development of a photovoltaic (PV) solar energy facility that would include: PV panels, a battery energy storage system (BESS), fencing, service roads, a power collection system, communication cables, overhead and underground transmission lines, electrical switchyards, a project substation and a Western Power Administration (WAPA) substation that will connect to the existing 161 kilovolt overhead transmission lines and operations and maintenance facilities. The proposed site plan is shown in Figure 3.

Specifically, the proposed project will install a solar farm consisting of 391,872 PV solar modules located within solar arrays that will generate a total of 160 Megawatts (MW) and would cover approximately 810 acres. Within the proposed solar arrays located across the project site would be power conversion stations (PCS), also known as inverters that would contain at a minimum one inverter and one transformer.

The proposed project would include a 640 MWh battery energy storage system (BESS). The BESS would likely consist of containers housing batteries connected in strings and mounted on racks. The container would likely include a transformer, monitoring equipment, and lighting and cooling equipment. The Project would utilize up to 47 containers (depending on container dimensions). Each container would be up to 80 feet long by 8 feet wide and 8 feet tall. The BESS is anticipated to utilize approximately 7.1 acres of the project site.

The proposed project would also include a project substation and a WAPA substation that are anticipated to include transformers, bus work, switches, breakers, and all associated equipment required to be compliant with utility grade interconnection services. The substation site would be cleared, graded, and graveled. A security fence would be installed around the perimeter for safety and security purposes. The two substations would cover approximately 7.5 acres of the project site and the BESS may be co-located within or adjacent to the substation yard.

In addition, the proposed project would include construction of new access roads (unpaved up to 20 feet wide), that would include an unpaved gravel onsite access road from U.S Route 95 to the proposed substations that would cover approximately 6 acres of the project site.

Construction of the proposed project is anticipated to start in the first quarter of 2023 and would last approximately 14 months. The onsite workforce is expected to average 220 workers per day with a peak up to 495 workers.

1.4 Executive Summary

Standard Air Quality, Energy, and GHG Regulatory Conditions

The proposed project will be required to comply with the following regulatory conditions from the MDAQMD and State of California (State).

<u>MDAQMD Rules</u>

The following lists the MDAQMD rules that are applicable, but not limited to the proposed project.

- Rule 401 Visible Emissions – Limits fugitive dust emissions;
- Rule 402 Nuisance – Controls the emissions of odors and other air contaminants;
- Rule 403 and 403.2 Fugitive Dust – Controls the emissions of fugitive dust;
- Rule 442 Solvents – Establishes VOC content limits in solvents;
- Rules 1103 Cutback and Emulsified Asphalt – Controls the VOC content in asphalt; and
- Rule 1113 Architectural Coatings - Controls the VOC content in paints and solvents

<u>State of California Rules</u>

The following lists the State of California Code of Regulations (CCR) air quality emission rules that are applicable, but not limited to the proposed project.

- CCR Title 13, Article 4.8, Chapter 9, Section 2449 – In use Off-Road Diesel Vehicles;
- CCR Title 13, Section 2025 – On-Road Diesel Truck Fleets;
- CCR Title 24 Part 6 – California Building Energy Standards; and
- CCR Title 24 Part 11 – California Green Building Standards.

Summary of Analysis Results

The following is a summary of the proposed project's impacts with regard to the State CEQA Guidelines air quality and GHG emissions checklist questions.

<u>Conflict with or obstruct implementation of the applicable air quality plan?</u>

Less than significant impact.

<u>Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable Federal or State ambient air quality standard?</u>

Less than significant impact.

<u>Expose sensitive receptors to substantial pollutant concentrations?</u>

Less than significant impact.

<u>Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?</u>

Less than significant impact.

<u>Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment?</u>

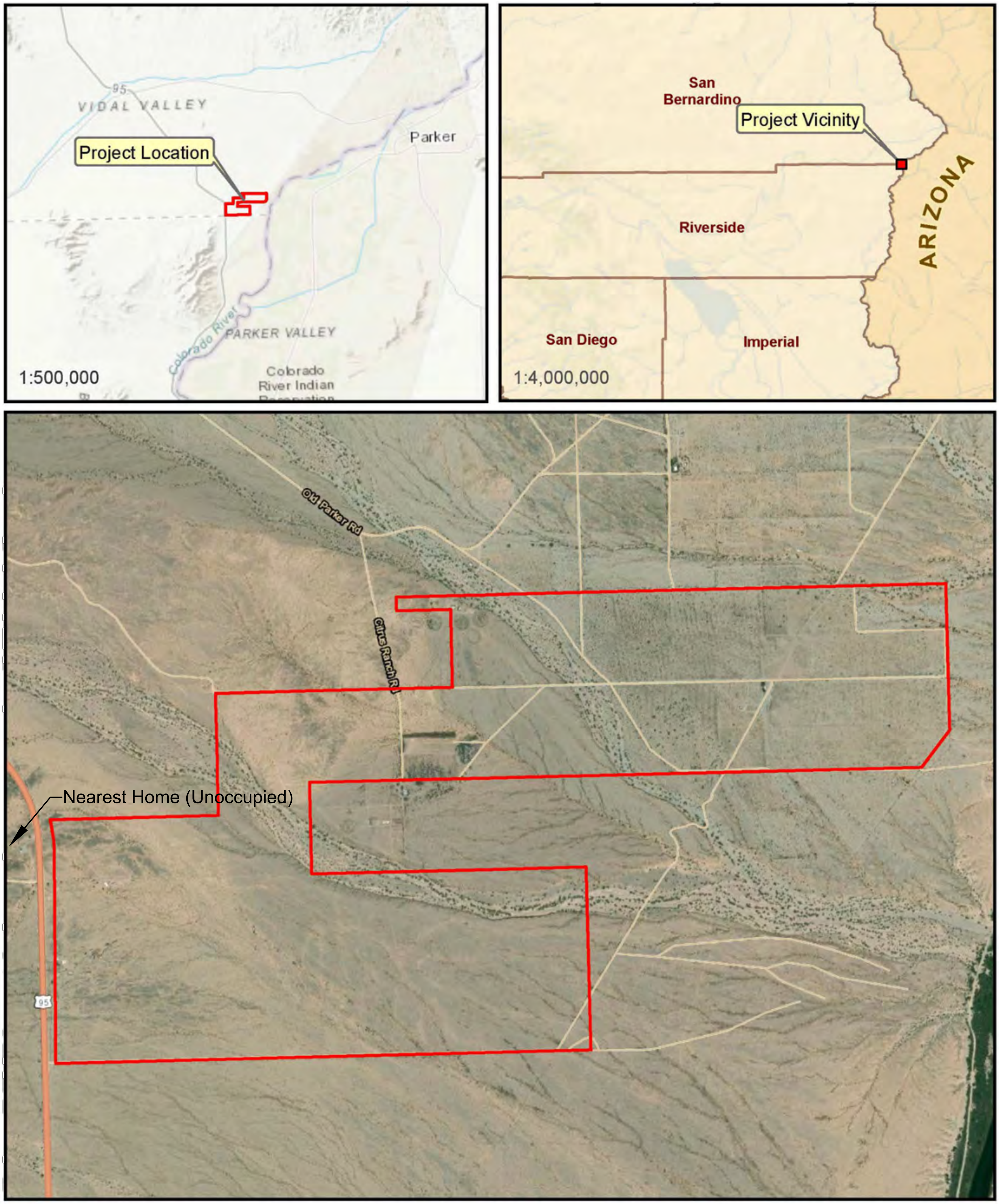
Less than significant impact.

<u>Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of GHGs?</u>

Less than significant impact.

1.5 Mitigation Measures for the Proposed Project

This analysis found that implementation of the State, MDAQMD, and County air quality and GHG emissions reductions regulations were adequate to limit criteria pollutants, toxic air contaminants, odors, and GHG emissions from the proposed project to less than significant levels. No mitigation measures are required for the proposed project with respect to air quality and GHG emissions.



Project Location

SOURCE: Chambers Group.

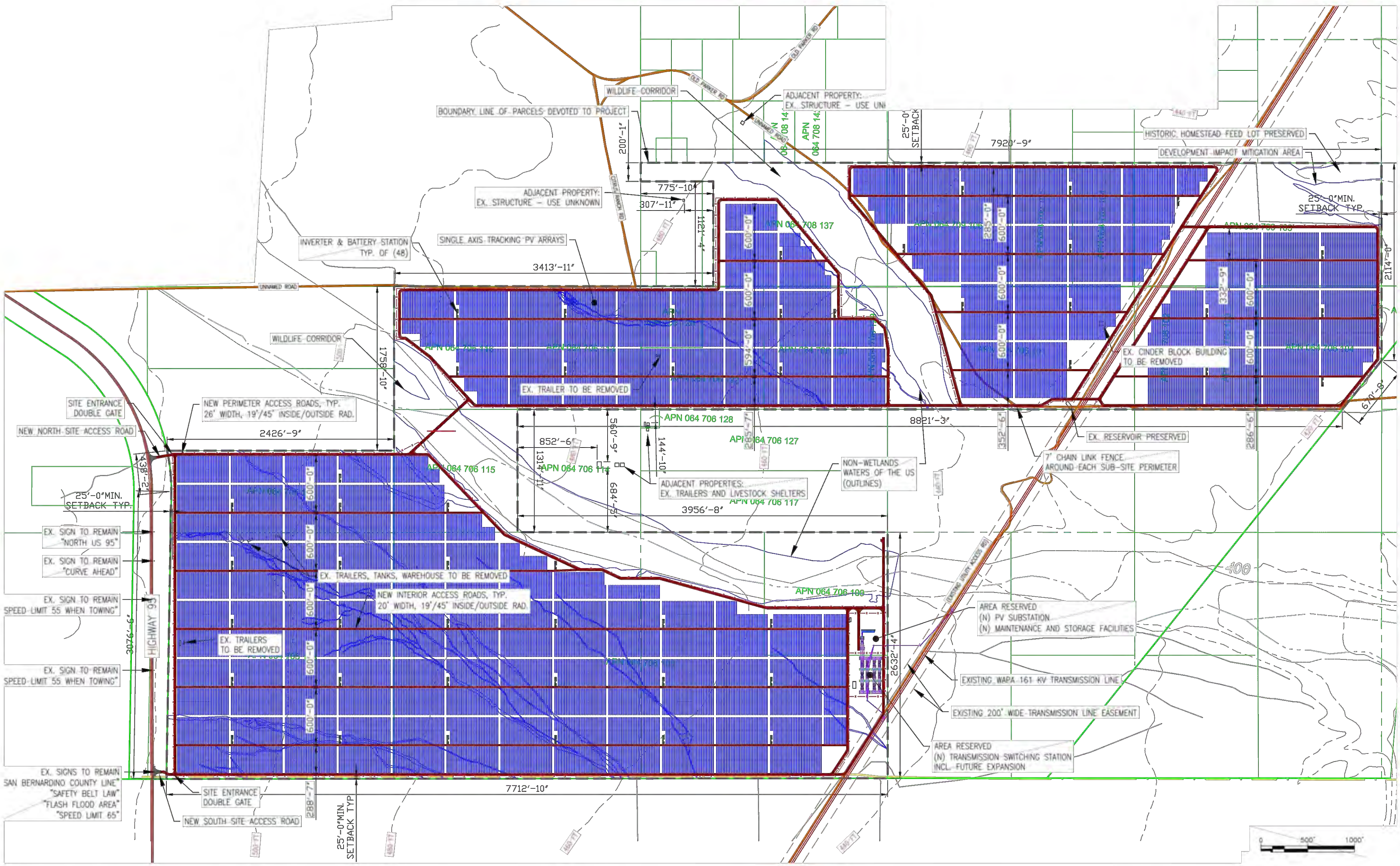
VISTA
ENVIRONMENTAL

Figure 1
Project Location and Vicinity Map

SOURCE: Public San Bernardino County Parcel Viewer.

VISTA ENVIRONMENTAL

Figure 2
Location of Nearest Home (Unoccupied) on West Side of Project Site



SOURCE: CORE.

Figure 3
Proposed Site Plan

2.0 AIR POLLUTANTS

Air pollutants are generally classified as either criteria pollutants or non-criteria pollutants. Federal ambient air quality standards have been established for criteria pollutants, whereas no ambient standards have been established for non-criteria pollutants. For some criteria pollutants, separate standards have been set for different periods. Most standards have been set to protect public health. For some pollutants, standards have been based on other values (such as protection of crops, protection of materials, or avoidance of nuisance conditions). A summary of federal and state ambient air quality standards is provided in the Regulatory Framework section.

2.1 Criteria Pollutants and Ozone Precursors

The criteria pollutants consist of: ozone, NO_x, CO, SO_x, lead, and particulate matter (PM). The ozone precursors consist of NO_x and VOC. These pollutants can harm your health and the environment, and cause property damage. The United States Environmental Protection Agency (EPA) calls these pollutants "criteria" air pollutants because it regulates them by developing human health-based and/or environmentally-based criteria for setting permissible levels. The following provides descriptions of each of the criteria pollutants and ozone precursors.

Nitrogen Oxides

Nitrogen Oxides (NOx) is the generic term for a group of highly reactive gases which contain nitrogen and oxygen. While most NOx are colorless and odorless, concentrations of NO_2 can often be seen as a reddish-brown layer over many urban areas. NOx form when fuel is burned at high temperatures, as in a combustion process. The primary manmade sources of NO_x are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuel. NOx reacts with other pollutants to form, ground-level ozone, nitrate particles, acid aerosols, as well as NO_2, which cause respiratory problems. NO_x and the pollutants formed from NO_x can be transported over long distances, following the patterns of prevailing winds. Therefore, controlling NOx is often most effective if done from a regional perspective, rather than focusing on the nearest sources.

Ozone

Ozone is not usually emitted directly into the air but in the vicinity of ground-level is created by a chemical reaction between NOx and volatile organic compounds (VOC) in the presence of sunlight. Motor vehicle exhaust, industrial emissions, gasoline vapors, chemical solvents as well as natural sources emit NOx and VOC that help form ozone. Ground-level ozone is the primary constituent of smog. Sunlight and hot weather cause ground-level ozone to form with the greatest concentrations usually occurring downwind from urban areas. Ozone is subsequently considered a regional pollutant. Ground-level ozone is a respiratory irritant and an oxidant that increases susceptibility to respiratory infections and can cause substantial damage to vegetation and other materials. Because NOx and VOC are ozone precursors, the health effects associated with ozone are also indirect health effects associated with significant levels of NOx and VOC emissions.

Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless gas that is formed when carbon in fuel is not burned completely. It is a component of motor vehicle exhaust, which contributes approximately 56 percent of all CO emissions nationwide. In cities, 85 to 95 percent of all CO emissions may come from motor vehicle exhaust. Other sources of CO emissions include industrial processes (such as metals processing and chemical manufacturing), residential wood burning, and natural sources such as forest fires. Woodstoves, gas stoves, cigarette smoke, and unvented gas and kerosene space heaters are indoor sources of CO. The highest levels of CO in the outside air typically occur during the colder months of the year when inversion conditions are more frequent. The air pollution becomes trapped near the ground beneath a layer of warm air. CO is described as having only a local influence because it dissipates quickly. Since CO concentrations are strongly associated with motor vehicle emissions, high CO concentrations generally occur in the immediate vicinity of roadways with high traffic volumes and traffic congestion, active parking lots, and in automobile tunnels. Areas adjacent to heavily traveled and congested intersections are particularly susceptible to high CO concentrations.

CO is a public health concern because it combines readily with hemoglobin and thus reduces the amount of oxygen transported in the bloodstream. The health threat from lower levels of CO is most serious for those who suffer from heart disease such as angina, clogged arteries, or congestive heart failure. For a person with heart disease, a single exposure to CO at low levels may cause chest pain and reduce that person's ability to exercise; repeated exposures may contribute to other cardiovascular effects. High levels of CO can affect even healthy people. People who breathe high levels of CO can develop vision problems, reduced ability to work or learn, reduced manual dexterity, and difficulty performing complex tasks. At extremely high levels, CO is poisonous and can cause death.

Sulfur Oxides

Sulfur Oxide (SOx) gases are formed when fuel containing sulfur, such as coal and oil is burned, as well as from the refining of gasoline. SOx dissolves easily in water vapor to form acid and interacts with other gases and particles in the air to form sulfates and other products that can be harmful to people and the environment.

Lead

Lead is a metal found naturally in the environment as well as manufactured products. The major sources of lead emissions have historically been motor vehicles and industrial sources. Due to the phase out of leaded gasoline, metal processing is now the primary source of lead emissions to the air. High levels of lead in the air are typically only found near lead smelters, waste incinerators, utilities, and lead-acid battery manufacturers. Exposure of fetuses, infants and children to low levels of Pb can adversely affect the development and function of the central nervous system, leading to learning disorders, distractibility, inability to follow simple commands, and lower intelligence quotient. In adults, increased lead levels are associated with increased blood pressure.

Particulate Matter

Particle matter (PM) is the term for a mixture of solid particles and liquid droplets found in the air. PM is made up of a number of components including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. The size of particles is directly linked to their potential for causing health problems. Particles that are less than 10 micrometers in diameter (PM10) that are also known as *Respirable Particulate Matter* are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. Particles that are less than 2.5 micrometers in diameter (PM2.5) that are also known as *Fine Particulate Matter* have been designated as a subset of PM10 due to their increased negative health impacts and its ability to remain suspended in the air longer and travel further.

Volatile Organic Compounds

Hydrocarbons are organic gases that are formed from hydrogen and carbon and sometimes other elements. Hydrocarbons that contribute to formation of O_3 are referred to and regulated as VOCs (also referred to as reactive organic gases). Combustion engine exhaust, oil refineries, and fossil-fueled power plants are the sources of hydrocarbons. Other sources of hydrocarbons include evaporation from petroleum fuels, solvents, dry cleaning solutions, and paint.

VOC is not classified as a criteria pollutant, since VOCs by themselves are not a known source of adverse health effects. The primary health effects of VOCs result from the formation of O_3 and its related health effects. High levels of VOCs in the atmosphere can interfere with oxygen intake by reducing the amount of available oxygen through displacement. Carcinogenic forms of hydrocarbons, such as benzene, are considered toxic air contaminants (TACs). There are no separate health standards for VOCs as a group.

2.2 Other Pollutants of Concern

Toxic Air Contaminants

In addition to the above-listed criteria pollutants, toxic air contaminants (TACs) are another group of pollutants of concern. TACs is a term that is defined under the California Clean Air Act and consists of the same substances that are defined as Hazardous Air Pollutants (HAPs) in the Federal Clean Air Act. There are over 700 hundred different types of TACs with varying degrees of toxicity. Sources of TACs include industrial processes such as petroleum refining and chrome plating operations, commercial operations such as gasoline stations and dry cleaners, and motor vehicle exhaust. Cars and trucks release at least 40 different toxic air contaminants. The most important of these TACs, in terms of health risk, are diesel particulates, benzene, formaldehyde, 1,3-butadiene, and acetaldehyde. Public exposure to TACs can result from emissions from normal operations as well as from accidental releases. Health effects of TACs include cancer, birth defects, neurological damage, and death.

TACs are less pervasive in the urban atmosphere than criteria air pollutants, however they are linked to short-term (acute) or long-term (chronic or carcinogenic) adverse human health effects. There are hundreds of different types of TACs with varying degrees of toxicity. Sources of TACs include industrial processes, commercial operations (e.g., gasoline stations and dry cleaners), and motor vehicle exhaust.

According to *The California Almanac of Emissions and Air Quality 2013 Edition*, the majority of the estimated health risk from TACs can be attributed to relatively few compounds, the most important of which is diesel particulate matter (DPM). DPM is a subset of PM2.5 because the size of diesel particles are typically 2.5 microns and smaller. The identification of DPM as a TAC in 1998 led the CARB to adopt the Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-fueled Engines and Vehicles in September 2000. The plan's goals are a 75-percent reduction in DPM by 2010 and an 85-percent reduction by 2020 from the 2000 baseline. Diesel engines emit a complex mixture of air pollutants, composed of gaseous and solid material. The visible emissions in diesel exhaust are known as particulate matter or PM, which includes carbon particles or "soot." Diesel exhaust also contains a variety of harmful gases and over 40 other cancer-causing substances. California's identification of DPM as a toxic air contaminant was based on its potential to cause cancer, premature deaths, and other health problems. Exposure to DPM is a health hazard, particularly to children whose lungs are still developing and the elderly who may have other serious health problems. Overall, diesel engine emissions are responsible for the majority of California's potential airborne cancer risk from combustion sources.

Another TAC is asbestos that is listed as a TAC by CARB and as a HAP by the EPA. Asbestos occurs naturally in mineral formations and crushing or breaking these rocks, through construction or other means, can release asbestiform fibers into the air. Asbestos emissions can result from the sale or use of asbestos-containing materials, road surfacing with such materials, grading activities, and surface mining. The risk of disease is dependent upon the intensity and duration of exposure. When inhaled, asbestos fibers may remain in the lungs and with time may be linked to such diseases as asbestosis, lung cancer, and mesothelioma. The nearest likely locations of naturally occurring asbestos, as identified in the *General Location Guide for Ultramafic Rocks in California*, prepared by the California Division of Mines and Geology, is located in Santa Barbara County. Due to the distance to the nearest natural occurrences of asbestos, the project site is not likely to contain asbestos.

The MDAQMD CEQA Guidelines, February 2020 provide no discussion of Valley Fever, as such it is not an issue that needs to be discussed in the MDAQMD area.

3.0 GREENHOUSE GASES

3.1 Greenhouse Gases

Constituent gases of the Earth's atmosphere, called atmospheric greenhouse gases (GHGs), play a critical role in the Earth's radiation amount by trapping infrared radiation from the Earth's surface, which otherwise would have escaped to space. Prominent GHGs contributing to this process include carbon dioxide (CO_2), methane (CH_4), ozone, water vapor, nitrous oxide (N_2O), and chlorofluorocarbons (CFCs). This phenomenon, known as the Greenhouse Effect, is responsible for maintaining a habitable climate. Anthropogenic (caused or produced by humans) emissions of these greenhouse gases in excess of natural ambient concentrations are responsible for the enhancement of the Greenhouse Effect and have led to a trend of unnatural warming of the Earth's natural climate, known as global warming or climate change. Emissions of gases that induce global warming are attributable to human activities associated with industrial/manufacturing, agriculture, utilities, transportation, and residential land uses. Emissions of CO_2 and N_2O are byproducts of fossil fuel combustion. Methane, a potent greenhouse gas, results from off-gassing associated with agricultural practices and landfills. Sinks of CO_2, where CO_2 is stored outside of the atmosphere, include uptake by vegetation and dissolution into the ocean.

Water vapor is the most abundant, important, and variable GHG in the atmosphere. Water vapor is not considered a pollutant; in the atmosphere it maintains a climate necessary for life. Changes in its concentration are primarily considered a result of climate feedbacks related to the warming of the atmosphere rather than a direct result of industrialization. The feedback loop in which water is involved is critically important to projecting future climate change. As the temperature of the atmosphere rises, more water is evaporated from ground storage (rivers, oceans, reservoirs, soil). Because the air is warmer, the relative humidity can be higher (in essence, the air is able to "hold" more water when it is warmer), leading to more water vapor in the atmosphere.

The following provides a description of the predominant GHGs and their global warming potential.

Carbon Dioxide

The natural production and absorption of CO_2 is achieved through the terrestrial biosphere and the ocean. However, humankind has altered the natural carbon cycle by burning coal, oil, natural gas, and wood. Since the industrial revolution began in the mid 1700s, each of these activities has increased in scale and distribution. CO_2 was the first GHG demonstrated to be increasing in atmospheric concentration with the first conclusive measurements being made in the last half of the 20th century. Prior to the industrial revolution, concentrations were fairly stable at 280 parts per million (ppm). The International Panel on Climate Change (IPCC) indicates that concentrations were 379 ppm in 2005, an increase of more than 30 percent. Left unchecked, the IPCC projects that concentration of carbon dioxide in the atmosphere is projected to increase to a minimum of 540 ppm by 2100 as a direct result of anthropogenic sources. This could result in an average global temperature rise of at least two degrees Celsius or 3.6 degrees Fahrenheit.

Methane

CH_4 is an extremely effective absorber of radiation, although its atmospheric concentration is less than that of CO_2. Its lifetime in the atmosphere is brief (10 to 12 years), compared to some other GHGs (such as CO_2, N_2O, and Chlorofluorocarbons (CFCs)). CH_4 has both natural and anthropogenic sources. It is released as part of the biological processes in low oxygen environments, such as in swamplands or in rice production (at the roots of the plants). Over the last 50 years, human activities such as growing rice, raising cattle, using natural gas, and mining coal have added to the atmospheric concentration of methane. Other anthropocentric sources include fossil-fuel combustion and biomass burning.

Nitrous Oxide

Concentrations of N_2O also began to rise at the beginning of the industrial revolution. In 1998, the global concentration of this GHG was documented at 314 parts per billion (ppb). N_2O is produced by microbial processes in soil and water, including those reactions which occur in fertilizer containing nitrogen. In addition to agricultural sources, some industrial processes (fossil fuel-fired power plants, nylon production, nitric acid production, and vehicle emissions) also contribute to its atmospheric load. N_2O is also commonly used as an aerosol spray propellant (i.e., in whipped cream bottles, in potato chip bags to keep chips fresh, and in rocket engines and race cars).

Chlorofluorocarbons

CFCs are gases formed synthetically by replacing all hydrogen atoms in methane or ethane (C_2H_6) with chlorine and/or fluorine atoms. CFCs are nontoxic, nonflammable, insoluble, and chemically unreactive in the troposphere (the level of air at the Earth's surface). CFCs have no natural source, but were first synthesized in 1928. They were used for refrigerants, aerosol propellants, and cleaning solvents. Due to the discovery that they are able to destroy stratospheric ozone, a global effort to halt their production was undertaken and in 1989 the European Community agreed to ban CFCs by 2000 and subsequent treaties banned CFCs worldwide by 2010. This effort was extremely successful, and the levels of the major CFCs are now remaining level or declining. However, their long atmospheric lifetimes mean that some of the CFCs will remain in the atmosphere for over 100 years.

Hydrofluorocarbons

HFCs are synthetic man-made chemicals that are used as a substitute for CFCs. Out of all the GHGs, they are one of three groups with the highest global warming potential. The HFCs with the largest measured atmospheric abundances are (in order), HFC-23 (CHF_3), HFC-134a (CF_3CH_2F), and HFC-152a (CH_3CHF_2). Prior to 1990, the only significant emissions were HFC-23. HFC-134a use is increasing due to its use as a refrigerant. Concentrations of HFC-23 and HFC-134a in the atmosphere are now about 10 parts per trillion (ppt) each. Concentrations of HFC-152a are about 1 ppt. HFCs are manmade for applications such as automobile air conditioners and refrigerants.

Perfluorocarbons

Perfluorocarbons (PFCs) have stable molecular structures and do not break down through the chemical processes in the lower atmosphere. High-energy ultraviolet rays about 60 kilometers above Earth's surface are able to destroy the compounds. Because of this, PFCs have very long lifetimes, between 10,000 and 50,000 years. Two common PFCs are tetrafluoromethane (CF_4) and hexafluoroethane (C_2F_6). Concentrations of CF_4 in the atmosphere are over 70 ppt. The two main sources of PFCs are primary aluminum production and semiconductor manufacturing.

Sulfur Hexafluoride

Sulfur Hexafluoride (SF_6) is an inorganic, odorless, colorless, nontoxic, nonflammable gas. SF_6 has the highest global warming potential of any gas evaluated; 23,900 times that of CO_2. Concentrations in the 1990s were about 4 ppt. Sulfur hexafluoride is used for insulation in electric power transmission and distribution equipment, in the magnesium industry, in semiconductor manufacturing, and as a tracer gas for leak detection.

Aerosols

Aerosols are particles emitted into the air through burning biomass (plant material) and fossil fuels. Aerosols can warm the atmosphere by absorbing and emitting heat and can cool the atmosphere by reflecting light. Cloud formation can also be affected by aerosols. Sulfate aerosols are emitted when fuel containing sulfur is burned. Black carbon (or soot) is emitted during biomass burning due to the incomplete combustion of fossil fuels. Particulate matter regulation has been lowering aerosol concentrations in the United States; however, global concentrations are likely increasing.

3.2 Global Warming Potential

GHGs have varying global warming potential (GWP). The GWP is the potential of a gas or aerosol to trap heat in the atmosphere; it is the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to the reference gas, CO_2. The GHGs listed by the IPCC and the CEQA Guidelines are discussed in this section in order of abundance in the atmosphere. Water vapor, the most abundant GHG, is not included in this list because its natural concentrations and fluctuations far outweigh its anthropogenic (human-made) sources. To simplify reporting and analysis, GHGs are commonly defined in terms of their GWP. The IPCC defines the GWP of various GHG emissions on a normalized scale that recasts all GHG emissions in terms of CO_2e. As such, the GWP of CO_2 is equal to 1. The GWP values used in this analysis are based on the IPCC Second Assessment Report (SAR) and United Nations Framework Convention on Climate Change (UNFCCC) reporting guidelines, and are detailed in Table A. The SAR GWPs are used in CARB's California inventory and Assembly Bill (AB) 32 Scoping Plan estimates.

Table A – Global Warming Potentials, Atmospheric Lifetimes and Abundances of GHGs

Gas	Atmospheric Lifetime (years)[1]	Global Warming Potential (100 Year Horizon)[2]	Atmospheric Abundance
Carbon Dioxide (CO_2)	50-200	1	379 ppm
Methane (CH_4)	9-15	25	1,774 ppb
Nitrous Oxide (N_2O)	114	298	319 ppb
HFC-23	270	14,800	18 ppt
HFC-134a	14	1,430	35 ppt
HFC-152a	1.4	124	3.9 ppt
PFC: Tetrafluoromethane (CF_4)	50,000	7,390	74 ppt
PFC: Hexafluoroethane (C_2F_6)	10,000	12,200	2.9 ppt
Sulfur Hexafluoride (SF_6)	3,200	22,800	5.6 ppt

Notes:
[1] Defined as the half-life of the gas.
[2] Compared to the same quantity of CO_2 emissions and is based on the Intergovernmental Panel On Climate Change (IPCC) 2007 standard, which is utilized in CalEEMod (Version 2016.3.2),that is used in this report (CalEEMod user guide: Appendix A).
Definitions: ppm = parts per million; ppb = parts per billion; ppt = parts per trillion
Source: IPCC 2007, EPA 2015

3.3 Greenhouse Gas Emissions Inventory

According to the Carbon Dioxide Information Analysis Center[1], 9,855 $MMTCO_2e$ were created globally in the year 2014. According to the EPA, the breakdown of global GHG emissions by sector consists of: 25 percent from electricity and heat production; 21 percent from industry; 24 percent from agriculture, forestry and other land use activities; 14 percent from transportation; 6 percent from building energy use; and 10 percent from all other sources of energy use[2].

According to *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2019,* prepared by EPA, in 2019 total U.S. GHG emissions were 6,558 $MMTCO_2e$. Total U.S. emissions have increased by 4 percent between 1990 and 2016 and GHG emissions decreased by 13 percent between 2005 and 2019. The recent decrease in GHG emissions was a result of multiple factors, including population, economic growth, energy markets, and technological changes the include energy efficiency and energy fuel choices. Between 2018 and 2019, GHG emissions decreased by almost 2 percent due to multiple factors, including a one percent decrease in total energy use.

According to *California Greenhouse Gas Emissions for 2000 to 2019 Trends of Emissions and Other Indicators*, prepared by CARB, July 28, 2021, the State of California created 418.2 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) in 2019. The 2019 emissions were 7.2 $MMTCO_2e$ lower than 2018 levels and almost 13 $MMTCO_2e$ below the State adopted year 2020 GHG limit of 431 $MMTCO_2e$. The breakdown of California GHG emissions by sector consists of: 39.7 percent from transportation; 21.1 percent from industrial; 14.1 percent from electricity generation; 7.6 percent from agriculture; 10.5 percent from residential and commercial buildings; 4.9 percent from high global warming potential sources, and 2.1 percent from waste.

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1 Obtained from: https://cdiac.ess-dive.lbl.gov/trends/emis/tre_glob_2014.html
2 Obtained from: https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data

4.0 AIR QUALITY MANAGEMENT

The air quality at the project site is addressed through the efforts of various international, federal, state, regional, and local government agencies. These agencies work jointly, as well as individually, to improve air quality through legislation, regulations, planning, policy-making, education, and a variety of programs. The agencies responsible for improving the air quality are discussed below.

4.1 Federal – United States Environmental Protection Agency

The Clean Air Act, first passed in 1963 with major amendments in 1970, 1977 and 1990, is the overarching legislation covering regulation of air pollution in the United States. The Clean Air Act has established the mandate for requiring regulation of both mobile and stationary sources of air pollution at the state and federal level. The EPA was created in 1970 in order to consolidate research, monitoring, standard-setting and enforcement authority into a single agency.

The EPA is responsible for setting and enforcing the National Ambient Air Quality Standards (NAAQS) for atmospheric pollutants. It regulates emission sources that are under the exclusive authority of the federal government, such as aircraft, ships, and certain locomotives. NAAQS pollutants were identified using medical evidence and are shown below in Table B.

Table B – State and Federal Criteria Pollutant Standards

Air Pollutant	Concentration / Averaging Time		Most Relevant Effects
	California Standards	Federal Primary Standards	
Ozone (O_3)	0.09 ppm / 1-hour 0.07 ppm / 8-hour	0.070 ppm, / 8-hour	(a) Pulmonary function decrements and localized lung edema in humans and animals; (b) Risk to public health implied by alterations in pulmonary morphology and host defense in animals; (c) Increased mortality risk; (d) Risk to public health implied by altered connective tissue metabolism and altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans; (e) Vegetation damage; and (f) Property damage.
Carbon Monoxide (CO)	20.0 ppm / 1-hour 9.0 ppm / 8-hour	35.0 ppm / 1-hour 9.0 ppm / 8-hour	(a) Aggravation of angina pectoris and other aspects of coronary heart disease; (b) Decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (c) Impairment of central nervous system functions; and (d) Possible increased risk to fetuses.
Nitrogen Dioxide (NO_2)	0.18 ppm / 1-hour 0.030 ppm / annual	100 ppb / 1-hour 0.053 ppm / annual	(a) Potential to aggravate chronic respiratory disease and respiratory symptoms in sensitive groups; (b) Risk to public health implied by pulmonary and extra-pulmonary biochemical and cellular changes and pulmonary structural changes; and (c) Contribution to atmospheric discoloration.
Sulfur Dioxide (SO_2)	0.25 ppm / 1-hour 0.04 ppm / 24-hour	75 ppb / 1-hour 0.14 ppm/annual	(a) Bronchoconstriction accompanied by symptoms which may include wheezing, shortness of breath and chest tightness, during exercise or physical activity in persons with asthma.
Suspended Particulate Matter (PM_{10})	50 µg/m^3 / 24-hour 20 µg/m^3 / annual	150 µg/m^3 / 24-hour	(a) Exacerbation of symptoms in sensitive patients with respiratory or cardiovascular disease; (b) Declines in pulmonary function growth in children; and (c) Increased risk of premature death from heart or lung diseases in elderly.

Air Pollutant	Concentration / Averaging Time		Most Relevant Effects
	California Standards	Federal Primary Standards	
Suspended Particulate Matter ($PM_{2.5}$)	12 µg/m^3 / annual	35 µg/m^3 / 24-hour 12 µg/m^3 / annual	
Sulfates	25 µg/m^3 / 24-hour	No Federal Standards	(a) Decrease in ventilatory function; (b) Aggravation of asthmatic symptoms; (c) Aggravation of cardio-pulmonary disease; (d) Vegetation damage; (e) Degradation of visibility; and (f) Property damage.
Lead	1.5 µg/m^3 / 30-day	0.15 µg/m^3 /3-month rolling	(a) Learning disabilities; and (b) Impairment of blood formation and nerve conduction.
Visibility Reducing Particles	Extinction coefficient of 0.23 per kilometer - visibility of ten miles or more due to particles when relative humidity is less than 70 percent.	No Federal Standards	Visibility impairment on days when relative humidity is less than 70 percent.

Source: http://www.arb.ca.gov/research/aaqs/aaqs2.pdf.

As part of its enforcement responsibilities, the EPA requires each state with federal nonattainment areas to prepare and submit a State Implementation Plan (SIP) that demonstrates the means to attain the national standards. The SIP must integrate federal, state, and local components and regulations to identify specific measures to reduce pollution, using a combination of performance standards and market-based programs within the timeframe identified in the SIP. The CARB defines attainment as the category given to an area with no violations in the past three years.

As indicated below in Table C, the Mojave Desert Air Basin (MDAB) has been designated by EPA for the national standards as a non-attainment area for ozone and PM10. Currently, the MDAB is in attainment with the national ambient air quality standards for PM2.5, CO, SO_2, and NO_2.

Table C – Mojave Desert Air Basin Attainment Status

Pollutant	Federal Designation	State Designation
Ozone (O_3)	Non-attainment*	Non-attainment
Respirable Particulate Matter (PM10)	Non-attainment**	Non-attainment
Fine Particulate Matter (PM2.5)	Unclassified/Attainment	Non-attainment*
Carbon Monoxide (CO)	Unclassified/Attainment	Attainment
Nitrogen Dioxide (NO_2)	Unclassified/Attainment	Attainment
Sulfur Dioxide (SO_2)	Unclassified/Attainment	Attainment

* Southwest corner of desert portion of San Bernardino County only;
** San Bernardino County portion only
Source: https://www.mdaqmd.ca.gov/home/showpublisheddocument/1267/636337468837000000

4.2 State – California Air Resources Board

The California Air Resources Board (CARB), which is a part of the California Environmental Protection Agency (CalEPA), is responsible for the coordination and administration of both federal and state air pollution control programs within California. In this capacity, the CARB conducts research, sets the California Ambient Air Quality Standards (CAAQS), compiles emission inventories, develops suggested control measures, provides oversight of local programs, and prepares the SIP. The CAAQS for criteria pollutants are shown above in Table B. In addition, the CARB establishes emission standards for motor vehicles sold in California, consumer products (e.g. hairspray, aerosol paints, and barbeque lighter fluid), and various types of commercial equipment. It also sets fuel specifications to further reduce vehicular emissions.

The MDAB has been designated by the CARB as a non-attainment area for ozone, PM10, and PM2.5. Currently, the MDAB is in attainment with the ambient air quality standards for CO, NO_2, and SO_2.

The following lists the State's CCR air quality emission rules that are applicable, but not limited to solar projects in the State.

Assembly Bill 2588

The Air Toxics "Hot Spots" Information and Assessment Act (Assembly Bill [AB] 2588, 1987, Connelly) was enacted in 1987 as a means to establish a formal air toxics emission inventory risk quantification program. AB 2588, as amended, establishes a process that requires stationary sources to report the type and quantities of certain substances their facilities routinely release in California. The data is ranked by high, intermediate, and low categories, which are determined by: the potency, toxicity, quantity, volume, and proximity of the facility to nearby receptors.

CARB Regulation for In-Use Off-Road Diesel Vehicles

On July 26, 2007, the CARB adopted CCR Title 13, Article 4.8, Chapter 9, Section 2449 to reduce DPM and NOx emissions from in-use off-road heavy-duty diesel vehicles in California. Such vehicles are used in construction, mining, and industrial operations. The regulation limits idling to no more than five consecutive minutes, requires reporting and labeling, and requires disclosure of the regulation upon vehicle sale. Performance requirements of the rule are based on a fleet's average NOx emissions, which can be met by replacing older vehicles with newer, cleaner vehicles or by applying exhaust retrofits. The regulation was amended in 2010 to delay the original timeline of the performance requirement making the first compliance deadline January 1, 2014 for large fleets (over 5,000 horsepower), 2017 for medium fleets (2,501-5,000 horsepower), and 2019 for small fleets (2,500 horsepower or less). Currently, no commercial operation in California may add any equipment to their fleet that has a Tier 0 or Tier 1 engine. By January 1, 2018 medium and large fleets will be restricted from adding Tier 2 engines to their fleets and by January 2023, no commercial operation will be allowed to add Tier 2 engines to their fleets. It should be noted that commercial fleets may continue to use their existing Tier 0 and 1 equipment, if they can demonstrate that the average emissions from their entire fleet emissions meet the NOx emissions targets.

CARB Resolution 08-43 for On-Road Diesel Truck Fleets

On December 12, 2008 the CARB adopted Resolution 08-43, which limits NOx, PM10 and PM2.5 emissions from on-road diesel truck fleets that operate in California. On October 12, 2009 Executive Order R-09-010 was adopted that codified Resolution 08-43 into Section 2025, title 13 of the California Code of

Regulations. This regulation requires that by the year 2023 all commercial diesel trucks that operate in California shall meet model year 2010 (Tier 4 Final) or latter emission standards. In the interim period, this regulation provides annual interim targets for fleet owners to meet. By January 1, 2014, 50 percent of a truck fleet is required to have installed Best Available Control Technology (BACT) for NOx emissions and 100 percent of a truck fleet installed BACT for PM10 emissions. This regulation also provides a few exemptions including a onetime per year 3-day pass for trucks registered outside of California. All on-road diesel trucks utilized during construction of the proposed project will be required to comply with Resolution 08-43.

4.3 Regional – Mojave Desert Air Basin

The MDAQMD is the agency principally responsible for comprehensive air pollution control in the San Bernardino County portion of the MDAB. To that end, as a regional agency, the MDAQMD works directly with the County and incorporated communities as well as the military bases within the MDAB to control air emissions within the MDAB. The applicable attainment plans adopted by the MDAQMD are described below.

MDAQMD Federal 8-hour Ozone Attainment Plan (Western Mojave Desert Non-Attainment Area)

On April 15, 2004, the USEPA designated the Western Mojave Desert nonattainment area as nonattainment for the 8-hour ozone NAAQS pursuant to the provisions of the Federal CAA. The Western Mojave Desert Ozone Nonattainment Area includes part of San Bernardino County, a portion of the MDAQMD, as well as the Antelope Valley portion of Los Angeles County. As a result, the MDAQMD prepared its Ozone Attainment Plan in June 2008 to: (1) demonstrate that the MDAQMD will meet the primary required Federal ozone planning milestones, attainment of the 8-hour ozone NAAQS by 2019 (revised June 2021); (2) present the progress the MDAQMD will make towards meeting all required ozone planning milestones; and (3) discuss the newest 0.075 part per million 8-hour ozone NAAQS, preparatory to an expected non-attainment designation for the new NAAQS. In February 2017, MDAQMD updated the 2008 Ozone Attainment Plan and adopted the MDAQMD Federal 75 ppb Ozone Attainment Plan (Western Mojave Desert Nonattainment Plan) to satisfy FCAA requirements that the MDAQMD develop a plan to attain the 0.075 ppm 8-hour ozone NAAQS.

Final Mojave Desert Planning Area Federal Particulate Matter 10 (PM10) Attainment Plan

On January 20, 1994, the USEPA re-designated a significant portion of the Mojave Desert as a nonattainment area with respect to the NAAQS for PM10. This nonattainment area covers a vast geographical region, including the urban areas of Victor Valley and Barstow, the Morongo Basin, along with the rural desert environs reaching to the Nevada and Arizona state lines. The PM10 Attainment Plan was prepared in July 1995 to provide a complete description and submittal to USEPA of the PM10 attainment planning elements which the MDAQMD will implement to bring the nonattainment area into compliance with federal law. Most importantly, the PM10 Attainment Plan serves as a planning tool for reducing PM10 pollution. The PM10 Attainment Plan sets forth an air quality improvement program for the region which will be implemented by both the public and private sector of the community.

In addition to the above attainment plans, the MDAQMD has adopted the following rules that are applicable to the proposed project.

Rule 401 – Visible Emissions

Rule 401 limits the discharge of any emissions source, including fugitive dust, for a period of more than three minutes in any hour, which creates an observable opacity of 20 percent or more (as dark in shade as No. 1 on the Ringelmann Chart).

Rule 402 - Nuisance

Rule 402 prohibits a person from discharging from any source whatsoever such quantities of air contaminants or other material which causes injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property. Compliance with Rule 402 will reduce local air quality and odor impacts to nearby sensitive receptors.

Rules 403 and 403.2 - Fugitive Dust

Rule 403 governs emissions of fugitive dust during construction activities and requires that no person shall cause or allow the emissions of fugitive dust from any transport, handling, construction or storage activity such that dust remains visible in the atmosphere beyond the property line of the emissions source. Compliance with this rule is achieved through application of standard Best Available Control Measures, which include but are not limited to the measures below. Compliance with these rules would reduce local air quality impacts to nearby sensitive receptors.

- Do not allow any track out of material onto public roadways and remove all track out at the end of each workday.
- Cover loaded haul vehicles while operating on public roads.
- Use periodic watering on active sites and pre-water all areas prior to clearing and soil moving activities.
- Apply nontoxic chemical stabilizers according to manufacturer specifications to all construction areas.
- Replant all disturbed area as soon as practical.
- Suspend all grading activities during high wind conditions.

Rule 442 – Usage of Solvents

Rule 442 governs the use manufacturing of paint thinners and multi-purpose solvents that are used in thinning of coating materials, cleaning of coating application equipment, and other solvent cleaning operations. This rule regulates the VOC content of solvents used during construction. Solvents used during construction and operation of the proposed project must comply with MDAQMD Rule 442.

Rules 1103 – Cutback and Emulsified Asphalt

Rule 1103 governs the sale, use, and manufacturing of asphalt and limits the VOC content in asphalt. This rule regulates the VOC contents of asphalt used during construction as well as any on-going maintenance during operations. Therefore, all asphalt used during construction and operation of the proposed project must comply with MDAQMD Rule 1103.

Rule 1113 – Architectural Coatings

Rule 1113 governs the sale, use, and manufacturing of architectural coatings and limits the VOC content in sealers, coatings, paints and solvents. This rule regulates the VOC contents of paints available during construction. Therefore, all paints and solvents used during construction and operation of the proposed project must comply with MDAQMD Rule 1113.

4.4 Local – County of San Bernardino

Local jurisdictions, such as the County of San Bernardino, have the authority and responsibility to reduce air pollution through its police power and decision-making authority. Specifically, the County is responsible for the assessment and mitigation of air emissions resulting from its land use decisions. The County is also responsible for the implementation of transportation control measures as outlined in the AQMPs. Examples of such measures include bus turnouts, energy-efficient streetlights, and synchronized traffic signals. In accordance with CEQA requirements and the CEQA review process, the County assesses the air quality impacts of new development projects, requires mitigation of potentially significant air quality impacts by conditioning discretionary permits, and monitors and enforces implementation of such mitigation. The applicable San Bernardino County Countywide Plan goals and policies are Development Code regulations are listed below.

San Bernardino County Countywide Plan / Policy Plan

The County's Countywide Plan, adopted on October 27, 2020, serves as a set of plans and tools for the County's unincorporated communities and complements the Countywide vision. The Countywide Plan consists of the Policy Plan, Business Plan, and Community Action Guides, together with the supporting environmental clearance. The Policy Plan is a component of the Countywide Plan that is an update and expansion of the County's General Plan for the unincorporated areas. The following goals and policies are applicable to the Project:

Natural Resources Element

Goal NR-1: Air Quality
Air quality that promotes health and wellness of residents in San Bernardino County through improvements in locally generated emission.

Policies

NR-1.1 Land use. We promote compact and transit-oriented development countywide and regulate the types and locations of development in unincorporated areas to minimize vehicle miles traveled and greenhouse gas emissions.

NR-1.2 Indoor air quality. We promote the improvement of indoor air quality through the California Building and Energy Codes and through the provision of public health programs and services.

NR-1.3 Coordination on air pollution. We collaborate with air quality management districts and other local agencies to monitor and reduce major pollutants affecting the county at the emission source.

NR-1.6 Fugitive dust emissions. We coordinate with air quality management districts on requirements for dust control plans, revegetation, and soil compaction to prevent fugitive dust emissions.

NR-1.8 Construction and operations. We invest in County facilities and fleet vehicles to improve energy efficiency and reduce emissions. We encourage County contractors and other builders and developers to use low-emission construction vehicles and equipment to improve air quality and reduce emissions.

NR-1.9 Building design and upgrades. We use the CALGreen Code to meet energy efficiency standards for new buildings and encourage the upgrading of existing buildings to incorporate design elements, building materials, and fixtures that improve environmental sustainability and reduce emissions.

<u>Renewable Energy Element</u>

Policies

RE 4.1 Apply standards to the design, siting, and operation of all renewable energy facilities that protect the environment, including sensitive biological resources, air quality, water supply and quality, cultural, archaeological, paleontological and scenic resources.

RE4.3.1 Define measures required to minimize ground disturbance, soil erosion, flooding, and blowing of sand and dust, with appropriate enforcements mechanisms in the Development Code

<u>Hazards Element</u>

Policies

HZ-3.3 Air quality management districts establish community emissions reduction plans for unincorporated environmental justice focus areas that should be considered in these areas. With particular emphasis in addressing the types of pollution identified in the Hazard Element table.

San Bernardino County Development Code

Section 83.01.040

(c) Diesel Exhaust Emissions Control Measures. The following emissions control measures shall apply to all discretionary land use projects approved by the County on or after January 15, 2009:

(1) On-Road Diesel Vehicles. On-road diesel vehicles are regulated by the State of California Air Resources Board.

(2) Off-Road Diesel Vehicle/Equipment Operations. All business establishments and contractors that use off-road diesel vehicle/equipment as part of their normal business operations shall adhere to the following measures during their operations in order to reduce diesel particulate matter emissions from diesel-fueled engines:

(A) Off-road vehicles/equipment shall not be left idling on site for periods in excess of five minutes. The idling limit does not apply to:

(I) Idling when queuing;

(II) Idling to verify that the vehicle is in safe operating condition;

(III) Idling for testing, servicing, repairing or diagnostic purposes;

(IV) Idling necessary to accomplish work for which the vehicle was designed (such as operating a crane);

(V) Idling required to bring the machine system to operating temperature; and

(VI) Idling necessary to ensure safe operation of the vehicle.

(B) Use reformulated ultra-low-sulfur diesel fuel in equipment and use equipment certified by the U.S. Environmental Protection Agency (EPA) or that pre-dates EPA regulations.

(C) Maintain engines in good working order to reduce emissions.

(D) Signs shall be posted requiring vehicle drivers to turn off engines when parked.

(E) Any requirements or standards subsequently adopted by the South Coast Air Quality Management District, the Mojave Desert Air Quality Management District or the California Air Resources Board.

(F) Provide temporary traffic control during all phases of construction.

(G) On-site electrical power connections shall be provided for electric construction tools to eliminate the need for diesel-powered electric generators, where feasible.

(H) Maintain construction equipment engines in good working order to reduce emissions. The developer shall have each contractor certify that all construction equipment is properly serviced and maintained in good operating condition.

(I) Contractors shall use ultra-low sulfur diesel fuel for stationary construction equipment as required by Air Quality Management District (AQMD) Rules 431.1 and 431.2 to reduce the release of undesirable emissions.

(J) Substitute electric and gasoline-powered equipment for diesel-powered equipment, where feasible.

Section 84.29.035

(c) The finding of fact shall include the following:

(20) The proposed commercial solar energy generation facility will be designed, constructed, and operated so as to minimize dust generation, including provision of sufficient watering of excavated or graded soil during construction to prevent excessive dust. Watering will occur at a minimum of three (3) times daily on disturbed soil areas with active operations, unless dust is otherwise controlled by rainfall or use of a dust palliative, or other approved dust control measure.

(21) All clearing, grading, earth moving, and excavation activities will cease during period of winds greater than 20 miles per hour (mph), averaged over one hour, or when dust plumes of 20 percent or greater opacity impact public roads, occupied structures, or neighboring property, and in conformance with AQMD regulations.

(22) For sites where the boundary of a new commercial solar energy generation facility will be located within one-quarter mile of a primary residential structure, an adequate wind barrier will be provided to reduce potentially blowing dust in the direction of the residence during construction and ongoing operation of the commercial solar energy generation facility.

(23) Any unpaved roads and access ways will be treated and maintained with a dust palliative or graveled or treated by another approved dust control Chapter 83.09 of the Development Code.

(24) On-site vehicle speed will be limited to 15 mph.

5.0 GLOBAL CLIMATE CHANGE MANAGEMENT

The regulatory setting related to global climate change is addressed through the efforts of various federal, state, regional, and local government agencies. These agencies work jointly, as well as individually, to reduce GHG emissions through legislation, regulations, planning, policy-making, education, and a variety of programs. The agencies responsible for global climate change regulations are discussed below.

5.1 Federal – United States Environmental Protection Agency

The EPA is responsible for implementing federal policy to address global climate change. The Federal government administers a wide array of public-private partnerships to reduce U.S. GHG intensity. These programs focus on energy efficiency, renewable energy, methane, and other non-CO_2 gases, agricultural practices and implementation of technologies to achieve GHG reductions. EPA implements several voluntary programs that substantially contribute to the reduction of GHG emissions.

In Massachusetts v. Environmental Protection Agency (Docket No. 05–1120), argued November 29, 2006 and decided April 2, 2007, the U.S. Supreme Court held that not only did the EPA have authority to regulate greenhouse gases, but the EPA's reasons for not regulating this area did not fit the statutory requirements. As such, the U.S. Supreme Court ruled that the EPA should be required to regulate CO_2 and other GHGs as pollutants under the federal Clean Air Act.

In response to the FY2008 Consolidations Appropriations Act (H.R. 2764; Public Law 110-161), EPA proposed a rule on March 10, 2009 that requires mandatory reporting of GHG emissions from large sources in the United States. On September 22, 2009, the Final Mandatory Reporting of GHG Rule was signed and published in the Federal Register on October 30, 2009. The rule became effective on December 29, 2009. This rule requires suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions to submit annual reports to EPA.

On December 7, 2009, the EPA Administrator signed two distinct findings under section 202(a) of the Clean Air Act. One is an endangerment finding that finds concentrations of the six GHGs in the atmosphere threaten the public health and welfare of current and future generations. The other is a cause or contribute finding, that finds emissions from new motor vehicles and new motor vehicle engines contribute to the GHG pollution which threatens public health and welfare. These actions did not impose any requirements on industry or other entities, however, since 2009 the EPA has been providing GHG emission standards for vehicles and other stationary sources of GHG emissions that are regulated by the EPA. On September 13, 2013 the EPA Administrator signed 40 CFR Part 60, that limits emissions from new sources to 1,100 pounds of CO_2 per MWh for fossil fuel-fired utility boilers and 1,000 pounds of CO_2 per MWh for large natural gas-fired combustion units.

On August 3, 2015, the EPA announced the Clean Power Plan, emissions guidelines for U.S. states to follow in developing plans to reduce GHG emissions from existing fossil fuel-fired power plants (Federal Register Vol. 80, No. 205, October 23 2015). On February 9, 2016 the Supreme Court stayed implementation of the Clean Power Plan due to a legal challenge from 29 states and in April 2017, the Supreme Court put the case on a 60 day hold and directed both sides to make arguments for whether it should keep the case on hold indefinitely or close it and remand the issue to the EPA. On October 11, 2017, the EPA issued a formal proposal to repeal the Clean Power Plan, however the repeal of the Plan will require following the same rule-making system used to create regulations and will likely result in court challenges.

On April 30, 2020, the EPA and the National Highway Safety Administration published the Final Rule for the *Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks* (SAFE Vehicles Rule). Part One of the Rule revokes California's authority to set its own GHG emissions standards and zero-emission vehicle mandates in California, which results in one emission standard to be used nationally for all passenger cars and light trucks that is set by the EPA.

5.2 State

The CARB has the primary responsible for implementing state policy to address global climate change, however there are State regulations related to global climate change that affect a variety of State agencies. CARB, which is a part of the California Environmental Protection Agency, is responsible for the coordination and administration of both the federal and state air pollution control programs within California. In this capacity, the CARB conducts research, sets California Ambient Air Quality Standards (CAAQS), compiles emission inventories, develops suggested control measures, provides oversight of local programs, and prepares the SIP. In addition, the CARB establishes emission standards for motor vehicles sold in California, consumer products (e.g. hairspray, aerosol paints, and barbeque lighter fluid), and various types of commercial equipment. It also sets fuel specifications to further reduce vehicular emissions.

In 2008, CARB approved a Climate Change Scoping Plan that proposes a "comprehensive set of actions designed to reduce overall carbon GHG emissions in California, improve our environment, reduce our dependence on oil, diversify our energy sources, save energy, create new jobs, and enhance public health" (CARB 2008). The Climate Change Scoping Plan has a range of GHG reduction actions which include direct regulations; alternative compliance mechanisms; monetary and non-monetary incentives; voluntary actions; market-based mechanisms such as a cap-and-trade system. In 2014, CARB approved the First Update to the Climate Change Scoping Plan (CARB, 2014) that identifies additional strategies moving beyond the 2020 targets to the year 2050. On December 14, 2017 CARB adopted the California's 2017 Climate Change Scoping Plan, November 2017 (CARB, 2017) that provides specific statewide policies and measures to achieve the 2030 GHG reduction target of 40 percent below 1990 levels by 2030 and the aspirational 2050 GHG reduction target of 80 percent below 1990 levels by 2050. In addition, the State has passed the following laws directing CARB to develop actions to reduce GHG emissions, which are listed below in chronological order, with the most current first.

Executive Order N-79-20

The California Governor issued Executive Order N-79-20 on September 23, 2020 that requires all new passenger cars and trucks and commercial drayage trucks sold in California to be zero-emissions by the year 2035 and all medium- heavy-duty vehicles (commercial trucks) sold in the state to be zero-emission by 2045 for all operations where feasible. Executive Order N-79-20 also requires all off-road vehicles and equipment to transition to 100 percent zero-emission equipment, where feasible by 2035.

California Code of Regulations (CCR) Title 24, Part 6

CCR Title 24, Part 6: *California's Energy Efficiency Standards for Residential and Nonresidential Buildings* (Title 24) were first established in 1978 in response to a legislative mandate to reduce California's energy consumption. The California Energy Commission (CEC) is the agency responsible for the standards that are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. In 2008 the State set an energy-use reduction goal of zero-net-energy use of all new homes by 2020 and the CEC was mandated to meet this goal through revisions to the Title 24, Part 6 regulations.

The Title 24 standards are updated on a three-year schedule and since 2008 the standards have been incrementally moving to the 2020 goal of the zero-net-energy use. On January 1, 2020 the 2019 standards went into effect, that have been designed so that the average new home built in California will now use zero-net-energy and that non-residential buildings will use about 30 percent less energy than the 2016 standards due mainly to lighting upgrades. The 2019 standards also encourage the use of battery storage and heat pump water heaters, require the more widespread use of LED lighting, as well as improve the building's thermal envelope through high performance attics, walls and windows. The 2019 standards also require improvements to ventilation systems by requiring highly efficient air filters to trap hazardous air particulates as well as improvements to kitchen ventilation systems.

California Code of Regulations (CCR) Title 24, Part 11

CCR Title 24, Part 11: *California Green Building Standards* (CalGreen Code) was developed in response to continued efforts to reduce GHG emissions associated with energy consumption. The CalGreen Code is also updated every three years and the current version is the 2019 California Green Building Standard Code that become effective on January 1, 2020.

The CalGreen Code contains requirements for construction site selection; storm water control during construction; construction waste reduction; indoor water use reduction; material selection; natural resource conservation; site irrigation conservation; and more. The code provides for design options allowing the designer to determine how best to achieve compliance for a given site or building condition. The code also requires building commissioning, which is a process for verifying that all building systems (e.g., heating and cooling equipment and lighting systems) are functioning at their maximum efficiency.

The CalGreen Code provides standards for bicycle parking, carpool/vanpool/electric vehicle spaces, light and glare reduction, grading and paving, energy efficient appliances, renewable energy, graywater systems, water efficient plumbing fixtures, recycling and recycled materials, pollutant controls (including moisture control and indoor air quality), acoustical controls, storm water management, building design, insulation, flooring, and framing, among others. Implementation of the CalGreen Code measures reduces energy consumption and vehicle trips and encourages the use of alternative-fuel vehicles, which reduces pollutant emissions.

Some of the notable changes in the 2019 CalGreen Code over the prior 2016 CalGreen Code include: an alignment of building code engineering requirements with the national standards that include anchorage requirements for solar panels, provides design requirements for buildings in tsunami zones, increases Minimum Efficiency Reporting Value (MERV) for air filters from 8 to 13, increased electric vehicle charging requirements in parking areas, and sets minimum requirements for use of shade trees.

Senate Bill 100 and Executive Order B-55-18

Senate Bill 100 (SB 100) was adopted September 2018 and the California Governor issued Executive Order B-55-18 in September 2018, shortly before the Global Climate Action Summit started in San Francisco. SB 100 and Executive Order B-55-18 requires that by December 1, 2045 that 100 percent of retail sales of electricity to be generated from renewable or zero-carbon emission sources of electricity. SB 100 supersedes the renewable energy requirements set by SB 350, SB 1078, SB 107, and SB X1-2. However, the interim renewable energy thresholds from the prior Bills of 44 percent by December 31, 2024, 52 percent by December 31, 2027, and 60 percent by December 31, 2030, will remain in effect.

Executive Order B-48-18 and Assembly Bill 2127

The California Governor issued Executive Order B-48-18 on January 26, 2018 that orders all state entities to work with the private sector to put at least five million zero-emission vehicles on California roads by 2030 and to install 200 hydrogen fueling stations and 250,000 electric vehicle chargers by 2025. Currently there are approximately 350,000 electric vehicles operating in California, which represents approximately 1.5 percent of the 24 million vehicles total currently operating in California. Implementation of Executive Order B-48-18 would result in approximately 20 percent of all vehicles in California to be zero emission electric vehicles. Assembly Bill 2127 (AB 2127) was codified into statute on September 13, 2018 and requires that the California Energy Commission working with the State Air Resources Board prepare biannual assessments of the statewide electric vehicle charging infrastructure needed to support the levels of zero emission vehicle adoption required for the State to meet its goals of putting at least 5 million zero-emission vehicles on California roads by 2030.

Executive Order B-30-15, Senate Bill 32 and Assembly Bill 197

The California Governor issued Executive Order B-30-15 on April 29, 2015 that aims to reduce California's GHG emissions 40 percent below 1990 levels by 2030. This executive order aligns California's GHG reduction targets with those of other international governments, such as the European Union that set the same target for 2030 in October, 2014. This target will make it possible to reach the ultimate goal of reducing GHG emissions 80 percent under 1990 levels by 2050 that is based on scientifically established levels needed in the U.S.A to limit global warming below 2 degrees Celsius – the warming threshold at which scientists say there will likely be major climate disruptions such as super droughts and rising sea levels. Assembly Bill 197 (AB 197) (September 8, 2016) and Senate Bill 32 (SB 32) (September 8, 2016) codified into statute the GHG emissions reduction targets of at least 40 percent below 1990 levels by 2030 as detailed in Executive Order B-30-15. AB 197 also requires additional GHG emissions reporting that is broken down to sub-county levels and requires CARB to consider the social costs of emissions impacting disadvantaged communities.

Executive Order B-29-15

The California Governor issued Executive Order B-29-15 on April 1, 2015 and directed the State Water Resources Control Board to impose restrictions to achieve a statewide 25% reduction in urban water usage and directed the Department of Water Resources to replace 50 million square feet of lawn with drought tolerant landscaping through an update to the State's Model Water Efficient Landscape Ordinance. The Ordinance also requires installation of more efficient irrigation systems, promotion of greywater usage and onsite stormwater capture, and limits the turf planted in new residential landscapes to 25 percent of the total area and restricts turf from being planted in median strips or in parkways unless the parkway is next to a parking strip and a flat surface is required to enter and exit vehicles. Executive Order B-29-15 would reduce GHG emissions associated with the energy used to transport and filter water.

Assembly Bill 341 and Senate Bills 939 and 1374

Senate Bill 939 (SB 939) requires that each jurisdiction in California to divert at least 50 percent of its waste away from landfills, whether through waste reduction, recycling or other means. Senate Bill 1374 (SB 1374) requires the California Integrated Waste Management Board to adopt a model ordinance by March 1, 2004 suitable for adoption by any local agency to require 50 to 75 percent diversion of construction and demolition of waste materials from landfills. Assembly Bill 341 (AB 341) was adopted in 2011 and builds upon the waste reduction measures of SB 939 and 1374, and sets a new target of a 75 percent reduction in solid waste generated by the year 2020.

Senate Bill 375

Senate Bill 375 (SB 375) was adopted September 2008 in order to support the State's climate action goals to reduce GHG emissions through coordinated regional transportation planning efforts, regional GHG emission reduction targets, and land use and housing allocation. SB 375 requires CARB to set regional targets for GHG emissions reductions from passenger vehicle use. In 2010, CARB established targets for 2020 and 2035 for each Metropolitan Planning Organizations (MPO) within the State. It was up to each MPO to adopt a sustainable communities strategy (SCS) that will prescribe land use allocation in that MPOs Regional Transportation Plan (RTP) to meet CARB's 2020 and 2035 GHG emission reduction targets. These reduction targets are required to be updated every eight years and the most current targets are detailed at: https://ww2.arb.ca.gov/our-work/programs/sustainable-communities-program/regional-plan-targets, which provides GHG emissions reduction targets for SCAG of 8 percent by 2020 and 19 percent by 2035.

The *2020-2045 Regional Transportation Plan/Sustainable Communities Strategy* (Connect SoCal), adopted September 3, 2020 provides a 2035 GHG emission reduction target of 19 percent reduction over the 2005 per capita emissions levels. The Connect SoCal include new initiatives of land use, transportation and technology to meet the 2035 new 19 percent GHG emission reduction target for 2035. CARB is also charged with reviewing SCAG's RTP/SCS for consistency with its assigned targets.

City and County land use policies, including General Plans, are not required to be consistent with the RTP and associated SCS. However, new provisions of CEQA incentivize, through streamlining and other provisions, qualified projects that are consistent with an approved SCS and categorized as "transit priority projects."

Assembly Bill 1109

California Assembly Bill 1109 (AB 1109) was adopted October 2007, also known as the Lighting Efficiency and Toxics Reduction Act, prohibits the manufacturing of lights after January 1, 2010 that contain levels of hazardous substances prohibited by the European Union pursuant to the RoHS Directive. AB 1109 also requires reductions in energy usage for lighting and is structured to reduce lighting electrical consumption by: (1) At least 50 percent reduction from 2007 levels for indoor residential lighting; and (2) At least 25 percent reduction from 2007 levels for indoor commercial and all outdoor lighting by 2018. AB 1109 would reduce GHG emissions through reducing the amount of electricity required to be generated by fossil fuels in California.

Executive Order S-1-07

Executive Order S-1-07 was issued in 2007 and proclaims that the transportation sector is the main source of GHG emissions in the State, since it generates more than 40 percent of the State's GHG emissions. It establishes a goal to reduce the carbon intensity of transportation fuels sold in the State by at least ten percent by 2020. This Executive Order also directs CARB to determine whether this Low Carbon Fuel Standard (LCFS) could be adopted as a discrete early-action measure as part of the effort to meet the mandates in AB 32.

In 2009 CARB approved the proposed regulation to implement the LCFS. The standard was challenged in the courts, but has been in effect since 2011 and was re-approved by the CARB in 2015. The LCFS is anticipated to reduce GHG emissions by about 16 MMT per year by 2020. The LCFS is designed to provide a framework that uses market mechanisms to spur the steady introduction of lower carbon fuels. The framework establishes performance standards that fuel producers and importers must meet annually.

Reformulated gasoline mixed with corn-derived ethanol and low-sulfur diesel fuel represent the baseline fuels. Lower carbon fuels may be ethanol, biodiesel, renewable diesel, or blends of these fuels with gasoline or diesel. Compressed natural gas and liquefied natural gas also may be low-carbon fuels. Hydrogen and electricity, when used in fuel cells or electric vehicles, are also considered as low-carbon fuels.

Senate Bill 97

Senate Bill 97 (SB 97) was adopted August 2007 and acknowledges that climate change is a prominent environmental issue that requires analysis under CEQA. SB 97 directed the Governor's Office of Planning and Research (OPR), which is part of the State Natural Resources Agency, to prepare, develop, and transmit to CARB guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions, as required by CEQA, by July 1, 2009. The Natural Resources Agency was required to certify and adopt those guidelines by January 1, 2010.

Pursuant to the requirements of SB 97 as stated above, on December 30, 2009 the Natural Resources Agency adopted amendments to the State CEQA guidelines that addresses GHG emissions. The CEQA Guidelines Amendments changed 14 sections of the CEQA Guidelines and incorporated GHG language throughout the Guidelines. However, no GHG emissions thresholds of significance were provided and no specific mitigation measures were identified. The GHG emission reduction amendments went into effect on March 18, 2010 and are summarized below:

- Climate Action Plans and other greenhouse gas reduction plans can be used to determine whether a project has significant impacts, based upon its compliance with the plan.
- Local governments are encouraged to quantify the GHG emissions of proposed projects, noting that they have the freedom to select the models and methodologies that best meet their needs and circumstances. The section also recommends consideration of several qualitative factors that may be used in the determination of significance, such as the extent to which the given project complies with state, regional, or local GHG reduction plans and policies. OPR does not set or dictate specific thresholds of significance. Consistent with existing CEQA Guidelines, OPR encourages local governments to develop and publish their own thresholds of significance for GHG impacts assessment.
- When creating their own thresholds of significance, local governments may consider the thresholds of significance adopted or recommended by other public agencies, or recommended by experts.
- New amendments include guidelines for determining methods to mitigate the effects of GHG emissions in Appendix F of the CEQA Guidelines.
- OPR is clear to state that "to qualify as mitigation, specific measures from an existing plan must be identified and incorporated into the project; general compliance with a plan, by itself, is not mitigation."
- OPR's emphasizes the advantages of analyzing GHG impacts on an institutional, programmatic level. OPR therefore approves tiering of environmental analyses and highlights some benefits of such an approach.
- Environmental impact reports must specifically consider a project's energy use and energy efficiency potential.

Assembly Bill 32

In 2006, the California State Legislature adopted AB 32, the California Global Warming Solutions Act of 2006. AB 32 requires CARB, to adopt rules and regulations that would achieve GHG emissions equivalent to statewide levels in 1990 by 2020 through an enforceable statewide emission cap which will be phased in starting in 2012. Emission reductions shall include carbon sequestration projects that would remove carbon from the atmosphere and utilize best management practices that are technologically feasible and cost effective.

In 2007 CARB released the calculated Year 1990 GHG emissions of 431 $MMTCO_2e$. The 2020 target of 431 $MMTCO_2e$ requires the reduction of 78 $MMTCO_2e$, or approximately 16 percent from the State's projected 2020 business as usual emissions of 509 $MMTCO_2e$ (CARB, 2014). Under AB 32, CARB was required to adopt regulations by January 1, 2011 to achieve reductions in GHGs to meet the 1990 cap by 2020. Early measures CARB took to lower GHG emissions included requiring operators of the largest industrial facilities that emit 25,000 metric tons of CO_2 in a calendar year to submit verification of GHG emissions by December 1, 2010. The CARB Board also approved nine discrete early action measures that include regulations affecting landfills, motor vehicle fuels, refrigerants in cars, port operations and other sources, all of which became enforceable on or before January 1, 2010.

CARB's Scoping Plan that was adopted in 2009, proposes a variety of measures including: strengthening energy efficiency and building standards; targeted fees on water and energy use; a market-based cap-and-trade system; achieving a 33 percent renewable energy mix; and a fee regulation to fund the program. The 2014 update to the Scoping Plan identifies strategies moving beyond the 2020 targets to the year 2050.

The Cap and Trade Program established under the Scoping Plan sets a statewide limit on sources responsible for 85 percent of California's GHG emissions, and has established a market for long-term investment in energy efficiency and cleaner fuels since 2012.

Executive Order S-14-08

In 2008 the California Governor issued Executive Order S-14-08 that expedites the permitting process for renewable energy facilities, including the proposed solar PV project. Executive Order S-14-08 requires collaboration between the CEC and Department of Fish and Wildlife in order to reduce the permitting time.

Executive Order S-3-05

In 2005 the California Governor issued Executive Order S 3-05, GHG Emission, which established the following reduction targets:

- 2010: Reduce greenhouse gas emissions to 2000 levels;
- 2020: Reduce greenhouse gas emissions to 1990 levels;
- 2050: Reduce greenhouse gas emissions to 80 percent below 1990 levels.

The Executive Order directed the secretary of the California Environmental Protection Agency (CalEPA) to coordinate a multi-agency effort to reduce GHG emissions to the target levels. To comply with the Executive Order, the secretary of CalEPA created the California Climate Action Team (CAT), made up of members from various state agencies and commissions. The team released its first report in March 2006. The report proposed to achieve the targets by building on the voluntary actions of businesses, local governments, and communities and through State incentive and regulatory programs. The State achieved its first goal of reducing GHG emissions to 2000 levels by 2010.

Assembly Bill 1493

California Assembly Bill 1493 (also known as the Pavley Bill, in reference to its author Fran Pavley) was enacted on July 22, 2002 and required CARB to develop and adopt regulations that reduce GHGs emitted by passenger vehicles and light duty trucks. In 2004, CARB approved the "Pavley I" regulations limiting the amount of GHGs that may be released from new passenger automobiles that are being phased in between model years 2009 through 2016. These regulations will reduce GHG emissions by 30 percent from 2002 levels by 2016. In June 2009, the EPA granted California the authority to implement GHG emission reduction standards for light duty vehicles, in September 2009, amendments to the Pavley I regulations were adopted by CARB and implementation of the "Pavley I" regulations started in 2009.

The second set of regulations "Pavley II" was developed in 2010, and is being phased in between model years 2017 through 2025 with the goal of reducing GHG emissions by 45 percent by the year 2020 as compared to the 2002 fleet. The Pavley II standards were developed by linking the GHG emissions and formerly separate toxic tailpipe emissions standards previously known as the "LEV III" (third stage of the Low Emission Vehicle standards) into a single regulatory framework. The new rules reduce emissions from gasoline-powered cars as well as promote zero-emissions auto technologies such as electricity and hydrogen, and through increasing the infrastructure for fueling hydrogen vehicles. In 2009, the U.S. EPA granted California the authority to implement the GHG standards for passenger cars, pickup trucks and sport utility vehicles and these GHG emissions standards are currently being implemented nationwide.

The EPA has performed a midterm evaluation of the longer-term standards for model years 2022-2025, and based on the findings of this midterm evaluation, the EPA proposed The Safer Affordable Fuel Efficient (SAFE) Vehicles Proposed Rule for Model Years 2021-2026 that amends the corporate average fuel economy (CAFE) and GHG emissions standards for light vehicles for model years 2021 through 2026. The SAFE Vehicles Rule was published on April 30, 2020 and made effective on June 29, 2020.

5.3 Regional – Mojave Desert Air Quality Management District

The MDAQMD is the agency principally responsible for comprehensive air pollution control that includes GHG emissions in the San Bernardino County portion of the MDAB. To that end, as a regional agency, the MDAQMD works directly with the County and incorporated communities as well as the military bases within the MDAB to control GHG emissions within the MDAB.

5.4 Local – County of San Bernardino

Local jurisdictions, such as the County of San Bernardino, have the authority and responsibility to reduce GHG emissions through their police power and decision-making authority. Specifically, the County is responsible for the assessment and mitigation of GHG emissions resulting from its land use decisions. In accordance with CEQA requirements and the CEQA review process, the County assesses the global climate change potential of new development projects, requires mitigation of potentially significant global climate change impacts by conditioning discretionary permits, and monitors and enforces implementation of such mitigation.

The *County of San Bernardino Greenhouse Gas Emissions Reduction Plan* (GHG Plan), prepared September, 2011, requires the reduction of 159,423 metric tons of $C0_2$ equivalent emissions ($MTCO_2e$) per year from new development by 2020 as compared to the unmitigated conditions. The *Greenhouse Gas Emissions Development Review Processes* (GHG Review Processes), prepared for the County of San Bernardino, March 2015, provides project level direction on how the County plans to achieve the reduction in GHG Emissions.

In addition, the County participated with SANBAG's regional planning efforts in the adoption of the San Bernardino County Regional Greenhouse Gas Reduction Plan (2014 Regional GHG Reduction Plan), March 2014. The 2014 Regional GHG Reduction Plan was developed in order to meet the requirements of AB 32 and SB 375 and includes a regional GHG emissions inventory, summarizes actions that participating jurisdictions have selected to reduce GHG emissions to 1990 levels by 2020, and provides specific reduction goals for each participating jurisdiction. In March 2021, San Bernardino Council of Governments (SBCOG) prepared an update to the Regional GHG Plan (2021 Regional GHG Plan), in order to address SB 32, which mandates a 40 percent reduction in GHG emissions from 1990 levels by 2030. The 2021 Regional GHG Plan was prepared in accordance with the GHG reduction measures provided in the California's 2017 Climate Change Scoping Plan, November 2017 (CARB, 2017).

6.0 ATMOSPHERIC SETTING

6.1 Regional Climate

The project site is located within the San Bernardino County portion of the Mojave Desert Air Basin (MDAB). The MDAB is an assemblage of mountain ranges interspersed with long broad valleys that often contain dry lakes. Many of the lower mountains which dot the vast terrain rise from 1,000 to 4,000 feet above the valley floor. Prevailing winds in the MDAB are out of the west and southwest. These prevailing winds are due to the proximity of the MDAB to coastal and central regions and the blocking nature of the Sierra Nevada Mountains to the north; air masses pushed onshore in southern California by differential heating are channeled through the MDAB. The MDAB is separated from the southern California coastal and central California valley regions by mountains (highest elevation approximately 10,000 feet), whose passes form the main channels for these air masses.

The Mojave Desert is bordered in the southwest by the San Bernardino Mountains, separated from the San Gabriel Mountains by the Cajon Pass (4,200 feet). A lesser channel lies between the San Bernardino Mountains and the Little San Bernardino Mountains (the Morongo Valley).

6.2 Local Climate

The project site is located within the Palo Verde Valley portion of the Mojave Desert that lies in the low desert, at the eastern end of a series of valleys (notably the Coachella Valley) whose primary channel is the San Gorgonio Pass between the San Bernardino and San Jacinto Mountains. Hot summers, mild winters, infrequent rainfall, moderate afternoon breezes and generally fair weather characterize the climate of Palo Verde, an interior sub-climate of Southern California's Mediterranean climate. The most important local weather pattern is associated with the funneling of the daily onshore sea breeze through San Gorgonio Pass into the lower desert from the heavily developed portions of the South Coast Air Basin. This daily airflow brings polluted air into the area late in the afternoon from late spring to early fall. This transport pattern creates both unhealthful air quality as well as destroying the scenic vistas of the mountains surrounding Palo Verde Valley.

The temperature and precipitation levels for the Parker, Arizona Monitoring Station that is located approximately 10 miles northeast of the project site is the nearest weather station to the project site with historical data are shown below in Table D. Table D shows that July is typically the warmest month and January is typically the coolest month. Rainfall in the project area varies considerably in both time and space. Most of the annual rainfall comes from the fringes of mid-latitude storms from late November to early April, and during the summer monsoon season from July to September.

Table D – Monthly Climate Data

Month	Average Maximum Temperature (°F)	Average Minimum Temperature (°F)	Average Total Precipitation (inches)	Average Total Snow Depth (inches)
January	67.3	36.1	0.72	0.0
February	73.0	40.8	0.58	0.0
March	78.9	45.7	0.49	0.0
April	87.4	52.2	0.19	0.0
May	95.3	59.7	0.08	0.0
June	104.0	68.5	0.03	0.0
July	108.3	77.5	0.32	0.0
August	106.6	76.8	0.60	0.0
September	101.6	68.1	0.48	0.0
October	90.5	55.1	0.31	0.0
November	77.4	42.7	0.35	0.0
December	67.5	36.1	0.61	0.0
Annual	**88.2**	**54.9**	**4.74**	**0.0**

Source: https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?az6250

6.3 Monitored Local Air Quality

The air quality at any site is dependent on the regional air quality and local pollutant sources. Regional air quality is determined by the release of pollutants throughout the MDAB as well as from air pollutants that travel from the coastal areas to the MDAB. The MDAQMD operates an extensive monitoring network throughout the County that continuously monitor ambient levels of criteria pollutants in compliance with federal monitoring regulations. Since not all air monitoring stations measure all of the tracked pollutants, the data from the following four monitoring stations, listed in the order of proximity to the project site have been used; Blythe Monitoring Station (Blythe Station), Joshua Tree National Park Monitoring Station (Joshua Tree Station), Niland Monitoring Station (Niland Station), and Palm Springs Monitoring Station (Palm Springs Station).

The Blythe Station is located approximately 33 miles south of the project site at 495 W Murphy Street, Blythe, the Joshua Tree Station is located approximately 80 miles west of the project site at Cottonwood Campground, the Niland Station is located approximately 84 miles southwest of the project site at 7711 English Road, Niland, and the Palm Springs Station is located approximately 119 miles west of the project site at 590 Racquet Club Avenue, Palm Springs. The monitoring data is presented in Table E and shows the most recent three years of monitoring data from CARB. Ozone was measured at the Blythe Station, NO_2 was measured at the Palm Springs Station, PM10 was measured at the Niland Station, and PM2.5 was measured at the Joshua Tree Station.

Table E – Local Area Air Quality Monitoring Summary

Pollutant (Standard)	Year		
	2018	2019	2020
Ozone:[1]			
Maximum 1-Hour Concentration (ppm)	0.067	0.064	0.066
Days > CAAQS (0.09 ppm)	0	0	0
Maximum 8-Hour Concentration (ppm)	0.060	0.059	0.053
Days > NAAQS (0.070 ppm)	0	0	0
Days > CAAQs (0.070 ppm)	0	0	0
Nitrogen Dioxide:[2]			
Maximum 1-Hour Concentration (ppb)	42.5	41.4	47.4
Days > NAAQS (100 ppb)	0	0	0
Inhalable Particulates (PM10) :[3]			
Maximum 24-Hour National Measurement (ug/m^3)	331.5	155.7	239.8
Days > NAAQS (150 ug/m^3)	10	1	1
Days > CAAQS (50 ug/m^3)	7	49	66
Annual Arithmetic Mean (AAM) (ug/m^3)	47.5	32.1	35.6
Annual > NAAQS (50 ug/m^3)	No	No	No
Annual > CAAQS (20 ug/m^3)	**Yes**	**Yes**	**Yes**
Ultra-Fine Particulates (PM2.5):[4]			
Maximum 24-Hour National Measurement (ug/m^3)	34.1	21.6	47.4
Days > NAAQS (35 ug/m^3)	0	0	**2**
Annual Arithmetic Mean (AAM) (ug/m^3)	ND	ND	ND
Annual > NAAQS and CAAQS (12 ug/m^3)	ND	ND	ND

Notes: Exceedances are listed in **bold.** CAAQS = California Ambient Air Quality Standard; NAAQS = National Ambient Air Quality Standard; ppm = parts per million; ppb = parts per billion; ND = no data available.
[1] Data obtained from the Blythe Station.
[2] Data obtained from the Palm Springs Station.
[3] Data obtained from the Niland Station.
[4] Data obtained from the Joshua Tree Station.
Source: http://www.arb.ca.gov/adam/

Ozone

The State 1-hour and 8-hour concentration standards for ozone have not been exceeded over the past three years at the Blythe Station. The Federal 8-hour ozone standard has not been exceeded over the past three years at the Blythe Station.

Ozone is a secondary pollutant as it is not directly emitted. Ozone is the result of chemical reactions between other pollutants, most importantly hydrocarbons and NO_2, which occur only in the presence of bright sunlight. Pollutants emitted from upwind cities react during transport downwind to produce the oxidant concentrations experienced in the area. Many areas of Southern California contribute to the ozone levels experienced at this monitoring station, with the more significant areas being those directly upwind.

Nitrogen Dioxide

The Palm Springs Station did not record an exceedance of either the Federal or State 1-hour NO_2 standards for the last three years.

Particulate Matter

The State 24-hour concentration standard for PM10 has been exceeded between 7 and 66 days each year over the past three years at the Niland Station. Over the past three years the Federal 24-hour standard for PM10 has been exceeded between 1 and 10 days each year of the past three years at the Niland Station. The annual PM10 concentration at the Niland Station has exceeded the State standard for the past three years and has not exceeded the Federal standard for the past three years.

Over the past three years the 24-hour concentration standard for PM2.5 has been exceeded between 0 and 2 days each year over the past three years at the Joshua Tree Station. No data was available for the annual PM2.5 concentration standards at the Joshua Tree Station. There does not appear to be a noticeable trend for PM10 or PM2.5 in either maximum particulate concentrations or days of exceedances in the area. Particulate levels in the area are due to natural sources, grading operations, and motor vehicles.

According to the EPA, some people are much more sensitive than others to breathing fine particles (PM10 and PM2.5). People with influenza, chronic respiratory and cardiovascular diseases, and the elderly may suffer worsening illness and premature death due to breathing these fine particles. People with bronchitis can expect aggravated symptoms from breathing in fine particles. Children may experience decline in lung function due to breathing in PM10 and PM2.5. Other groups considered sensitive are smokers and people who cannot breathe well through their noses. Exercising athletes are also considered sensitive, because many breathe through their mouths during exercise.

7.0 MODELING PARAMETERS AND ASSUMPTIONS

7.1 CalEEMod Model Input Parameters

The criteria air pollution and GHG emissions impacts created by the proposed project have been analyzed through use of CalEEMod Version 2020.4.0. CalEEMod is a computer model published by the SCAQMD for estimating air pollutant emissions. The CalEEMod program uses the EMFAC2017 computer program to calculate the emission rates specific for the Mojave Desert portion of San Bernardino County for employee, vendor and haul truck vehicle trips and the OFFROAD2011 computer program to calculate emission rates for heavy equipment operations. EMFAC2017 and OFFROAD2011 are computer programs generated by CARB that calculates composite emission rates for vehicles. Emission rates are reported by the program in grams per trip and grams per mile or grams per running hour.

The project characteristics in the CalEEMod model were set to a project location of the Mojave Desert portion of San Bernardino County, a Climate Zone of 10, utility company of Southern California Edison, and an opening year of 2024 was utilized in this analysis. In addition, the EMFAC off-model adjustment factors for gasoline light duty vehicle to account for the SAFE Vehicle rule was selected in the CalEEMod model run.

Land Use Parameters

The proposed project consists of the development of a PV solar energy facility that would include: PV panels, a BESS, fencing, service roads, a power collection system, communication cables, overhead and underground transmission lines, electrical switchyards, two substations and operations and maintenance facilities. Specifically, the proposed project will install a solar farm consisting of 391,872 PV solar modules located within solar arrays that will generate a total of 160 MW and would cover approximately 810 acres. The BESS would likely consist of up to 47 containers that would be up to 80 feet long by 8 feet wide and 8 feet tall (up to 30,080 square feet of container space) on approximately 7.1 acres of the project site. The two substations would cover approximately 7.5 acres of the project site and the BESS may be co-located within or adjacent to the substation yard. In addition, the proposed project would include construction of new access roads (unpaved gravel up to 20 feet wide), that would include an unpaved onsite access road from U.S Route 95 to the proposed substations that would cover approximately 6 acres of the project site. The proposed project's land use parameters that were entered into the CalEEMod model are shown in Table F.

Table F – CalEEMod Land Use Parameters

Proposed Land Use	Land Use Subtype in CalEEMod	Land Use Size[1]	Lot Acreage[2]	Building/Paving (square feet)
Solar Panels	Other Non-Asphalt Surfaces	810.00 AC	223.49	35,283,600
BESS	Refrigerated Warehouse – No Rail	30.08 TSF	7.10	30,080
Substations	User Defined Industrial	7.50 AC	7.50	100,000
Onsite Access Roads	Other Non-Asphalt Surfaces	6.0 AC	6.00	261,360

Notes:
[1] AC = Acres; TSF = Thousand square feet.
[2] Lot acreage calculated based on the total disturbed area of 830.6-acres.

Construction Parameters

Construction of the proposed project is anticipated to start in the first quarter of 2023 and would last 14 months, which were utilized in the CalEEMod model. The onsite workforce is expected to average 220 workers per day with a peak up to 495 workers. The phases of construction activities that have been analyzed are detailed below and include: 1) Site Preparation; 2) Access Roads Construction; 3) Electrical Infrastructure; and 4) PV System Assembly and Installation, and 5) BESS and Substations Installation.

The CalEEMod model provides the selection of "mitigation" to account for project conditions that would result in less emissions than a project without these conditions, however it should be noted that this "mitigation" may represent regulatory requirements. This includes the required to adherence to MDAQMD Rule 403, which requires that the Best Available Control Measures be utilized to reduce fugitive dust emissions. Table G provides a summary of the anticipated construction equipment and vehicle trips generated by each phase

Table G – Off-Road Equipment and Vehicle Trips for Construction of the Proposed Project

Equipment Type	Equipment Quantity	Horse-power	Load Factor	Operating Hours per Day	Worker Trips per Day[1]	Vendor Truck Trips per Day
Site Preparation						
Rubber Tired Dozers	3	247	0.40	8	18	6
Crawler Tractors	4	212	0.43	8		
Access Road Construction						
Pavers	2	130	0.42	8	15	6
Paving Equipment	2	132	0.36	8		
Rollers	2	80	0.38	8		
Electrical Infrastructure						
Excavators	2	158	0.38	8	13	6
Rubber Tired Loaders	1	203	0.36	8		
Tractors/Loaders/Backhoes	2	97	0.37	8		
PV System Assembly						
Air Compressor	1	78	0.48	8	990	50
Cranes	1	231	0.29	8		
Forklifts	3	89	0.20	8		
Generator Set	1	84	0.74	8		
Grader	1	187	0.41	8		
Tractors/Loaders/Backhoes	1	97	0.37	8		
Welders	3	46	0.45	8		
BESS and Substation Installation						
Aerial Lift	1	63	0.31	8	990	50
Air Compressor	1	78	0.48	8		
Cranes	2	231	0.29	8		
Forklifts	3	89	0.20	8		
Generator Set	1	84	0.74	8		
Tractors/Loaders/Backhoes	1	97	0.37	8		
Welders	3	46	0.45	8		

Notes:
[1] Worker Trips for Site Preparation, Access Road Construction and Electrical Infrastructure from CalEEMod model default values, for PV System Assembly and BESS and Substation Installation from Traffic Study.

Source: Project Applicant and CalEEMod Version 2020.4.0 (see Appendix A).

Site Preparation

The site preparation phase would begin with clearing of existing brush and rocks on the area of the project site that will be disturbed. The site preparation phase is anticipated to start January 2023 and was based on occurring over 90 working days. The site preparation phase would generate up to 18 worker trips per day. In addition, 6 vendor trips per day were added to the CalEEMod model, in order to account for water truck emissions. The onsite equipment would consist of three rubber tired dozers, and four of either tractors, loaders, or backhoes, which is based on the CalEEMod default equipment mix. The mitigation of applying water to all exposed areas two times per day was chosen in order to account for the fugitive dust reduction that would occur through adhering to MDAQMD Rule 403, which requires that the Best Available Control Measures be utilized to reduce fugitive dust emissions.

Access Road Construction

The construction of the access roads was modeled as a paving phase in the CalEEMod model. The access road construction was modeled as occurring after completion of the site preparation phase and occurring over 15 working days. The paving phase would generate up to 15 worker trips per day and 6 vendor truck trips per day. The onsite equipment would consist of the simultaneous operation of two pavers, two paving equipment, and two rollers, which is based on the CalEEMod default equipment mix.

Electrical Infrastructure

The electrical infrastructure construction phase would consist of installation of underground utilities and was modeled as a trenching phase in CalEEMod. The electrical infrastructure phase would occur after the completion of the paving of access road phase and was modeled as occurring over 20 working days. This phase would generate 15 worker trips and 6 vendor trips per day. The onsite equipment would consist of the simultaneous operation of 2 excavators, 1 rubber tired loader, and 2 of either tractors, loaders, or backhoes.

PV System Assembly and Installation

The PV system assembly and Installation phase was modeled as a building construction phase in CalEEMod. This phase would occur after completion of the electrical infrastructure phase and was modeled as occurring over 90 working days. This phase would generate up to 990 worker trips per day and up to 50 vendor truck trips per day. The onsite equipment was modeled as consisting of one air compressor, one crane, three forklifts, one generator set, one grader, three welders, and one of either a tractor, loader, or backhoe.

BESS and Substations Installation

The BESS and Substations Installation phase was modeled as a building construction phase in CalEEMod. This phase would occur after completion of the PV system assembly and installation phase and was modeled as occurring over 90 working days. This phase would generate up to 990 worker trips per day and up to 50 vendor truck trips per day. The onsite equipment was modeled as consisting of one aerial lift, one air compressor, two cranes, three forklifts, one generator set, three welders, and one of either a tractor, loader, or backhoe.

Operational Emissions Modeling

The operations-related criteria air pollutant emissions and GHG emissions created by the proposed project have been analyzed through use of the CalEEMod model. The proposed project was analyzed in the CalEEMod model based on the land use parameters provided above and the parameters entered for each operational source is described below.

Mobile Sources

Mobile sources include emissions the additional vehicle miles generated from the proposed project. Up to 12 full-time and/or part-time staff would be required for operation, which would result in the generation of up to 24 daily trips from the operation of the project, which was entered into the CalEEMod model. No other changes were made to the default mobile source parameters in the CalEEMod model.

Area Sources

Area sources include emissions from consumer products, landscape equipment, and architectural coatings. The area source emissions were based on the on-going use of the proposed project in the CalEEMod model. No changes were made to the default area source parameters in the CalEEMod model.

Energy Usage

Energy usage includes emissions from electricity and natural gas used onsite. The natural gas emission rates were set to zero, since no natural gas will be used onsite. For electricity use, the proposed solar PV panels system is rated at 160 MW. The 160 MW were converted to 160,000 kW panels and was then multiplied by 8 hours, to provide a conservative average hours per day of sunlight that the solar panels will generate electricity and then divided by 1.2 to account for the loss associated with converting the direct current (DC) power from the solar panels to the alternating current (AC) power on the electrical grid and then multiplying by 365 days, which resulted in the proposed solar panels generating 389,333,333 kilowatt-hours per year. According to the BESS system specifications, the air conditioning units and power conversion associated with the proposed BESS will not use more than 2 percent of the electricity stored, the calculated 389,333,333 kWh generated by the solar panels was multiplied by 2 percent, which results in the proposed project utilizing 7,786,667 kWh (7,787 MWh) per year that was entered into the CalEEMod model.

Solid Waste

Waste includes the GHG emissions associated with the processing of waste from the proposed project as well as the GHG emissions from the waste once it is interred into a landfill. The analysis was based on the default CalEEMod waste generation rate of 28 tons of solid waste per year from the proposed project. No changes were made to the default solid waste parameters or mitigation measures in the CalEEMod model.

Water and Wastewater

Water is based on the GHG emissions associated with the energy used to transport and filter the water. No water will be used for fire suppressant for the BESS and no water would be utilized for dust control during operation of the proposed project. However, once per year, the solar panels may be cleaned with water, which would utilize up to 8,000 gallons per cleaning. As such 8,000 gallons per year was entered in to the CalEEMod model. No other changes were made to the default water and wastewater parameters in the CalEEMod model.

8.0 THRESHOLDS OF SIGNIFICANCE

8.1 MDAQMD Significance Thresholds

The MDAQMD's CEQA and Federal Conformity Guidelines (MDAQMD, 2020), outlines significance determination thresholds. The MDAQMD Guidelines state that any project is significant if it triggers or exceed the most appropriate evaluation criteria, and further specifies that the emissions comparison (criteria number 1) is sufficient for most projects:

1. Generate total emissions (direct and indirect) in excess of the threshold given in Table H;
2. Generates a violation of any ambient air quality standard when added to the local background;
3. Does not conform with the applicable attainment or maintenance plan(s)[3];
4. Exposes sensitive receptors to substantial pollutant concentrations, including those resulting in a cancer risk greater than or equal to 10 in a million and/or a Hazard Index (HI) (non-cancerous) greater than or equal to 1.

The MDAQMD significant emissions thresholds are shown in Table H. According to the MDAQMD Guidelines, A significant project must incorporate mitigation sufficient to reduce its impact to a level that is not significant. A project that cannot be mitigated to a level that is not significant must incorporate all feasible mitigation. Note that the emission thresholds are given as a daily value and an annual value, so that multi-phased project (such as project with a construction phase and a separate operational phase) with phases shorter than one year can be compared to the daily value. Since construction of the proposed project is anticipated to take over a year, the annual threshold has been utilized for both short-term construction impact analysis and long-term operational impacts.

Table H – MDAQMD Significant Emissions Thresholds

Pollutant	Annual Threshold (tons)	Daily Threshold (pounds)
Greenhouse Gases (CO_2e)	100,000	548,000
Carbon Monoxide (CO)	100	548
Oxides of Nitrogen (NO_X)	25	137
Volatile Organic Compounds (VOC)	25	137
Oxides of Sulfur (SO_X)	25	137
Particulate Matter (PM_{10})	15	82
Particulate Matter ($PM_{2.5}$)	12	65
Hydrogen Sulfide (H_2S)	10	54
Lead (Pb)	0.6	3

Source: https://www.mdaqmd.ca.gov/home/showpublisheddocument?id=8510

3 A project is deemed to not exceed this threshold, and hence not be significant, if it is consistent with the existing land use plan. Zoning changes, specific plans, general plan amendments and similar land use plan changes which do not increase dwelling unit density, do not increase vehicle trips, and do not increase vehicle miles traveled are also deemed to not exceed this threshold.

9.0 IMPACT ANALYSIS

9.1 CEQA Thresholds of Significance

Consistent with CEQA and the State CEQA Guidelines, a significant impact related to air quality and GHG emissions would occur if the proposed project is determined to:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard;
- Expose sensitive receptors to substantial pollutant concentrations;
- Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people;
- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or
- Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of GHGs.

9.2 Air Quality Compliance

The proposed project would not conflict with or obstruct implementation of the MDAQMD Air Quality Management Plans (AQMPs). The Project Site is located within the Mojave Desert Air Basin and is regulated by the MDAQMD. The MDAQMD PM10 Attainment Plan and Ozone Attainment Plan established under the Western Mojave Desert AQMPs set forth a comprehensive set of programs that will lead the Basin into compliance with Federal and State air quality standards. The control measures and related emission reduction estimates within the MDAQMD PM10 Attainment Plan and Ozone Attainment Plan are based upon emissions projections for a future development scenario derived from land use, population, and employment characteristics defined in consultation with local governments. Accordingly, conformance with these attainment plans is determined by:

- Demonstrating Project consistency with local land use plans and/or population projections (Criterion 1);
- Demonstrating Project compliance with applicable MDAQMD Rules and Regulations (Criterion 2); and
- Demonstrating Project implementation will not increase the frequency or severity of a violation in the Federal or State ambient air quality standards (Criterion 3).

Criterion 1: Consistency with local land use plans and/or population projections.

Growth projections included in the AQMPs form the basis for the projections of air pollutant emissions and are based on general plan land use designations and the *2020-2045 Regional Transportation Plan/Sustainable Communities Strategy* (Connect SoCal), adopted September 3, 2020 and the *2019 Federal Transportation Improvement* Program (2019 FTIP), adopted September 2018, which addresses regional development and growth forecasts. While SCAG has recently adopted the Connect SoCal, the MDAQMD has not released an updated AQMP that utilizes information from the Connect SoCal. As such, this consistency analysis is based off the 2016-2040 RTP/SCS. The population, housing, and employment forecasts within the 2016-2040 RTP/SCS are based on local general plans as well as input from local governments, such as the County. The MDAQMD has incorporated these same demographic growth forecasts for various socioeconomic categories (e.g., population, housing, employment) into the AQMPs.

San Bernardino Land Use Service Zoning Maps is the local law that regulates various aspects of how land can be used. The project site is designated and is zoned as Resource Conservation (RC). The RC land use zoning district provides sites for open space and recreational activities, single-family homes on very large parcels, and similar and compatible uses. Commercial renewable energy facilities are an allowable land use within the RC land use zoning district.

The County's unincorporated area population estimate as of January 1, 2021 was 1,871,997 persons, and the County's total area population estimate as of January 1, 2021 was 2,175,909 persons. SCAG growth forecasts in the 2016-2040 RTP/SCS estimate the County's population to reach 2,731,000 persons by 2040, representing a total increase of 620,000 persons between 2015 and 2040.13 Additionally, SCAG growth forecasts in the 2016-2040 RTP/SCS estimate the County's employment to reach 1,028,000 jobs by 2040, representing a total increase of 299,000 jobs between 2012 and 2040.14

The proposed project would include neither a residential component that would increase local population growth, nor a commercial component that would substantially increase employment. Construction of the proposed project would not result in residential, commercial, or growth-inducing development that would result in a substantial increase in growth-related emissions. In addition, because of the presence of locally available construction workers, and because of the relatively short duration of construction (approximately 14 months), workers are not expected to relocate to the area with their families. Up to 8 to 12 full-time and/or part-time staff would be required for operation, inspection, security, maintenance, and system monitoring purposes. Due to the limited number of employees required for the full time operation of the proposed project, the proposed project would not cause the SCAG growth forecast to be exceeded. As the MDAQMD has incorporated these forecasts on population, housing, and employment into the AQMPs, the Project would be consistent with the AQMPs. Impacts would be less than significant.

Criterion 2: Compliance with applicable MDAQMD Rules and Regulations.

The Project would be required to comply with all applicable MDAQMD Rules and Regulations. This would include MDAQMD Rules 401, 402, and 403. MDAQMD Rule 403 requires periodic watering for short-term stabilization of disturbed surface area to minimize visible fugitive dust (PM10) emissions, covering loaded haul vehicles, and reduction of non-essential earth moving activities during higher wind conditions. The proposed project would comply with applicable MDAQMD rules, and as such, would not conflict with applicable MDAQMD Rules and Regulations; therefore, impacts would be less than significant.

Criterion 3: Demonstrating Project implementation will not increase the frequency or severity of a violation in the Federal or State ambient air quality standards.

Analysis of the proposed project's potential to result in more frequent or severe violations of the CAAQS and NAAQS can be satisfied by comparing the proposed project emissions to MDAQMD thresholds. Based on the air quality modeling analysis contained in this report, short-term construction air emissions would not result in significant impacts based on MDAQMD thresholds of significance discussed above in Section 8.1. The ongoing operation of the proposed project would generate air pollutant emissions that are inconsequential and would not result in significant impacts based on MDAQMD thresholds of significance discussed above in Section 8.1.

Therefore, the proposed project would not delay the MDAB's attainment goals for ozone, PM10, and PM2.5, and would not result in an increase in the frequency or severity of existing air quality violations. As such, the proposed project would not cause or contribute to localized air quality violations or delay the attainment of air quality standard or interim emissions reductions specified in the AQMPs; thus, impacts would be reduced to less than significant.

Level of Significance

Less than significant.

9.3 Cumulative Net Increase in Non-Attainment Pollution

The proposed project would not result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable Federal or State ambient air quality standard. The following section calculates the potential air emissions associated with the construction and operations of the proposed project and compares the emissions to the MDAQMD criteria pollutant emissions standards detailed above in Section 8.1.

Construction Emissions

Construction activities for the proposed project are anticipated to start in the first quarter of 2023 and would last approximately 14 months. The CalEEMod model has been utilized to calculate the construction-related criteria pollutant emissions from the proposed project and the input parameters utilized in this analysis have been detailed in Section 7.1. The annual construction-related criteria pollutant emissions from the proposed project is shown below in Table I and the CalEEMod Annual printouts are shown in Appendix A.

Table I – Construction-Related Air Pollutant Emissions

Construction Year	Pollutant Emissions[1] (tons per year)					
	VOC	**NOx**	**CO**	**SO_2**	**PM10**	**PM2.5**
2023	0.49	2.92	4.15	<0.01	0.65	0.77
2024	0.11	0.53	1.02	<0.01	0.05	0.07
MDAQMD Thresholds	**25**	**25**	**100**	**25**	**15**	**12**
Exceeds Thresholds?	No	No	No	No	No	No

Notes:
[1] Construction based on adherence to fugitive dust suppression requirements from MDAQMD Rule 403.2.
Source: CalEEMod Version 2020.4.0.

Table I shows that none of the analyzed criteria pollutants emissions would exceed the MDAQMD annual thresholds during construction of the proposed project. Therefore, a less than significant air quality emissions impact would occur from construction of the proposed project.

Operational Emissions

The operations-related criteria air quality impacts created by the proposed project have been analyzed through use of the CalEEMod model and the input parameters utilized in this analysis have been detailed in Section 7.1. The annual operations-related criteria pollutant emissions from the proposed project is shown below in Table J and the CalEEMod annual printouts are shown in Appendix A.

Table J – Operations-Related Air Pollutant Emissions

Emissions Source	Pollutant Emissions (tons per year)					
	VOC	NOx	CO	SO_2	PM10	PM2.5
Area Sources[1]	4.19	<0.01	<0.01	0.00	<0.01	<0.01
Energy Sources[2]	0.00	0.00	0.00	0.00	0.00	0.00
Mobile Sources[3]	0.01	0.02	0.12	<0.01	0.03	<0.01
Total Emissions	**4.20**	**0.02**	**0.12**	**<0.01**	**0.03**	**<0.01**
MDAQMD Thresholds	**25**	**25**	**100**	**25**	**15**	**12**
Exceeds Thresholds?	No	No	No	No	No	No

Notes:
[1] Area sources consist of emissions from consumer products, hearths, architectural coatings, and landscaping equipment.
[2] Energy usage consist of emissions from natural gas usage (no natural gas would be utilized by the proposed project).
[3] Mobile sources consist of emissions from vehicles and road dust.
Source: CalEEMod Version 2020.4.0.

Table J shows that none of the analyzed criteria pollutants emissions would exceed the MDAQMD annual emissions thresholds during operation of the proposed project. Therefore, a less than significant air quality emissions impact would occur from operation of the proposed project.

Friant Ranch Decision

In *Sierra Club v. County of Fresno* (2018) 6 Cal.5th 502 (also referred to as "*Friant Ranch*"), the California Supreme Court held that when an EIR concluded that when a project would have significant impacts to air quality impacts, an EIR should "make a reasonable effort to substantively connect a project's air quality impacts to likely health consequences." As shown in Table T above, and unlike the project at issue in the *Friant Ranch* case, the project's emissions of criteria pollutants would not exceed the MDAQMD's thresholds and would not have a significant air quality impact. Therefore, it is not necessary to connect this small project's air quality impacts to likely health impacts. However, for informational purposes this analysis considers the Court's direction as follows:

1) The air quality discussion shall describe the specific health risks created from each criteria pollutant, including diesel particulate matter.

Although it has been determined that the project would not result in significant air quality impacts, this analysis details the specific health risks created from each criteria pollutant above in Section 3.1 and specifically in Table B. In addition, the specific health risks created from diesel particulate matter is detailed above in Section 2.2 of this analysis. As such, this analysis meets the part 1 requirements of the Friant Ranch Case.

2) The analysis shall identify the magnitude of the health risks created from the Project. The Ruling details how to identify the magnitude of the health risks. Specifically, on page 24 of the ruling it states "The Court of Appeal identified several ways in which the EIR could have framed the analysis so as to adequately inform the public and decision makers of possible adverse health effects. The County could have, for example, identified the Project's impact on the days of nonattainment per year."

The Friant Ranch Case found that an EIR's air quality analysis must meaningfully connect the identified air quality impacts to the human health consequences of those impacts, or meaningfully explain why that analysis cannot be provided. As noted in the Brief of Amicus Curiae by the SCAQMD in the Friant Ranch case (https://www.courts.ca.gov/documents/9-s219783-ac-south-coast-air-quality-mgt-dist-041315.pdf) (Brief), SCAQMD has among the most sophisticated air quality modeling and health impact evaluation capability of any of the air districts in the State, and thus it is uniquely situated to express an opinion on how lead agencies should correlate air quality impacts with specific health outcomes. The SCAQMD discusses that it may be infeasible to quantify health risks caused by projects similar to the proposed project, due to many factors. It is necessary to have data regarding the sources and types of air toxic contaminants, location of emission points, velocity of emissions, the meteorology and topography of the area, and the location of receptors (worker and residence). The Brief states that it may not be feasible to perform a health risk assessment for airborne toxics that will be emitted by a generic industrial building that was built on "speculation" (i.e., without knowing the future tenant(s)). Even where a health risk assessment can be prepared, however, the resulting maximum health risk value is only a calculation of risk, it does not necessarily mean anyone will contract cancer as a result of the Project. The Brief also cites the author of the CARB methodology, which reported that a PM2.5 methodology is not suited for small projects and may yield unreliable results. Similarly, SCAQMD staff does not currently know of a way to accurately quantify ozone-related health impacts caused by NOX or VOC emissions from relatively small projects, due to photochemistry and regional model limitations. The Brief concludes, with respect to the Friant Ranch EIR, that although it may have been technically possible to plug the data into a methodology, the results would not have been reliable or meaningful.

On the other hand, for extremely large regional projects (unlike the proposed project), the SCAQMD states that it has been able to correlate potential health outcomes for very large emissions sources – as part of their rulemaking activity, specifically 6,620 pounds per day of NOx and 89,180 pounds per day of VOC (1,208 tons per year of NOx and 16,275 tons per year of VOC) were expected to result in approximately 20 premature deaths per year and 89,947 school absences due to ozone.

As shown above in Table I, project-related construction activities would generate a maximum of 0.31 tons per year of VOC and 2.12 tons per year of NOx and as shown above in Table J, operation of the proposed project would generate 4.21 tons per year of VOC and 0.02 tons per year of NOx. The proposed project would not generate anywhere near these levels of 1,208 tons per year of NOx or 16,275 tons per year of VOC emissions. Therefore, the proposed project's emissions are not sufficiently high enough to use a regional modeling program to correlate health effects on a basin-wide level.

Therefore, the proposed project would not result in a cumulatively considerable net increase of any criteria pollutant.

Level of Significance

Less than significant impact.

9.4 Sensitive Receptors

The proposed project would not expose sensitive receptors to substantial pollutant concentrations. The MDAQMD Guidelines details that sensitive receptor land uses consist of: Residences, schools, daycare centers, playgrounds and medical facilities are considered sensitive receptor land uses. The nearest sensitive receptor to the project site is an unoccupied home that is located as near as 740 feet west of the project site and on the west side of U.S. 95. The closest occupied residence is located over 1,600 feet to the north along Old Parker Road.

According to the MDAQMD Guidelines, the following project types proposed for sites within the specified distance to an existing or planned (zoned) sensitive receptor land use must be evaluated to determine if it exposes sensitive receptors to substantial pollutant concentrations:

- Any industrial project within 1000 feet;
- A distribution center (40 or more trucks per day) within 1000 feet;
- A major transportation project (50,000 or more vehicles per day) within 1000 feet;
- A dry cleaner using perchloroethylene within 500 feet;
- A gasoline dispensing facility within 300 feet.

The proposed project would consist of development of a PV solar energy facility, which would emit nominal air emissions. As such, the proposed project would not be considered one of the above land uses. Therefore, the proposed project would result in a less than significant exposure of sensitive receptors to substantial pollutant concentrations.

Level of Significance

Less than significant impact.

9.5 Odor Emissions Adversely Affecting a Substantial Number of People

The proposed project would not create objectionable odors affecting a substantial number of people. Individual responses to odors are highly variable and can result in a variety of effects. Generally, the impact of an odor results from a variety of factors such as frequency, duration, offensiveness, location, and sensory perception. The frequency is a measure of how often an individual is exposed to an odor in the ambient environment. The intensity refers to an individual's or group's perception of the odor strength or concentration. The duration of an odor refers to the elapsed time over which an odor is experienced. The offensiveness of the odor is the subjective rating of the pleasantness or unpleasantness of an odor. The location accounts for the type of area in which a potentially affected person lives, works, or visits; the type of activity in which he or she is engaged; and the sensitivity of the impacted receptor.

Sensory perception has four major components: detectability, intensity, character, and hedonic tone. The detection (or threshold) of an odor is based on a panel of responses to the odor. There are two types of thresholds: the odor detection threshold and the recognition threshold. The detection threshold is the lowest concentration of an odor that will elicit a response in a percentage of the people that live and work in the immediate vicinity of the project site and is typically presented as the mean (or 50 percent of the population). The recognition threshold is the minimum concentration that is recognized as having a characteristic odor quality, this is typically represented by recognition by 50 percent of the population. The intensity refers to the perceived strength of the odor. The odor character is what the substance smells like. The hedonic tone is a judgment of the pleasantness or unpleasantness of the odor. The hedonic tone varies in subjective experience, frequency, odor character, odor intensity, and duration. Potential odor impacts have been analyzed separately for construction and operations below.

Construction-Related Odor Impacts

Potential sources that may emit odors during construction activities include the application of coatings such as asphalt pavement, paints and solvents and from emissions from diesel equipment. Standard construction requirements that limit the time of day when construction may occur as well as MDAQMD

Rule 442 that limits VOC content in solvents, Rule 1103 that limits VOC content in asphalt and Rule 1113 that limits the VOC content in paints and solvents would minimize odor impacts from construction. As such, the objectionable odors that may be produced during the construction process would be temporary and would not likely be noticeable for extended periods of time beyond the project site's boundaries. Through compliance with the applicable regulations that reduce odors and due to the transitory nature of construction odors, a less than significant odor impact would occur and no mitigation would be required.

Operations-Related Odor Impacts

The proposed project would consist of the development of a PV solar energy facility, which does not include any components that are a known sources of odors. Therefore, a less than significant odor impact would occur and no mitigation would be required.

Level of Significance

Less than significant impact.

9.6 Generation of Greenhouse Gas Emissions

The proposed project would not generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment. The proposed project would consist of development of a PV solar energy facility. The proposed project is anticipated to generate GHG emissions from construction activities and from operational activities that would include area sources, energy usage, mobile sources, waste disposal, and water usage. The proposed project is also anticipated to reduce GHG emissions by providing production of non-carbon emissions electrical generation that would replace existing carbon-powered electrical generation source

The MDAQMD shares responsibility with CARB for ensuring that all state and federal GHG standards are achieved and maintained within its jurisdiction. The MDAQMD CEQA Guidelines provides a project level significance threshold of 100,000 tons of CO_2e per year for both construction and operational activities. The MDAQMD developed this threshold in order to comply with the GHG emission reductions required by AB 32.

The project's GHG emissions have been calculated with the CalEEMod model based on the construction and operational parameters detailed above in Section 7.1. A summary of the results is shown below in Table K and the CalEEMod model run is provided in Appendix A.

Table K – Project Related Greenhouse Gas Annual Emissions

Category	Greenhouse Gas Emissions (Metric Tons per Year)			
	CO_2	CH_4	N_2O	CO_2e
Construction				
Year 2023	877.67	0.11	0.02	887.28
Year 2024	232.19	0.02	<0.01	234.73
Total Construction Emissions	1,109.86	0.13	0.03	1,122.01
Amortized Construction Emissions[1] (30 Years)	**37.00**	**<0.01**	**<0.01**	**37.40**
Operations				
Area Sources[2]	0.02	<0.01	0.00	0.02
Energy Usage and Production[3]	1,380.96	0.12	0.01	1,388.08
Mobile Sources[4]	23.89	<0.01	<0.01	24.29
Solid Waste[5]	5.74	0.34	0.00	14.22
Water and Wastewater[6]	0.02	0.00	0.00	0.02
Total Operational Emissions	**1,410.62**	**0.46**	**0.02**	**1,426.62**
Total Annual Emission (Construction & Operations)	**1,447.61**	**0.46**	**0.02**	**1,464.02**
MDAQMD Threshold				**100,000**
Exceed Thresholds?				**No**

Notes:
[1] Construction emissions amortized over 30 years as recommended in the SCAQMD GHG Working Group on November 19, 2009.
[2] Area sources consist of GHG emissions from consumer products, architectural coatings, and landscaping equipment.
[3] Energy usage consists of GHG emissions from electricity used and generated onsite.
[4] Mobile sources consist of GHG emissions from vehicles.
[5] Waste includes the CO_2 and CH_4 emissions created from the solid waste placed in landfills.
[6] Water includes GHG emissions from electricity used for transport of water and processing of wastewater.
Source: CalEEMod Version 2020.4.0.

The data provided in Table K shows that the construction activities would create a total of 1,122.01 $MTCO_2e$, which equates to 37.40 $MTCO_2e$ per year, when amortized over 30 years. Table K also shows that operational activities would create 1426.62 $MTCO_2e$ per year and when combined with the amortized construction emissions, the proposed project would create a total of 1,464.02 $MTCO_2e$ per year, which is within the MDAQMD threshold of 100,000 $MTCO_2e$ per year that is described above in Section 8.1. Therefore, a less than significant generation of greenhouse gas emissions would occur from development of the proposed project. Impacts would be less than significant.

Level of Significance

Less than significant impact.

9.7 Greenhouse Gas Plan Consistency

The proposed project would not conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing GHG emissions. Since the *County of San Bernardino Greenhouse Gas Emissions Reduction Plan* (GHG Plan), September 2011 is not consistent with the State's post-2020 GHG reduction goals, the GHG Plan was not used in this analysis. Instead, the consistency analysis for the proposed project is based off the project's consistency with the *San Bernardino County Regional Greenhouse Gas Reduction Plan* (RGHGRP), prepared by SBCOG, March 2021, the County's Policy Plan, and CARB's 2017 Scoping Plan Update.

Consistency with the 2021 Regional GHG Reduction Plan

The Regional GHG Reduction Plan includes GHG inventories, and local GHG reduction strategies for each of the 25 Partnership jurisdictions including the unincorporated areas of San Bernardino County. This RGHGRP is not mandatory for the Partnership jurisdictions. Instead, it provides information that can be used by Partnership jurisdictions, if they choose so, to develop individual climate action plans (CAPs). The RGHGHRP describes the reductions that are possible if SBCOG and every Partnership jurisdiction were to adopt the reduction strategies as described in the document.

The RGHGRP demonstrates how Unincorporated San Bernardino could achieve its selected goal, "of reducing its community GHG emissions to a level that is 40% below its 2020 GHG emissions level by 2030".11 The majority (approximately 80 percent) of unincorporated San Bernardino County's GHG reduction goal will be achieved through state efforts, such as the Pavley vehicle standards, the state's low carbon fuel standard, the RPS, and other state measures to reduce GHG emissions in the on-road, solid waste and building energy sectors in 2030. According to the RGHGRP, the remaining 20 percent need to meet its goal could be achieved "primarily through the following local measures, in order of reductions achieved: Solar Installation for Existing Commercial/Industrial (Energy-8); Waste Diversion and Reduction (Waste-2); Solar Installation for Existing Housing (Energy-7)."12 As shown on Table 3-75 of the RGHGRP13, the County has proposed to adopt ten GHG reduction measures, including increasing the energy efficiency of and solar installation upon new and existing buildings, Transportation Demand Management and Synchronization, expanded bike lanes, waste diversion and reduction, water efficient landscaping, and other measures. It should be noted that the County has not adopted its jurisdictional plan.

Of the 10 GHG reduction measures proposed, the following two apply to the County directly and not project owners or occupants: OnRoad-3 encouraging signal synchronization and OnRoad-4 encouraging bike lanes; thus, these measures are not applicable to the proposed project. The following six measures do not apply to the proposed project because they are directed towards sources the proposed project would not include: Energy-1 improving the energy efficiency of new buildings, Energy-7 encouraging solar installation for existing housing, Energy-8 encouraging solar installation for existing commercial and industrial, Energy-10 encouraging urban tree planting for shading and energy savings, Offroad-2 directed at heavy duty diesel truck idling, and PS-1 proposing a GHG performance standard for new development. The proposed project is designed to be consistent with GHG reduction measure Water-3, encouraging water-efficient landscaping practices, and would be operated consistent with Waste-2 encouraging increased waste diversion and reduction if adopted and as applicable.

Assuming the County is successful in adopting its plan substantively as written, the above discussion demonstrates that the Project would be consistent with the applicable portions of the jurisdictional GHG reduction measures contained in the RGHGRP, and impacts would be less than significant.

Consistency with the San Bernardino County Policy Plan

As previously discussed, the San Bernardino Policy Plan includes goals and policies that all new projects are required to comply with, as applicable. Project consistency with the policy plan goals and policies is discussed in Table 3, Consistency with the County's Policy Plan. As depicted in Table L, the proposed project would be consistent with the policy plan and potential impacts would be less than significant.

Table L – Consistency with GHG Policies in the County's Policy Plan

Policy No.	San Bernardino County Policy Plan Policy	Proposed Project Consistency with Policy
IU-4.3	**Waste diversion.** We shall meet or exceed state waste diversion requirements, augment future landfill capacity, and reduce greenhouse gas emissions and use of natural resources through the reduction, reuse, or recycling of solid waste.	**Consistent.** The proposed project is a solar generation and energy storage facility, which would generate a limited amount of solid waste from project operations. The proposed project would be required to comply with State waste diversion requirements. As such, the proposed project would be consistent with this policy.
IU-5.5	**Energy and fuel facilities.** We encourage the development and upgrade of energy and regional fuel facilities in areas that do not pose significant environmental or public health and safety hazards, and in a manner that is compatible with military operations and local community identity.	**Consistent.** The proposed project is a solar generation and energy storage facility and would not create additional significant environmental or public health and safety hazards as it would displace fossil fuel energy production. Clean energy would be produced from operation of the proposed project. Therefore, the proposed project would not conflict with this policy.
NR-1.1	**Land use.** We promote compact and transit-oriented development countywide and regulate the types and locations of development in unincorporated areas to minimize vehicle miles traveled and greenhouse gas emissions.	**Consistent.** The proposed project would generate minimal vehicle miles traveled and associated GHG emissions. Therefore, the proposed project would not conflict with this policy.
NR-1.7	**Greenhouse gas reduction targets**. We strive to meet the 2040 and 2050 greenhouse gas emission reduction targets in accordance with state law.	**Consistent.** The proposed project would indirectly reduce GHG emissions overall and is consistent with state goals and requirements to replace non-carbon neutral electricity sources with carbon-neutral electrical sources. Therefore, the proposed project would be consistent with this policy.
NR-1.9	**Building design and upgrades.** We use the CALGreen Code to meet energy efficiency standards for new buildings and encourage the upgrading of existing buildings to incorporate design elements, building materials, and fixtures that improve environmental sustainability and reduce emissions.	**Consistent.** The proposed project would be required to comply the most current CalGreen Code and Title 24 Standards, as applicable. Therefore, the proposed project would not conflict with this policy.
RE 4.10	Prohibit utility-oriented RE project development on sites that would create adverse impacts on the quality of life or economic development opportunities in existing unincorporated communities. Any exceptions or revisions to the following policy direction would require approval by the Board of Supervisors.	**Consistent.** The proposed project is located on land that is crossed over by high voltage lines and has limited use, other than for PV solar projects. Therefore, the proposed project would not conflict with this policy.
RE 5.2	Utility-oriented RE generation projects on private land in the unincorporated County will be limited to the site-types below, in addition to meeting criteria established herein and in the Development Code: ix. Sites within or adjacent to electric transmission and utility distribution corridors	**Consistent.** The proposed project is located on land that is crossed over by high voltage lines.. Therefore, the proposed project is consistent with this policy.

Source: County of San Bernardino, 2020.

Consistency with the 2017 CARB Scoping Plan

The 2017 Scoping Plan identifies additional GHG reduction measures necessary to achieve the 2030 target. These measures build upon those identified in the first update to the Scoping Plan (2013). Although a number of these measures are currently established as policies and measures, some measures have not yet been formally proposed or adopted. It is expected that these measures or similar actions to reduce GHG emissions will be adopted as required to achieve statewide GHG emissions targets. Provided in Table M, Consistency with the 2017 Scoping Plan, is an evaluation of applicable reduction actions/strategies by emissions source category to determine how the proposed project would be consistent with or exceed reduction actions/strategies outlined in the 2017 Scoping Plan. Therefore, the proposed project would be consistent with the 2017 CARB Scoping Plan and potential impacts would be less than significant in this regard.

Table M – Consistency with the 2017 Scoping Plan

Actions and Strategies	Proposed Project Consistency with Actions and Strategies
SB 350	
Achieve a 50 percent Renewable Portfolio Standard (RPS) by 2030, with a doubling of energy efficiency savings by 2030	**No Conflict.** The proposed project includes the construction and operation of a renewable energy generation and storage facility. Therefore, the proposed project would help the State achieve the Renewables Portfolio Standard (RPS) goals. As such, the proposed project would be consistent with SB 350 (and SB 100).
Low Carbon Fuel Standard (LCFS)	
Increase stringency of carbon fuel standards; reduce the carbon intensity of fuels by 18 percent by 2030, which is up from 10 percent in 2020.	**No Conflict.** This standard applies to all vehicle fuels sold in California including that could be used in vehicles associated with the proposed project. The proposed project would not impede this goal.
Mobile Source Strategy (Cleaner Technology and Fuel Scenario)	
Maintain existing GHG standards of light and heavy-duty vehicles while adding an addition 4.2 million zero emission vehicles (ZEVs) on the road. Increase the number of ZEV buses, delivery trucks, or other trucks.	**No Conflict.** The proposed project may include occasional light- and heavy duty truck uses for operations and maintenance activities. Trucks uses associated with the Project would be required to comply with all CARB regulations, including the LCFS and newer engine standards. The Project would not conflict with the CARB's goal of adding 4.2 million zero-emission (ZEVs) on the road. As such, the proposed project would not conflict with the goals of the Mobile Source Strategy.
Sustainable Freight Action Plan	
Improve the freight system efficiency and maximize the use of near zero emission vehicles and equipment powered by renewable energy. Deploy over 100,000 zero-emission trucks and equipment by 2030.	**No Conflict.** As described above, occasional truck uses associated with the proposed project would be required to comply with all CARB regulations, including the LCFS and newer engine standards. Additionally, the Project would comply with all future applicable regulatory standards adopted by CARB and would not conflict with CARB's goal to deploy over 100,000 zero-emission trucks and equipment by 2030.
Short-Lived Climate Pollutant (SLCP) Reduction Strategy	
Reduce the GHG emissions of methane and hydrofluorocarbons by 40 percent below the 2013 levels by 2030. Furthermore, reduce the emissions of black carbon by 50 percent below the 2013 levels by the year 2030.	**No Conflict.** The proposed project would not emit a large amount of CH_4 (methane) emissions; refer to Table 2. Furthermore, the proposed project would comply with all applicable CARB and MDAQMD hydrofluorocarbon regulations. As such, the Project would not conflict with the SLCP reduction strategy.

Actions and Strategies	Proposed Project Consistency with Actions and Strategies
Post-2020 Cap and Trade Programs	
The Cap-and-Trade Program will reduce greenhouse gas (GHG) emissions from major sources (covered entities) by setting a firm cap on statewide GHG emissions while employing market mechanisms to cost-effectively achieve the emission-reduction goals.	**Not Applicable.** As seen in Table K, the proposed project is estimated to generate approximately 1,464.02 $MTCO_2e$ per year, which is below the 25,000 $MTCO_2e$ per year Cap-and-Trade screening level. Therefore, this goal is not applicable to the proposed project.

Source: CARB, 2017.

Level of Significance

Less than significant impact.

10.0 REFERENCES

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APPENDIX A

CalEEMod Model Annual Printouts

Vidal Solar Project - San Bernardino-Mojave Desert County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Vidal Solar Project

San Bernardino-Mojave Desert County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Refrigerated Warehouse-No Rail	30.08	1000sqft	7.10	30,080.00	0
User Defined Industrial	7.50	User Defined Unit	7.50	100,000.00	0
Other Non-Asphalt Surfaces	6.00	Acre	6.00	261,360.00	0
Other Non-Asphalt Surfaces	810.00	Acre	810.00	35,283,600.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.6	**Precipitation Freq (Days)**	32
Climate Zone	10			**Operational Year**	2024
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	390.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Total area disturbed on project site 830.6 acres

Construction Phase - Construction schedule provided by applicant

Off-road Equipment -

Off-road Equipment - BESS & Substation Construction - 1 Aerial Lift, 1 Air Compressor, 2 Cranes, 3 Forklifts, 1 Generator, 1 Tractor/Loader/Backhoe, and 3 Welders

Off-road Equipment - Electrical Infrastructure - 2 Excavators, 1 Rubber Tired Loader, 2 Tractors/Loaders/Backhoes

Off-road Equipment -

Off-road Equipment - PV System - 1 Air Compressor, 1 Crane, 3 Forklifts, 1 Generator Set, 1 Tractor/loader/backhoes, 3 Welders

Vidal Solar Project - San Bernardino-Mojave Desert County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Trips and VMT - PV System and BESS-Substation would generate 990 worker trips and 50 vendor trips per day. 6 Vendor trips added to Site Preparation, Electrical and Paving phases

Grading - 831 acres graded

Vehicle Trips - Up to 24 daily trips

Energy Use - Natural Gas use set to zero. Electric usage set to 7,786,667 kWhy/year

Water And Wastewater - Outdoor water use set to 8000 gallons per year

Construction Off-road Equipment Mitigation - Water Exposed Area 2x per day selected to account for MDAQMD Rule 403 minimum requirements

Energy Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	540.00	90.00
tblConstructionPhase	NumDays	990.00	15.00
tblConstructionPhase	NumDays	13,950.00	90.00
tblConstructionPhase	NumDays	13,950.00	90.00
tblEnergyUse	LightingElect	2.37	0.00
tblEnergyUse	NT24E	36.52	258.87
tblEnergyUse	NT24NG	48.51	0.00
tblEnergyUse	T24E	0.95	0.00
tblEnergyUse	T24NG	3.22	0.00
tblGrading	AcresOfGrading	135.00	831.00
tblLandUse	LandUseSquareFeet	0.00	100,000.00
tblLandUse	LotAcreage	0.69	7.10
tblLandUse	LotAcreage	0.00	7.50
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	3.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	3.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblOffRoadEquipment	UsageHours	7.00	8.00
tblTripsAndVMT	VendorTripNumber	0.00	6.00
tblTripsAndVMT	VendorTripNumber	5,847.00	50.00
tblTripsAndVMT	VendorTripNumber	5,847.00	50.00
tblTripsAndVMT	VendorTripNumber	0.00	6.00
tblTripsAndVMT	VendorTripNumber	0.00	6.00
tblTripsAndVMT	WorkerTripNumber	14,984.00	990.00
tblTripsAndVMT	WorkerTripNumber	14,984.00	990.00
tblVehicleTrips	ST_TR	2.12	0.80
tblVehicleTrips	SU_TR	2.12	0.80
tblVehicleTrips	WD_TR	2.12	0.80
tblWater	IndoorWaterUseRate	6,956,000.00	0.00
tblWater	OutdoorWaterUseRate	0.00	8,000.00

2.0 Emissions Summary

Vidal Solar Project - San Bernardino-Mojave Desert County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2023	0.4913	2.9230	4.1459	9.7500e-003	1.8256	0.1263	1.9519	0.6470	0.1183	0.7653	0.0000	877.6748	877.6748	0.1128	0.0228	887.2773
2024	0.1142	0.5287	1.0176	2.5600e-003	0.1870	0.0203	0.2073	0.0499	0.0192	0.0691	0.0000	232.1943	232.1943	0.0199	6.8500e-003	234.7314
Maximum	**0.4913**	**2.9230**	**4.1459**	**9.7500e-003**	**1.8256**	**0.1263**	**1.9519**	**0.6470**	**0.1183**	**0.7653**	**0.0000**	**877.6748**	**877.6748**	**0.1128**	**0.0228**	**887.2773**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2023	0.4913	2.9230	4.1459	9.7500e-003	1.1361	0.1263	1.2624	0.3750	0.1183	0.4933	0.0000	877.6743	877.6743	0.1128	0.0228	887.2769
2024	0.1142	0.5287	1.0176	2.5600e-003	0.1870	0.0203	0.2073	0.0499	0.0192	0.0691	0.0000	232.1942	232.1942	0.0199	6.8500e-003	234.7313
Maximum	**0.4913**	**2.9230**	**4.1459**	**9.7500e-003**	**1.1361**	**0.1263**	**1.2624**	**0.3750**	**0.1183**	**0.4933**	**0.0000**	**877.6743**	**877.6743**	**0.1128**	**0.0228**	**887.2769**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	34.26	0.00	31.93	39.03	0.00	32.59	0.00	0.00	0.00	0.00	0.00	0.00

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	1-1-2023	3-31-2023	0.9808	0.9808
2	4-1-2023	6-30-2023	0.6472	0.6472
3	7-1-2023	9-30-2023	0.8573	0.8573
4	10-1-2023	12-31-2023	0.9622	0.9622
5	1-1-2024	3-31-2024	0.6252	0.6252
		Highest	0.9808	0.9808

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.1928	7.0000e-005	7.8300e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.0153	0.0153	4.0000e-005	0.0000	0.0163
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1,380.9560	1,380.9560	0.1166	0.0141	1,388.0801
Mobile	0.0116	0.0178	0.1162	2.5000e-004	0.0265	2.1000e-004	0.0267	7.0800e-003	1.9000e-004	7.2700e-003	0.0000	23.8900	23.8900	1.4100e-003	1.2200e-003	24.2887
Waste						0.0000	0.0000		0.0000	0.0000	5.7406	0.0000	5.7406	0.3393	0.0000	14.2221
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0158	0.0158	0.0000	0.0000	0.0158
Total	**4.2044**	**0.0179**	**0.1240**	**2.5000e-004**	**0.0265**	**2.4000e-004**	**0.0267**	**7.0800e-003**	**2.2000e-004**	**7.3000e-003**	**5.7406**	**1,404.8770**	**1,410.6176**	**0.4573**	**0.0154**	**1,426.6229**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.1928	7.0000e-005	7.8300e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.0153	0.0153	4.0000e-005	0.0000	0.0163
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1,380.956 0	1,380.956 0	0.1166	0.0141	1,388.080 1
Mobile	0.0116	0.0178	0.1162	2.5000e-004	0.0265	2.1000e-004	0.0267	7.0800e-003	1.9000e-004	7.2700e-003	0.0000	23.8900	23.8900	1.4100e-003	1.2200e-003	24.2887
Waste						0.0000	0.0000		0.0000	0.0000	5.7406	0.0000	5.7406	0.3393	0.0000	14.2221
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0158	0.0158	0.0000	0.0000	0.0158
Total	**4.2044**	**0.0179**	**0.1240**	**2.5000e-004**	**0.0265**	**2.4000e-004**	**0.0267**	**7.0800e-003**	**2.2000e-004**	**7.3000e-003**	**5.7406**	**1,404.877 0**	**1,410.617 6**	**0.4573**	**0.0154**	**1,426.622 9**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	1/1/2023	5/7/2023	5	90	
2	Acces Rd Construction	Paving	5/8/2023	5/26/2023	5	15	
3	Electrical Infrastructure	Trenching	5/27/2023	6/23/2023	5	20	

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4	PV System Assembly & Installation	Building Construction	6/24/2023	10/27/2023		5	90	
5	BESS and Substation Construction	Building Construction	10/28/2023	3/1/2024		5	90	

Acres of Grading (Site Preparation Phase): 831

Acres of Grading (Grading Phase): 0

Acres of Paving: 816

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
PV System Assembly & Installation	Air Compressors	1	8.00	78	0.48
PV System Assembly & Installation	Cranes	1	8.00	231	0.29
PV System Assembly & Installation	Forklifts	3	8.00	89	0.20
PV System Assembly & Installation	Generator Sets	1	8.00	84	0.74
PV System Assembly & Installation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
PV System Assembly & Installation	Welders	3	8.00	46	0.45
BESS and Substation Construction	Aerial Lifts	1	8.00	63	0.31
BESS and Substation Construction	Air Compressors	1	8.00	78	0.48
BESS and Substation Construction	Cranes	2	8.00	231	0.29
BESS and Substation Construction	Forklifts	3	8.00	89	0.20
BESS and Substation Construction	Generator Sets	1	8.00	84	0.74
BESS and Substation Construction	Tractors/Loaders/Backhoes	1	7.00	97	0.37
BESS and Substation Construction	Welders	3	8.00	46	0.45
Acces Rd Construction	Pavers	2	8.00	130	0.42
Acces Rd Construction	Paving Equipment	2	8.00	132	0.36

Acces Rd Construction	Rollers		2	8.00	80	0.38
Electrical Infrastructure	Excavators		2	8.00	158	0.38
Electrical Infrastructure	Rubber Tired Loaders		1	8.00	203	0.36
Electrical Infrastructure	Tractors/Loaders/Backhoes		2	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	7	18.00	6.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
PV System Assembly & Installation	10	990.00	50.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
BESS and Substation Construction	12	990.00	50.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Acces Rd Construction	6	15.00	6.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Electrical Infrastructure	5	13.00	6.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

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3.2 Site Preparation - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.2536	0.0000	1.2536	0.4945	0.0000	0.4945	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1197	1.2386	0.8210	1.7100e-003		0.0570	0.0570		0.0524	0.0524	0.0000	150.5281	150.5281	0.0487	0.0000	151.7452
Total	**0.1197**	**1.2386**	**0.8210**	**1.7100e-003**	**1.2536**	**0.0570**	**1.3106**	**0.4945**	**0.0524**	**0.5469**	**0.0000**	**150.5281**	**150.5281**	**0.0487**	**0.0000**	**151.7452**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.1000e-004	0.0103	4.0900e-003	5.0000e-005	1.8000e-003	8.0000e-005	1.8800e-003	5.2000e-004	7.0000e-005	5.9000e-004	0.0000	4.9514	4.9514	1.3000e-004	7.3000e-004	5.1726
Worker	2.3600e-003	1.6600e-003	0.0205	6.0000e-005	6.5300e-003	3.0000e-005	6.5600e-003	1.7300e-003	3.0000e-005	1.7700e-003	0.0000	5.1341	5.1341	1.6000e-004	1.5000e-004	5.1829
Total	**2.6700e-003**	**0.0120**	**0.0246**	**1.1000e-004**	**8.3300e-003**	**1.1000e-004**	**8.4400e-003**	**2.2500e-003**	**1.0000e-004**	**2.3600e-003**	**0.0000**	**10.0855**	**10.0855**	**2.9000e-004**	**8.8000e-004**	**10.3555**

3.2 Site Preparation - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.5641	0.0000	0.5641	0.2225	0.0000	0.2225	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1197	1.2386	0.8210	1.7100e-003		0.0570	0.0570		0.0524	0.0524	0.0000	150.5280	150.5280	0.0487	0.0000	151.7451
Total	**0.1197**	**1.2386**	**0.8210**	**1.7100e-003**	**0.5641**	**0.0570**	**0.6211**	**0.2225**	**0.0524**	**0.2749**	**0.0000**	**150.5280**	**150.5280**	**0.0487**	**0.0000**	**151.7451**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.1000e-004	0.0103	4.0900e-003	5.0000e-005	1.8000e-003	8.0000e-005	1.8800e-003	5.2000e-004	7.0000e-005	5.9000e-004	0.0000	4.9514	4.9514	1.3000e-004	7.3000e-004	5.1726
Worker	2.3600e-003	1.6600e-003	0.0205	6.0000e-005	6.5300e-003	3.0000e-005	6.5600e-003	1.7300e-003	3.0000e-005	1.7700e-003	0.0000	5.1341	5.1341	1.6000e-004	1.5000e-004	5.1829
Total	**2.6700e-003**	**0.0120**	**0.0246**	**1.1000e-004**	**8.3300e-003**	**1.1000e-004**	**8.4400e-003**	**2.2500e-003**	**1.0000e-004**	**2.3600e-003**	**0.0000**	**10.0855**	**10.0855**	**2.9000e-004**	**8.8000e-004**	**10.3555**

3.3 Acces Rd Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	7.7500e-003	0.0764	0.1094	1.7000e-004		3.8300e-003	3.8300e-003		3.5200e-003	3.5200e-003	0.0000	15.0202	15.0202	4.8600e-003	0.0000	15.1416
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.7500e-003**	**0.0764**	**0.1094**	**1.7000e-004**		**3.8300e-003**	**3.8300e-003**		**3.5200e-003**	**3.5200e-003**	**0.0000**	**15.0202**	**15.0202**	**4.8600e-003**	**0.0000**	**15.1416**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.0000e-005	1.7200e-003	6.8000e-004	1.0000e-005	3.0000e-004	1.0000e-005	3.1000e-004	9.0000e-005	1.0000e-005	1.0000e-004	0.0000	0.8252	0.8252	2.0000e-005	1.2000e-004	0.8621
Worker	3.3000e-004	2.3000e-004	2.8500e-003	1.0000e-005	9.1000e-004	0.0000	9.1000e-004	2.4000e-004	0.0000	2.5000e-004	0.0000	0.7131	0.7131	2.0000e-005	2.0000e-005	0.7199
Total	**3.8000e-004**	**1.9500e-003**	**3.5300e-003**	**2.0000e-005**	**1.2100e-003**	**1.0000e-005**	**1.2200e-003**	**3.3000e-004**	**1.0000e-005**	**3.5000e-004**	**0.0000**	**1.5383**	**1.5383**	**4.0000e-005**	**1.4000e-004**	**1.5820**

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3.3 Acces Rd Construction - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	7.7500e-003	0.0764	0.1094	1.7000e-004		3.8300e-003	3.8300e-003		3.5200e-003	3.5200e-003	0.0000	15.0201	15.0201	4.8600e-003	0.0000	15.1416
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.7500e-003**	**0.0764**	**0.1094**	**1.7000e-004**		**3.8300e-003**	**3.8300e-003**		**3.5200e-003**	**3.5200e-003**	**0.0000**	**15.0201**	**15.0201**	**4.8600e-003**	**0.0000**	**15.1416**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	5.0000e-005	1.7200e-003	6.8000e-004	1.0000e-005	3.0000e-004	1.0000e-005	3.1000e-004	9.0000e-005	1.0000e-005	1.0000e-004	0.0000	0.8252	0.8252	2.0000e-005	1.2000e-004	0.8621
Worker	3.3000e-004	2.3000e-004	2.8500e-003	1.0000e-005	9.1000e-004	0.0000	9.1000e-004	2.4000e-004	0.0000	2.5000e-004	0.0000	0.7131	0.7131	2.0000e-005	2.0000e-005	0.7199
Total	**3.8000e-004**	**1.9500e-003**	**3.5300e-003**	**2.0000e-005**	**1.2100e-003**	**1.0000e-005**	**1.2200e-003**	**3.3000e-004**	**1.0000e-005**	**3.5000e-004**	**0.0000**	**1.5383**	**1.5383**	**4.0000e-005**	**1.4000e-004**	**1.5820**

3.4 Electrical Infrastructure - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	9.5100e-003	0.0882	0.1249	2.3000e-004		3.9200e-003	3.9200e-003		3.6100e-003	3.6100e-003	0.0000	20.0390	20.0390	6.4800e-003	0.0000	20.2011
Total	**9.5100e-003**	**0.0882**	**0.1249**	**2.3000e-004**		**3.9200e-003**	**3.9200e-003**		**3.6100e-003**	**3.6100e-003**	**0.0000**	**20.0390**	**20.0390**	**6.4800e-003**	**0.0000**	**20.2011**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	7.0000e-005	2.3000e-003	9.1000e-004	1.0000e-005	4.0000e-004	2.0000e-005	4.2000e-004	1.2000e-004	2.0000e-005	1.3000e-004	0.0000	1.1003	1.1003	3.0000e-005	1.6000e-004	1.1495
Worker	3.8000e-004	2.7000e-004	3.2900e-003	1.0000e-005	1.0500e-003	1.0000e-005	1.0500e-003	2.8000e-004	1.0000e-005	2.8000e-004	0.0000	0.8240	0.8240	3.0000e-005	2.0000e-005	0.8318
Total	**4.5000e-004**	**2.5700e-003**	**4.2000e-003**	**2.0000e-005**	**1.4500e-003**	**3.0000e-005**	**1.4700e-003**	**4.0000e-004**	**3.0000e-005**	**4.1000e-004**	**0.0000**	**1.9243**	**1.9243**	**6.0000e-005**	**1.8000e-004**	**1.9813**

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3.4 Electrical Infrastructure - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	9.5100e-003	0.0882	0.1249	2.3000e-004		3.9200e-003	3.9200e-003		3.6100e-003	3.6100e-003	0.0000	20.0390	20.0390	6.4800e-003	0.0000	20.2010
Total	**9.5100e-003**	**0.0882**	**0.1249**	**2.3000e-004**		**3.9200e-003**	**3.9200e-003**		**3.6100e-003**	**3.6100e-003**	**0.0000**	**20.0390**	**20.0390**	**6.4800e-003**	**0.0000**	**20.2010**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	7.0000e-005	2.3000e-003	9.1000e-004	1.0000e-005	4.0000e-004	2.0000e-005	4.2000e-004	1.2000e-004	2.0000e-005	1.3000e-004	0.0000	1.1003	1.1003	3.0000e-005	1.6000e-004	1.1495
Worker	3.8000e-004	2.7000e-004	3.2900e-003	1.0000e-005	1.0500e-003	1.0000e-005	1.0500e-003	2.8000e-004	1.0000e-005	2.8000e-004	0.0000	0.8240	0.8240	3.0000e-005	2.0000e-005	0.8318
Total	**4.5000e-004**	**2.5700e-003**	**4.2000e-003**	**2.0000e-005**	**1.4500e-003**	**3.0000e-005**	**1.4700e-003**	**4.0000e-004**	**3.0000e-005**	**4.1000e-004**	**0.0000**	**1.9243**	**1.9243**	**6.0000e-005**	**1.8000e-004**	**1.9813**

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3.5 PV System Assembly & Installation - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0961	0.7625	0.8378	1.4300e-003		0.0361	0.0361		0.0346	0.0346	0.0000	119.4172	119.4172	0.0220	0.0000	119.9680
Total	**0.0961**	**0.7625**	**0.8378**	**1.4300e-003**		**0.0361**	**0.0361**		**0.0346**	**0.0346**	**0.0000**	**119.4172**	**119.4172**	**0.0220**	**0.0000**	**119.9680**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.5900e-003	0.0861	0.0341	4.2000e-004	0.0150	6.3000e-004	0.0156	4.3300e-003	6.0000e-004	4.9300e-003	0.0000	41.2618	41.2618	1.0700e-003	6.1000e-003	43.1050
Worker	0.1298	0.0912	1.1273	3.0400e-003	0.3590	1.8600e-003	0.3609	0.0954	1.7200e-003	0.0971	0.0000	282.3764	282.3764	8.7900e-003	8.2700e-003	285.0614
Total	**0.1324**	**0.1773**	**1.1614**	**3.4600e-003**	**0.3740**	**2.4900e-003**	**0.3765**	**0.0997**	**2.3200e-003**	**0.1020**	**0.0000**	**323.6382**	**323.6382**	**9.8600e-003**	**0.0144**	**328.1664**

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 PV System Assembly & Installation - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0961	0.7625	0.8378	1.4300e-003		0.0361	0.0361		0.0346	0.0346	0.0000	119.4170	119.4170	0.0220	0.0000	119.9678
Total	**0.0961**	**0.7625**	**0.8378**	**1.4300e-003**		**0.0361**	**0.0361**		**0.0346**	**0.0346**	**0.0000**	**119.4170**	**119.4170**	**0.0220**	**0.0000**	**119.9678**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	2.5900e-003	0.0861	0.0341	4.2000e-004	0.0150	6.3000e-004	0.0156	4.3300e-003	6.0000e-004	4.9300e-003	0.0000	41.2618	41.2618	1.0700e-003	6.1000e-003	43.1050
Worker	0.1298	0.0912	1.1273	3.0400e-003	0.3590	1.8600e-003	0.3609	0.0954	1.7200e-003	0.0971	0.0000	282.3764	282.3764	8.7900e-003	8.2700e-003	285.0614
Total	**0.1324**	**0.1773**	**1.1614**	**3.4600e-003**	**0.3740**	**2.4900e-003**	**0.3765**	**0.0997**	**2.3200e-003**	**0.1020**	**0.0000**	**323.6382**	**323.6382**	**9.8600e-003**	**0.0144**	**328.1664**

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3.6 BESS and Substation Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0563	0.4748	0.4785	8.7000e-004		0.0216	0.0216		0.0206	0.0206	0.0000	73.6649	73.6649	0.0155	0.0000	74.0531
Total	**0.0563**	**0.4748**	**0.4785**	**8.7000e-004**		**0.0216**	**0.0216**		**0.0206**	**0.0206**	**0.0000**	**73.6649**	**73.6649**	**0.0155**	**0.0000**	**74.0531**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.2900e-003	0.0431	0.0171	2.1000e-004	7.5000e-003	3.1000e-004	7.8200e-003	2.1700e-003	3.0000e-004	2.4700e-003	0.0000	20.6309	20.6309	5.4000e-004	3.0500e-003	21.5525
Worker	0.0649	0.0456	0.5636	1.5200e-003	0.1795	9.3000e-004	0.1804	0.0477	8.6000e-004	0.0485	0.0000	141.1882	141.1882	4.3900e-003	4.1400e-003	142.5307
Total	**0.0662**	**0.0887**	**0.5807**	**1.7300e-003**	**0.1870**	**1.2400e-003**	**0.1883**	**0.0499**	**1.1600e-003**	**0.0510**	**0.0000**	**161.8191**	**161.8191**	**4.9300e-003**	**7.1900e-003**	**164.0832**

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3.6 BESS and Substation Construction - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0563	0.4748	0.4785	8.7000e-004		0.0216	0.0216		0.0206	0.0206	0.0000	73.6648	73.6648	0.0155	0.0000	74.0530
Total	**0.0563**	**0.4748**	**0.4785**	**8.7000e-004**		**0.0216**	**0.0216**		**0.0206**	**0.0206**	**0.0000**	**73.6648**	**73.6648**	**0.0155**	**0.0000**	**74.0530**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.2900e-003	0.0431	0.0171	2.1000e-004	7.5000e-003	3.1000e-004	7.8200e-003	2.1700e-003	3.0000e-004	2.4700e-003	0.0000	20.6309	20.6309	5.4000e-004	3.0500e-003	21.5525
Worker	0.0649	0.0456	0.5636	1.5200e-003	0.1795	9.3000e-004	0.1804	0.0477	8.6000e-004	0.0485	0.0000	141.1882	141.1882	4.3900e-003	4.1400e-003	142.5307
Total	**0.0662**	**0.0887**	**0.5807**	**1.7300e-003**	**0.1870**	**1.2400e-003**	**0.1883**	**0.0499**	**1.1600e-003**	**0.0510**	**0.0000**	**161.8191**	**161.8191**	**4.9300e-003**	**7.1900e-003**	**164.0832**

3.6 BESS and Substation Construction - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0527	0.4447	0.4744	8.7000e-004		0.0190	0.0190		0.0181	0.0181	0.0000	73.6678	73.6678	0.0154	0.0000	74.0520
Total	**0.0527**	**0.4447**	**0.4744**	**8.7000e-004**		**0.0190**	**0.0190**		**0.0181**	**0.0181**	**0.0000**	**73.6678**	**73.6678**	**0.0154**	**0.0000**	**74.0520**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.2600e-003	0.0435	0.0168	2.1000e-004	7.5000e-003	3.1000e-004	7.8100e-003	2.1700e-003	3.0000e-004	2.4600e-003	0.0000	20.3471	20.3471	5.2000e-004	3.0100e-003	21.2556
Worker	0.0603	0.0406	0.5264	1.4800e-003	0.1795	9.0000e-004	0.1804	0.0477	8.2000e-004	0.0485	0.0000	138.1795	138.1795	3.9900e-003	3.8400e-003	139.4238
Total	**0.0615**	**0.0840**	**0.5432**	**1.6900e-003**	**0.1870**	**1.2100e-003**	**0.1882**	**0.0499**	**1.1200e-003**	**0.0510**	**0.0000**	**158.5265**	**158.5265**	**4.5100e-003**	**6.8500e-003**	**160.6794**

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3.6 BESS and Substation Construction - 2024

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0527	0.4447	0.4744	8.7000e-004		0.0190	0.0190		0.0181	0.0181	0.0000	73.6677	73.6677	0.0154	0.0000	74.0519
Total	**0.0527**	**0.4447**	**0.4744**	**8.7000e-004**		**0.0190**	**0.0190**		**0.0181**	**0.0181**	**0.0000**	**73.6677**	**73.6677**	**0.0154**	**0.0000**	**74.0519**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.2600e-003	0.0435	0.0168	2.1000e-004	7.5000e-003	3.1000e-004	7.8100e-003	2.1700e-003	3.0000e-004	2.4600e-003	0.0000	20.3471	20.3471	5.2000e-004	3.0100e-003	21.2556
Worker	0.0603	0.0406	0.5264	1.4800e-003	0.1795	9.0000e-004	0.1804	0.0477	8.2000e-004	0.0485	0.0000	138.1795	138.1795	3.9900e-003	3.8400e-003	139.4238
Total	**0.0615**	**0.0840**	**0.5432**	**1.6900e-003**	**0.1870**	**1.2100e-003**	**0.1882**	**0.0499**	**1.1200e-003**	**0.0510**	**0.0000**	**158.5265**	**158.5265**	**4.5100e-003**	**6.8500e-003**	**160.6794**

4.0 Operational Detail - Mobile

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0116	0.0178	0.1162	2.5000e-004	0.0265	2.1000e-004	0.0267	7.0800e-003	1.9000e-004	7.2700e-003	0.0000	23.8900	23.8900	1.4100e-003	1.2200e-003	24.2887
Unmitigated	0.0116	0.0178	0.1162	2.5000e-004	0.0265	2.1000e-004	0.0267	7.0800e-003	1.9000e-004	7.2700e-003	0.0000	23.8900	23.8900	1.4100e-003	1.2200e-003	24.2887

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Refrigerated Warehouse-No Rail	24.06	24.06	24.06	70,255	70,255
User Defined Industrial	0.00	0.00	0.00		
Total	24.06	24.06	24.06	70,255	70,255

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0
Refrigerated Warehouse-No	9.50	7.30	7.30	59.00	0.00	41.00	92	5	3
User Defined Industrial	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.540566	0.056059	0.172680	0.136494	0.026304	0.007104	0.011680	0.017449	0.000554	0.000251	0.025076	0.000954	0.004830
Refrigerated Warehouse-No Rail	0.540566	0.056059	0.172680	0.136494	0.026304	0.007104	0.011680	0.017449	0.000554	0.000251	0.025076	0.000954	0.004830
User Defined Industrial	0.540566	0.056059	0.172680	0.136494	0.026304	0.007104	0.011680	0.017449	0.000554	0.000251	0.025076	0.000954	0.004830

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	1,380.956 0	1,380.956 0	0.1166	0.0141	1,388.080 1
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	1,380.956 0	1,380.956 0	0.1166	0.0141	1,388.080 1
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Refrigerated Warehouse-No Rail	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Refrigerated Warehouse-No Rail	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Refrigerated Warehouse-No Rail	7.78681e+006	1,380.9560	0.1166	0.0141	1,388.0801
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**1,380.9560**	**0.1166**	**0.0141**	**1,388.0801**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Refrigerated Warehouse-No Rail	7.78681e+006	1,380.9560	0.1166	0.0141	1,388.0801
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**1,380.9560**	**0.1166**	**0.0141**	**1,388.0801**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	4.1928	7.0000e-005	7.8300e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.0153	0.0153	4.0000e-005	0.0000	0.0163
Unmitigated	4.1928	7.0000e-005	7.8300e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.0153	0.0153	4.0000e-005	0.0000	0.0163

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.3864					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	2.8057					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	7.2000e-004	7.0000e-005	7.8300e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.0153	0.0153	4.0000e-005	0.0000	0.0163
Total	**4.1928**	**7.0000e-005**	**7.8300e-003**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.0153**	**0.0153**	**4.0000e-005**	**0.0000**	**0.0163**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.3864					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	2.8057					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	7.2000e-004	7.0000e-005	7.8300e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.0153	0.0153	4.0000e-005	0.0000	0.0163
Total	**4.1928**	**7.0000e-005**	**7.8300e-003**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.0153**	**0.0153**	**4.0000e-005**	**0.0000**	**0.0163**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0158	0.0000	0.0000	0.0158
Unmitigated	0.0158	0.0000	0.0000	0.0158

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Refrigerated Warehouse-No Rail	0 / 0.008	0.0158	0.0000	0.0000	0.0158
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0158**	**0.0000**	**0.0000**	**0.0158**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Refrigerated Warehouse-No Rail	0 / 0.008	0.0158	0.0000	0.0000	0.0158
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0158**	**0.0000**	**0.0000**	**0.0158**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	5.7406	0.3393	0.0000	14.2221
Unmitigated	5.7406	0.3393	0.0000	14.2221

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Refrigerated Warehouse-No Rail	28.28	5.7406	0.3393	0.0000	14.2221
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**5.7406**	**0.3393**	**0.0000**	**14.2221**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Refrigerated Warehouse-No Rail	28.28	5.7406	0.3393	0.0000	14.2221
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**5.7406**	**0.3393**	**0.0000**	**14.2221**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Appendix D – Biological Resources Report

CHAMBERS GROUP

July 1, 2022
5 Hutton Centre Drive, Suite 750
Santa Ana, California 92707

CDH Vidal LLC
860 Wyckoff Avenue, Suite 200
Mahwah, New Jersey 07430

Subject: Biological Resources Reconnaissance Assessment for the Vidal Solar Interconnection Project

Chambers Group, Inc. (Chambers Group) was retained by CDH Vidal LLC (CORE), a private solar development company and the project proponent to conduct a literature review and biological reconnaissance-level survey for the interconnect of a proposed photovoltaic (PV) to its electrical transmission system. The Vidal Solar Interconnection Project (hereinafter referred to as the Project) is located near Vidal in San Bernardino County, California on privately owned lands, Bureau of Indian Affairs (BIA)-managed lands, and lands administered by the Bureau of Land Management (BLM).The purpose of this survey was to document existing vegetation communities, conduct a jurisdictional waters assessment, identify special status species with a potential for occurrence, and map habitats that could support special status wildlife species as well as evaluate potential impacts of the Project to these resources.

Project Background

The PV solar plant is located approximately 2.5 miles southeast of Vidal, an unincorporated area of San Bernardino County that is located just east of U.S. Route 95, just north of the Riverside County line, and just west of the Colorado River (Attachment 1: Figure 1 – Project Location and Vicinity). The PV solar site encompasses approximately 1,090 acres within 25 privately owned parcels (in their entirety and portions of) that are in the process of lease acquisition by CORE. A biological reconnaissance survey, jurisdictional delineation, and focused surveys for special status plants, desert tortoise (*Gopherus agassizii*) and burrowing owl (*Athene cunicularia*) were conducted for the PV solar site. The results are found in the Biological Resources Report for the Vidal Energy Project (Chambers Group, December 2020).

CORE plans to install approximately 52 miles of new 48-strand overhead fiber optic grounding wire on the Headgate Rock-Blythe 161-kilovolt (kV) transmission line between the headgate Rock and Blyth station, looped through the Western Area Power Administration (WAPA) interconnection switchyard. This plan will require temporary access to 31 pull sites (a construction area used to stage equipment required for installing conductor) along the west end of the Colorado River Reservation, San Bernardino and Riverside counties, California. No Riverside Multiple Species Habitat Conservation Plan (MSHCP) Criteria Cells or Conservation Areas are located within the Project area.

The fiber optic grounding wire will be placed onto existing transmission line poles. All work and access (other than pull sites) are contained within the existing road prism and do not require an environmental assessment for sensitive resources.

Methods

The Survey Area encompasses the 31 temporary pull sites that are required for installing conductor on an existing transmission line.

Literature Review

Prior to performing the biological reconnaissance survey, Chambers Group staff conducted a literature review for soils, jurisdictional water features that contribute to hydrology, and special status species known to occur within the vicinity (approximately 5 miles) of the Survey Area.

Soils

Prior to performing the biological reconnaissance survey, soil maps for the Survey Area were referenced in accordance with categories set forth by the U.S. Department of Agriculture (USDA) Soil Conservation Service and the USDA Natural Resources Conservation Service (NRCS) Web Soil Survey (USDA 2022).

Preliminary Jurisdictional Delineation

A desktop assessment was conducted of available data prior to the biological reconnaissance survey in the field. Once completed, a preliminary delineation was performed for the Survey Area. A general assessment of waters potentially regulated by the U.S. Army Corps of Engineers (USACE), California Regional Water Quality Control Board (RWQCB), and California Department of Fish and Wildlife (CDFW) was conducted for the Survey Area.

Pursuant to Section 404 of the Clean Water Act, USACE regulates the discharge of dredged and/or fill material into waters of the United States. The State of California (State) regulates discharge of material into waters of the State pursuant to Section 401 of the Clean Water Act and the California Porter-Cologne Water Quality Control Act (California Water Code, Division 7, §13000 et seq.). Pursuant to Division 2, Chapter 6, Sections 1600-1602 of the California Fish and Wildlife Code, CDFW regulates all diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake, which supports fish or wildlife.

Field verification of all USFWS National Wetland Inventory (NWI) drainages (USFWS 2022a) were conducted for the Survey Area. Active channels and drainages were mapped by identifying clear evidence of hydrology including sediment deposition, shelving, drift deposits, and destruction of vegetation. These characteristics were used to inventory the active channels and drainages during the surveys.

Special Status Habitats and Species

The most recent records of the USFWS sensitive species database (USFWS 2022b), California Natural Diversity Database (CNDDB) managed by CDFW (2022) and the California Native Plant Society's Electronic Inventory (CNPSEI) of Rare and Endangered Vascular Plants of California (CNPS 2022) were reviewed for the following quadrangles containing and surrounding the Project: *Ripley, Mccoy Wash, Blythe NE, Big Maria Mountains SE, Big Maria Mountains NE, Vidal, Parker SW, Parker NW,* and *Parker,* California U.S. Geological Survey (USGS) 7.5-minute quadrangles. These databases contain records of reported occurrences of federally or State-listed endangered or threatened species, California Species of Concern (SSC), or otherwise special status species or habitats that may occur within or in the vicinity of the Survey Area (Attachment 1: Figure 2 – CNDDB Occurrences Map and Figure 3 – USFWS Critical Habitat Map).

Biological Reconnaissance Survey

The biological reconnaissance survey was conducted on foot within the Survey Area. During the survey, the biologists identified and mapped all vegetation communities found within the pull sites onto aerial photographs (Attachment 1: Figure 4 – Vegetation Communities Map). Plant communities were determined in accordance with the *Manual of California Vegetation*, *Second Edition* (Sawyer et al. 2009). Plant nomenclature follows that of *The Jepson Manual*, *Vascular Plants of California, Second Edition* (Baldwin et al. 2012). Plant and wildlife species observed or detected within the Survey Area were recorded (Attachments 2 and 3, respectively). In addition, site photographs were taken depicting current site conditions (Attachment 4).

Results

Chambers Group biologists Paul Morrissey, Erik Olmos, Heather Franklin and Jessica Calvillo conducted the biological reconnaissance survey of the Survey Area to identify vegetation communities, identify the potential for occurrence of special status species, and/or habitats that could support special status wildlife species, and conduct a preliminary jurisdictional waters assessment. The survey was conducted between 0600 and 1700 hours May 2 through May 5, 2022. Weather conditions during the survey included temperatures ranging from 65 to 98 degrees Fahrenheit, wind speeds between 0 and 8 miles per hour, with cloud cover ranging from 0 to 50 percent, and no precipitation.

Biological Site Conditions

The Survey Area is situated along an existing transmission line, primarily along the west side of the Colorado River. Pull sites 12-9 south to 25-4 are within San Bernardino County. Pull sites 25-4 (located in both San Bernardino and Riverside counties) south to pull site 64-4 are located in Riverside County. The Project lies between relatively flat alluvial floor of Vidal Valley, eastern Rice Valley, and the valley surrounded by Big Maria Mountains and McCoy Mountains, the eastern slopes of the Riverside Mountains and Big Maria Mountains, and the agricultural areas of north Blythe. Elevation ranges between 272 and 452 feet above mean sea level (amsl). Many alluvial braided channels and ephemeral drainages cross the Survey Area.

Soils

According to the results from the USDA NRCS Web Soil Survey (USDA 2022), the Survey Area is located in the Colorado Desert Area, CA803; Colorado River Indian Reservation, Parts of La Paz County, Arizona, and Riverside and San Bernardino counties, AZ Areas, 656; and Palo Verde Area, CA681 parts of the soil map. Six soil types are known to occur within and/or adjacent to the Project site. These soil types are described below.

- Carrizo extremely gravelly coarse sand, 0 to 3 percent slopes is a soil found on floodplains and is derived from stratified mixed igneous alluvium. A typical soil profile consists of extremely gravelly coarse sand to a depth of 5 inches, followed by very gravelly coarse sand to a depth of 60 inches. This excessively drained soil type is characterized by low runoff and a very low water storage profile.
- Gilman fine sandy loam, strongly saline, 0 to 3 percent slopes typically occurs on floodplains and is derived from stratified mixed alluvium. The typical profile for this soil is fine sandy loam from 0 to 10 inches and very fine sandy loam from 10 to 60 inches. It is well drained with a low runoff and a very low water storage profile.
- Gunsight very gravelly sandy loam, 15 to 60 percent slopes is typically found in fan terraces and is derived from calcareous stratified mixed alluvium. The profile for this soil is very gravelly sandy loam from 0 to 2 inches, very gravelly sandy clay loam from 2 to 12 inches, and extremely gravelly sandy loam from 12 to 60 inches. This is a somewhat excessively drained soil with a high runoff class and a low water storage profile.
- Badland occurs from 300 to 700 feet amsl and is derived from residuum weathered from sedimentary rock. The profile consists of unweathered bedrock from 0 to 37 inches. This soil has a very high runoff class and a moderately high water storage profile.
- Badland-Torriorthents-Torripsamments complex, 10 to 60 percent slopes is a soil complex composed of 35 percent Badland, 30 percent Torriorthents and similar soils, 20 percent Torripsamments and similar soils, and 15 percent of other minor components. Torriorthents are hillslopes formed from unconsolidated alluvium derived from claystone and/or unconsolidated sediment alluvium derived from sandstone and siltstone with 20 to 45 percent slopes. A typical soil profile consists of very gravelly sandy loam to a depth of 10 inches and extremely gravelly sandy loam below 10 inches. Torriorthents are characterized by high runoff and low water storage profile. Torripsamments are hillslopes formed from the same parent material as Torriorthents with 10 to 30 percent slopes. A typical soil profile consists of fine sand to a depth of 60 inches. Torripsamments are also characterized by high runoff and low water storage profile.

- Superstition gravelly loamy fine sand, 0 to 3 percent slopes comprises somewhat excessively drained soils found on terraces and is derived from alluvium and sandy eolian deposits. A typical soil profile consists of gravelly loamy fine sand to a depth of 1 inch followed by loamy fine sand to a depth of 60 inches. This soil type is characterized by very low runoff and a low water storage profile. Superstition Series soils are important for livestock grazing and irrigated cropland. Vegetation typical of this soil series includes creosote and bur-sage.

Hydrology

The Survey Area is located within the Vidal Wash (Hydrologic Unit Code (HUC 1503010402), the Upper Parker Valley-Colorado River (HUC 1503010403), the Lower Parker Valley-Colorado River (HUC 1503010404), the Palo Verde Valley (HUC 15030310408), and the McCoy Wash (HUC 1503010405; USDA 2022) watersheds in San Bernardino and Riverside counties, California (Attachment 1: Figure 5 – Watersheds Map). The Vidal Wash Watershed is bounded on the west by the Turtle Mountains, on the north by the Mopah Mountains, and on the south by the Riverside Mountains. The southeastern corner of the Vidal Wash Watershed joins the Colorado River southeast of Vidal (Google Earth 2022). The Upper Parker – Colorado River Watershed is bounded by the Whipple Mountains on the northeast, by the Buckskin Mountains on the East, and by Riverside Mountains on the southwest. Agricultural areas and the Colorado River cut through the southern portion of the Upper Parker – Colorado River Watershed trending northeast to southwest (Google Earth 2022). The Lower Parker Valley-Colorado River Watershed is Riverside Mountains and the Big Maria Mountains to the west and Parker Valley to the east. The Colorado River runs parallel through the middle of this watershed. The Palo Verde Valley Watershed is bounded by the northeast by the Big Maria Mountains and the Colorado River to the east. A small portion of the Project runs through the McCoy Wash Watershed, which is bounded by the Big Maria Mountains to the northeast and agricultural fields to the south.

Alluvial braided channels and ephemeral drainages are the major water source for all of these watersheds. Within the Vidal Wash and the Upper Parker Valley-Colorado River watersheds in San Bernardino County, hundreds of unnamed ephemeral drainages and braided channels receive runoff immediately after rain events from the Turtle Mountains to the west and Whipple Mountains to the north of the Project through Vidal Valley. The major wash system within Upper Parker Valley-Colorado River Watershed includes Ash Creek. The major wash system within the Vidal Wash Watershed includes Vidal Wash.

Within the Lower Parker Valley-Colorado River, Palo Verde Valley, and the McCoy Wash watersheds in Riverside County to the south, hundreds of unnamed ephemeral drainages receive runoff immediately after rain events from the Riverside Mountains from the west, Big Maria and Little Maria Mountains further south from the west, and finally the McCoy Mountains in the southern portion of the Project, west and northwest of the Blythe Airport. All runoff from these drainages ultimately terminates in the Colorado River. The Colorado River, a major river of North America originating from the Rocky Mountains of Colorado, generally flows west and south for 1,450 miles and terminates into the Gulf of California in northwestern Mexico.

FEMA Flood Hazard Zones

Federal Emergency Management Agency (FEMA) flood hazard zones (Area of Undetermined Flood Hazard) occur throughout the Survey Area. FEMA Special Floodway occurs within the Colorado River and cross at pull sites 14-3 and 14-6. One percent Annual Chance Flood Hazard and 0.2 percent Chance Flood Hazard occur primarily east of the Colorado River. FEMA Flood Hazard Zones are provided in Attachment 1: Figure 6.

Vegetation Communities and Other Areas

Fifteen vegetation communities or land types were found within the Survey Area during the biological reconnaissance survey. A total of 49.35 acres of vegetation were mapped within the Survey Area, comprised of a total of 37.23 native vegetation and 12.13 acres non-native vegetation. Eight native vegetation communities were mapped including Allscale Scrub, Distrubed Allscale Scrub, Arrow Weed Thickets, Blue Palo Verde-Ironwood Woodland, Brittlebush Scrub, Creosote Scrub, Creosote Scrub – Brittlebush Scrub, Iodine Bush Scrub, Mesquite Thickets, and Quailbush Scrub. The majority of the Survey Area was comprised of Creosote Scrub. Four non-native communities were mapped including Agriculture/Ornamental, Bare Ground, Disturbed, and Tamarisk Thickets. In addition, Open Water was also mapped.

The vegetation communities and total acreage is found in Table 1 and are described below.

Table 1. Vegetation Communities Within Survey Area

Vegetation Communities	Acres
Native Communities	
Allscale Scrub	0.01
Arrow Weed Thickets	0.81
Blue Palo Verde - Ironwood Woodland	3.04
Brittlebush Scrub	0.86
Creosote Bush Scrub	29.19
Creosote Bush – Brittlebush Scrub	0.06
Disturbed Allscale Scrub	0.73
Iodine Bush Scrub	1.43
Mesquite Thickets	0.61
Open Water	0.18
Quailbush Scrub	0.31
Total for Native Communities	*37.23*
Non-native/Other Communities	
Agriculture/Ornamental	2.03
Bare Ground	5.63
Disturbed	2.98
Tamarisk Thickets	1.49
Total for Non-native/other Communities	*12.13*
Total for all Vegetation Communities	**49.35**

Allscale Scrub

Allscale Scrub is found in washes, playa lake beds and shores, dissected alluvial fans, rolling hills, terraces, and edges of large, low gradient washes (Sawyer et al. 2009). Soils may be carbonate rich, alkaline, sandy, or sandy clay loams. Allscale (*Atriplex polycarpa*) is often dominant in the shrub canopy and can be associated with species such as white bur-sage (*Ambrosia dumosa*), cheesebush (*Ambrosia salsola*), four-wing saltbush (*Atriplex canescens*), red brome (*Bromus madritensis* subsp. *rubens*), and creosote bush (*Larrea tridentata*). Emergent trees may be present at low cover, including honey mesquite (*Prosopis glandulosa*). Shrubs are typically less than 3 meters tall with a canopy that is open to continuous. The herbaceous layer is variable, including seasonal annuals (Sawyer et al. 2009).

Areas with Allscale Scrub vegetation are present within the Survey Area at pull sites 16-7 and 59-2. Native plant species found on the Project site typical of this vegetation community included allscale.

Disturbed Allscale Scrub

A disturbed form of Allscale Scrub vegetation is found within the Survey Area. Disturbed vegetation communities have a high percentage of non-native weedy species (i.e., greater than 25 percent of the species cover). Areas with Disturbed Allscale Scrub vegetation are present within the Survey Area at pull site 59-2. Native plant species found on the Project site typical of this vegetation community included allscale, Jimsonweed (*Datura wrightii*), and bush seepweed (*Suaeda nigra*). Non-native species include Mediterranean tamarisk (*Tamarix ramosissima*) and Sahara mustard (*Brassica tournefortii*).

Arrow Weed Thickets

Arrow Weed Thickets are found around springs, seeps, irrigation ditches, canyon bottoms, stream borders, and seasonally flooded washes (Sawyer et al. 2009). Soils are alluvial- or aeolian-derived sands or clay loams that are usually alkaline or saline. Stands occur as dense, narrow thickets along permanent springs and slow-flowing streams or as part of vegetation mosaics that surround alkali springs and marshes. Arrow weed (*Pluchea sericea*) is dominant or co-dominant in the shrub canopy and can occur with species including iodine bush (*Allenrolfea occidentalis*), four-wing saltbush, quailbush (*Atriplex lentiformis*), mule fat (*Baccharis salicifolia*), and tamarisk (*Tamarix* spp.). Emergent trees may be present at low cover, including Fremont cottonwood (*Populus fremontii*), black cottonwood (*Populus trichocarpa*) or honey mesquite. Shrubs are typically less than 5 meters tall with a canopy that is intermittent to continuous. The herbaceous layer is sparse with seasonal annuals (Sawyer et al. 2009).

Areas with Arrow Weed Thicket vegetation are present within the Survey Area along the Colorado River and agricultural runoff ditches at pull sites: 49-4, 49-6, 49-8. Native plant species found on the Project site typical of this vegetation community included: Arrow weed. Non-native species include annual beard grass (*Polypogon monspeliensis*).

Blue Palo Verde – Ironwood Woodland

Blue Palo Verde – Ironwood Woodland is found along desert arroyo margins, seasonal watercourses and washes, bottomlands, middle and upper bajadas and alluvial fans, and lower slopes. Soils are sandy, well- drained, and derived from alluvium or colluvium (Sawyer et al. 2009). Ironwood (*Olneya tesota*) and/or blue palo verde (*Parkinsonia florida*) are typically co-dominant, or either species is dominant, in the tree or tall shrub canopy often occurring with desert willow (*Chilopsis linearis*), ocotillo (*Fouquieria splendens*), honey mesquite, and smoke tree (*Psorothamnus spinosus*). Shrubs may include white bur-sage, cheesebush, sweetbush (*Bebbia juncea*), golden cholla (*Cylindropuntia echinocarpa*), brittle bush (*Encelia farinosa*), creosote bush, Anderson's wolfberry (*Lycium andersonii*), or cat claw acacia (*Senegalia greggii*). Trees are typically less than 14 meters tall with a canopy that is open to continuous. The shrub layer is intermittent or open with an herbaceous layer that is sparse with seasonal annuals (Sawyer et al. 2009).

Areas with Blue Palo Verde – Ironwood Woodland vegetation are present within the Survey Area at pull sites: 13-6, 25-1, 25-1, 25-4, 28-2, 29-3, 31-3, 36-3, 37-4, and 44-1. Native plant species found on the Project site typical of this vegetation community included: ironwood, blue palo verde, cat claw acacia, creosote bush, honey mesquite, and Anderson's wolfberry.

Brittle Bush Scrub

Brittle Bush Scrub is found within alluvial fans, bajadas, colluvium, rocky hillsides, slopes of small washes and rills (Sawyer et al. 2009). Soils are typically well drained, rocky, and may be covered by desert pavement. Some brittle bush stands are long-lived on harsh rocky sites in the desert and inner coastal mountains, while undisturbed stands can give way to creosote bush types under less demanding conditions in the desert (Sawyer et al. 2009). Brittle bush is dominant or co-dominant in the shrub canopy and may often occur with white bur-sage, California sagebrush (*Artemisia californica*), Engelmann's hedgehog cactus (*Echinocereus engelmannii*), thick-leaved yerba santa (*Eriodictyon crassifolium*), California buckwheat (*Eriogonum fasciculatum*), California barrel cactus (*Ferocactus cylindraceus*), chaparral yucca (*Hesperoyucca whipplei*), wishbone bush (*Mirabilis laevis*) and/or white sage (*Salvia apiana*). Emergent trees or tall shrubs may be present at low cover, including ocotillo. Shrubs are typically less than 2 meters with a canopy that is open to intermittent. The herbaceous layer is open with seasonal annuals (Sawyer et al. 2009).

Areas with Brittle Bush Scrub vegetation are present within the Survey Area at pull site 50-2. Native plant species found on the Project site typical of this vegetation community included: brittle bush, beavertail cactus (*Opuntia basilaris*), golden cholla, California barrel cactus, and occasional creosote bush.

Creosote Bush – Brittle Bush Scrub

Creosote Bush – Brittle Bush Scrub is found within small washes, rills, alluvial fans, bajadas, and colluvium on upland slopes (Sawyer et al. 2009). Soils are typically well-drained, rocky, may have desert pavement surfaces, and are often derived from granitic or volcanic rock. Brittle bush and creosote bush are co-dominant in this community and equally conspicuous in the shrub canopy where they may occur with white bur-sage, desert holly (*Atriplex hymenelytra*), sweetbush, jumping cholla (*Cylindropuntia bigelovii*), desert trumpet (*Eriogonum inflatum*), California barrel cactus, white rhatany (*Krameria grayi*), beavertail cactus, and wire lettuce (*Stephanomeria pauciflora*). Emergent trees or tall shrubs may be present at low cover, including ocotillo. Shrubs are typically less than 3 meters tall with a canopy that is open to intermittent and two tiered. The herbaceous layer is open with seasonal annuals (Sawyer et al. 2009).

Areas with Creosote Bush – Brittle Bush Scrub vegetation are present within the Survey Area at pull site 50-2. Native plant species found on the Project site typical of this vegetation community included: creosote bush, brittle bush, beavertail cactus, and occasional California barrel cactus.

Creosote Bush Scrub

Creosote Bush Scrub can be found in alluvial fans, bajadas, upland slopes, and minor intermittent washes (Sawyer et al. 2009). Soils in this community are well-drained and sometimes include desert pavement. In sandy situations, it often co-occurs with perennial grasses, and along certain washes and wash terrace deposits with somewhat alkaline soils, it co-dominates with allscale. Plants also may form semi-riparian stands along low-gradient sandy or silty washes (Sawyer et al. 2009). Creosote bush is dominant or co-dominant in the shrub canopy and has been known to occur with goldenhead (*Acamptopappus sphaerocephalus*), white bur-sage, cheesebush, shadscale (*Atriplex confertifolia*), desert holly, allscale, brittle bush, desert tea (*Ephedra californica*), Nevada ephedra (*Ephedra nevadensis*), and Anderson's wolfberry. Emergent trees may be present at low cover, including honey mesquite or Joshua tree (*Yucca brevifolia*). Shrubs are typically less than 3 meters tall with a canopy that is intermittent to open. The herbaceous layer is open to intermittent with seasonal annuals or perennial grasses (Sawyer et al. 2009).

Areas with Creosote Bush Scrub vegetation are present within the Survey Area at pull sites: 12-9, 13-6, 14-3, 22-4, 25-1, 25-4, 28-2, 29-3 to 44-1, 50-2 to 58-5, and 59-6. Native plant species found on the Project site typical of this vegetation community included: creosote bush, brittle bush, desert trumpet, big galleta (*Hilaria rigida*), pencil cholla (*Cylindropuntia ramosissima*), golden cholla, beavertail cactus, Yaqui mammillaria (*Mammillaria tetrancistra*), foxtail cactus (*Coryphantha alversonii*), rush milkweed (*Asclepias subulata*), cheesebush, and sweetbush. Non-native species present on site include Mediterranean grass and Sahara mustard.

Iodine Bush Scrub

Iodine Bush Scrub can be found on dry lakebed margins, hummocks, playas perched above current drainages, and seeps (Sawyer et al. 2009). Iodine Bush Scrub is dominated by iodine bush. Iodine bush is dominant or co-dominant in the shrub and herbaceous layers and may occur with four-wing saltbush, salt grass (*Distichlis spicata*), alkali heath (*Frankenia salina*), kochia (*Kochia californica*), alkali sacaton (*Sporobolus airoides*) and bush seepweed. Shrubs in this community are typically less than 7 feet in height with an open to continuous canopy. The herbaceous layer is variable and may include salt grass and alkali sacaton (Sawyer et al. 2009).

Areas with Iodine Bush Scrub vegetation are present within the Survey Area at pull sites 14-6 and 49-4. Native plant species found on the Project site typical of this vegetation community include iodine bush and bush seepweed. Non-native species include Mediterranean tamarisk.

Mesquite Thickets

Mesquite Thickets are found on the fringes of playa lakes, river terraces, stream banks, springs, gullies, floodplains, the rarely flooded margins of arroyos and washes, and sand dunes (Sawyer et al. 2009). Soils in this community are slightly to moderately saline, with a wide range of soil textures. Honey mesquite and/or screwbean mesquite (*Prosopis pubescens*) may be dominant or co-dominant in the small tree canopy with Fremont cottonwood, sandbar willow (*Salix exigua*), arroyo willow (*Salix lasiolepis*), and/or blue elderberry (*Sambucus mexicana*). Shrubs may include iodine bush, white bur-sage, four-wing saltbush, allscale, mule fat, sweetbush, arrow weed, sugarbush (*Rhus ovata*) or bush seepweed. Trees are typically less than 10 meters tall with a canopy that is open to continuous. The shrub and herbaceous layers are open to intermittent (Sawyer et al. 2009). Areas with Mesquite Thicket vegetation are present within the Survey Area at pull sites: 14-3 and 31-3. Native plant species found on the Project site typical of this vegetation community include honey mesquite and Anderson's wolfberry.

Quailbush Scrub

Quailbush Scrub is found on gentle to steep southeast- and southwest-facing slopes (Sawyer et al. 2009). Soils in this community are clays. Stands may be found in a variety of settings, from coastal shrublands to alkali sinks and alkali meadows, to desert washes and oases in southern California, and to saline, intermittently flooded wetlands in the Central Valley. This community especially occurs in disturbed areas, including roadsides and fluvial areas with alkaline soils (Sawyer et al. 2009). Quailbush is dominant in the shrub canopy and can occur with California sagebrush, four-wing saltbush, coyote brush (*Baccharis pilularis*), mule fat, salt grass, California bush sunflower (*Encelia californica*), laurel sumac (*Malosma laurina*), arrow weed, lemonadeberry (*Rhus integrifolia*), alkali sacaton, and tamarisk species. Emergent trees may be present at low cover, including myoporum (*Myoporum laetum*) or honey mesquite. Shrubs are typically less than 5 meters with a canopy that is open to intermittent. The herbaceous layer is variable (Sawyer et al. 2009).

Areas with Quailbush Scrub vegetation are present within the Survey Area at pull site 49-6. Native plant species found on the Project site typical of this vegetation community included: quailbush, arrow weed, and bush seepweed.

Tamarisk Thickets

Tamarisk Thickets are found along arroyo margins, lake margins, ditches, washes, rivers, and other watercourses (Sawyer et al. 2009). Tamarisk species (*Tamarix* spp.) possess eco-physiological characteristics that make them formidable as invasive plants. They are long-lived shrubs or trees with extensive and deep root systems. They consume large quantities of water, possibly more than any other woody species in similar habitats, because they can obtain water at very low water potentials and have very high water-use efficiencies. They are highly tolerant of alkaline and saline habitats and can concentrate salts in their leaves (Sawyer et al. 2009). Mediterranean tamarisk or another *Tamarix* species would be dominant in the shrub canopy of this community. Emergent trees may be present at low cover, including Fremont cottonwood or willow (*Salix* spp.). Shrubs are typically less than 8 meters with a canopy that is continuous or open. The herbaceous layer is sparse (Sawyer et al. 2009).

Areas with Tamarisk Thicket vegetation are present within the Survey Area at pull sites: 16-7, 31-3, 49-4, and 49-8. Native plant species found on the Project site typical of this vegetation community include quailbush and four-wing saltbush. Non-native species include Mediterranean tamarisk.

Other Areas

Agriculture/Ornamental

Ornamental vegetation includes areas where the vegetation is dominated by non-native horticultural plants (Gray and Bramlet 1992). Typically, the species composition consists of introduced trees, shrubs, flowers and turf grass. Agriculture consists of annual crops, vineyards, orchards, dairies, and stockyards (Gray and Bramlet 1992). A large portion of the Survey Area is actively cultivated as alfalfa (*Medicago sativa*) crops.

Areas with Agriculture/Ornamental vegetation are present within the Survey Area in farmland and putting greens at pull sites: 49-6, 49-8, 59-2, and 59-6. Non-native plant species found on the Project site typical of this vegetation community included: alfalfa, Brazilian pepper (*Schinus terebinthifolius*), and Mediterranean tamarisk.

Bare Ground

Areas with Bare Ground contain no vegetation and include access roads.

Disturbed

Disturbed areas are those areas that are cleared or graded such as dirt roads with scattered vegetation or those areas that have a high percentage of non-native weedy species (i.e., greater than 25 percent of the species cover).

Areas with Disturbed vegetation are present within the Survey Area at all pull sites with the exception of two: 25-1 and 25-4. Native plant species found on the Project site typical of this vegetation community include bush seepweed, though present in small quantities. Non-native species in Disturbed areas include Sahara mustard.

Open Water

Open Water often contains a number of phytoplankton species and filamentous blue-green and green algae. In shallow water, vascular species including horned pondweed (*Zannichellia palustris*), duckweed fern (*Azolla filiculoides*), and duckweed (*Lemna* sp.) may be found floating on the water surface (Gray and Bramlet 1992).

Areas with Open Water are present within the Survey Area at pull site 14-3 (Main Canal), but no vegetation is present at this location.

The vegetation acreages for each community within each pull site are found in Table 2 below.

Table 2. Vegetation Communities within Pull Sites

Vegetation Community	12-9	13-6	14-3	14-6	16-7	22-4	25-1	25-4	28-2	29-3	31-3	31-4	32-6	33-5	36-3
Agriculture/Ornamental															
Allscale Scrub					0.01										
Arrow Weed Thickets			0.09												
Bare Ground	0.03	0.10	0.53	0.10	0.18	0.05			0.07	0.14	0.09	0.07	0.14	0.14	0.05
Blue Palo Verde - Ironwood Woodland		0.58					0.25	0.05	0.19	0.73	0.29				0.19
Brittle Brush Scrub															
Creosote Bush - Brittle Bush Scrub															
Creosote Bush Scrub	0.66	0.69	0.26			1.32	5.44	5.69	1.11	0.49	0.63	1.29	1.23	1.23	1.13
Disturbed					0.58										
Disturbed Allscale Scrub															
Iodine Bush Scrub				1.28											
Mesquite Thickets			0.26				0.048				0.30				
Open Water			0.18												
Quail Bush Scrub															
Tamarisk Thickets					0.60						0.05				
Total	**0.69**	**1.37**	**1.31**	**1.38**	**1.37**	**1.37**	**5.74**	**5.74**	**1.37**	**1.37**	**1.37**	**1.36**	**1.36**	**1.37**	**1.37**

Vegetation Community	37-4	38-1	38-3	44-1	49-4	49-6	49-8	50-2	52-4	54-1	58-5	59-2	59-6	64-2	64-4	Total
Agriculture/Ornamental						0.25	0.67					0.55	0.56			2.03
Allscale Scrub																0.01
Arrow Weed Thickets					0.30	0.06	0.35									0.81
Bare Ground	0.05	0.08	0.56	0.04	0.26	0.74	0.16	0.30	0.03	0.66	0.22	0.06	0.32	0.26	0.17	5.63
Blue Palo Verde - Ironwood Woodland	0.51			0.25												3.04
Brittle Brush Scrub								0.86								0.86
Creosote Bush - Brittle Bush Scrub								0.06								0.06
Vegetation Community	**37-4**	**38-1**	**38-3**	**44-1**	**49-4**	**49-6**	**49-8**	**50-2**	**52-4**	**54-1**	**58-5**	**59-2**	**59-6**	**64-2**	**64-4**	**Total**
Creosote Bush Scrub	0.80	1.29	0.82	1.08				0.14	1.32	0.71	1.16		0.70			29.19
Disturbed													0.45	0.76	1.18	2.98

Disturbed Allscale Scrub												0.73				0.73
Iodine Bush Scrub					0.15											1.43
Mesquite Thickets																0.61
Open Water																0.18
Quailbush Scrub						0.31										0.31
Tamarisk Thickets					0.66		0.18									1.49
Total	**1.36**	**1.37**	**1.38**	**1.37**	**1.37**	**1.36**	**1.36**	**1.37**	**1.35**	**1.37**	**1.38**	**1.34**	**2.05**	**1.02**	**1.35**	**49.35**

General Plants

A total of 38 plant species were observed within the Survey Area during the biological reconnaissance survey (Attachment 2: Plant Species Observed). Plant species observed during the survey were representative of the existing Survey Area conditions. One special status plant species, Alverson's foxtail cactus (CRPR 4.3), was observed during the survey within pull sites 52-4 and 54-1.

A complete list of plant species observed or detected is provided in Attachment 2 – Species Observed/Detected List.

General Wildlife

A total of 28 wildlife species were observed within the Survey Area during the biological reconnaissance survey. Wildlife species observed or detected during the survey were characteristic of the existing Survey Area conditions. One California Species of Special Concern (SSC) species, vermilion flycatcher (*Pyrocepalus rubins*), was observed foraging near the Blythe Municipal Golf Course (near pull site 59-2). A CDFW Watch List (WL) species, brown-crested flycatcher (*Myiarchus tyrannulus*), was observed foraging in the Blue Polo Verde – Ironwood Woodland within the northern area of pull site 36-3. No state or federally listed species were observed.

A complete list of wildlife species observed or detected is provided in Attachment 3 – Wildlife Species Observed/Detected List.

Sensitive Species

Special Status Species

The following information is a list of abbreviations used to help determine special status biological resources potentially occurring in the Survey Area.

CNPS California Rare Plant Rank (CRPR)

1A	=	Plants presumed extinct in California.
1B	=	Plants rare and endangered in California and throughout their range.
2	=	Plants rare, threatened or endangered in California but more common elsewhere in their range.
3	=	Plants about which we need more information, a review list.
4	=	Plants of limited distribution; a watch list.

CRPR Extensions

0.1 = Seriously endangered in California (greater than 80 percent of occurrences threatened/high degree and immediacy of threat).
0.2 = Fairly endangered in California (20 to 80 percent occurrences threatened).
0.3 = Not very endangered in California (less than 20 percent of occurrences threatened).

Federal

FE = Federally listed; Endangered
FT = Federally listed; Threatened

State

ST = State listed; Threatened
SE = State listed; Endangered
RARE = State listed; Rare (Listed "Rare" animals have been re-designated as Threatened, but Rare plants have retained the Rare designation.)
SSC = State Species of Special Concern
WL = CDFW Watch List
FP = CDFW Fully Protected

The following information was used to determine biological resources potentially occurring within the Survey Area. The criteria used to evaluate the potential for special status species to occur within the Survey Area are outlined in Table 3, below.

Table 3: Criteria for Evaluating Special Status Species Potential for Occurrence (PFO)

PFO*	CRITERIA
Absent:	Species is restricted to habitats or environmental conditions that do not occur within the Project site.
Low:	Historical records for this species do not exist within the vicinity (approximately 5 miles) of the Project site, and/or habitats or environmental conditions needed to support the species are of poor quality.
Moderate:	Either a historical record exists of the species within the vicinity of the Project site (approximately 5 miles) and marginal habitat exists on the Survey Area, or the habitat requirements or environmental conditions associated with the species occur within the Survey Area, but no historical records exist within 5 miles of the Project site.
High:	Both a historical record exists of the species within the Survey Area or its immediate vicinity (approximately 1 mile), and the habitat requirements and environmental conditions associated with the species occur within the Survey Area.
Present:	Species was detected within the Survey Area at the time of the survey.

*PFO: Potential for Occurrence

Special Status Plant Species

Database searches (CDFW 2022; CNPS 2022) resulted in a list of 12 special status plant species documented to historically occur within the vicinity of the Survey Area. One of the plants is State-listed as Endangered, but no others have federal status. Of the 12 plant species that resulted from the database search, it was determined that four are considered absent, two are considered to have a low potential to exist, and five are considered to have a moderate or higher potential to exist. One species, foxtail cactus with a CRPR of 4.3 is considered present. No other special status plant species were found during the biological reconnaissance survey.

The following four plant species are considered **Absent** from the Survey Area due to lack of suitable habitat within the Survey Area or the Survey Area is outside of the elevation requirements:

- California satintail (*Imperata brevifolia*) – CRPR 2B.1
- creamy blazing star (*Mentzelia tridentata*) – CRPR 1B.3
- dwarf germander (*Teucrium cubense* subsp. *depressum*) – CRPR 2B.2
- Hardwood's eriastrum (*Eriastrum harwoodii*) – CRPR 1B.2

The following two species has a Low potential to occur in the Survey Area, as the environmental conditions required by the species is of low quality. The following descriptions were sourced from CNPS Rare Plant Inventory (2022).

Emory's crucifixion-thorn (*Castela emoryi*) is a CRPR 2B.2 species. This species is a perennial deciduous shrub in the Simaroubaceae that occurs in Mojave Desert Scrub, Sonoran Desert Scrub, and playas. It can be found at elevations between 295 and 2,380 feet amsl. This species typically blooms between June and July but can be found in bloom as early as April depending on environmental conditions. Moderate quality Creosote Bush Scrub is present within the Survey Area, and this species has been recorded in one location within the northern terminus of the Project site near pull sites 12-9, 13-6, 14-3, and 14-6. However, the vegetation at these pull sites contain low quality Creosote Scrub habitat. Additionally, this occurrence was recorded in 1954 (CNDDB – on the west side of the Colorado River opposite Parker Arizona and needs fieldwork verification). This species was not observed during the survey effort; however, a focused special status plant survey was not conducted. Based on the poor quality of habitat in the area, the recorded date of this single location, and the amount of disturbance from development since 1954, it is unlikely this species is present in the area. Therefore, this species is considered to have a low potential to occur.

Sand evening-primrose (*Chylismia arenaria*) is a CRPR 2B.2 species. This species in an annual/perennial herb in the Onagraceae family that occurs in Sonoran Desert scrub. This species typically blooms between November and May. It can be found at elevations between 230 and 3,000 feet amsl. Moderate to high quality Creosote Bush Scrub is present within the Survey Area, and this species has been one location approximately 2.5 miles from the northern terminus of the Project site near pull sites 12-9, 13-6, 14-3, and 14-6. However, the vegetation at these pull sites contain low quality Creosote Scrub habitat. Additionally, this occurrence was recorded in 2003 (CNDDB – exact location unknown, needs fieldwork for verification). This species was not observed during the survey effort within the appropriate blooming period; however, a focused special status plant survey was not conducted. Based on the poor quality of habitat in the area, the recorded date of this single location and the amount of disturbance and development in this area, this species is considered to have a low potential to occur.

The following five plant species have a Moderate or higher potential to occur in the Survey Area, as the environmental conditions needed for the species exist. The following descriptions were sourced from the CNPS Rare Plant Inventory (CNPS 2022).

Angel trumpets (*Acleisanthes longiflora*) is a CRPR 2B.3 species. This species is a perennial herb in the Nyctaginaceae family that occurs in Sonoran Desert Scrub and Creosote Scrub. This species typically blooms in May. It can be found at elevations between 295 and 310 feet amsl. Moderate to high quality Creosote Bush Scrub is present within the Survey Area, and this species has been recorded (CNDDB in 2012) in one wash within the transmission line alignment near pole 51-1, approximately 1-mile south of the closest pull site 50-2. This species was not observed during the survey effort within the appropriate blooming period; however, a focused special status plant survey was not conducted.

Harwood's milk-vetch (*Astragalus insularis* var. *harwoodii*) is a CRPR 2B.2 species. This species is an annual herb in the Fabaceae family that occurs in desert dunes and Mojave Desert Scrub. This species typically blooms between January and May. It can be found at elevations between 0 to 2,330 feet amsl. Moderate to high quality Creosote Bush Scrub is present within the Survey Area, and this species has been recorded in many locations within 5 miles of the site, with two locations less than half a mile south of pull sites 64-2, and 64-4. However, the vegetation at these pull site locations do not contain suitable habitat for this species. Pull site 59-6 is the closest to this historic occurrence, approximately 5 miles to the north. Other locations are found north of the Blythe Airport, more than three miles west of the transmission alignment and more than 6 miles from the nearest pull site with suitable habitat. This species was not observed during the survey effort within the appropriate blooming period; however, a focused special status plant survey was not conducted.

Glandular ditaxis (*Ditaxis claryana*) is a CRPR 2B.2 species. This species is a perennial herb in the Euphorbiaceae family that occurs in sandy soils of Mojavean Desert Scrub, Sonoran Desert Scrub, and Creosote Bush Scrub. This species typically blooms from October to March. It can be found at elevations between 0 and 1,525 feet amsl. Moderate to high-quality Creosote Bush Scrub is present in the Survey Area. This species has been recorded within several locations within 3 miles of the site. The closest known location (CNDDB in 2013), approximately 500 feet south of pull site 29-3, near transmission pole 29-4. Other locations include west of the same area approximately 1.5 miles (CNDDB) and north of the alignment, approximately 3.3 miles away (CNDDB in 2003). This species was not observed during the survey effort; however, a focused special status plant survey was not conducted.

California ditaxis (*Ditaxis serrata* var. *californica*) is a CRPR 3.2 species. This species is a perennial herb in the Euphorbiaceae family that occurs in Sonoran Desert Scrub. This species typically blooms between March and December. It can be found at elevations between 100 and 3,280 feet amsl. Moderate to high quality Creosote Bush Scrub is present within the Survey Area. This species has been recorded in one location (CNDDB in 2013) approximately 500 feet south of pull site 29-3, near transmission pole 29-4. This species was not observed during the survey effort; however, a focused special status plant survey was not conducted.

Abrams' spurge (*Euphorbia abramsiana*) is a State endangered, CRPR 2B.2 species. This species is a prostrate annual herb in the Euphorbiaceae family that occurs in sandy flats of Mojavean Desert Scrub and Sonoran Desert Scrub. This species blooms from September to November. It can be found at elevations between -15 and 4,300 feet amsl. Moderate to high-quality Creosote Bush Scrub is present, and this species has been recorded within several locations (CNDDB in 2012) between 2 and 5 miles south and west of the Project site (south of the McCoy Mountains, and southwest of Blythe Airport). This species was not observed during the survey effort; however, a focused special status plant survey was not conducted.

One special status plant species is considered **Present** and the locations present within the Survey Area have been mapped (Attachment 1: Figure 10).

Alverson's foxtail cactus (*Coryphantha alversonii*), is a CRPR 4.3 species. This species is a perennial stem succulent is in the Cactaceae family that occurs in Mojavean Desert Scrub and Sonoran Desert Scrub usually on granitic substrate, but sometimes on rocky or sandy soils as well. It blooms between April and June, sometimes extending the blooming period into September or October. It occurs at elevations between 245 and 5,005 feet amsl (CNPS 2022). Alverson's foxtail cactus is not afforded special protection under CEQA as it is only on a Watch List with less than 20 percent of occurrences threatened in California (CDFW 2022), but individuals present within the Survey Area (Figure 10) should be avoided or translocated if possible. Alverson's foxtail cactus was observed during the survey effort at the following pull sites: one location within 52-4 (southern area) and many locations within 54-1.

Special Status Wildlife Species

Database searches (CDFW 2022; USFWS 2022b) resulted in a list of 22 federally and/or state listed endangered or threatened, State Species of Concern, or otherwise special status wildlife species documented to occur within the Survey Area. After a literature review and the assessment of the various habitat types within the Survey Area, it was determined that 11 special status wildlife species are considered absent, four have a low potential to occur, five have a moderate or higher potential to occur, and two species are considered present within the Survey Area.

The majority of pull sites are located in areas that do not contain riparian or wetland habitats associated with the Colorado River. Vegetation communities for all pull sites are found in Attachment 1: Figure 4 – Vegetation Communities. There are several pull sites that contain riparian habitats including pull sites 14-3, 31-3, 49-4, 49-6, and 49-8. These pull sites are described in the Delineation Results of this report. Impacts to riparian and/or wetland vegetation are not anticipated.

The following eleven wildlife species are considered **Absent** from the Survey Area due to the absence of suitable habitat required to support these species:

- cave myotis (*Myotis velifer*) – SSC
- elf owl (*Micrathene whitneyi*) – **SE**
- gilded flicker (*Colaptes chrysoides*) – **SE**
- mountain plover (*Charadrius montanus*) – SSC
- razorback (*Xyrauchen texanus*) – **FE**, **SE**
- Sonoran yellow warbler (*Setophaga petechia sonorana*) – SSC
- southwestern willow flycatcher (*Empidonax traillii extimus*) – **FE**, **SE**
- summer tanager (*Piranga rubra*) – SSC
- Yuma ridgeway's rail (*Rallus obsoletus yumanensis*) – **FE**, **ST**
- Arizona myotis (*Myotis occultus*) – SSC
- California leaf-nosed bat (*Macrotus californicus*) – SSC

The following four sensitive wildlife species have a Low potential for occurrence in the Survey Area due to low quality and disturbed suitable habitat.

The American badger (*Taxidea taxus*) is a California Species of Special Concern. This carnivorous species ranges over most of the western United States and upper midwestern United States south into central Mexico. In California, the badger may occupy a variety of habitats, especially grasslands, savannas, sandy soils, and deserts. It prefers friable soils for burrowing and relatively open, uncultivated ground. Prey items include pocket gophers and ground squirrels (Jameson and Peeters 1988). The American badger may weigh up to 11.4 kilograms or 25 pounds and is easily recognized by its overall silver-gray coloration, white stripe on top of its head, white cheeks, and black feet with noticeably long front claws. It is a heavy-bodied animal that is stout and flattened. The American badger is chiefly nocturnal, but it is often seen by day as well. It gives birth to one to four young from March to April (Jameson and Peeters 1988). Threats to this species include habitat loss due to agriculture, housing and other land conversions, and illegal hunting. Suitable habitat for this species is present throughout the Survey Area; however, this species was recorded in one location approximately 3 miles from the site in 1935 near Vidal. Considering the volume of development in the area since 1935 and no other recorded occurrences within 5 miles of the Survey Area, the potential for occurrence is Low.

The Colorado River cotton rat (*Sigmodon arizonae plenus*) is an SSC. This species is found in Arizona (La Paz County) and California (Imperial, Riverside, and San Bernardino Counties; Natureserve 2011). The Colorado River cotton rat is a subspecies of the Arizona Cotton Rat (*Sigmodon arizonae*) and occurs near rivers, streams, and other sources of fresh water in semidesert, open grassland, or swampy habitats, preferring area of dense grassy vegetation (Linzey, et al., 2012). This species has been recorded within one mile of the Survey Area; however, the Survey Area contains low quality habitat (dense grassy vegetation) for this species and lacks fresh water and/or moist environments required for this species. Therefore, this species has a low potential to occur at the following pull sites: 14-3, 49-4, and 49-8.

The desert tortoise (*Gopherus agassizii*) is a federally and state listed threatened species. The desert tortoise ranges from central Nevada and extreme southwestern Utah south through southeastern California and southwestern Arizona into northern Mexico (Berry et al. 2002). In California, the historic range of this species includes northeastern Los Angeles, eastern Kern, eastern San Diego, and southeastern Inyo counties as well as most of San Bernardino, Riverside, and Imperial counties. This species inhabits river washes, rocky hillsides, slopes, and flat deserts with sandy or gravelly soils. Soil conditions must be friable for burrow and nest construction. Creosote bush, white bursage, saltbush, Joshua tree, Mojave yucca, and cacti are often present in the habitat along with other shrubs, grasses, and wildflowers. This species has been recorded within 3.2 miles of the Project site, approximately 7 miles WSW of Blythe in the Palo Verde Mesa; however, the Survey Area contains lower quality creosote scrub, resulting in low quality habitat for this species. Therefore, this species has a low potential to occur at the following pull sites: 22-4, 25-1, 25-4, 28-2, 54-1, 58-5, and 59-6.

Townsend's big-eared bat (*Corynorhinus townsendii*) is a California Species of Concern. This species is found in all habitat types except alpine and subalpine, but it is rare in California and throughout most of its range. Roosts occur in caves, buildings, tunnels, mines, and other human-made structures (CDFW 1995). This species hibernates singly or in groups from October to April and undergoes short migrations to hibernation roosts. Females form maternity colonies, but males are solitary in the spring and summer. This species has high site fidelity, but it is extremely sensitive to disturbance of roosting sites. One visit to a roosting site can cause abandonment. This species has been recorded within one mile west of pull site 29-3, at Mountaineer Mine (CNDDB in 2003). However, no potential roosting sites occur within the Survey Area (man-made structures); therefore, this species has a Low potential to occur (foraging).

The following five wildlife species have a Moderate or higher potential to occur in the Survey Area, as the environmental conditions needed for the species exist.

The burrowing owl (*Athene cunicularia*) is a California Species of Special Concern. It is broadly distributed across the western United States, with populations in Florida and Central and South America. The burrowing owl breeds in open plains from western Canada and the western United States, Mexico through Central America and into South America to Argentina (Klute 2003). This species inhabits dry, open, native or non-native grasslands, deserts, and other arid environments with low-growing and low-density vegetation (Ehrlich 1988). It may occupy golf courses, cemeteries, road rights-of way, airstrips, abandoned buildings, irrigation ditches, and vacant lots with holes or cracks suitable for use as burrows (TLMA 2006). Burrowing owls typically use burrows made by mammals such as California ground squirrels (*Spermophilus beecheyi*), foxes, or badgers (Trulio 1997). When burrows are scarce, the burrowing owl may use man-made structures such as openings beneath cement or asphalt pavement, pipes, culverts, and nest boxes (TLMA 2006). Burrowing owls often are found within, under, or in close proximity to man-made structures. Prey sources for this species include small rodents; arthropods such as spiders, crickets, centipedes, and grasshoppers; smaller birds; amphibians; reptiles; and carrion. Threats to the burrowing owl include loss of nesting burrows, habitat loss, and mortality from motor vehicles. This species has been documented within many locations (CNDDB in 2007) with 12 documented occurrences within 2 miles of the Project, especially within the southern agricultural areas from pull site 49-5 and south. Suitable nesting and foraging habitat exist within the majority of the pull sites; therefore, this species potential for occurrence is High.

The crissal thrasher (*Toxostoma crissale*) is a California Species of Concern. It is widely distributed from southeastern California and southwestern Utah to Central America, inhabiting desert washes and riparian thickets in the Colorado River and Rio Grande valleys and their tributaries in southwestern North America. To the south and southeast within its range it can be found on brushy plains, in foothill scrub, or in open piñon-oak-juniper woodlands where there is a shrubby understory. The crissal thrasher is mostly insectivorous but may eat seeds, fruits, and berries (e.g., juniper berries) outside the summer season. It is a relatively large, grayish-brown songbird with a long, graduated tail and a rusty colored crissal (the area surrounding the cloacal opening). It has a long, decurved bill. Loss of habitat to clearing for agriculture or urban and suburban development threatens some populations. Other possible factors affecting this species include grazing of arid lands and off-road vehicle use (Cody 1999). Suitable nesting and foraging habitat for this species is present throughout the desert washes that cross through the Survey Area; therefore, the potential for occurrence is Moderate.

Gila woodpecker (*Melanerpes uropygialis*) is a State-listed Endangered species. It is a permanent resident of the lower Colorado River and Imperial Valley of southeastern California, throughout central Arizona and southwestern New Mexico, and south into northeastern Mexico. Physical characteristics include a tan to brown head and underparts, yellow-tinged belly, and black and white bar patterns on the back. The Gila woodpecker inhabits dry subtropical forests, riparian woodlands, and deserts with large cacti or tree species suitable for nesting. Habitats include saguaro desert, desert washes, riparian woodlands, and residential areas, including orchards and vineyards (Bancroft 1929; Price et al. 1995). Near Brawley, California, it is found primarily in date palm groves and ranch yards (Garrett and Dunn 1981). It is omnivorous; and its diet may include insect larvae, insects, cactus fruits, and berries. The disappearance of this species from much of Imperial Valley during the latter half of the twentieth century may have been connected to the clearing of riparian woodlands and to nest-site competition with European starlings (*Sturnus vulgaris*; Edwards and Schnell 2000; Bancroft 1929; Price et al. 1995). This species has been observed in several locations within three miles of the Project; however, the most recent was in 1986 (CNDDB). Suitable habitat for this species is present throughout the desert washes within the Survey Area, especially near pull sites 28-2, 29-3, 31-1, 36-3, 37-4, 44-1, 49-4, and 49-8. Therefore, the potential for occurrence is Moderate.

The pallid bat (*Antrozous pallidus*) is listed as a California Species of Concern. Its range extends from southern British Columbia along the Pacific coast south to central Mexico and east to central Kansas and Oklahoma. In California it is found throughout the state except for the high Sierra Nevada from Shasta to Kern Counties, and the northwest corner of the state from Del Norte and western Siskiyou Counties to northern Mendocino County. It occurs in a variety of habitats, including arid desert scrub, oak woodlands, juniper woodlands, grasslands, coniferous forests, and water-associated habitats (CDFW 1990). It may be more common throughout its range where rocky outcrops provide roost sites. This species is known to form day roosts of 12-100 individuals. Roosts may be natural or artificial, and often times, alternate night roosts are used as social centers. Unlike most other bat species, the pallid bat takes few insects on the wing. It forages by looking for prey on the ground and actually listening for the footsteps of ground-dwelling insects, scorpions, crickets, grasshoppers, spiders, centipedes and other prey. The pallid bat has been recorded within several locations, within two miles of the Survey Area (CNDDB 1992, 2015) west of pull site 29-3 in the Riverside Mountains. Therefore, the potential for occurrence is Moderate.

The western yellow bat (*Lasiurus xanthinus*) is a California species of special concern. It is found in localized populations throughout the desert regions of Los Angeles and San Bernardino Counties, and the southwestern United States to southern Mexico. It is an obligate foliage roosting species that prefers dead palm fronds to other types of tree substrates. It is possible that the western yellow bat may be finding roosts in fan palms planted for ornamental landscaping. The western yellow bat is primarily non-colonial, but small colonies have been documented in some areas. Unlike many other bats found in this region, it appears that this species is found throughout the year in southern California. It is most commonly associated with palm oases but can also occur in valley foothill riparian, desert riparian, and desert wash areas (CDFW 2008). This species has been recorded in two locations within three miles of the Project (CNDDB 1980, 2015) in the southern portion of the Survey Area (pull site 49-4 and south). Suitable habitat for this species occurs within the desert washes and the ornamental vegetation; therefore, this species has a Moderate potential to occur within the Survey Area.

The following two sensitive wildlife species were detected during survey efforts and are therefore considered Present in the Survey Area. For locations, see Attachment 1: Figure 10 – Sensitive Species Results Map.

The vermilion flycatcher (*Pyrocephalus rubinus*) is a California Species of Concern. It is a widespread tropical species whose range barely extends northward into the southwestern United States, where it breeds locally northward to southeastern California and southern Nevada. It may be found in wet oases in desert and semi-arid habitats and in diverse mixes of trees, brush, and grassy openings near open water. The male vermilion flycatcher has brilliant red underparts and a crown that contrast with the rest of its blackish coloration. Nests are open-cup and are usually 8-20 ft. above the ground in a horizontal fork of a large tree (Bent, 1942). Although the advent of various man-made habitat oases, such as parks, golf courses, and suburbs, in areas formerly supporting desert scrub have provided potential flycatcher nesting locations in the Mojave Desert of California, these areas also provide excellent foraging habitat for the brown-headed cowbird (*Molothrus ater*), a brood parasite known to use this flycatcher as a host (Hanna, 1936). This species was observed during the reconnaissance survey foraging in an ornamental tree near pull site 59-2 at the Blythe Golf Course and is considered present within the Survey Area.

The brown-crested flycatcher (*Myiarchus tyrannulus*; nesting) is a California Species of Concern and ranges from the southwestern U.S. to Argentina. In California, the brown-crested flycatcher of the northwestern-most subspecies (*M.t.*

magister) nests along the Colorado River and at a few scattered localities throughout the deserts. During migration, this species is rarely observed in California away from known breeding areas (Garrett and Dunn 1981). This species typically inhabits riparian woodlands, sycamore woodlands, and saguaro deserts. This species was observed foraging at pull site 36-3 within the Blue Palo Verde – Ironwood Woodland near the northern boundary during the reconnaissance survey and is considered present with the Survey Area.

United States Fish Wildlife Service Critical Habitat

Critical Habitat is defined as areas of land, water, and air space containing the physical and biological features essential for the survival and recovery of endangered and threatened species. Designated Critical Habitat includes sites for breeding and rearing, movement or migration, feeding, roosting, cover, and shelter. Designated Critical Habitats require special management and protection of existing resources, including water quality and quantity, host animals and plants, food availability, pollinators, sunlight, and specific soil types. Designated Critical Habitat delineates all suitable habitat, occupied or not, that is essential to the survival and recovery of the species. According to the USFWS Critical Habitat WebGIS map, the Project site does not fall within any designated Critical Habitat (USFWSb 2022). Critical Habitat for the desert tortoise is present within 3 miles of the Project site to the northwest, and Critical Habitat for the razorback is present within 1 mile of the Project site within the Colorado River that flows adjacent to the site as depicted in (Attachment 1: Figure 3 – USFWS Critical Habitat Map).

Delineation Results

The Survey Area contains primarily alluvial fan systems consisting of braided channels, individual drainage channels, erosional channels, and man-made berms. Drainages found within the Survey Area are potentially subject to jurisdiction by the USACE, CDFW, and RWQCB. The active channels throughout the Survey Area consisted of alluvial sediment comprised of sand and gravel deposits. The active channels and drainages mapped exhibited clear evidence of hydrology including sediment deposition, shelving, drift deposits, and destruction of vegetation. These characteristics were used to inventory the active channels and drainages during the surveys.

The widths of the Ordinary High Water Mark (OHWM) and bank features were similar due to the erosion of banks in a vertical formation; therefore, the OHWM measurements were measured as the same width as the banks throughout the Survey Area.

The USFWS NWI and Jurisdictional Delineation Results are found in Figure 8. The Impacts to Jurisdictional Waters are found in Figure 9. Mapped vegetation communities are found in Figure 4.

The Colorado River is the main waterway adjacent to the Project and is a Traditional Navigable Waters (TNW). One Colorado River crossing is located between pull sites 14-3 and 14-6. The Colorado River is listed as the wetland type Lake and the banks of the Colorado River are listed as Freshwater Forested/Shrub Wetland by the USFWS NWI. Based on the results of the survey, the vegetation within pull site 14-3 includes Mesquite Thickets and Arrow Weed Thickets. The Main Canal is also located within the eastern pull site 14-3 and is unvegetated. No work is proposed within the Colorado River or Main Canal.

The majority of pull sites are located in areas that do not contain riparian or wetland habitats associated with the Colorado River. There are a few pull sites that contain riparian and/or wetland habitats including pull sites 14-3, 16-7, 31-3, 49-4, 49-6, and 49-8. These pull sites are described below:

- Pull site 14-3 is located on the east side of the Colorado River (transmission line crosses Colorado River from this location). The majority of pull site 14-3 contains bare ground and Creosote Scrub and only a portion of the site contains riparian habitat including Mesquite Thickets, Arrow Weed Thickets, and Open Water (largely unvegetated Main Canal). The pull site is located at the edge of the community of Parker, Arizona and is surrounded to the south and east by residential and commercial development and to the north and west by the Colorado River. This area is highly disturbed and pull site operations can be contained within the Bare Ground and Creosote Scrub areas.

- Pull site 16-7 is located approximately 1,770 feet north of the Colorado River, north of the residential community along Rio Vista Drive. This pull site contains Tamarisk Thickets, Disturbed habitat, Bare Ground, and a small area of Allscale Scrub. A NWI Freshwater Forested/Shrub Wetland exists in the southern areas of the pull sites, and the delineation has extended the wetland area (Tamarisk Thickets) in two small areas. This area is highly disturbed, and residential development has altered the community, becoming more arid. This area receives flow from ephemeral washes and drainages from the north. Pull site operations can be contained within the Bare Ground and Disturbed habitat areas.
- Pull site 31-3 is located approximately 4,580 feet west of the Colorado River and west of Lost Lake Resort, west of Interstate 95. The majority of pull site 31-3 contains Creosote Scrub and sparse Blue Palo Verde – Ironwood Woodland with a small patch of Tamarisk thickets and sparse area of Mesquite Thickets that can be avoided.
- Pull site 49-4 is located approximately 4,200 feet west of the Colorado River, immediately east and adjacent to Interstate 95. Approximately 50 percent of this site contains Tamarisk Thickets and Arrow Weed Thickets; however, agriculture development in this area has separated the Colorado River from this riparian/wetland habitat. Water is currently received from ephemeral drainages from the west and vegetation in this area has become more arid and is not suitable for sensitive species that require wet/moist, riparian habitats. In addition, pull site operations can be contained within the access road and adjacent bare ground areas within the proposed pull sites. Therefore, impact to riparian habitat is not anticipated.
- Pull site 49-6 is located approximately 3,400 feet west of the Colorado River, immediately east and adjacent to Interstate 95. This area is highly disturbed. The majority of pull site 49-6 contains bare ground and agriculture. Small areas of scattered Quail Bush Scrub and Arrow Weed Thickets exist; however, agriculture development in this area has separated the Colorado River from riparian/wetland habitat associated with the banks of the Colorado River. Although Quailbush Scrub is not considered a wetland community, the NWI database identified the area at Pull Site 49-6 as a Freshwater Forested/Shrub Wetland. Field verification identified intermixed Arrow Weed Thickets; therefore, the general area was confirmed as a wetland community surrounded by human disturbance. Water is currently received from ephemeral drainages from the west and vegetation in this area has transitioned into an arid environment and is not suitable for sensitive species that require wet/moist, riparian habitats. Pull site operations can likely avoid these riparian habitats.
- Pull site 49-8 is located approximately 3,400 feet west of the Colorado River, immediately east and adjacent to Interstate 95. This area is highly disturbed. The majority of pull site 49-8 contains agriculture and bare ground. Two areas of scattered Tamarisk Thickets and Arrow Weed Thickets exist; however, agriculture development in this area has separated the Colorado River from this riparian/wetland habitat. Water is currently received from ephemeral drainages from the west and vegetation in this area has become more arid and is not suitable for sensitive species that require wet/moist, riparian habitats. In addition, pull site operations can be contained within the access road and adjacent bare ground areas within the proposed pull sites. Therefore, impact to riparian habitat is not anticipated.

The following pull sites contain ephemeral drainages and/or ephemeral braided channels:

- Pull site 13-6 has two small drainages located within Blue Palo Verde – Ironwood Woodland. No NWI drainage exists in this area; however, these drainages connect to a NWI Freshwater Forested/Shrub Wetland that exists to the southeast. These drainages can be avoided by keeping work activities within Bare Ground or open space areas within Creosote Scrub habitat. Impacts to the drainages are not anticipated.

- Pull site 22-4 has a NWI Riverine drainage along the eastern boundary of the site. No drainage was identified in this area during the survey effort.
- Pull site 25-1 (Staging Area) has a NWI Riverine drainage through the lower portion of the site. No drainage was identified in this NWI area during the survey effort. However, a drainage was identified along the northwestern portion of the site that connects to a large, NWI braided channel immediately north of the site. This area can be avoided during lay down operations. The staging area is comprised mainly of sparse Creosote Scrub, with small portions of Blue Palo Verde – Ironwood Woodland and Mesquite Thickets along the northern area that can be avoided.
- Pull site 25-4 (Staging Area) has a small ephemeral drainage that goes subsurface through the site (no longer exhibits surface flow characteristics). No NWI is present at this location (one NWI drainage is located to the north of the site). This area can be avoided during the pull site operations. The staging area is comprised mainly of sparse Creosote Scrub and one small patch of Blue Palo Verde – Ironwood Woodland that can be avoided.
- Pull sites 28-2 and 29-3 do not contain NWI drainages, or field mapped drainage. Several small erosional features (non-jurisdictional) were mapped through the pull sites. A man-made berm designed to direct flow away from the Interstate 95 and through a culvert was identified and can be avoided during pull site operations.
- Pull site 31-3 has several NWI drainages (braided channels) that contain Mesquite Thickets, Tamarisk Thickets, and Blue Palo Verde – Ironwood Woodland, surrounded by Creosote Scrub and Bare Ground. The drainages can be avoided during pull site operations.
- Pull sites 32-6, 38-1, 38-3, 50-2, 52-4, 54-1, and 58-5 do not have NWI drainages present. Field verification identified several erosional features within these pull sites, and no drainages present within the pull sites.
- Pull site 33-5 does not have a NWI drainage present. However, a small drainage within Creosote Scrub was identified within the southwestern corner of the southern pull site. Erosional features (non-jurisdictional) were also present. Pull site operations can be contained within the Bare Ground and within the Creosote Scrub habitats (sparse vegetation). The drainage can be avoided during pull site operations.
- Pull site 36-3 does not have a NWI drainage present; however, a braided channel within Blue Palo Verde – Ironwood Woodland was identified during field surveys. Several erosional features (non-jurisdictional) were also identified. The drainage can be avoided during pull site operations.
- Pull site 44-1 has a NWI drainage present. Field verification identified a large, braided wash system within Blue Palo Verde – Ironwood Woodland habitat. Pull site operations can be contained within the sparse areas of Creosote Scrub and Bare Ground areas. The drainage can be avoided during pull site operations.
- Pull site 64-2 contains NWI lake (open water) within portions of the pull site. The pull site is located within agricultural development. Field verification did not identify a ponded area, this area has been manipulated by the land owner and is no longer present (currently it is Disturbed habitat).
- Pull site 64-4 has a NWI drainage present; however, field verification did not identify a drainage. The pull sites are within agricultural development, this area has been manipulated and the drainage is no longer present (Disturbed habitat).
- No water features exist within the following pull sites: 12-9, 14-6, 22-4, 31-4, 37-4, 59-2, and 59-6.

Conclusions and Recommendations

This Project proposes to install approximately 52 miles of new 48-strand overhead fiber optic grounding wire on the existing Headgate Rock-Blythe 161-kilovolt (kV) transmission line and temporary access to 31 pull sites along the west end of the Colorado River Reservation, San Bernardino and Riverside counties. All work and access (other than pull sites) are contained within the existing road prism and do not require an environmental assessment for sensitive resources. No new poles or permanent structures are proposed. No ground disturbance other than the crushing of vegetation is proposed. Impacts associated with this Project are considered temporary. Work areas will be modified to avoid and/or minimize impacts to known sensitive resources; work areas are expected to be smaller than provided in this analysis.

Delineation

The Survey Area contains primarily alluvial fan systems consisting of braided channels, individual drainage channels, erosional channels, and man-made berms. Drainages found within the Survey Area are potentially subject to jurisdiction by the USACE, CDFW, and RWQCB. Due to topography of the drainages and the vertical erosion of the banks, bank to bank and OHWM measurements were recorded as the same widths. Impact calculations are based on larger temporary work areas (pull sites and staging areas) that will be refined through Project design finalization to minimize actual impacts. Although impacts to drainage features are not anticipated, impact calculations are based on the entire temporary work areas provided in this report. Currently proposed impacts to drainages and vegetation within the drainages are provided below.

Table 4. Drainage Temporary Impacts (acres) Within Pull Sites

Temporary Impact Type - Vegetation Community	13-6	14-3	16-7	25-1	25-4	31-3	33-5
Ephemeral Drainages							
Blue Palo Verde - Ironwood Woodland	0.07338					0.29442	
Creosote Bush Scrub	0.00001			0.01207	0.02621	0.00705	0.00261
Mesquite Thickets						0.05135	
Tamarisk Thickets						0.00533	
Open Water							
Open Water		0.17847					
Wetland Areas							
Arrow Weed Thickets		0.09306					
Iodine Bush Scrub							
Mesquite Thickets		0.25837					
Quail Bush Scrub							
Tamarisk Thickets			0.59656				
Total	**0.07**	**0.53**	**0.60**	**0.01**	**0.03**	**0.36**	**0.00**

Temporary Impact Type - Vegetation Community	36-3	44-1	49-4	49-6	49-8	Total
Ephemeral Drainages						
Blue Palo Verde - Ironwood Woodland	0.07413	0.18913				0.63
Creosote Bush Scrub	0.00063	0.00229				0.05
Mesquite Thickets						0.05
Tamarisk Thickets						0.01
Open Water						
Open Water						0.18
Wetland Areas						
Arrow Weed Thickets			0.30211	0.05876	0.35365	0.81
Iodine Bush Scrub			0.14733			0.15
Mesquite Thickets						0.26
Quailbush Scrub				0.30787		0.31
Tamarisk Thickets			0.66127		0.17591	1.43
Total	**0.07**	**0.19**	**1.11**	**0.37**	**0.53**	**3.87**

An estimated total of 3.87 acres of proposed temporary impacts to water features under USACE, RWQCB, and CDFW is proposed based on the current Project design.

Temporary impacts to ephemeral drainages and associated native vegetation include: 0.63 acre Blue Palo Verde – Ironwood Woodland, 0.05 acre Creosote Bush Scrub, and 0.05 acre Mesquite Thickets for a total of 0.73 acre of temporary impact. Temporary impacts to ephemeral drainage and associated non-native vegetation include 0.01 acre of Tamarisk Thickets.

Temporary impacts to wetlands and associated native vegetation include 0.81 acre Arrow Weed Thickets, 0.15 acre Iodine Bush Scrub, 0.26 acre Mesquite Thickets, 0.31 acre Quailbush Scrub for a total of 1.52 acres of temporary impact. Temporary impacts to wetlands and associated non-native vegetation include 1.43 acres of Tamarisk Thickets. A total of 0.18 acre of temporary impact is estimated for Open Water (Main Canal).

Although impacts to drainage features are not anticipated, temporary impact calculations are based on the entire temporary work areas provided in this report. If Project activities could potentially impact any of these features, applications for a USACE 404 permit, State 401 certification, and/or CDFW State Streambed Alteration Agreement may be required for Project authorization.

Several ephemeral drainages occur throughout the Survey Area and cross through the existing access roads throughout the transmission line corridor. Repairs to the existing access roads are anticipated to occur as a part of Project activities; however, all repairs will occur within the existing road prism, and no new permanent disturbance would result from this activity. Therefore, no impacts to jurisdictional features are anticipated to occur as a result of access road repair activities. If any required improvements associated with access road repair activities could potentially impact waters outside the existing access road prism, a Jurisdictional Delineation must be conducted along the access road to determine agency jurisdiction, and applications for a USACE 404 permit, State 401 certification, or CDFW State Streambed Alteration Agreement may be required for Project authorization.

Vegetation

Fifteen vegetation communities for a total of 49.35 acres were documented within the Survey Area. A total of 37.23 native vegetation including Allscale Scrub, Distrubed Allscale Scrub, Arrow Weed Thickets, Blue Palo Verde-Ironwood Woodland, Brittlebush Scrub, Creosote Scrub, Creosote Scrub – Brittlebush Scrub, Iodine Bush Scrub, Mesquite Thickets, and Quailbush Scrub, and 12.13 acres non-native or other vegetation including Agriculture/Ornamental, Bare Ground, Disturbed, and Tamarisk Thickets may be impacted.

Temporary impacts to native and non-native vegetation are anticipated. Impact calculations are based on larger temporary work areas (pull sites and staging areas) that will be refined through project design finalization to minimize actual impacts. Impacts to vegetation are based on the entire temporary work areas provided in this report; actual impacts are anticipated to be much less. Temporary impacts may include trimming or crushing of vegetation; however, no vegetation removal is proposed for this Project. Additional temporary impacts may include construction-related dust could reduce the rates of photosynthesis and hinder growth.

See avoidance and minimization measure to avoid or reduce impacts to native vegetation.

Special Status Plant Species

Following the literature review and after the assessment of the various habitat types in the Survey Area, it was determined that 12 special status plant species were documented to historically occur within the vicinity of the Survey Area. One of the plants is State-listed as Endangered, but no others have federal status. Of the 12 plant species that resulted from the database search, it was determined that four are considered absent, two are considered to have a low potential to exist, and five are considered to have a moderate or higher potential to exist. One species, foxtail cactus with a CRPR of 4.3 is considered present. No other special status plant species were found during the biological reconnaissance survey. The following species are considered to have a moderate or higher potential to occur within the Survey Area.

- Angel trumpets is a CRPR 2B.3 species that typically blooms in May. This species has been recorded in one wash within the transmission line alignment in 2012 (CNDDB) near pole 51-1, approximately 1-mile south of the closest pull site 50-2.
- Harwood's milk-vetch is a CRPR 2B.2 species that typically blooms between January and May. This species has been recorded in many locations within 5 miles of the site, with two locations (CNDDB) less than half a mile south of pull sites 64-2, and 64-4. However, the vegetation at these pull site locations do not contain suitable habitat for this species. Pull site 59-6 is the closest to this historic occurrence.
- Glandular ditaxis is a CRPR 2B.2 species typically blooms from October to March. This species has been recorded within several locations in 2013 (CNDDB) within 3 miles of the site. The closest known location is approximately 500 feet south of pull site 29-3, near transmission pole 29-4.
- California ditaxis is a CRPR 3.2 species typically blooms between March and December. This species has been recorded in one location in 2013 (CNDDB) approximately 500 feet south of pull site 29-3, near transmission pole 29-4.
- Abrams' spurge is a State endangered, CRPR 2B.2 species that typically blooms from September to November. This species was recorded in 2012(CNDDB) between 2 and 5 miles south and west of the Project site (south of the McCoy Mountains, and southwest of Blythe Airport).

One special status plant species is considered **Present** and the locations present within the Survey Area have been mapped (Attachment 1: Figure 10).

Alverson's foxtail cactus is a CRPR 4.3 species that typically blooms between April and June. Alverson's foxtail cactus is not afforded special protection under CEQA as it is only on a State Watch List species but individuals present within the Survey Area (Figure 10) should be avoided or translocated if possible. Alverson's foxtail cactus was observed during the survey effort at the following pull sites: one location within 52-4 (southern area) and many locations within 54-1.

See avoidance and minimization measures to avoid or reduce impacts to special status plant species.

Special Status Wildlife Species

Following the literature review and after the assessment of the various habitat types in the Survey Area, it was determined that 22 federally and/or state listed endangered or threatened, State Species of Concern, or otherwise special status wildlife species documented to occur within the Survey Area. After a literature review and the assessment of the various habitat types within the Survey Area, it was determined that 11 special status wildlife species are considered absent, four have a low potential to occur, five have a moderate or higher potential to occur, and two species are considered present within the Survey Area. One species is a State-listed Endangered species, but no other species with a potential to occur have federal status.

The following five wildlife species have a Moderate or higher potential to occur in the Survey Area:

The burrowing owl is a California Species of Special Concern. This species has been documented within many locations (CNDDB in 2007) with 12 documented occurrences within 2 miles of the Project, especially within the southern agricultural areas from pull site 49-5 and south. Suitable nesting and foraging habitat exist within the majority of the pull sites.

The crissal thrasher is a California Species of Concern. Suitable nesting and foraging habitat for this species is present throughout the desert washes that cross through the Survey Area.

Gila woodpecker is a State-listed Endangered species. Suitable habitat for this species is present throughout the desert washes within the Survey Area, especially near pull sites 28-2, 29-3, 31-1, 36-3, 37-4, 44-1, 49-4, and 49-8.

The pallid bat is listed as a California Species of Concern. The pallid bat has been recorded within several locations, within two miles of the Survey Area (CNDDB in 1992, 2015) west of pull site 29-3 in the Riverside Mountains.

The western yellow bat is a California species of special concern. This species has been recorded in two locations within three miles of the Project (CNDDB in 1980, 2015) in the southern portion of the Survey Area (pull site 49-4 and south). Suitable habitat for this species occurs within the desert washes and the ornamental vegetation.

The following two sensitive wildlife species were detected during survey efforts and are therefore considered Present in the Survey Area. For locations, see Attachment 1: Figure 10 – Sensitive Species Results Map.

The vermilion flycatcher is a California Species of Concern. This species was observed during the reconnaissance survey foraging in an ornamental tree near pull site 59-2 at the Blythe Golf Course and is considered present within the Survey Area.

The brown-crested flycatcher is a California Species of Concern. This species typically inhabits riparian woodlands, sycamore woodlands, and saguaro deserts. This species was observed foraging at pull site 36-3 within the Blue Palo

Verde – Ironwood Woodland near the northern boundary during the reconnaissance survey and is considered present with the Survey Area.

Avoidance and Minimization Measures

1. **Preconstruction Surveys**. Preconstruction surveys shall be conducted by biologists according to standardized methods. Surveys shall encompass all construction areas. Existing baseline vegetation data shall be used during post-construction restoration efforts, as needed. Preconstruction surveys shall take place for each discrete work area within 14 days of the start of construction activities, or if work has lapsed for longer than 14 days. The biologist shall conduct preconstruction clearance sweeps for special status plant and wildlife species with a moderate or higher potential for occurrence where suitable habitat is present.

   In addition to these preconstruction surveys, a biologist shall conduct protocol-level surveys for the following plant species during the appropriate blooming period when these species would be conspicuous: Angel trumpets (May), Hardwood's milk-vetch (January – May), Glandular ditaxis (October – March), California ditaxis (March – December), and Abram's spurge (September – November). Any special status species identified shall be flagged for avoidance. If surveys for these species are not feasible during the blooming period, a qualified botanist shall conduct a preconstruction search for remnants of these species and flag for avoidance. A botanist shall flag the documented locations of Alverson's foxtail cactus within pull sites 52-4 and 54-1 for avoidance.

   In addition, the biologists shall conduct preconstruction surveys for the following sensitive wildlife species: burrowing owl, crissal thrasher, Gila woodpecker, pallid bat, western yellow bat, vermilion flycatcher and brown-crested flycatcher in suitable habitat.

   Should biologists identify sensitive species at any time prior to or during construction, biologists shall flag an appropriate avoidance buffer that sufficiently protects the species from disturbance caused by construction activities, as determined by a qualified biologist. The location should be monitored regularly, and the buffer must remain in place until construction is complete, or the species has vacated the area. If a special status species is found at any time, WAPA shall be notified within 48 hours, and WAPA shall determine the need for additional consultation with the appropriate resource agency or agencies.

2. **Preconstruction Surveys for Burrowing Owls**. Prior to ground disturbance, an avian biologist shall conduct preconstruction take-avoidance surveys for burrowing owls within 150 meters of Project areas in suitable habitat no more than 14 days prior to ground-disturbing activities according to methods outlined in the CDFW's 2012 (or most recent) Staff Report on Burrowing Owl Mitigation (CDFG 2012). Surveys will provide data on whether burrowing owls occupy the area and, if so, whether the owls are actively nesting.

   a) **Burrowing Owl Impact Avoidance**. If pre-construction take-avoidance surveys detect the presence of any active burrowing owl burrows during breeding season, the burrows will be avoided, and construction activities within 150 meters will be enclosed by construction fencing. Buffer sizes are outlined in the CDFW's Staff Report on Burrowing Owl Mitigation. Active burrowing owl burrows should be monitored regularly according to methods outlined in the Nesting Bird Management Plan, and buffers should remain in place until the nest fledges or fails.
   b) **Eviction**. If, in consultation with the CDFW, it is determined that Project activities require removal of

occupied burrows, or burrows potentially occupied by burrowing owls, eviction and burrow closure may be required to ensure against "take" of owls or nests. However, if eviction is required, it will occur only after consulting with CDFW and CDFW approval of a Burrowing Owl Exclusion Plan. Monitoring will be conducted to ensure take is avoided during eviction procedures. Owls may not be evicted or captured without prior authorization from the CDFW.

Migratory Bird Treaty Act. To minimize potential impacts to nesting birds protected under the Migratory Bird Treaty Act (MBTA), construction activities should take place outside nesting season (February 1 to August 31), to the greatest extent practicable. If construction activities occur during nesting season, preconstruction nesting bird surveys shall be conducted for all construction areas including pull sites, staging areas, and transmission line work. The survey area shall include the construction area, plus an additional distance large enough to accommodate the protective buffer of MBTA-protected bird species likely to occur in proximity to the construction area. The surveys shall occur no more than seven days prior to initiation of construction activities, and any occupied passerine and/or raptor nests occurring within or adjacent to the impact area shall be delineated. The avian biologist shall flag an appropriate avoidance buffer that sufficiently protects the species from disturbance caused by construction activities. To the maximum extent practicable, a minimum buffer zone around occupied nests should be determined by the avian biologist to avoid impacts to the active nest. Buffers shall not be based on generalized assumptions regarding all nesting birds but shall be specific to the site and species and account for specific stage of nesting cycle and construction work type. Appropriate and effective buffer distances shall be monitored. Buffer reductions for special status species and raptors shall be determined upon consultation with USFWS and CDFW. Buffer reductions for common species must be approved by the avian biologist and WAPA, USFWS and CDFW shall be notified. The location should be monitored regularly, and the buffer must remain in place until construction is complete, or the nest has fledged. If a special status species is found at any time, WAPA shall be notified within 48 hours, and WAPA shall determine the need for additional consultation with the appropriate resource agency or agencies. Once nesting has ceased, the buffer may be removed.

3. **Take Avoidance**. Should biologists identify nesting birds at any time prior to or during construction, biologists will implement a buffer around the nest that sufficiently protects the nesting pair from disturbance caused by construction activities, as determined by the avian biologist. The nest should be monitored regularly near active work areas, and the buffer must remain in place until construction is complete, or the nest is no longer active. If a special status species is found at any time, WAPA shall be notified within 48 hours, and WAPA shall determine the need for additional consultation with the appropriate resource agency or agencies.

4. **Biological Monitoring**. Biological monitors shall be present during construction activities in areas where sensitive resources identified by a biologist may be impacted by construction of the Project. Biological monitors shall be assigned to the Project in areas of sensitive biological resources. The monitors shall be responsible for ensuring that impacts on special status species, native vegetation, wildlife habitat, or aquatic resources shall be avoided to the fullest extent possible. Where appropriate, monitors shall flag the boundaries of areas where activities will need to be restricted in order to protect native plants and wildlife, special status species, and aquatic resources. Those restricted areas shall be monitored to ensure their protection during construction. The biological monitor shall halt work if it is determined that sensitive species or active nesting could be disturbed by construction activities. A Post-construction Report shall be provided to WAPA that includes a summary of Project activities, temporary impact limits of construction, a summary of monitoring activities, avoidance and minimization measures implemented, and non-compliance issues and

the actions to correct. The report shall be submitted to WAPA once the Project has been completed. WAPA shall submit to the appropriate resource agency or agencies.

5. **Limit Disturbance to Native Vegetation Communities and Trees**. Disturbance to native vegetation and trees shall be limited to the minimum practicable area required for construction of the Project. To the extent feasible, only crushing and/or trimming of vegetation shall only occur. Drive-and-crush methods shall be employed, with the exception of those areas where this method is not feasible for temporary staging areas for safety reasons and placement of temporary structures, such as construction trailers and water tanks.

6. **Restoration**. To restore temporarily disturbed areas, the crushed vegetation shall be clean cut to remove the damaged branches to prevent potential pest infestation/disease and increase plant recovery. Implementation of clean cutting the vegetation shall be under the supervision of a botanist. The cut vegetation from native plants shall be left to decompose on site. In addition, areas that were rutted and disturbed by tire marks shall be raked to discourage unauthorized off-road use.

7. **Habitat Restoration Plan**. If impacts to sensitive vegetation are not avoidable, prior to construction of the proposed Project and with the coordination and review of USFWS and CDFW, the applicant shall prepare a habitat restoration plan for temporary impacts to sensitive vegetation including Arrow Weed Thickets, Blue Palo Verde-Ironwood Woodland, Iodine Bush Scrub, and Mesquite Thickets. Details of the restoration plan shall be finalized pending consultation between the applicant, WAPA, USFWS, and CDFW. The restoration plan shall be prepared by a qualified botanist familiar with this vegetation association. The plan shall include the following elements: planting/reseeding species; monitoring plan and schedule, including duration and performance criteria; and any specific measures that shall be required to ensure success of the restoration effort. Suitable habitat shall be replaced at a 1:1 ratio, unless the applicant chooses to implement the restoration effort outside the project area, it must be no more than 100 miles away from the Project area.

8. **Invasive Plant Control Measures**. The applicant shall use standard BMPs to avoid the introduction and spread of controllable invasive plant species including but not limited to tamarisk, Sahara mustard, mustard species, non-native grasses, etc. during construction of the Project. Proper handling during construction shall include the following:
    a. All vehicles and equipment shall be cleaned prior to arrival at the work site.
    b. Crews, with construction inspector oversight, shall ensure that vehicles and equipment are free of soil and debris capable of transporting noxious weed seeds, roots, or rhizomes before the vehicles and equipment are allowed use of access roads.
    c. Straw or hay bales used for sediment barrier installations or mulch distribution shall be obtained from state- cleared sources that are free of invasive weeds.

    The applicant shall develop an Invasive Plant Management Plan to outline the methods that shall be employed to prevent the spread of invasive plants on site. This plan shall be submitted to the CDFW and WAPA for review and comment no more than four months prior to the start of construction, with the intent to produce a final draft of the plan no later than two months prior to the start of construction.

Implementation of these avoidance and minimization measures shall reduce the potential for impacts to less than significant. Additional mitigation measures may be required by the agencies for Project authorization.

Please contact me at (949) 261-5414 ext. 7288 if you have any questions or concerns regarding this memo report.

Sincerely,

CHAMBERS GROUP, INC.

Paul Morrissey

Director of Biology, Vice President
pmorrissey@chambersgroupinc.com
(949) 261-5414 ext. 7288

Attachments

Attachment 1: Figure 1: Project Location and Vicinity
Figure 2: CNDDB Occurrences Map
Figure 3: USFWS Critical Habitat Map
Figure 4: Vegetation Communities Map
Figure 5: Watersheds Map
Figure 6: FEMA Flood Hazard Zones Map
Figure 7: NWI and NHD Mapped Jurisdictional Waters
Figure 8: Jurisdictional Delineation Results Map
Figure 9: Impacts to Jurisdictional Waters
Figure 10: Sensitive Species Observed

Attachment 2: Plant Species Observed

Attachment 3: Wildlife Species Observed/Detected

Attachment 4: Site Photographs

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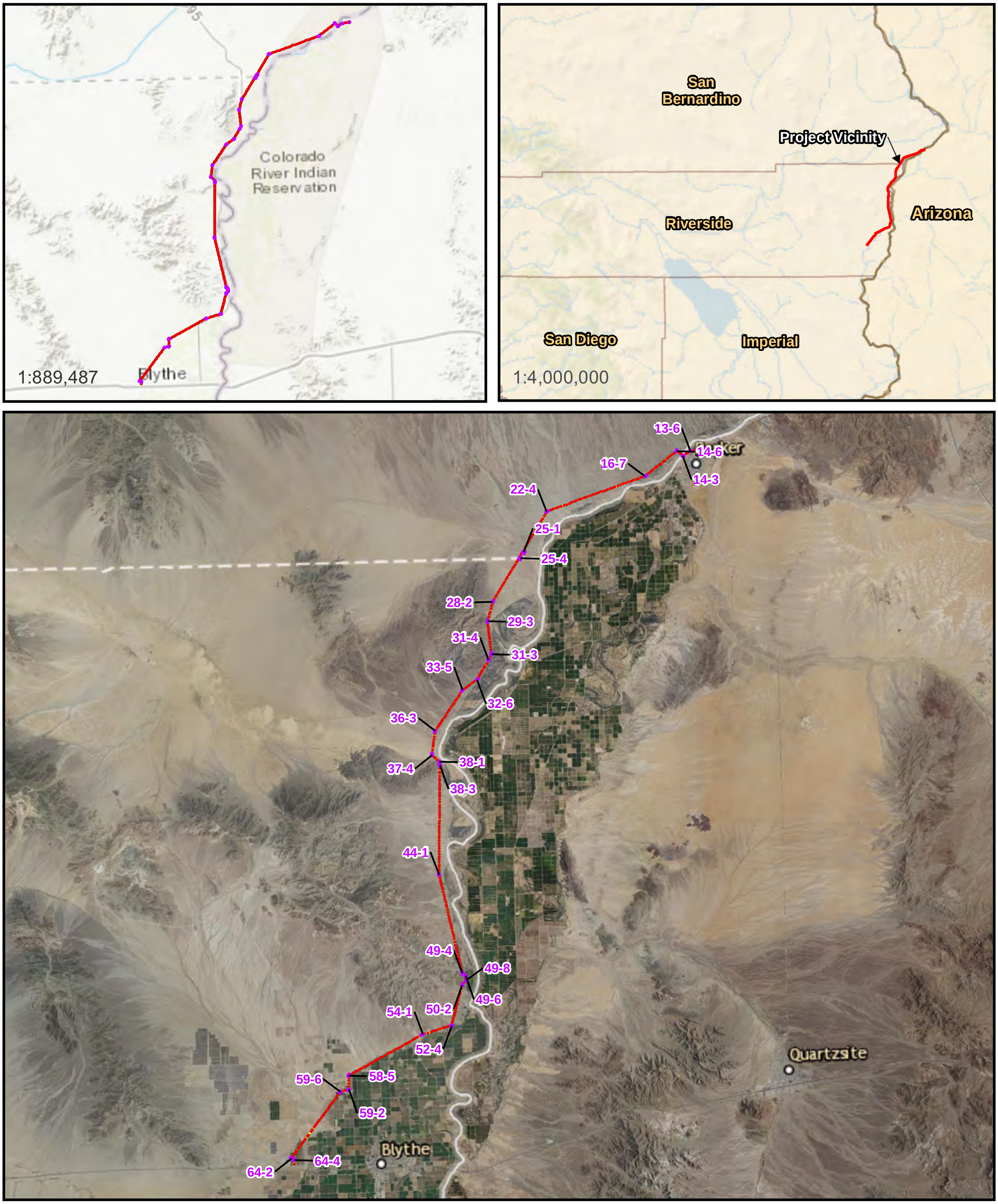
ATTACHMENT 1 – FIGURES



Structures

Transmission Line

Pull Sites

N

0 2 4 8

Miles

Figure 1
Vidal Energy
Project Location & Vicinity

Name: 21232 BIO Fig 1 Project Location and Vicinity.Mxd
Print Date: 7/4/2022, Author: pcarlos

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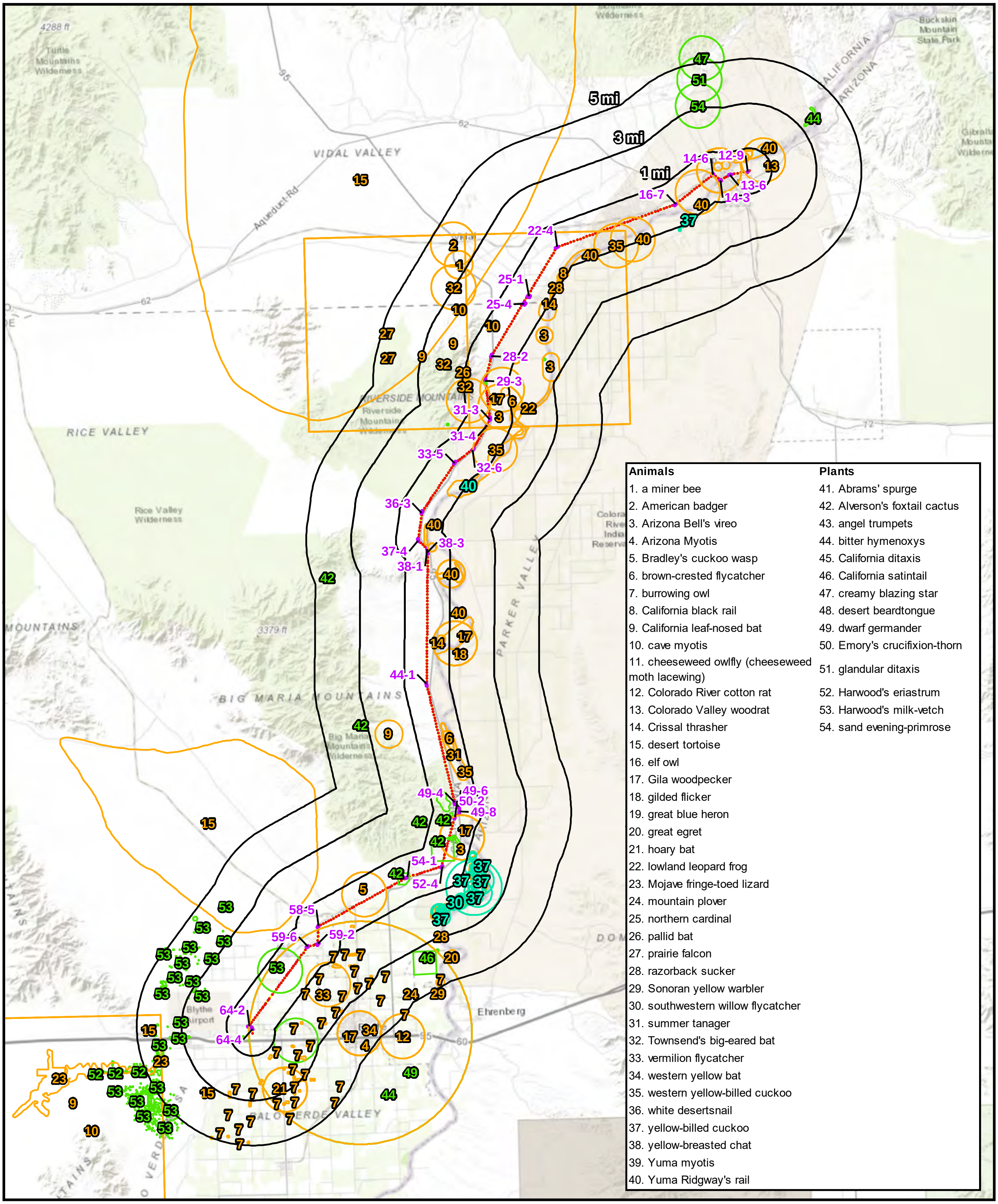

Structures
Pull Sites
Transmission Line
USFWS Occurences
CNDDB Occurrences
Animals
Plants

N

0 2 4 8
Miles

Figure 2
Vidal Energy FOC
Sensitive Species Occurrences
Within 5 Miles

Name: 21232 BIO Fig 2 Sensitive Species Occurrences Within 5 Miles.Mxd
Print Date: 7/6/2022, Author: pcarlos

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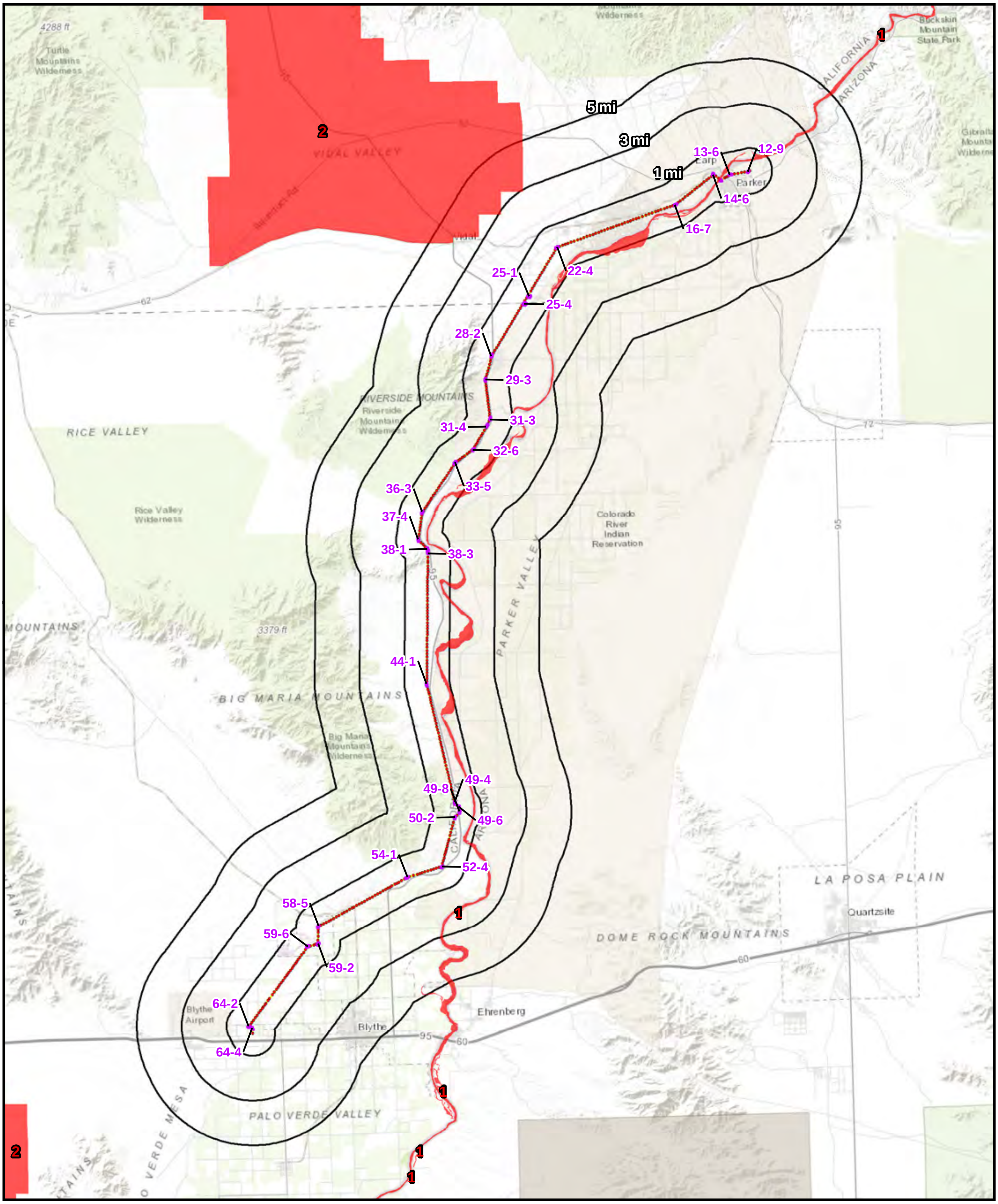

- Structures
- Transmission Line
- Pull Sites
- USFWS Critical Habitat

1. Razorback sucker
2. Desert tortoise

N

0 2 4 8
Miles

Figure 3
Vidal Energy FOC
USFWS Critical Habitat

Name: 21232 BIO Fig 3 USFWS Critical Habitat.Mxd
Print Date: 7/4/2022, Author: pcarlos

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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 12-9

- Structures
- Transmission Line
- Pull Sites

Vegetation Community Surveys

- 1. Creosote Bush Scrub
- 3. Bare Ground

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
Print Date: 7/6/2022 6:23:40 PM Author: pcarlos

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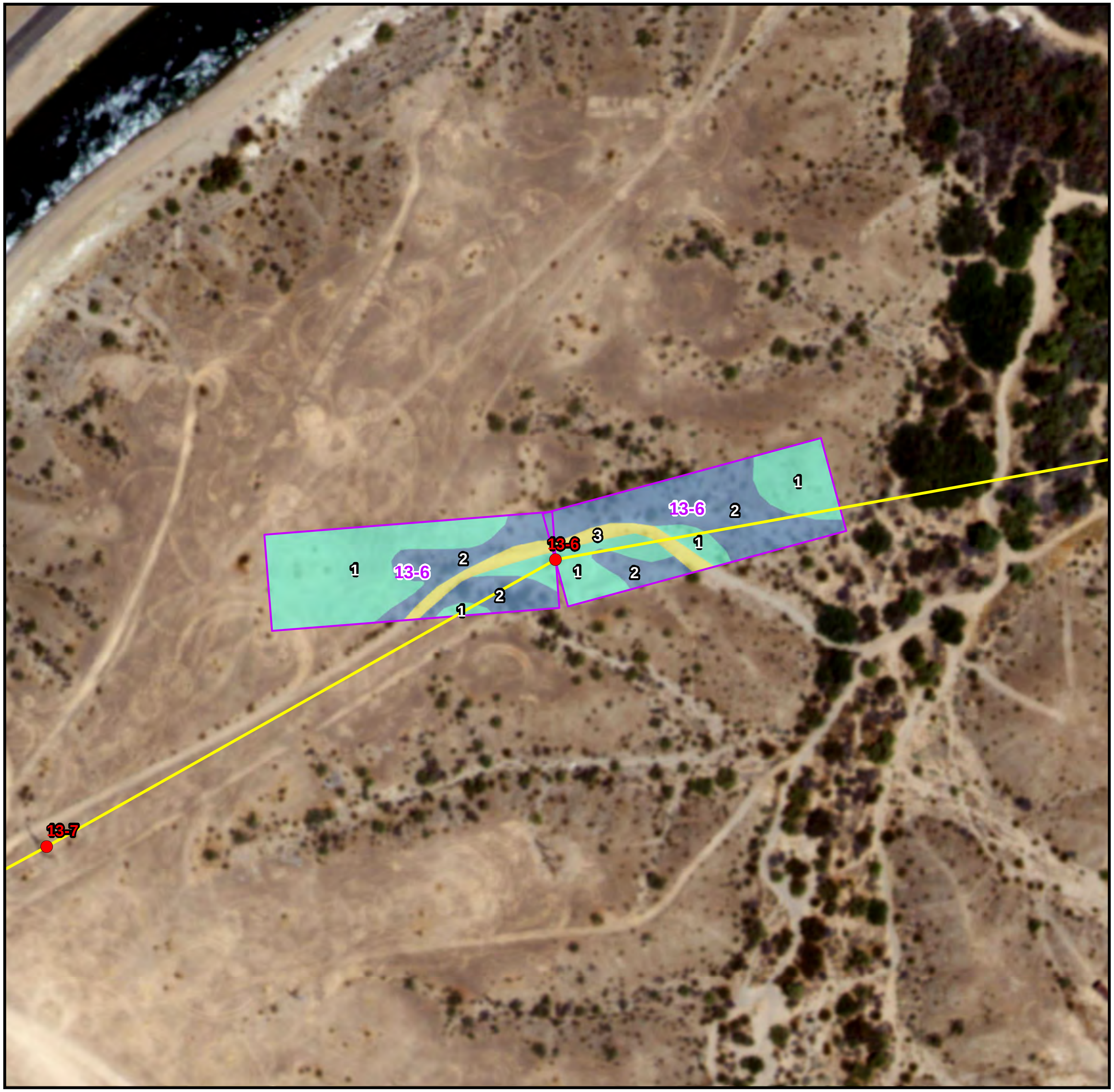

Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 13-6

- Structures
- Transmission Line
- Pull Sites

Vegetation Community Surveys

- 1. Creosote Bush Scrub
- 2. Blue Palo Verde - Ironwood Woodland
- 3. Bare Ground

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
Print Date: 7/6/2022 6:23:40 PM Author: pcarlos

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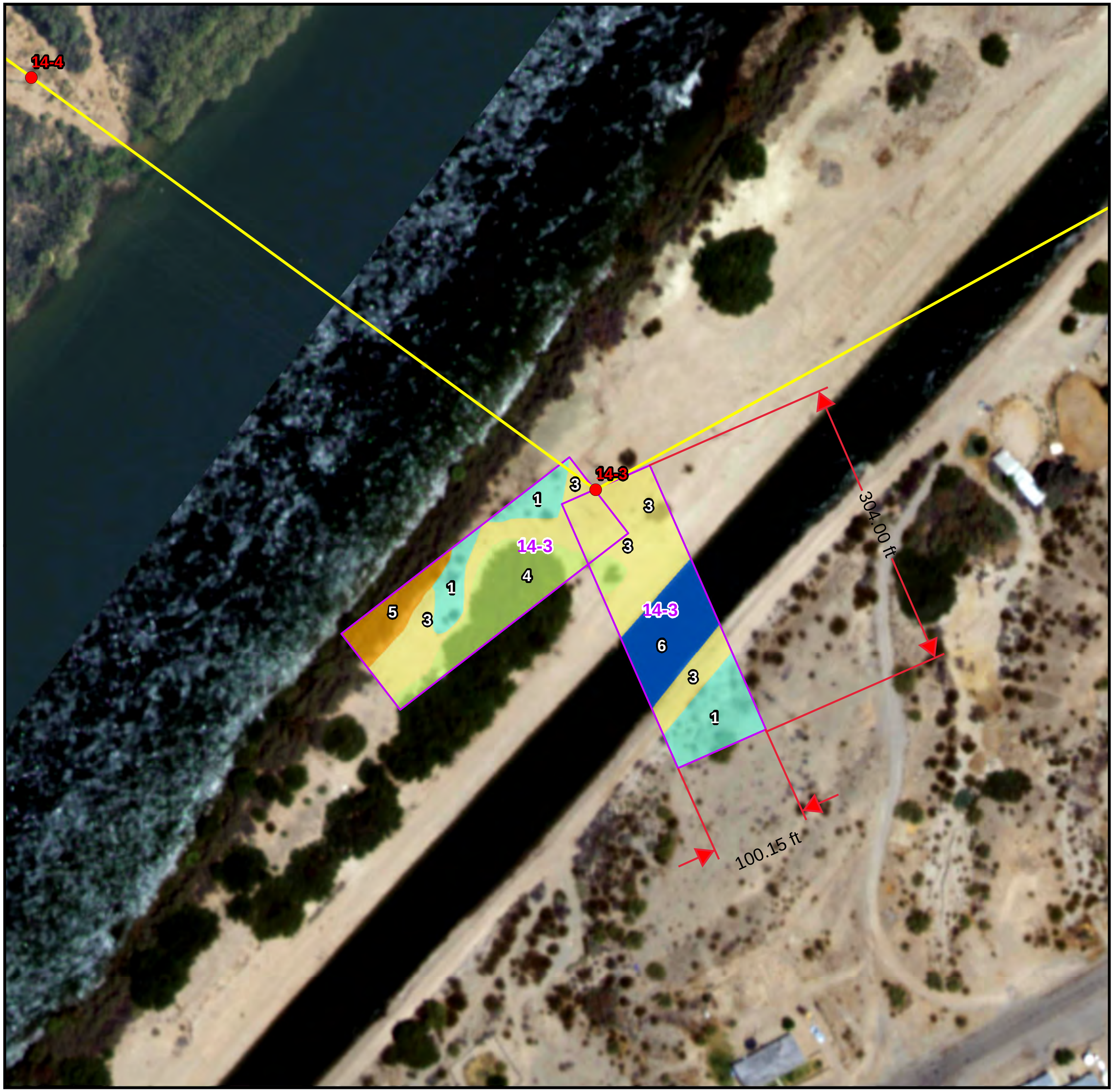
Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 14-3



- Structures
- Transmission Line
- Pull Sites

Vegetation Community Surveys

- 1. Creosote Bush Scrub
- 3. Bare Ground
- 4. Mesquite Thickets
- 5. Arrow Weed Thickets
- 6. Open Water

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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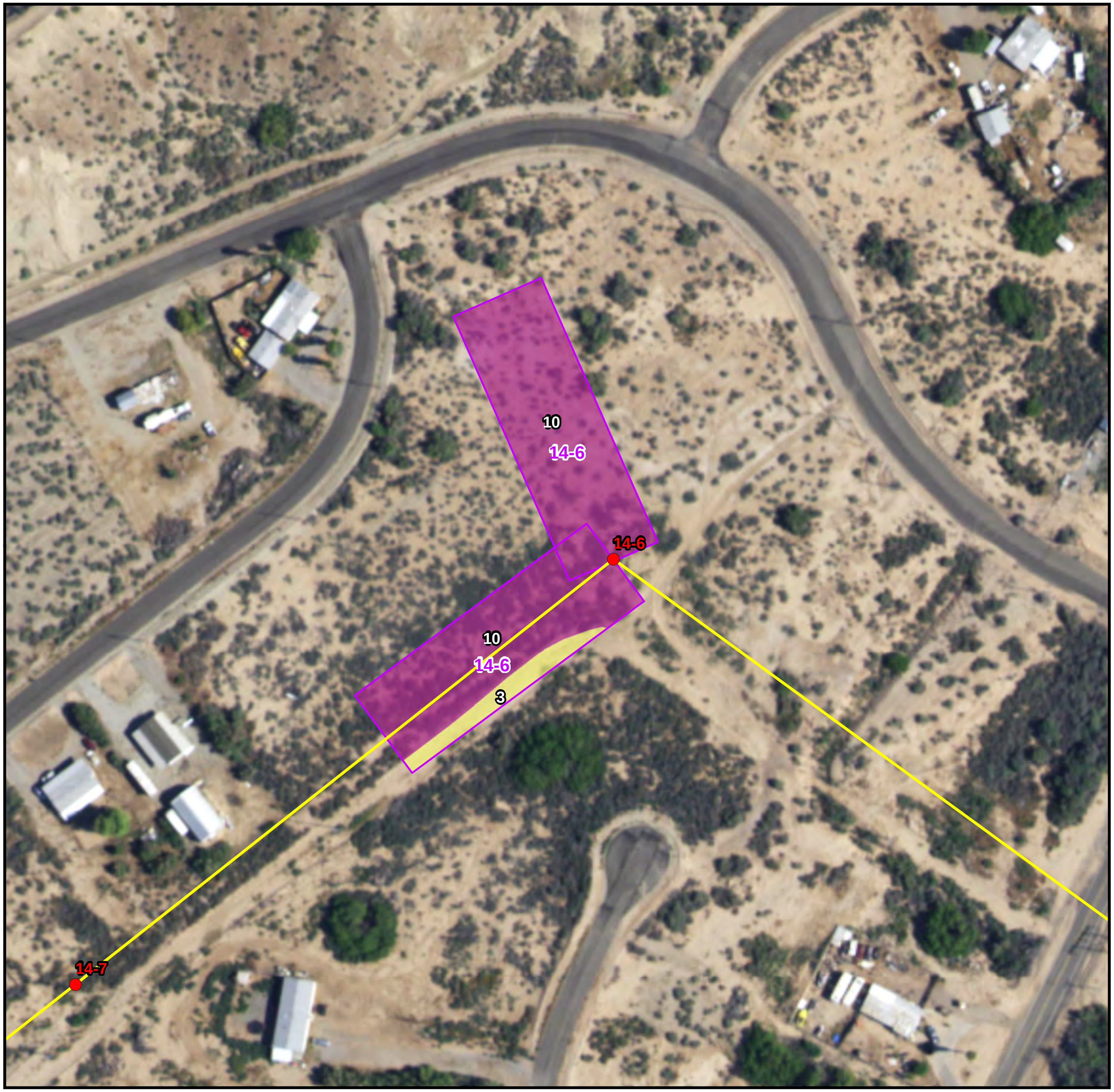
Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 14-6



Structures

Transmission Line

Pull Sites

Vegetation Community Surveys

3. Bare Ground

10. Iodine Bush Scrub

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 16-7

- Structures
- Transmission Line
- Pull Sites

Vegetation Community Surveys

- 3. Bare Ground
- 7. Tamarisk Thickets
- 8. Allscale Scrub
- 9. Disturbed

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 22-4

Structures

Transmission Line

Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub

3. Bare Ground

N

0 75 150 300

Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 25-1

Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub
2. Blue Palo Verde - Ironwood Woodland
4. Mesquite Thickets

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4

Vidal FOC

Vegetation Communities

Pull Site: 25-4

Structures

Transmission Line

Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub

2. Blue Palo Verde - Ironwood Woodland

N

0 75 150 300

Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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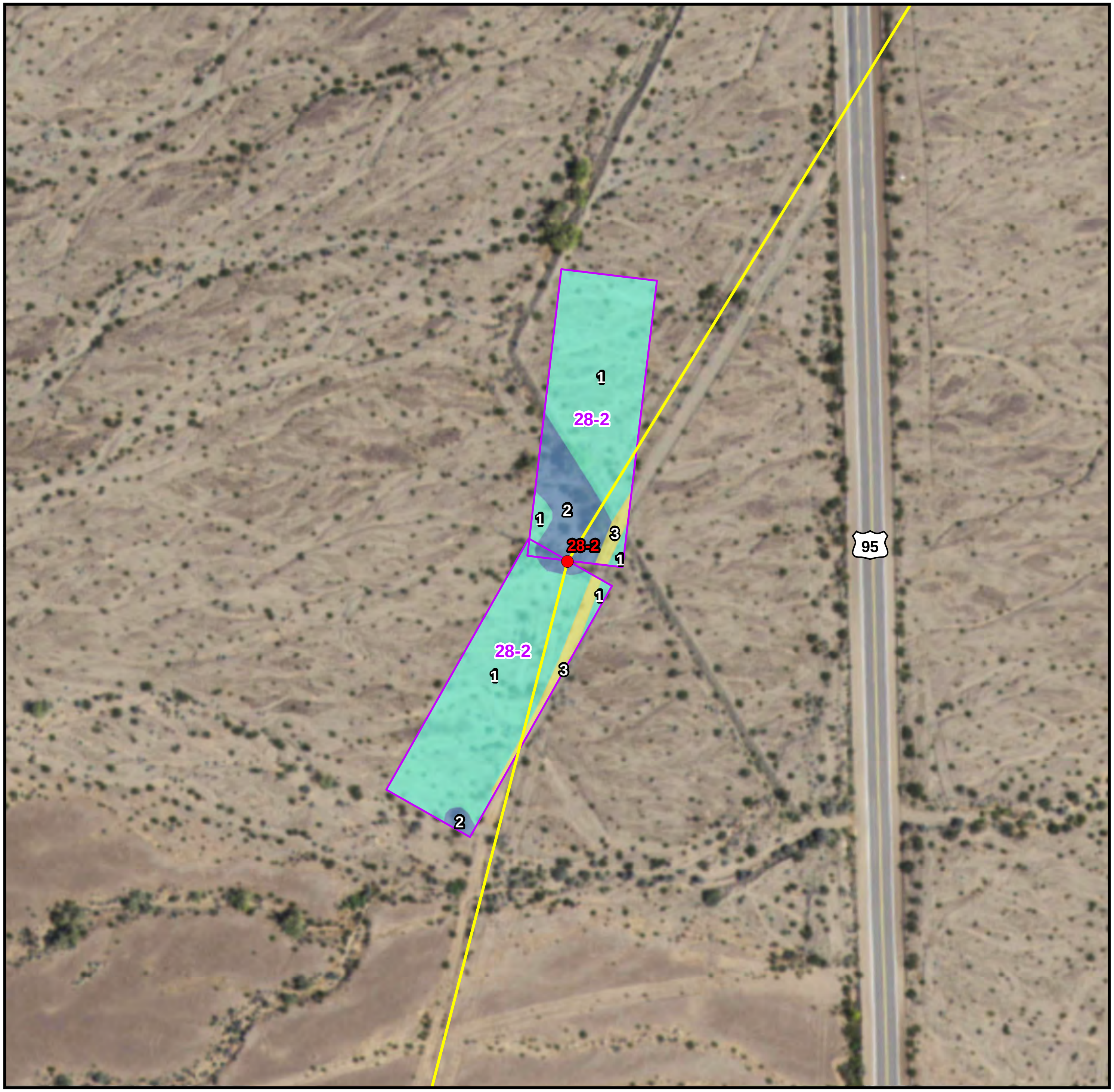
Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 28-2



Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub
2. Blue Palo Verde - Ironwood Woodland
3. Bare Ground

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4

Vidal FOC

Vegetation Communities

Pull Site: 29-3

Structures

Transmission Line

Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub
2. Blue Palo Verde - Ironwood Woodland
3. Bare Ground

N

0 75 150 300

Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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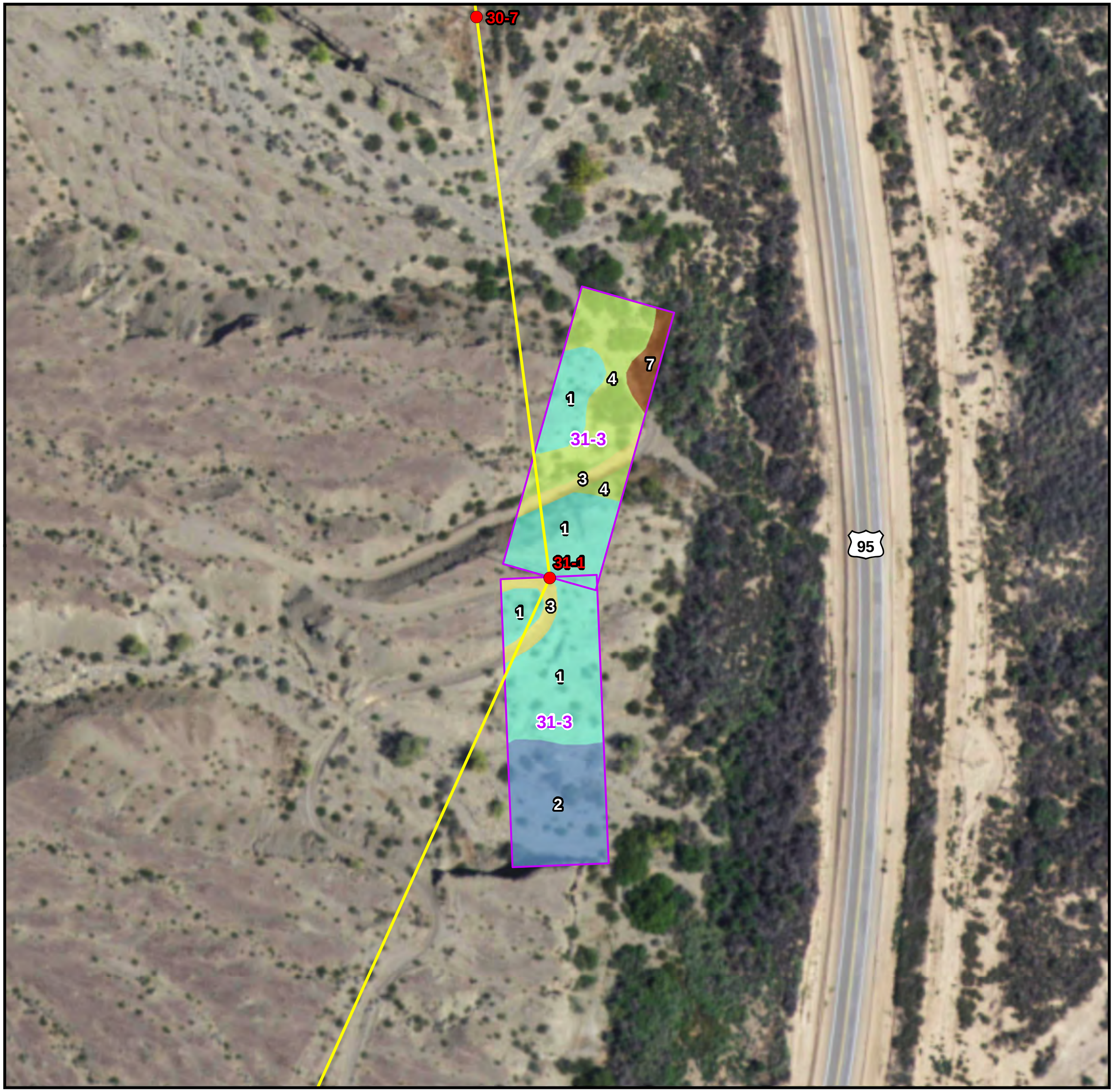

Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 31-3

- Structures
- Transmission Line
- Pull Sites

Vegetation Community Surveys

- 1. Creosote Bush Scrub
- 2. Blue Palo Verde - Ironwood Woodland
- 3. Bare Ground
- 4. Mesquite Thickets
- 7. Tamarisk Thickets

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 31-4

Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub
3. Bare Ground

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 32-6

Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub
3. Bare Ground

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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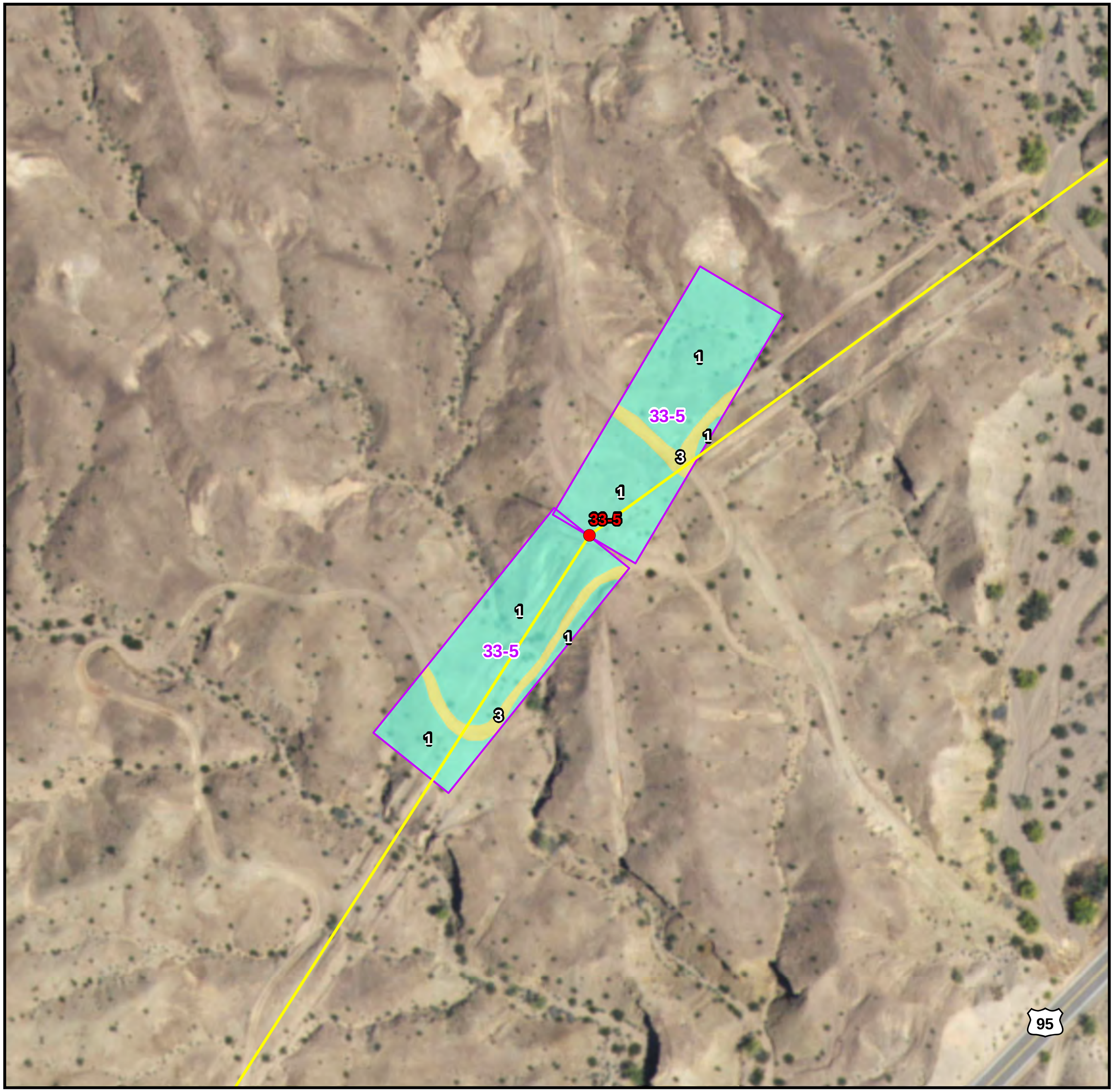
Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 33-5



Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub

3. Bare Ground

N

0 75 150 300

Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 36-3

Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub
2. Blue Palo Verde - Ironwood Woodland
3. Bare Ground

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 37-4

Structures

Transmission Line

Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub

2. Blue Palo Verde - Ironwood Woodland

3. Bare Ground

N

0 75 150 300

Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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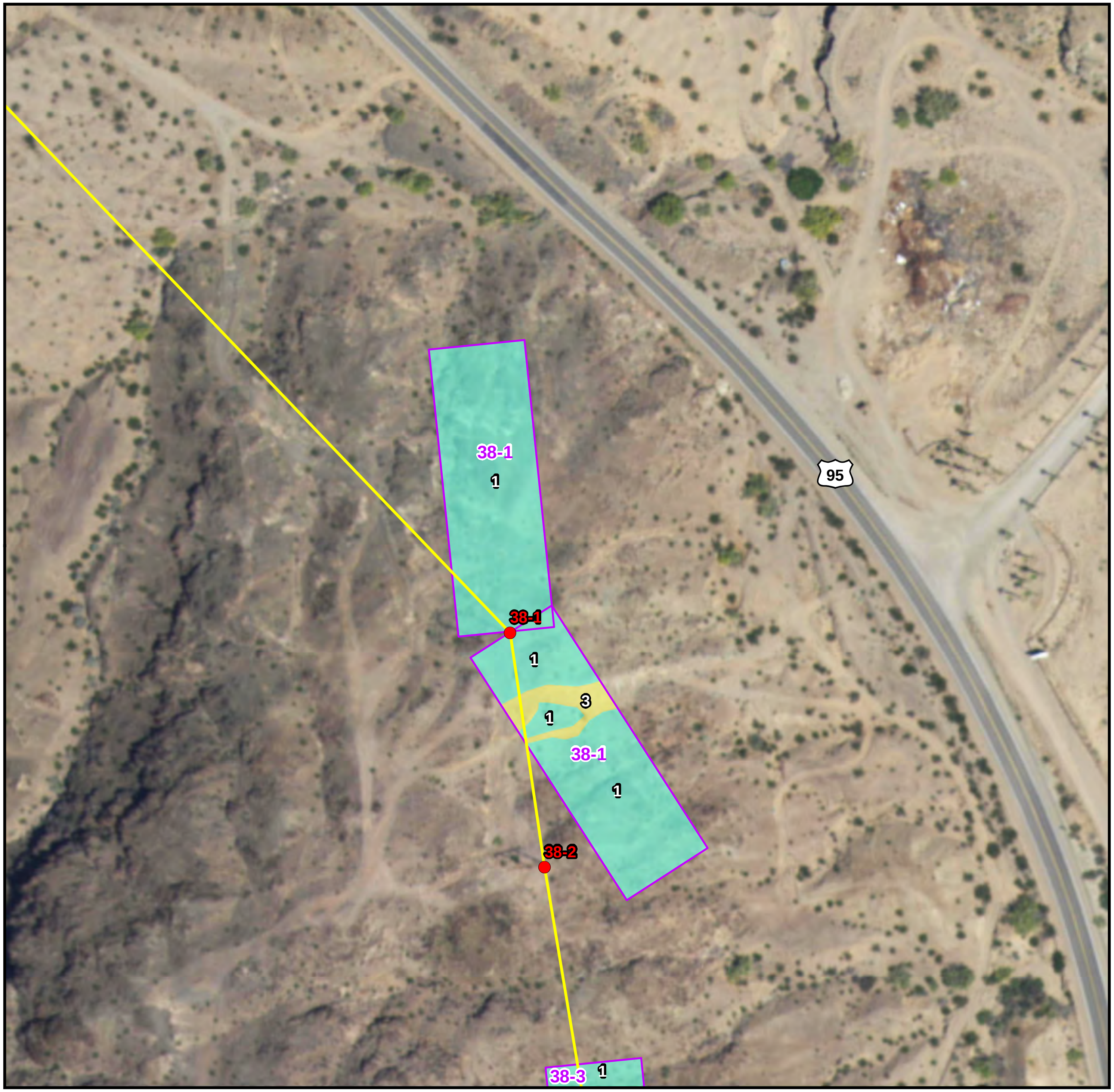

Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 38-1

Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub
3. Bare Ground

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 38-3

Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub
3. Bare Ground

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 44-1

Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub
2. Blue Palo Verde - Ironwood Woodland
3. Bare Ground

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 49-4

- Structures
- Transmission Line
- Pull Sites

Vegetation Community Surveys

- 3. Bare Ground
- 5. Arrow Weed
- 7. Tamarisk Thickets
- 10. Iodine Bush Scrub

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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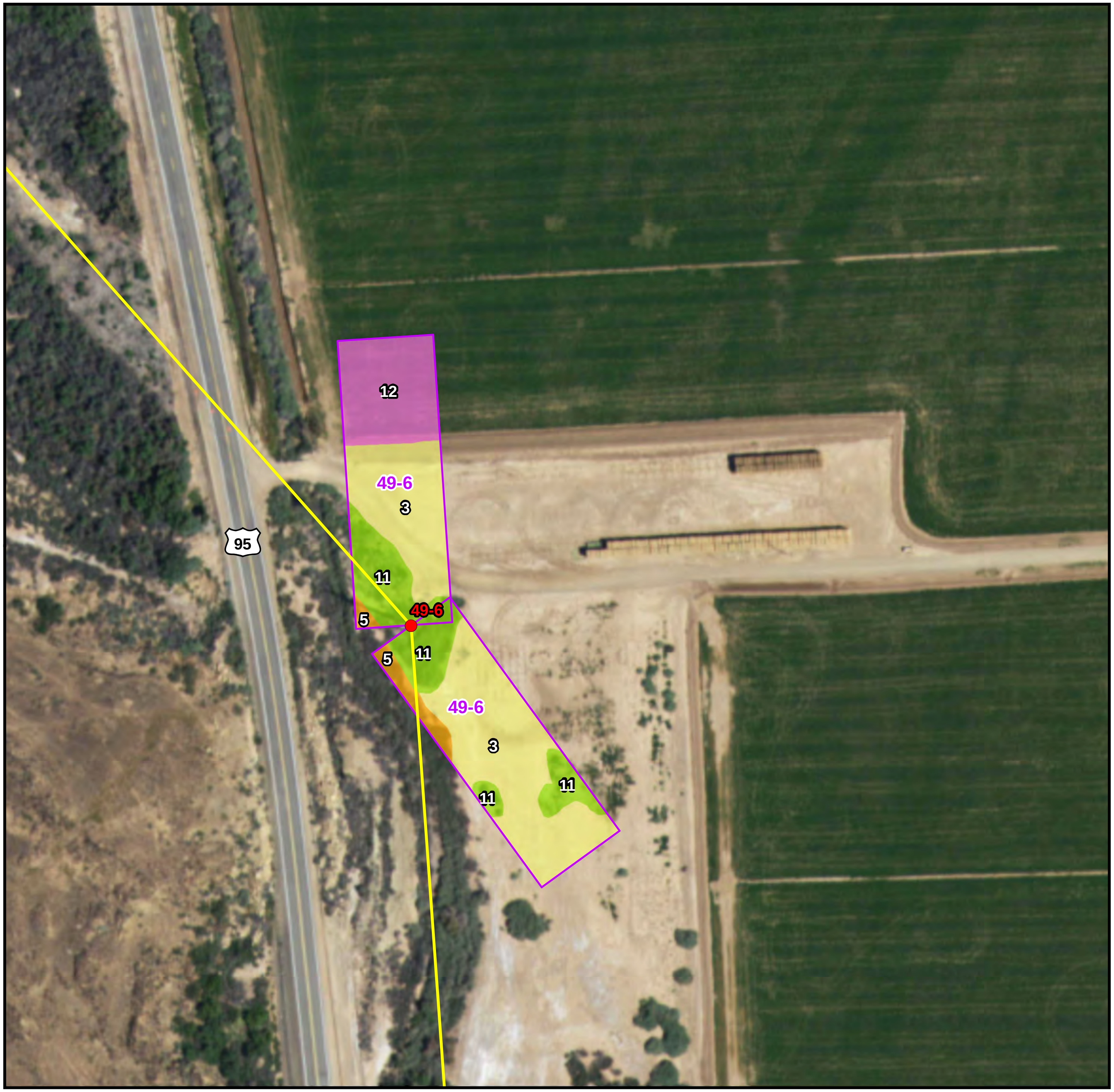

Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 49-6

Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

3. Bare Ground
5. Arrow Weed Thickets
11. Quail Bush Scrub
12. Agriculture/Ornamental

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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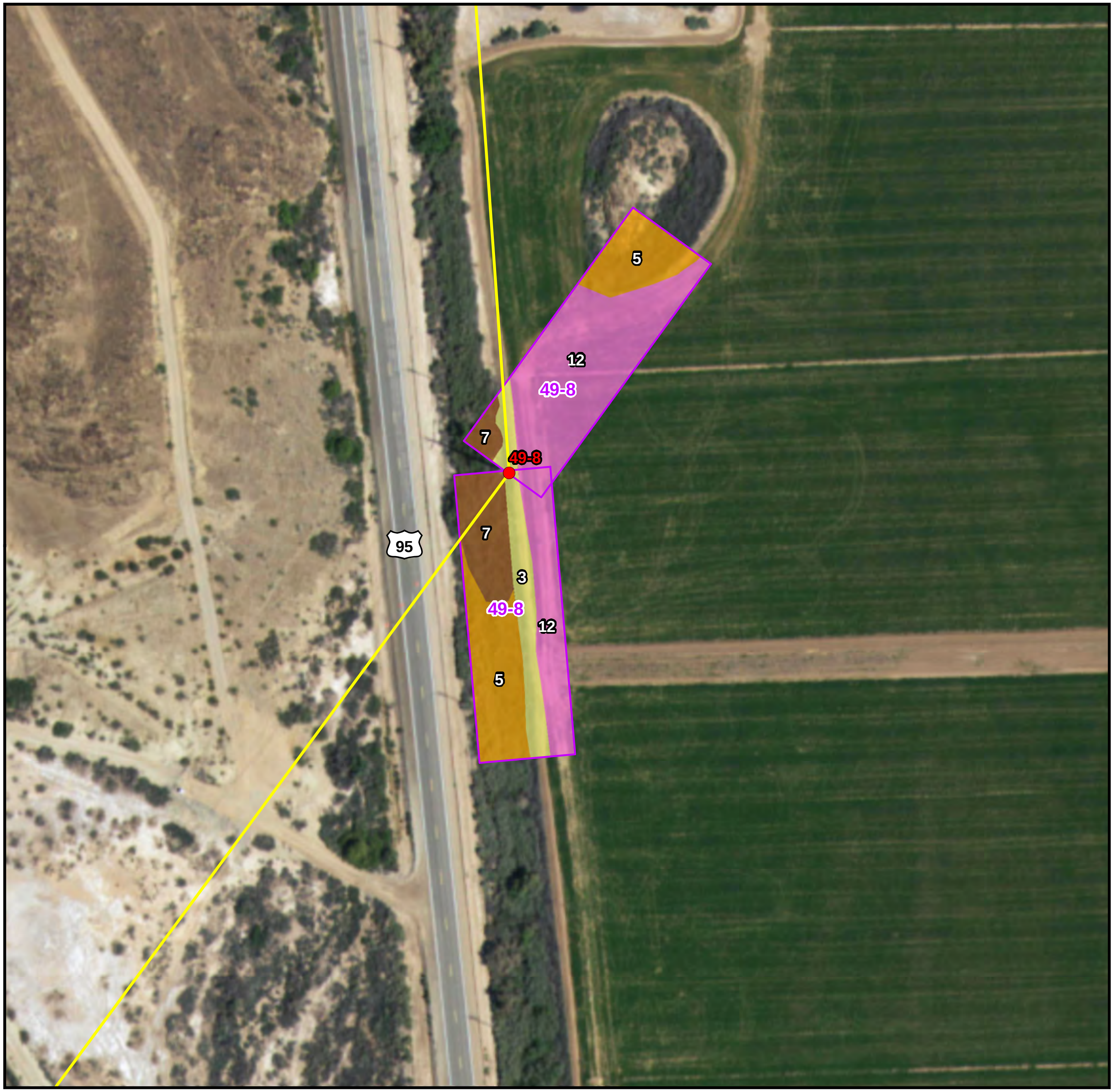

Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 49-8

- Structures
- Transmission Line
- Pull Sites

Vegetation Community Surveys

- 3. Bare Ground
- 5. Arrow Weed Thickets
- 7. Tamarisk Thickets
- 12. Agriculture/Ornamental

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 50-2

Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub
3. Bare Ground
13. Brittle Brush Scrub
14. Creosote Bush - Brittle Bush Scrub

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 52-4

Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub
3. Bare Ground

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
Print Date: 7/6/2022 6:23:40 PM Author: pcarlos

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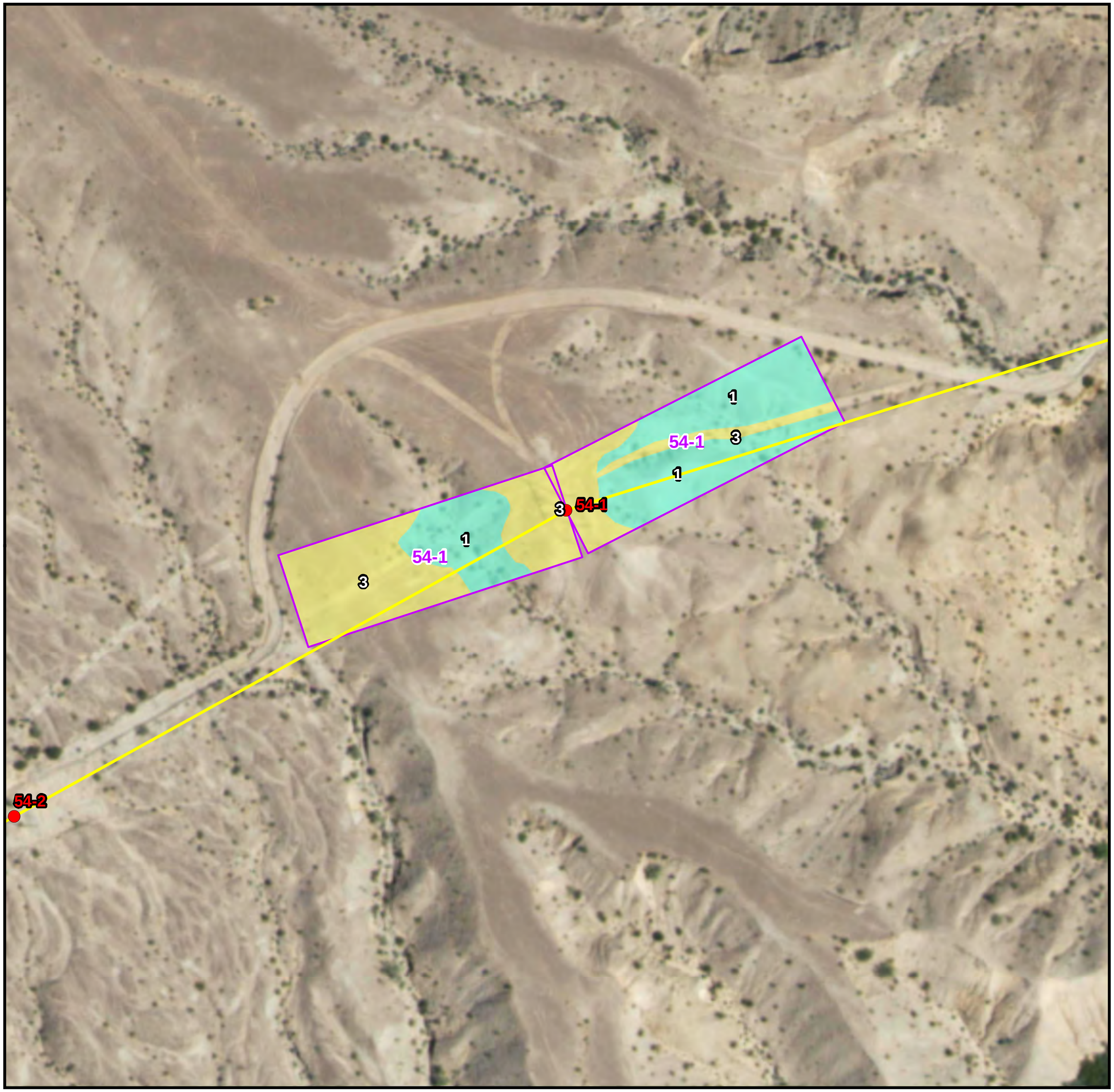
Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 54-1



Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub

3. Bare Ground

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 58-5

Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub
3. Bare Ground

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 59-2

Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

3. Bare Ground
8D. Disturbed Allscale Scrub
12. Agriculture/Ornamental

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
Print Date: 7/6/2022 6:23:40 PM Author: pcarlos

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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 59-6

Structures
Transmission Line
Pull Sites

Vegetation Community Surveys

1. Creosote Bush Scrub
3. Bare Ground
12. Agriculture/Ornamental

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
Print Date: 7/6/2022 6:23:40 PM Author: pcarlos

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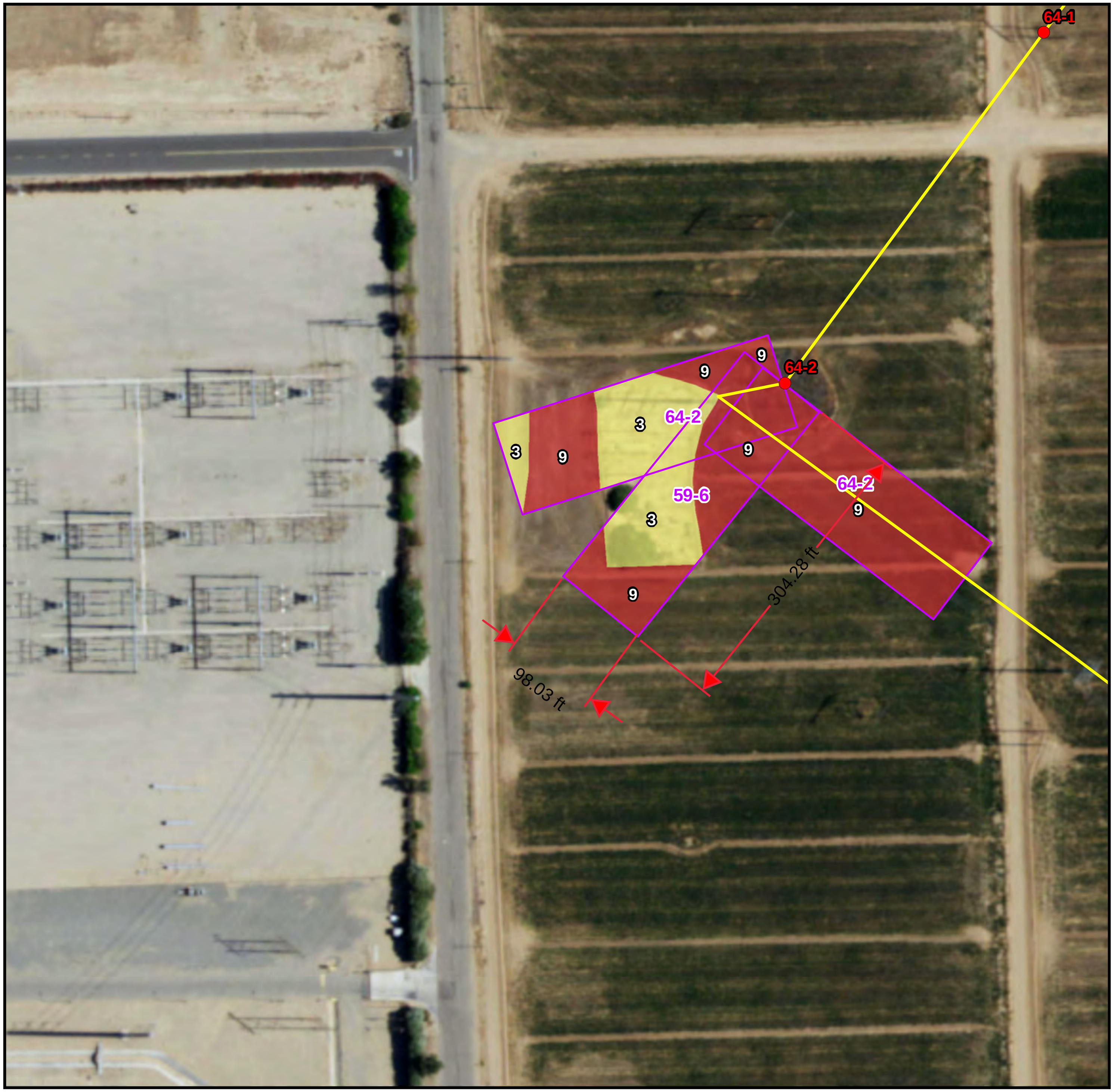
Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 64-2, 59-6



- Structures
- Transmission Line
- Pull Sites

Vegetation Community Surveys

- 3. Bare Ground
- 9. Disturbed

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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Figure 4
Vidal FOC
Vegetation Communities
Pull Site: 64-4

Transmission Line
Pull Sites

Vegetation Community Surveys

3. Bare Ground
9. Disturbed

N

0 75 150 300
Feet

Name: 21232 BIO Fig 4 Vegetation Communities.Mxd
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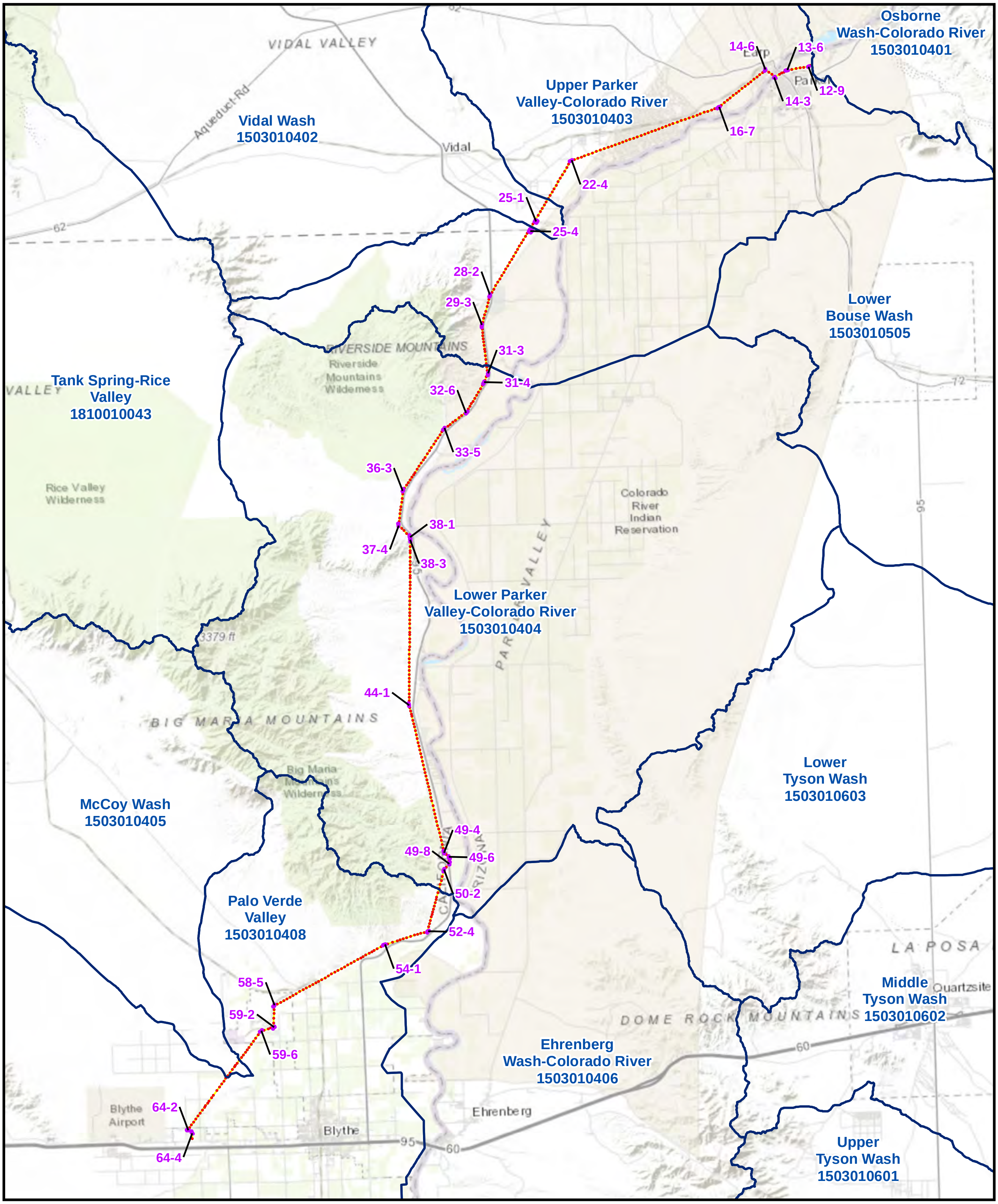

Structures
Transmission Line
Pull Sites
Watershed (HUC 10)

N

0 1.75 3.5 7
Miles

Figure 5
Vidal Energy FOC
Watersheds

Name: 21232 BIO Fig 5 Watersheds.Mxd
Print Date: 7/4/2022, Author: pcarlos

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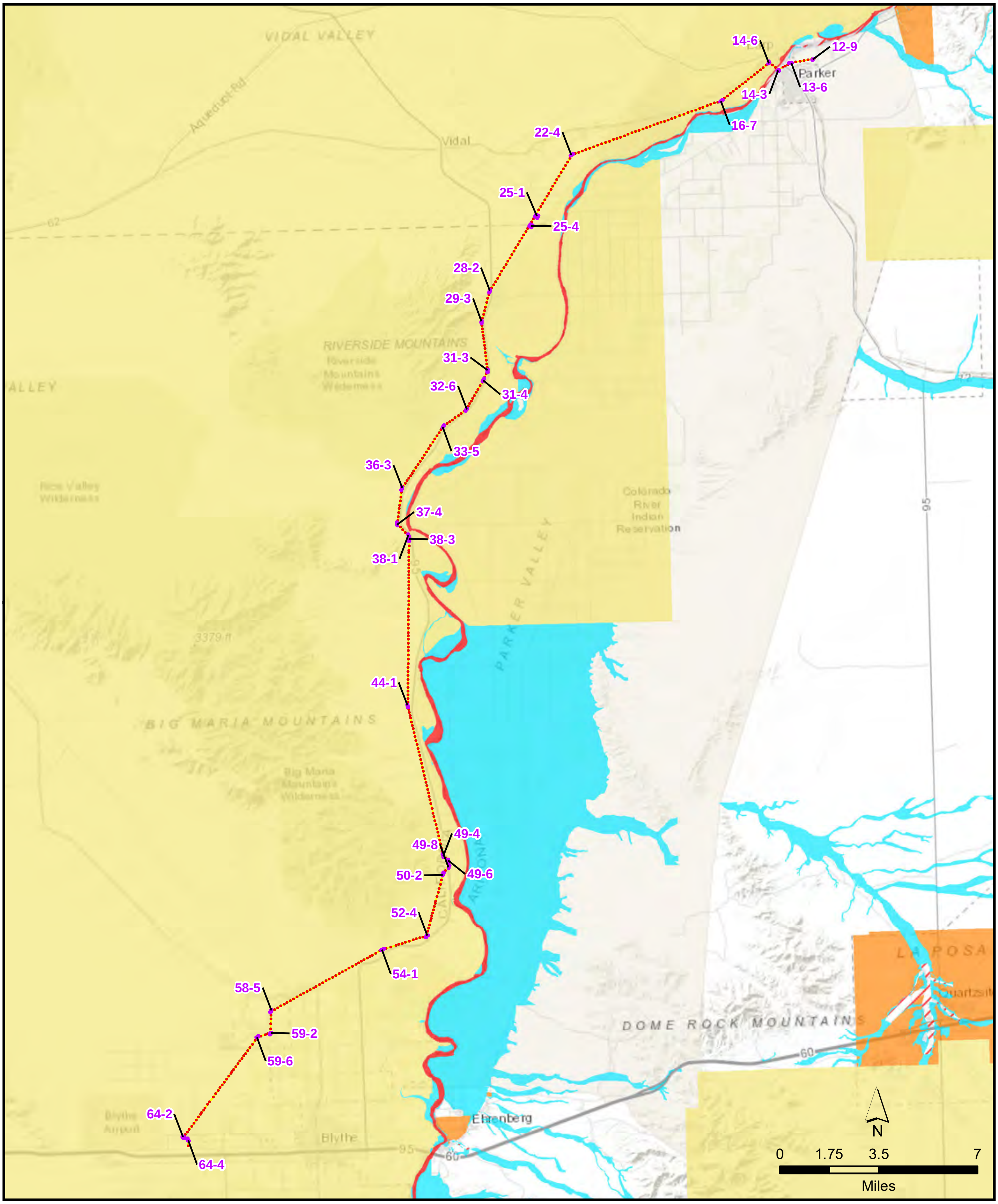

● Structures — Transmission Line ▭ Pull Sites

FEMA Flood Hazard Zones

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard

Figure 6
Vidal Energy FOC
FEMA Flood Hazard Zones

Name: 21232 BIO Fig 6 FEMA Flood Hazard Zones.Mxd
Print Date: 7/5/2022, Author: pcarlos

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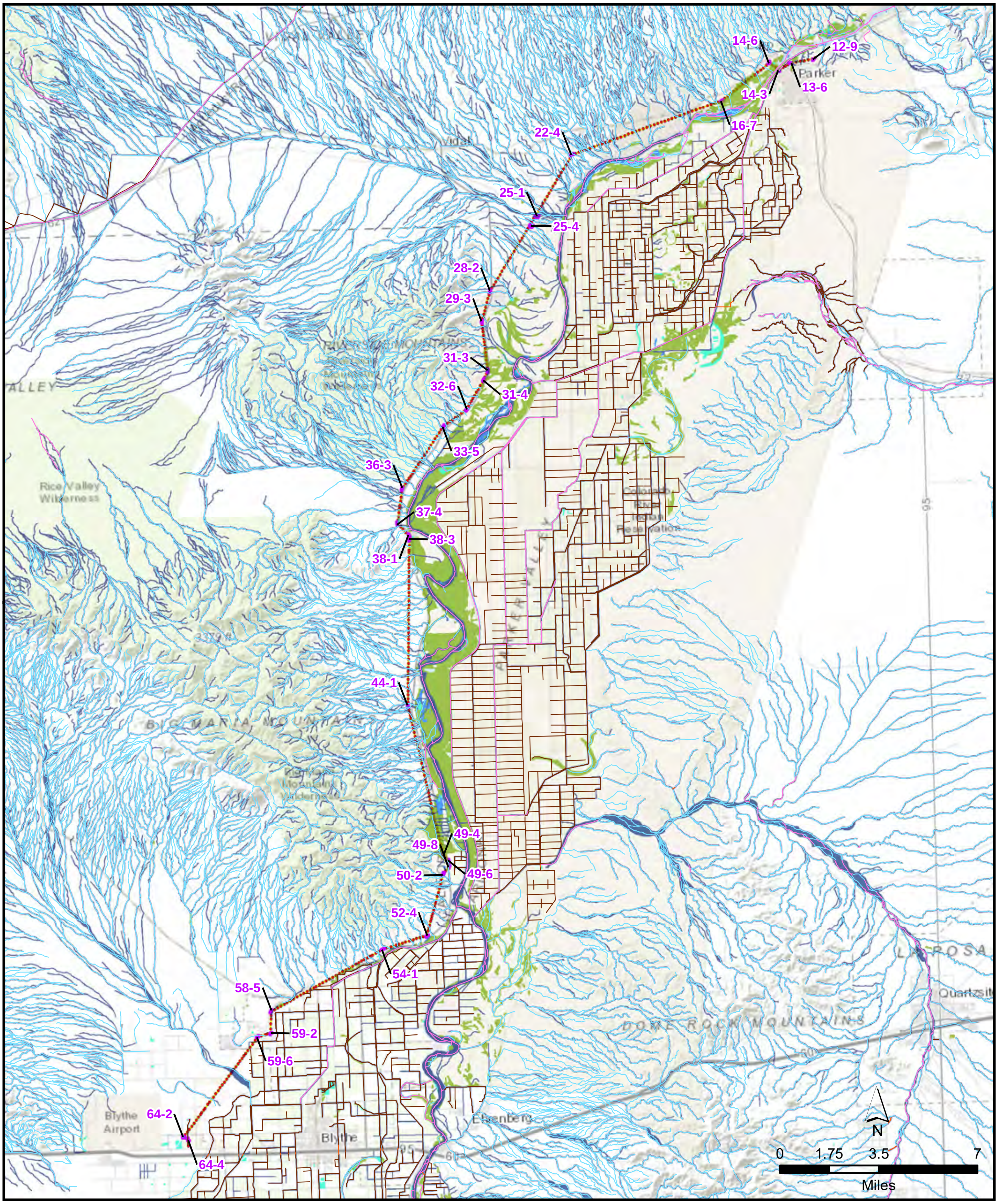

● Structures — Transmission Line — Pull Sites

NHD

- Artificial Path
- Connector
- Stream/River
- Canal/Ditch
- Pipeline

NWI

- Freshwater Emergent Wetland
- Freshwater Pond
- Riverine
- Freshwater Forested/Shrub Wetland
- Lake

Figure 7
Vidal Energy FOC
Jurisdictional Waters NWI and NHD

Name: 21232 BIO Fig 7 Jurisdictional Waters NWI and NHD.Mxd
Print Date: 7/5/2022, Author: pcarlos

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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 12-9

- Structures
- Pull Sites
- Transmission Line

NWI

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results

- Bank to Bank
- Wetland Results

Non-Jurisdictional Features

- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
Print Date: 7/7/2022 10:35:15 AM Author: pcarlos

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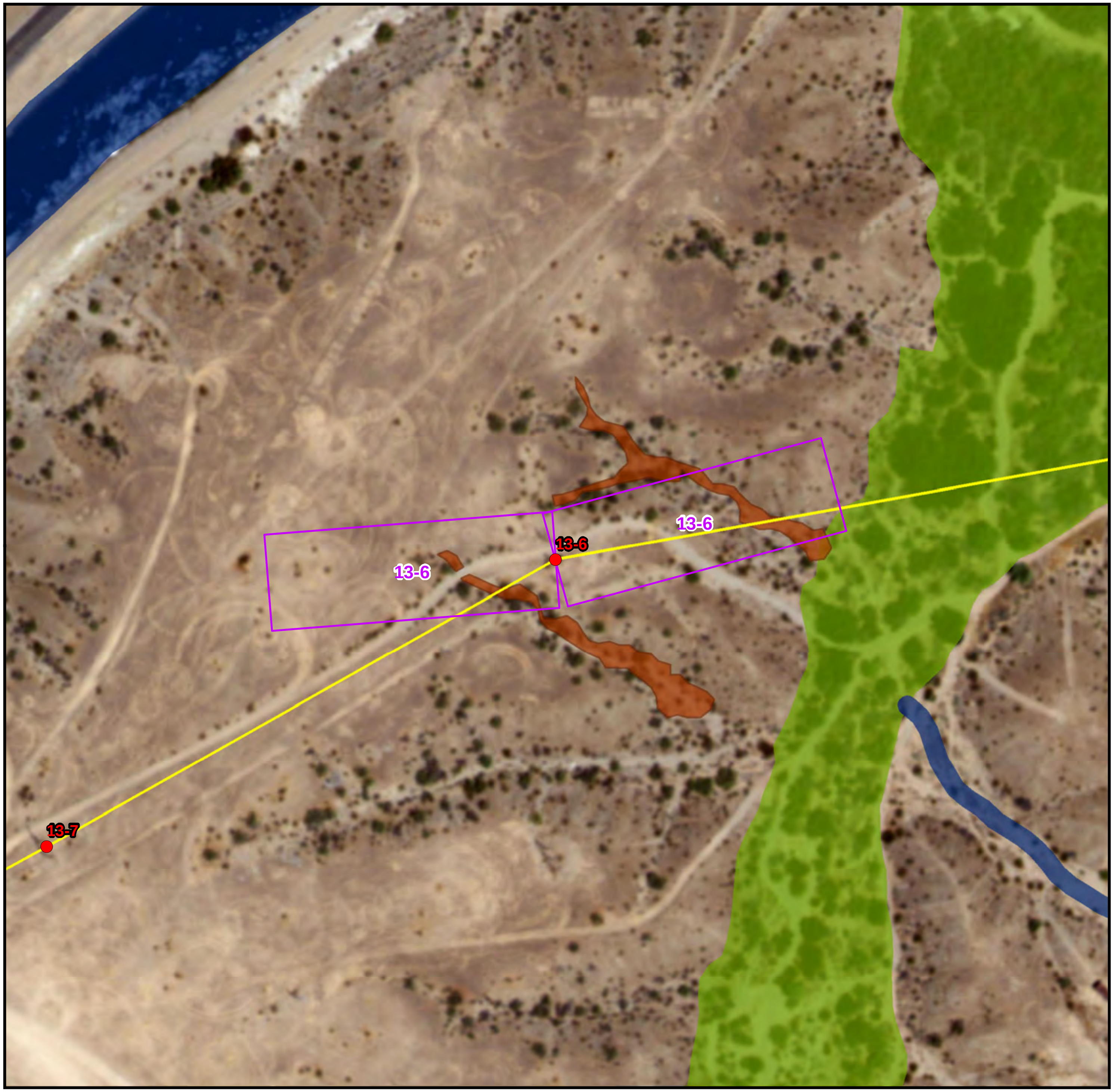
Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 13-6



- Structures
- Pull Sites
- Transmission Line

NWI

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results

- Bank to Bank
- Wetland Results

Non-Jurisdictional Features

- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 14-3

Structures
Pull Sites
Transmission Line

NWI

Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine

Jurisdictional Delineation Results

Bank to Bank
Wetland Results

Non-Jurisdictional Features

Erosional Feature
Man-made Berm
Culvert
No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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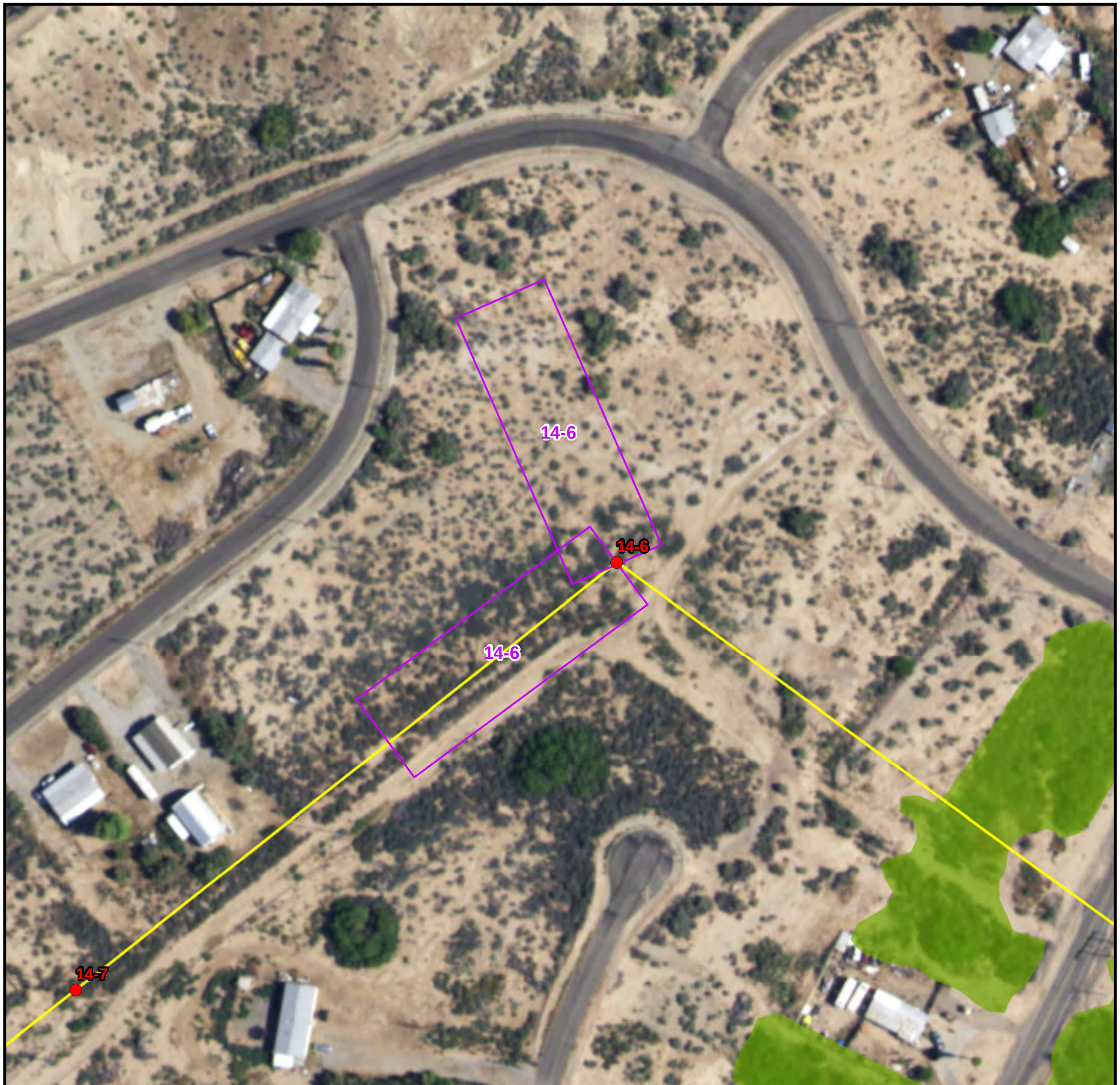
Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 14-6



- Structures
- Pull Sites
- Transmission Line

NWI
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results
- Bank to Bank
- Wetland Results

Non-Jurisdictional Features
- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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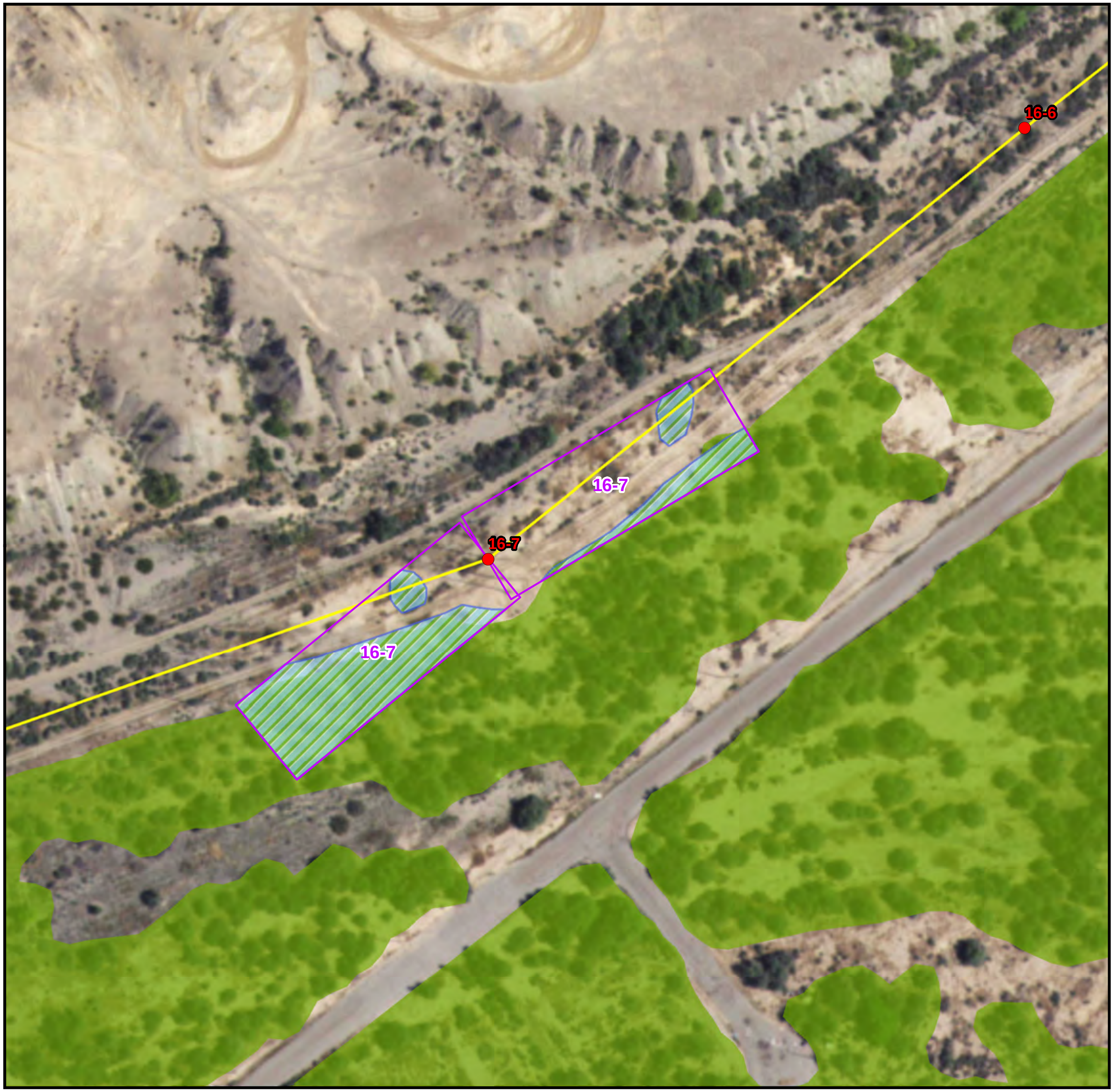

Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 16-7

- Structures
- Pull Sites
- Transmission Line

NWI
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results
- Bank to Bank
- Wetland Results

Non-Jurisdictional Features
- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 22-4

- Structures
- Pull Sites
- Transmission Line

NWI

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results

- Bank to Bank
- Wetland Results

Non-Jurisdictional Features

- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
Print Date: 7/7/2022 10:35:15 AM Author: pcarlos

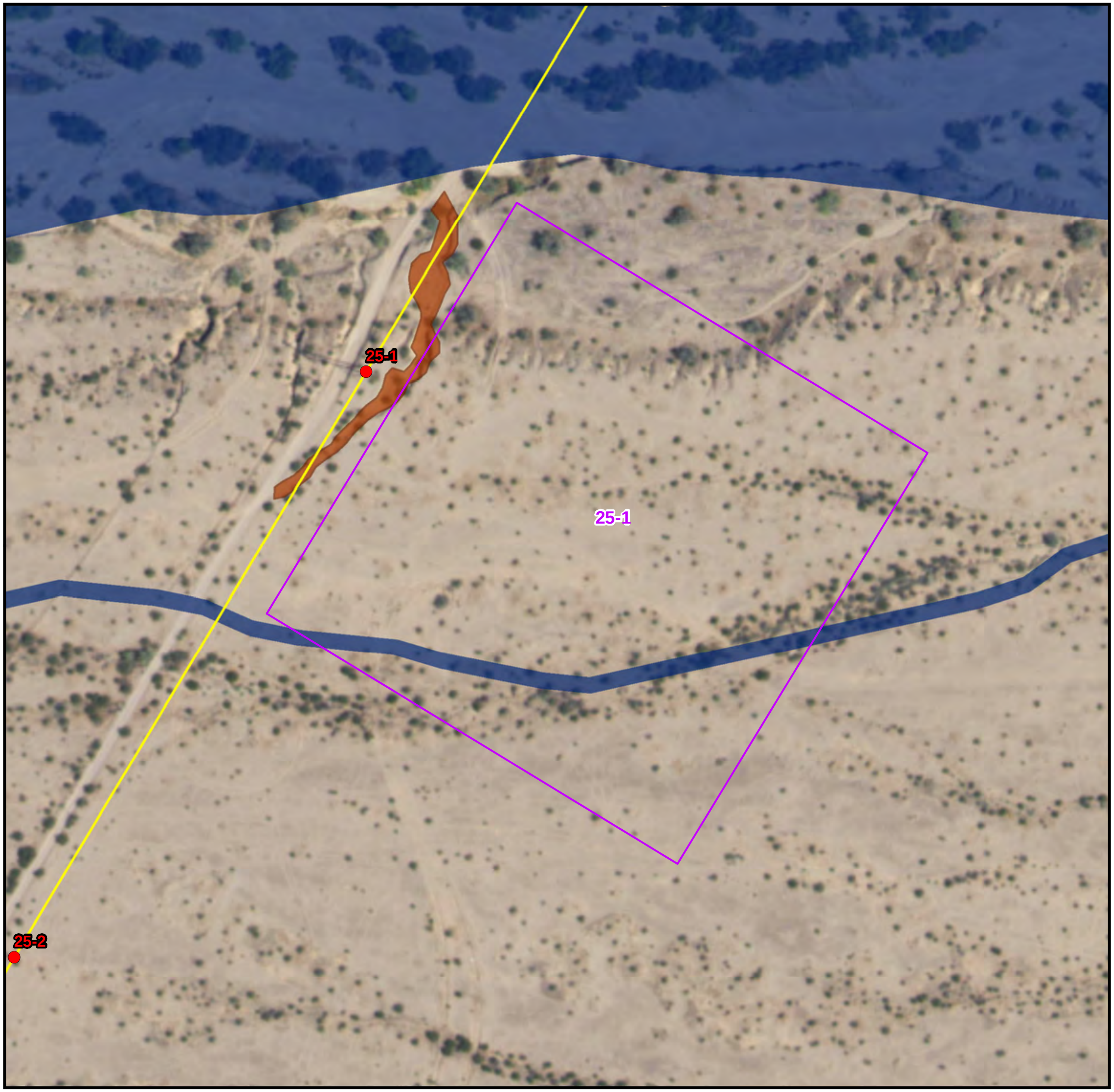

Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 25-1

- Structures
- Pull Sites
- Transmission Line

NWI
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results
- Bank to Bank
- Wetland Results

Non-Jurisdictional Features
- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 25-4

Structures
Pull Sites
Transmission Line

NWI

Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine

Jurisdictional Delineation Results

Bank to Bank
Wetland Results

Non-Jurisdictional Features

Erosional Feature
Man-made Berm
Culvert
No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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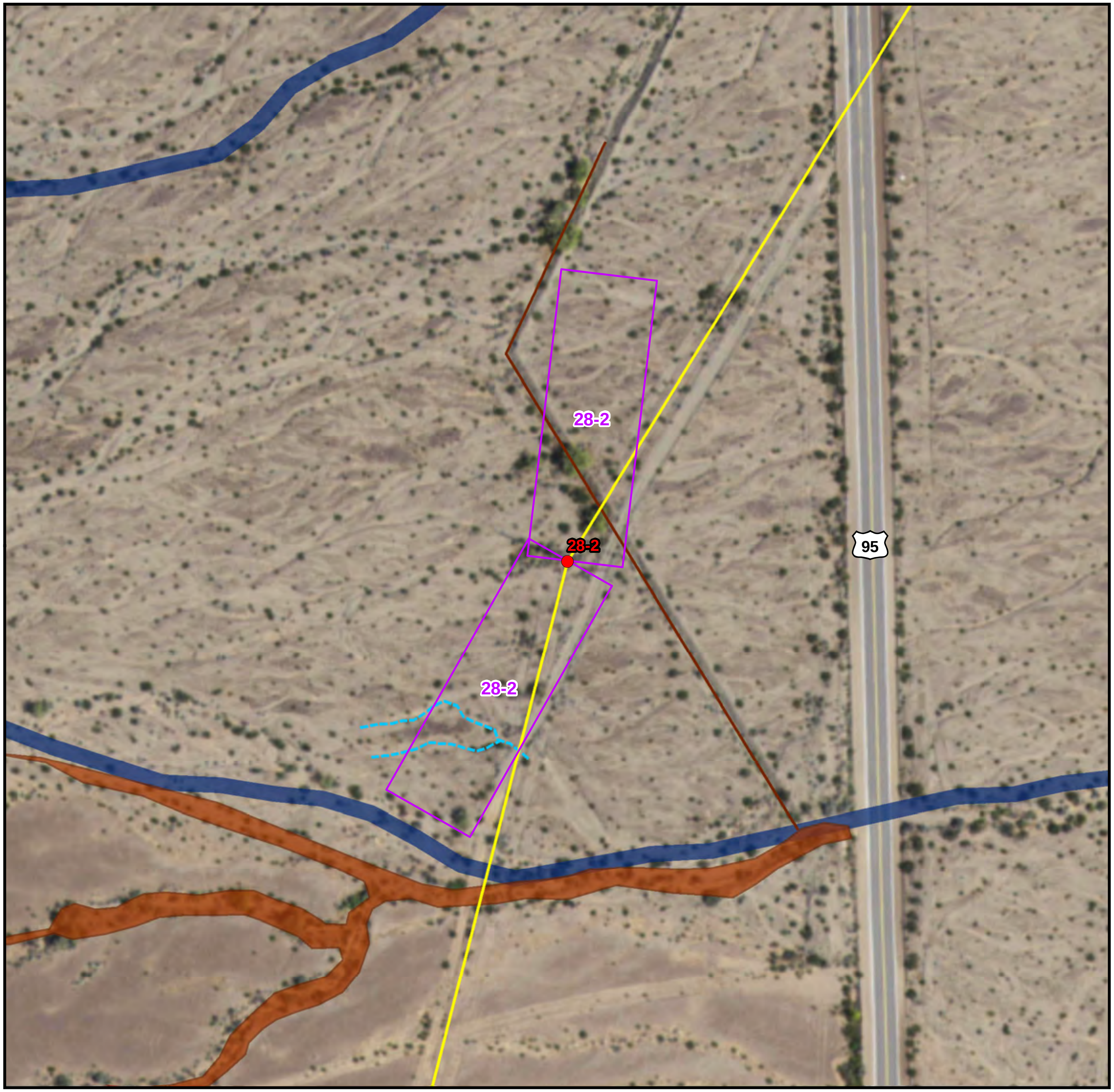

Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 28-2

- Structures
- Pull Sites
- Transmission Line

NWI
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results
- Bank to Bank
- Wetland Results

Non-Jurisdictional Features
- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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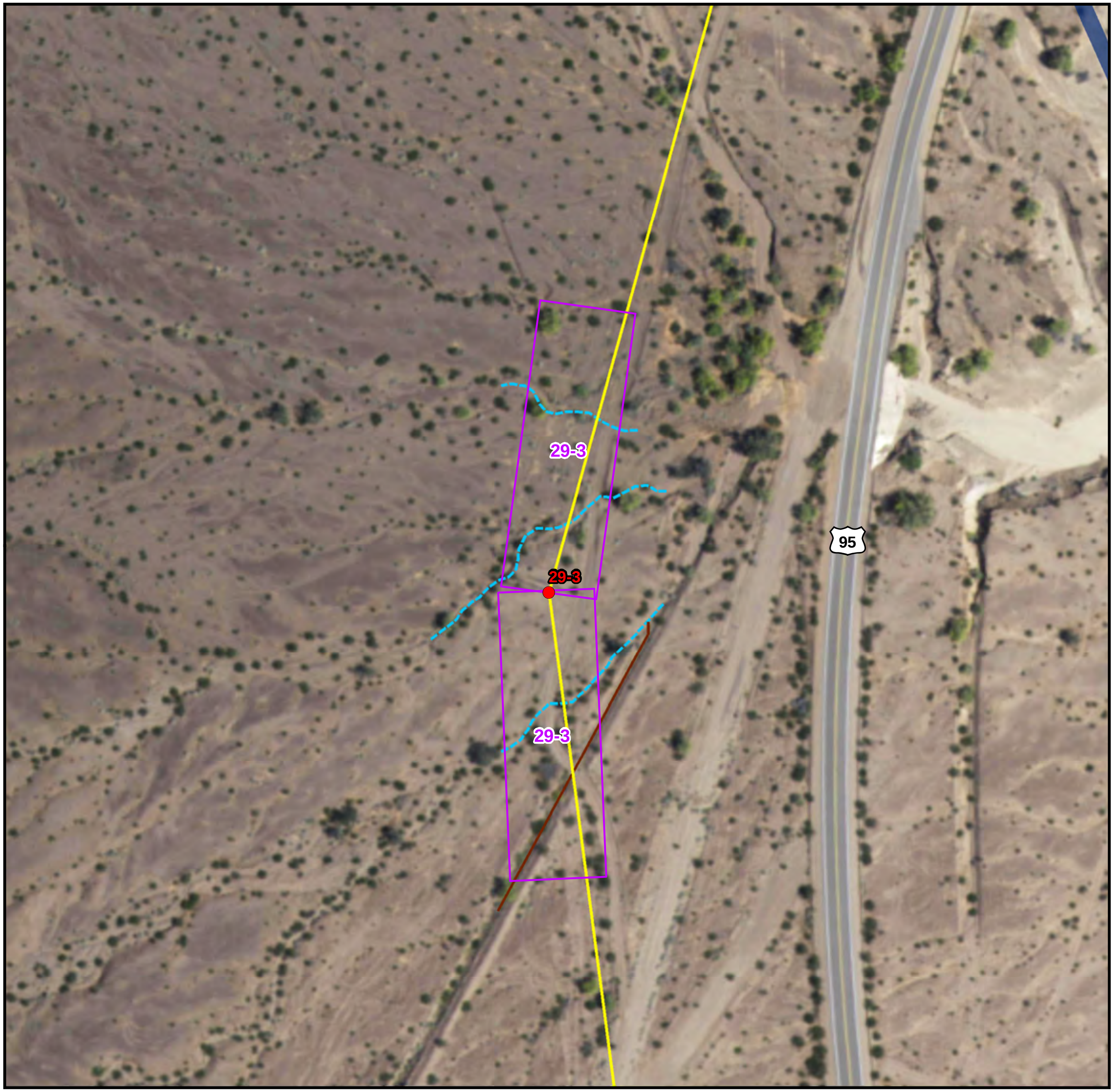

Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 29-3

- Structures
- Pull Sites
- Transmission Line

NWI

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results

- Bank to Bank
- Wetland Results

Non-Jurisdictional Features

- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 31-3

Structures
Pull Sites
Transmission Line

NWI

Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine

Jurisdictional Delineation Results

Bank to Bank
Wetland Results

Non-Jurisdictional Features

Erosional Feature
Man-made Berm
Culvert
No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 31-4

- Structures
- Pull Sites
- Transmission Line

NWI

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results

- Bank to Bank
- Wetland Results

Non-Jurisdictional Features

- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 32-6

- Structures
- Pull Sites
- Transmission Line

NWI

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results

- Bank to Bank
- Wetland Results

Non-Jurisdictional Features

- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 33-5

- Structures
- Pull Sites
- Transmission Line

NWI
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results
- Bank to Bank
- Wetland Results

Non-Jurisdictional Features
- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 36-3

Structures
Pull Sites
Transmission Line

NWI

Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine

Jurisdictional Delineation Results

Bank to Bank
Wetland Results

Non-Jurisdictional Features

Erosional Feature
Man-made Berm
Culvert
No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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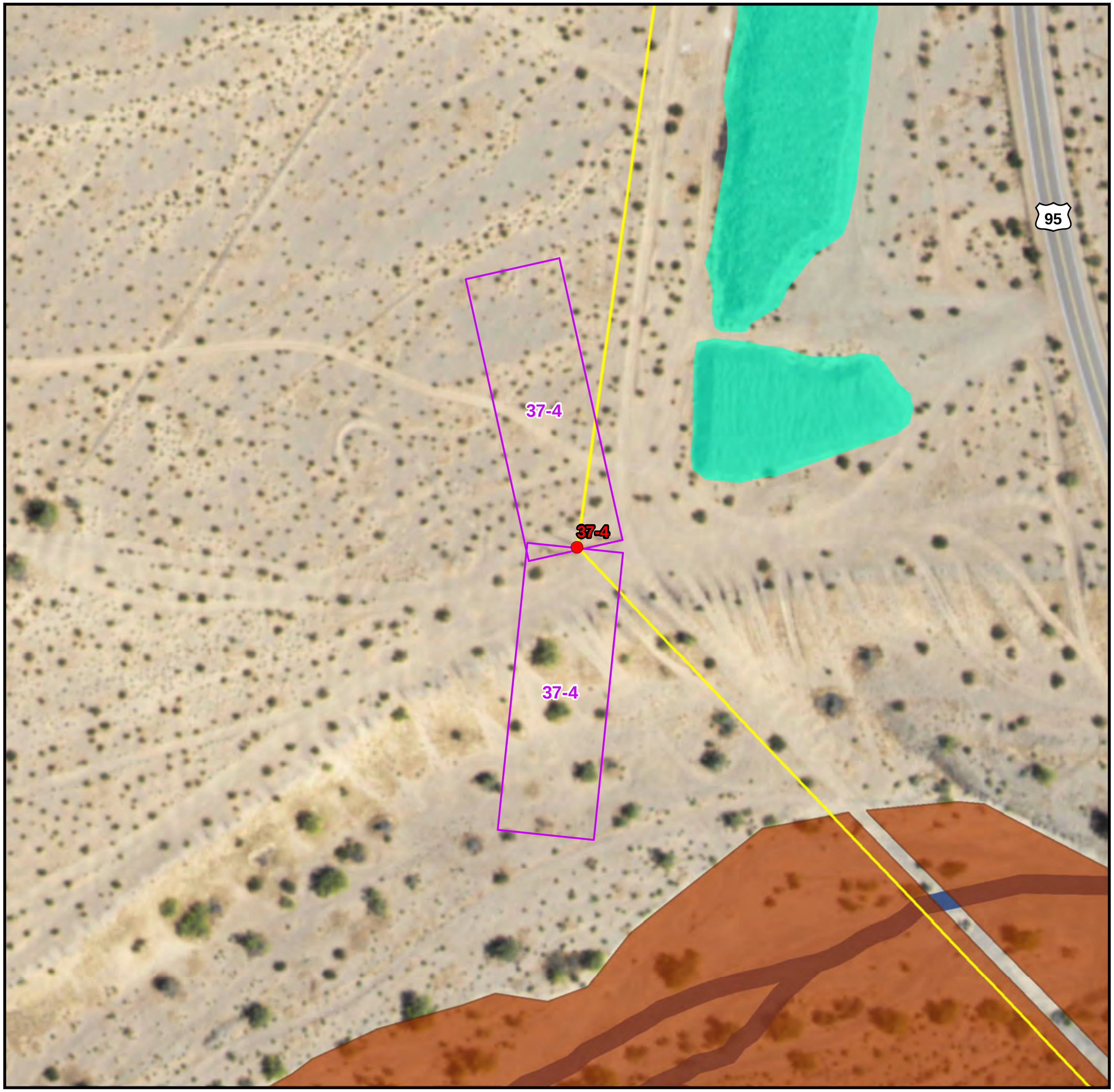
Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 37-4



- Structures
- Pull Sites
- Transmission Line

NWI
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results
- Bank to Bank
- Wetland Results

Non-Jurisdictional Features
- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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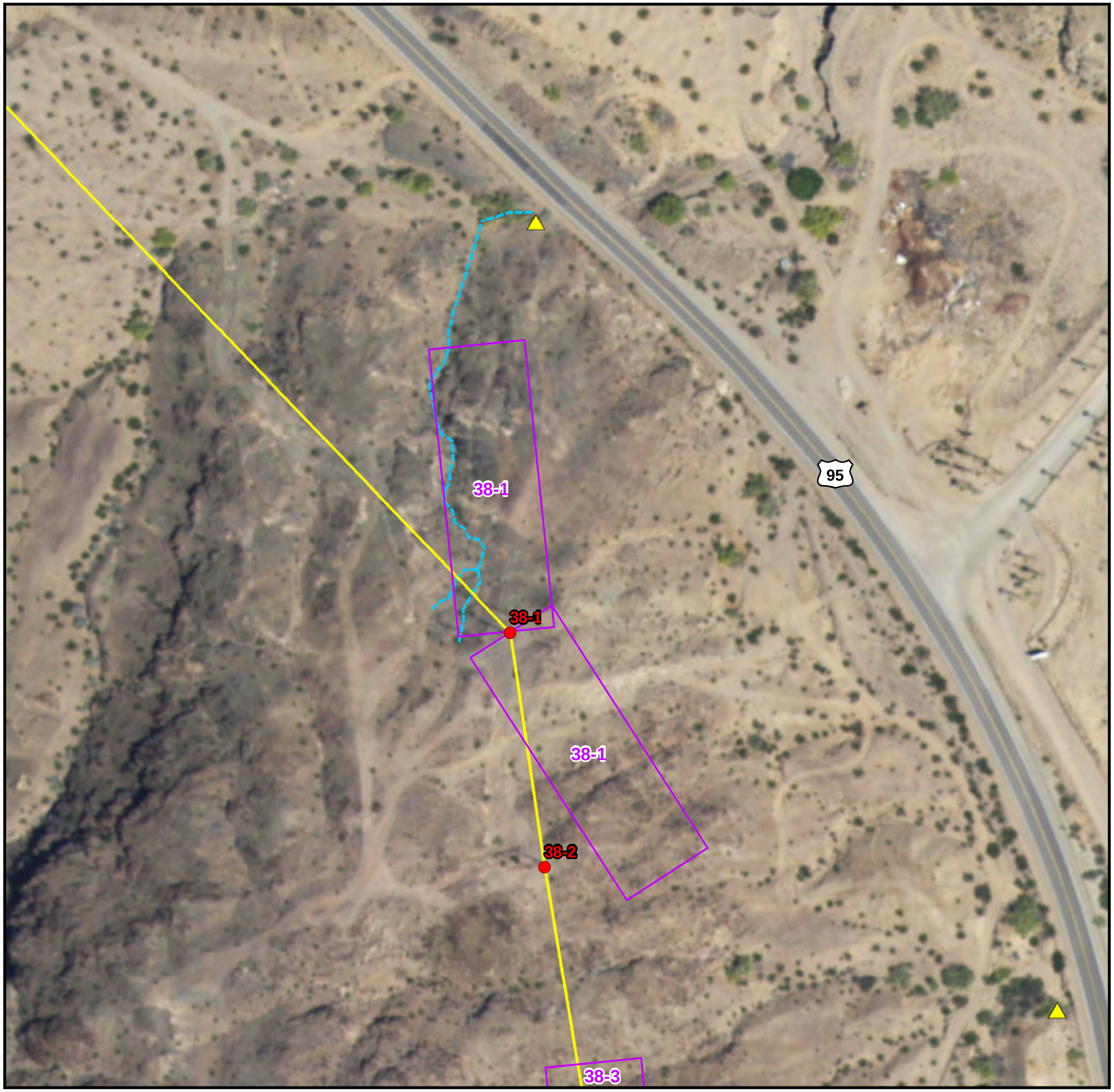
Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 38-1



Structures
Pull Sites
Transmission Line

NWI

Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine

Jurisdictional Delineation Results

Bank to Bank
Wetland Results

Non-Jurisdictional Features

Erosional Feature
Man-made Berm
Culvert
No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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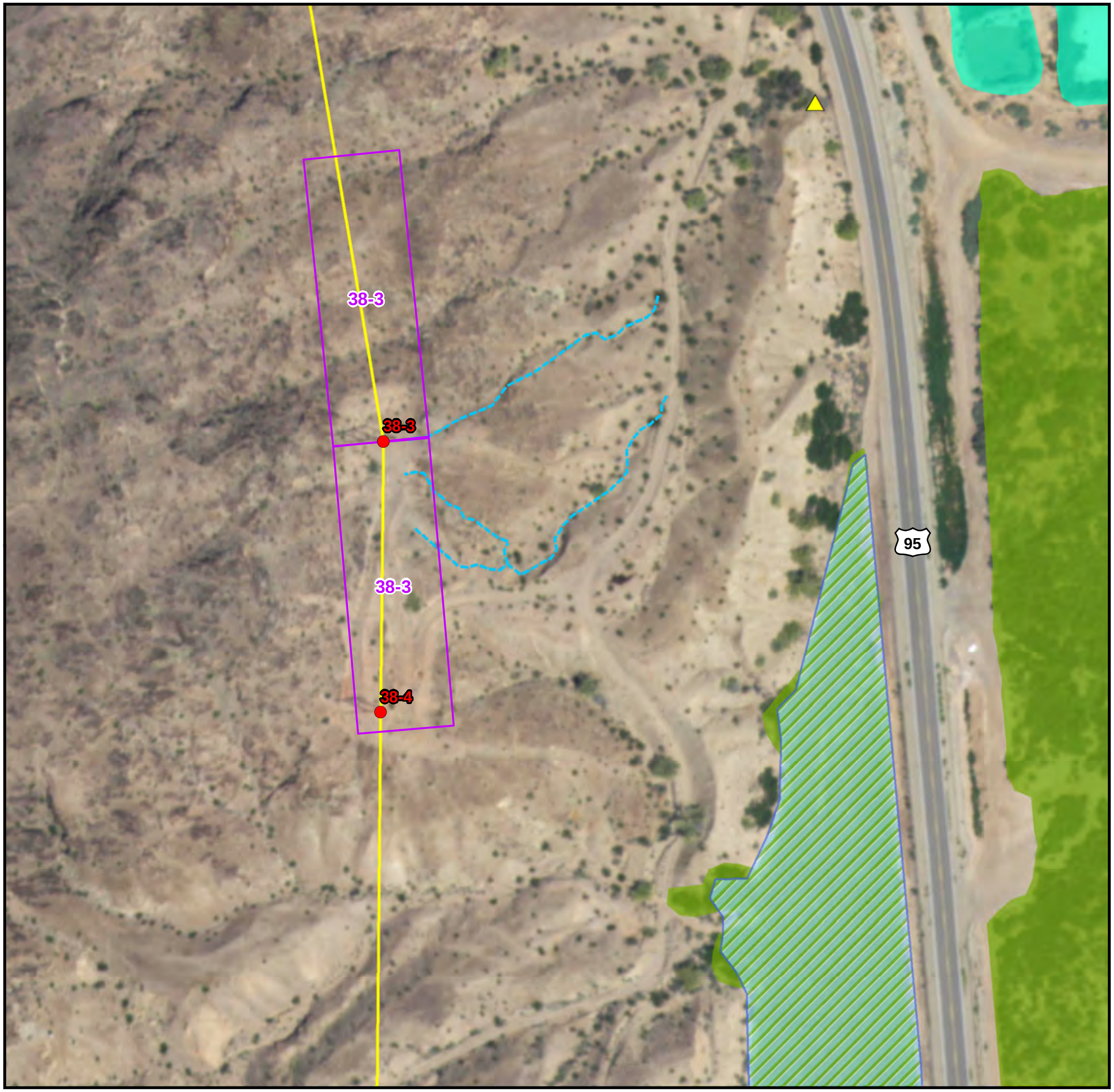
Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 38-3



Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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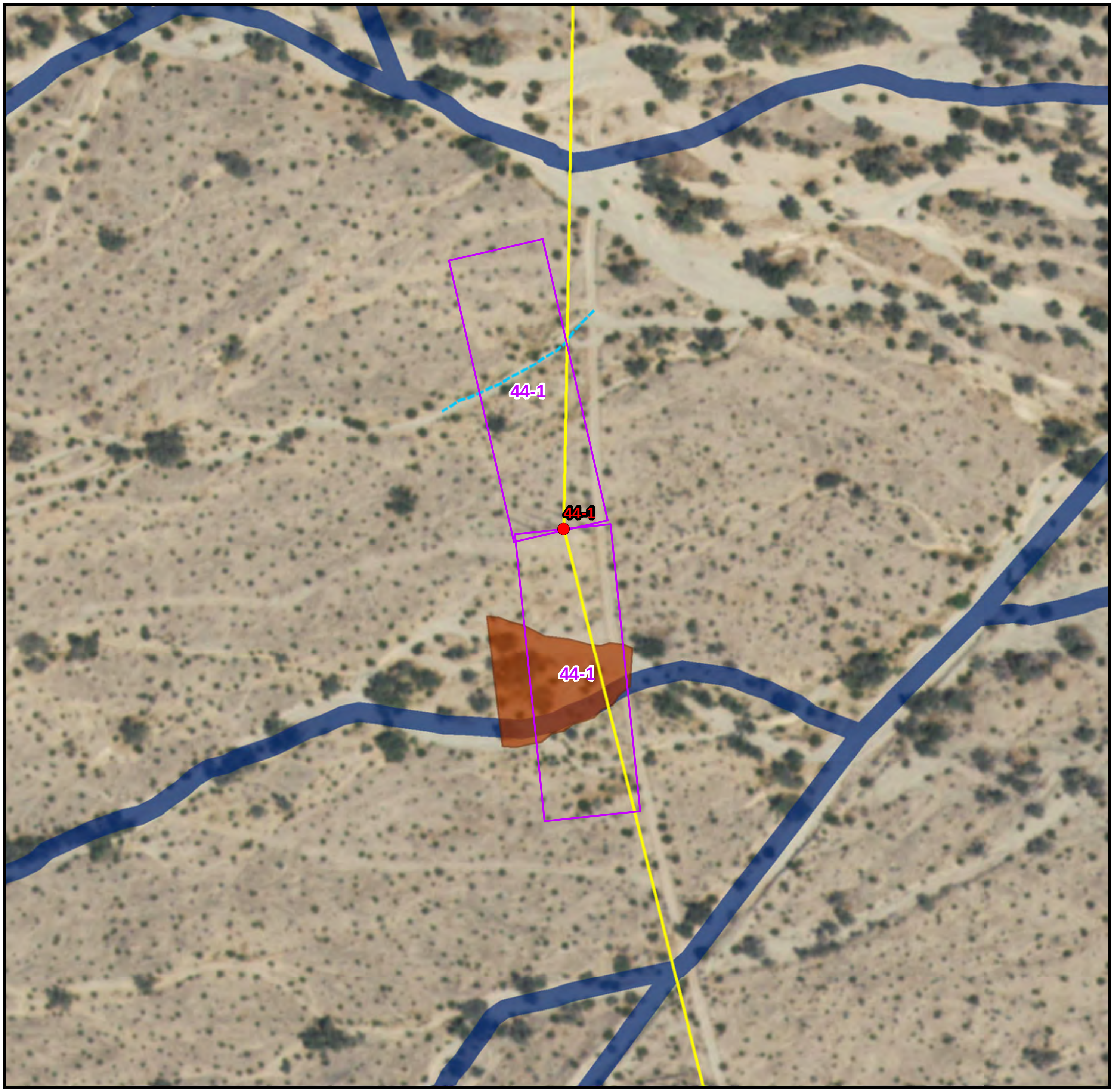

Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 44-1

- Structures
- Pull Sites
- Transmission Line

NWI
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results
- Bank to Bank
- Wetland Results

Non-Jurisdictional Features
- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8

Vidal FOC

Jurisdictional Delineation Results

Pull Site: 49-4

- Structures
- Pull Sites
- Transmission Line

NWI

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results

- Bank to Bank
- Wetland Results

Non-Jurisdictional Features

- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300

Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8

Vintage FOC

Jurisdictional Delineation Results

Pull Site: 49-6

- Structures
- Pull Sites
- Transmission Line

NWI

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results

- Bank to Bank
- Wetland Results

Non-Jurisdictional Features

- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300

Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8

Vidal FOC

Jurisdictional Delineation Results

Pull Site: 49-8

Structures

Pull Sites

Transmission Line

NWI

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Lake

Riverine

Jurisdictional Delineation Results

Bank to Bank

Wetland Results

Non-Jurisdictional Features

Erosional Feature

Man-made Berm

Culvert

No Water Feature

N

0 75 150 300

Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 50-2

Structures
Pull Sites
Transmission Line

NWI

Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine

Jurisdictional Delineation Results

Bank to Bank
Wetland Results

Non-Jurisdictional Features

Erosional Feature
Man-made Berm
Culvert
No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 52-4

Structures
Pull Sites
Transmission Line

NWI

Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine

Jurisdictional Delineation Results

Bank to Bank
Wetland Results

Non-Jurisdictional Features

Erosional Feature
Man-made Berm
Culvert
No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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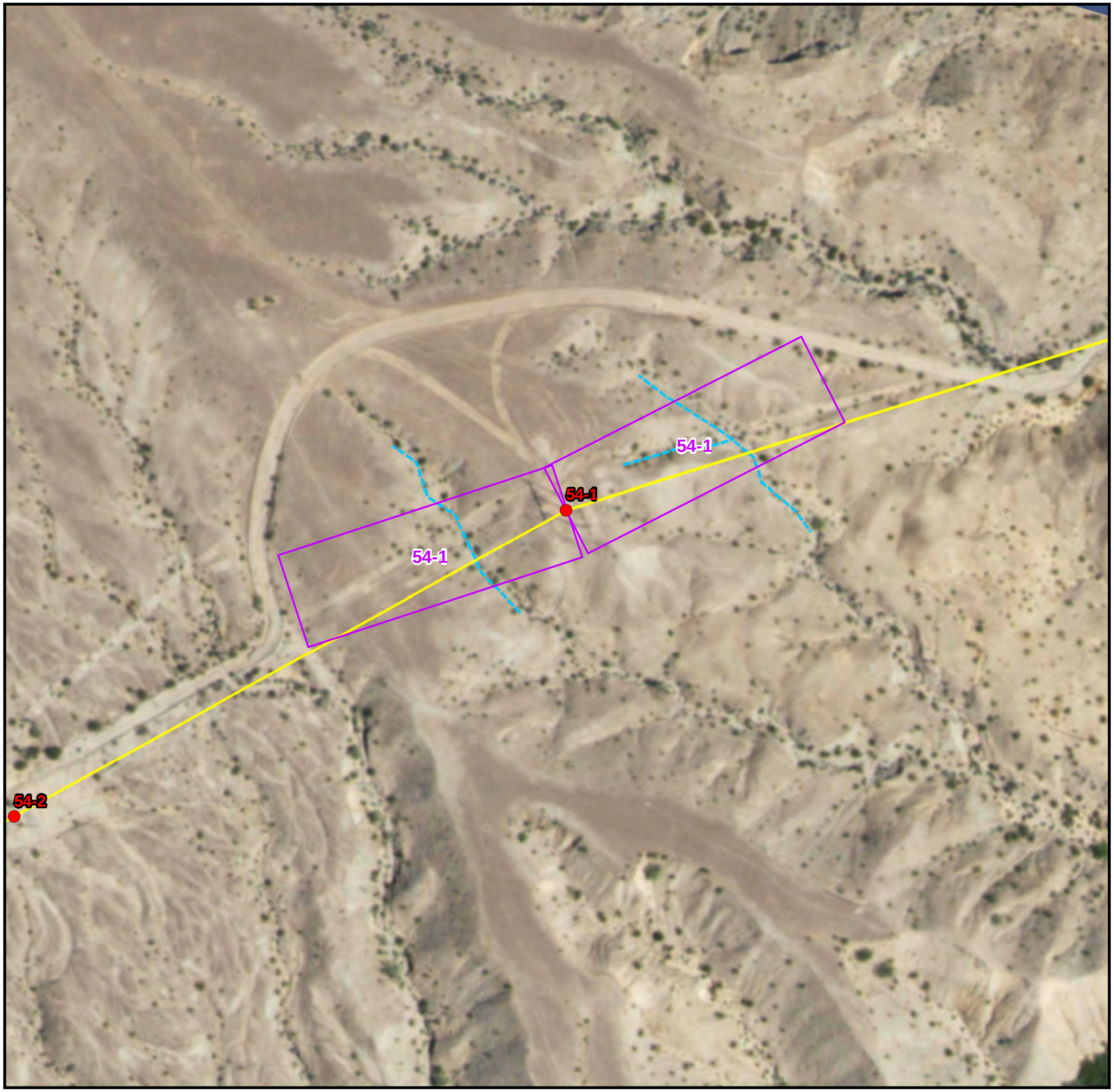
Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 54-1



Structures
Pull Sites
Transmission Line

NWI
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine

Jurisdictional Delineation Results
Bank to Bank
Wetland Results

Non-Jurisdictional Features
Erosional Feature
Man-made Berm
Culvert
No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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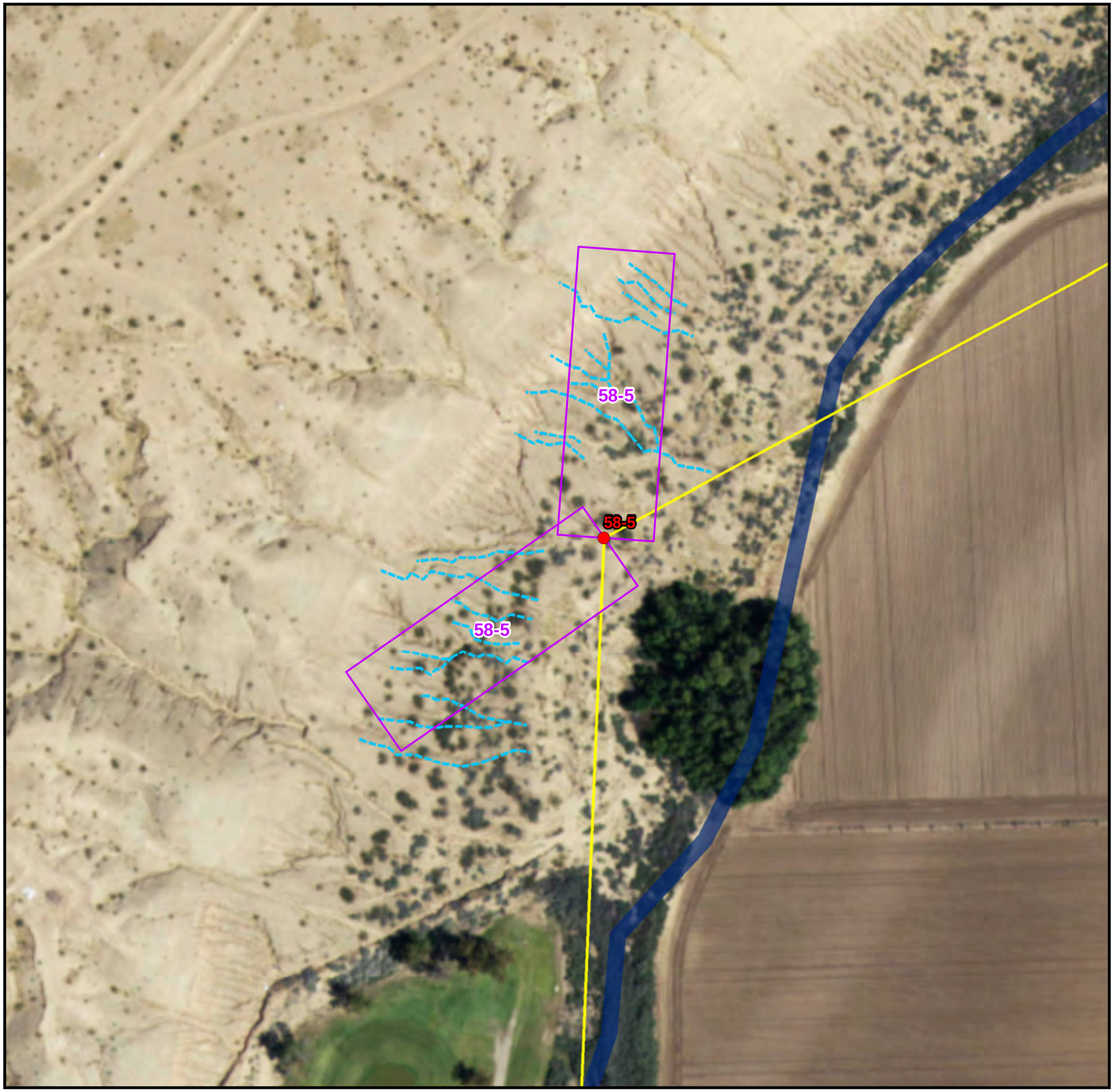
Figure 8

Vidal FOC

Jurisdictional Delineation Results

Pull Site: 58-5



● Structures

Pull Sites

Transmission Line

NWI

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Lake

Riverine

Jurisdictional Delineation Results

Bank to Bank

Wetland Results

Non-Jurisdictional Features

Erosional Feature

Man-made Berm

Culvert

No Water Feature

N

0 75 150 300

Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 59-2

Structures
Pull Sites
Transmission Line
NWI
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine
Jurisdictional Delineation Results
Bank to Bank
Wetland Results
Non-Jurisdictional Features
Erosional Feature
Man-made Berm
Culvert
No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 59-6

- Structures
- Pull Sites
- Transmission Line

NWI
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results
- Bank to Bank
- Wetland Results

Non-Jurisdictional Features
- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 64-2, 59-6

Structures
Pull Sites
Transmission Line
NWI
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine
Jurisdictional Delineation Results
Bank to Bank
Wetland Results
Non-Jurisdictional Features
Erosional Feature
Man-made Berm
Culvert
No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 8
Vidal FOC
Jurisdictional Delineation Results
Pull Site: 64-4

- Structures
- Pull Sites
- Transmission Line

NWI

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

Jurisdictional Delineation Results

- Bank to Bank
- Wetland Results

Non-Jurisdictional Features

- Erosional Feature
- Man-made Berm
- Culvert
- No Water Feature

N

0 75 150 300
Feet

Name: 21232 BIO Fig 8 Jurisdictional Delineation Results.Mxd
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Figure 9
Vidal FOC
Impacts to Jurisdictional Waters
Pull Site: 13-6

- Structures
- Transmission Line
- Pull Sites

Impacts to Jurisdictional Waters

- Bank to Bank - 0.07 ac

N

0 75 150 300

Feet

Name: 21232 BIO Fig 9 Impacts to Jurisdictional Waters.Mxd
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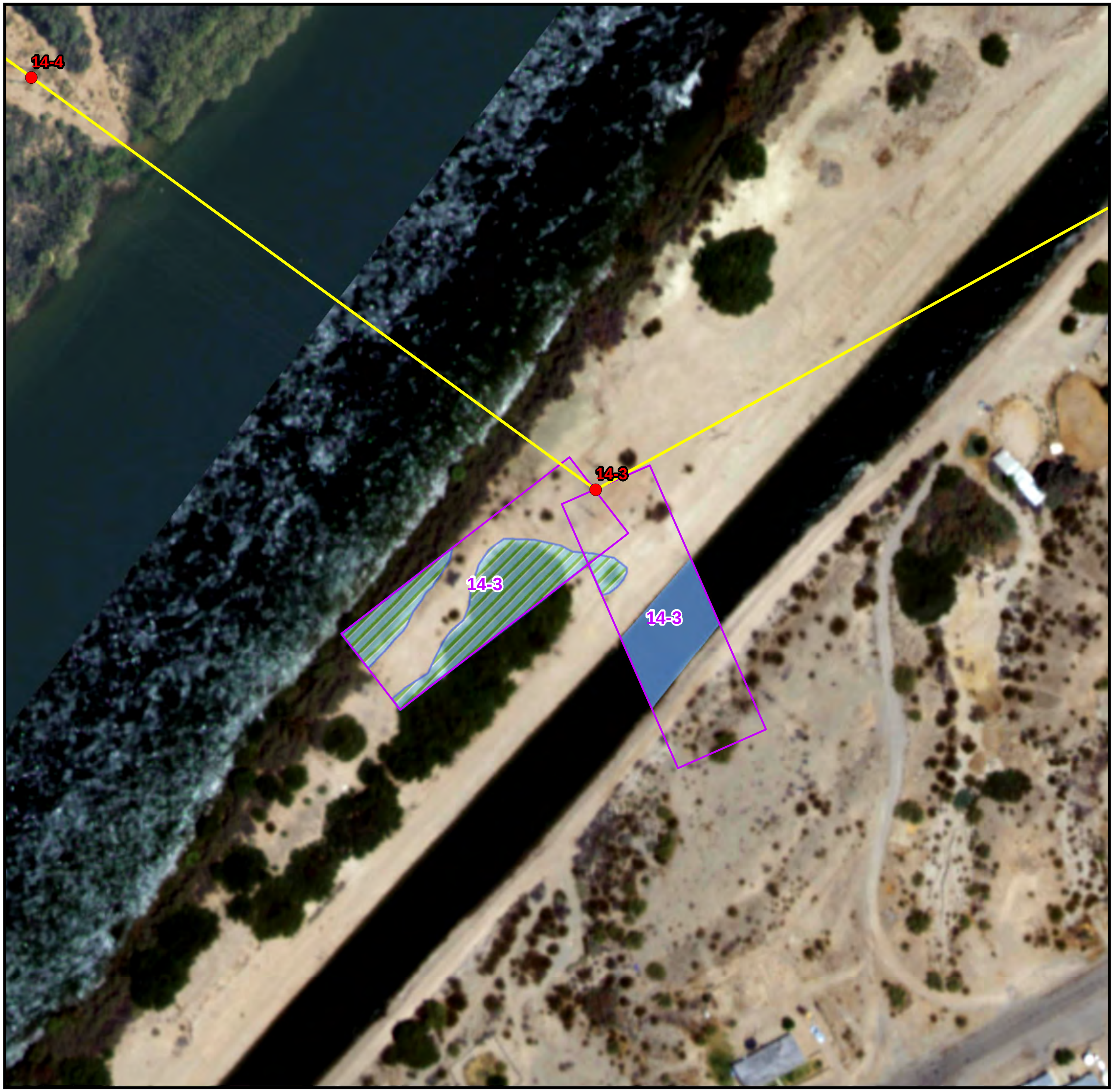
Figure 9
Vidal FOC
Impacts to Jurisdictional Waters
Pull Site: 14-3



Structures
Transmission Line
Pull Sites

Impacts to Jurisdictional Waters

Open Water - 0.18 ac
Wetland Results - 0.37 ac

N

0 75 150 300
Feet

Name: 21232 BIO Fig 9 Impacts to Jurisdictional Waters.Mxd
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Figure 9
Vidal FOC
Impacts to Jurisdictional Waters
Pull Site: 16-7

- Structures
- Transmission Line
- Pull Sites

Impacts to Jurisdictional Waters

- Wetland Results - 0.60 ac

N

0 75 150 300
Feet

Name: 21232 BIO Fig 9 Impacts to Jurisdictional Waters.Mxd
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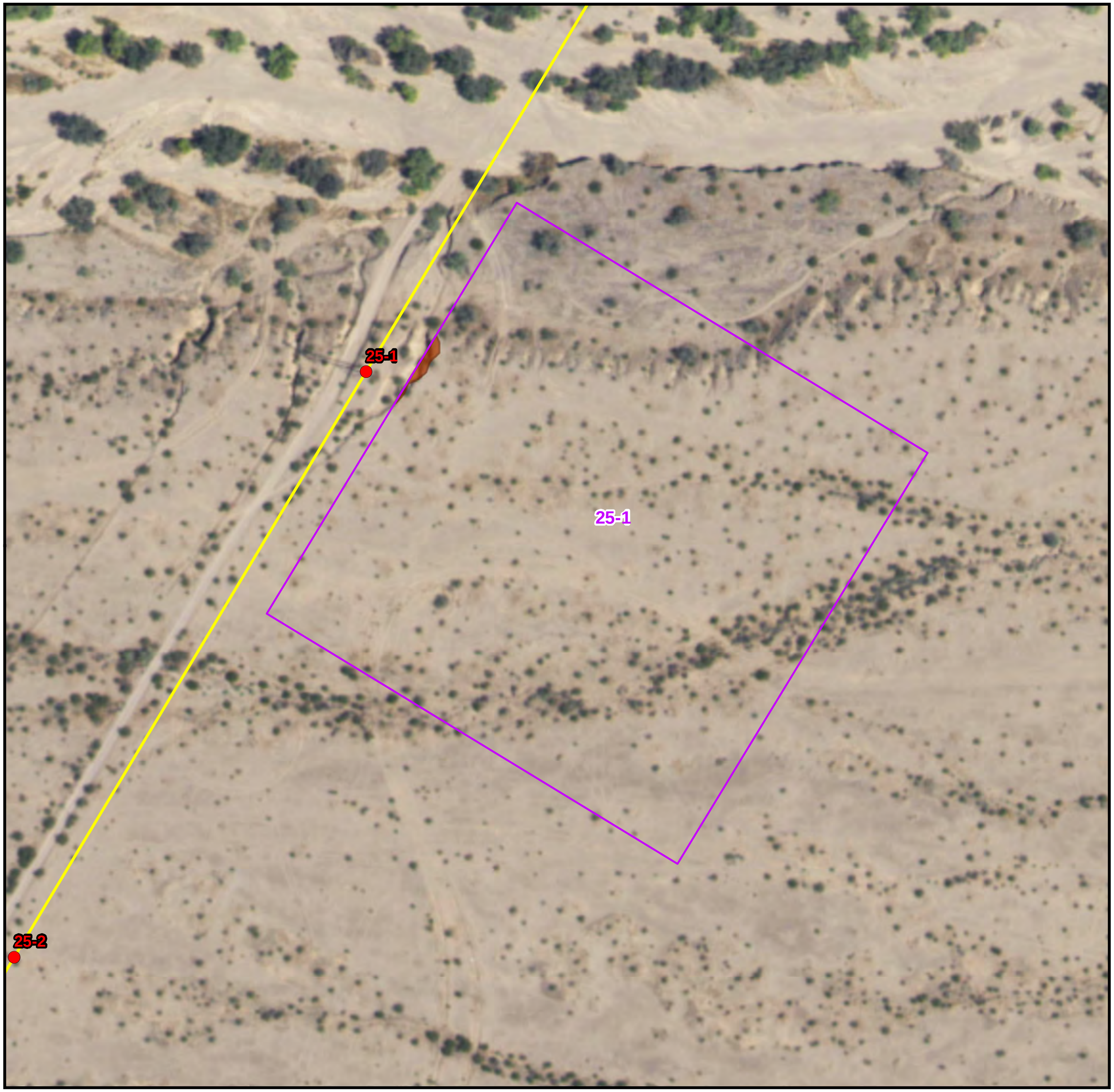

Figure 9
Vidal FOC
Impacts to Jurisdictional Waters
Pull Site: 25-1

- Structures
- Transmission Line
- Pull Sites

Impacts to Jurisdictional Waters

- Bank to Bank - 0.01 ac

N

0 75 150 300
Feet

Name: 21232 BIO Fig 9 Impacts to Jurisdictional Waters.Mxd
Print Date: 7/7/2022 10:34:38 AM Author: pcarlos

CHAMBERS GROUP

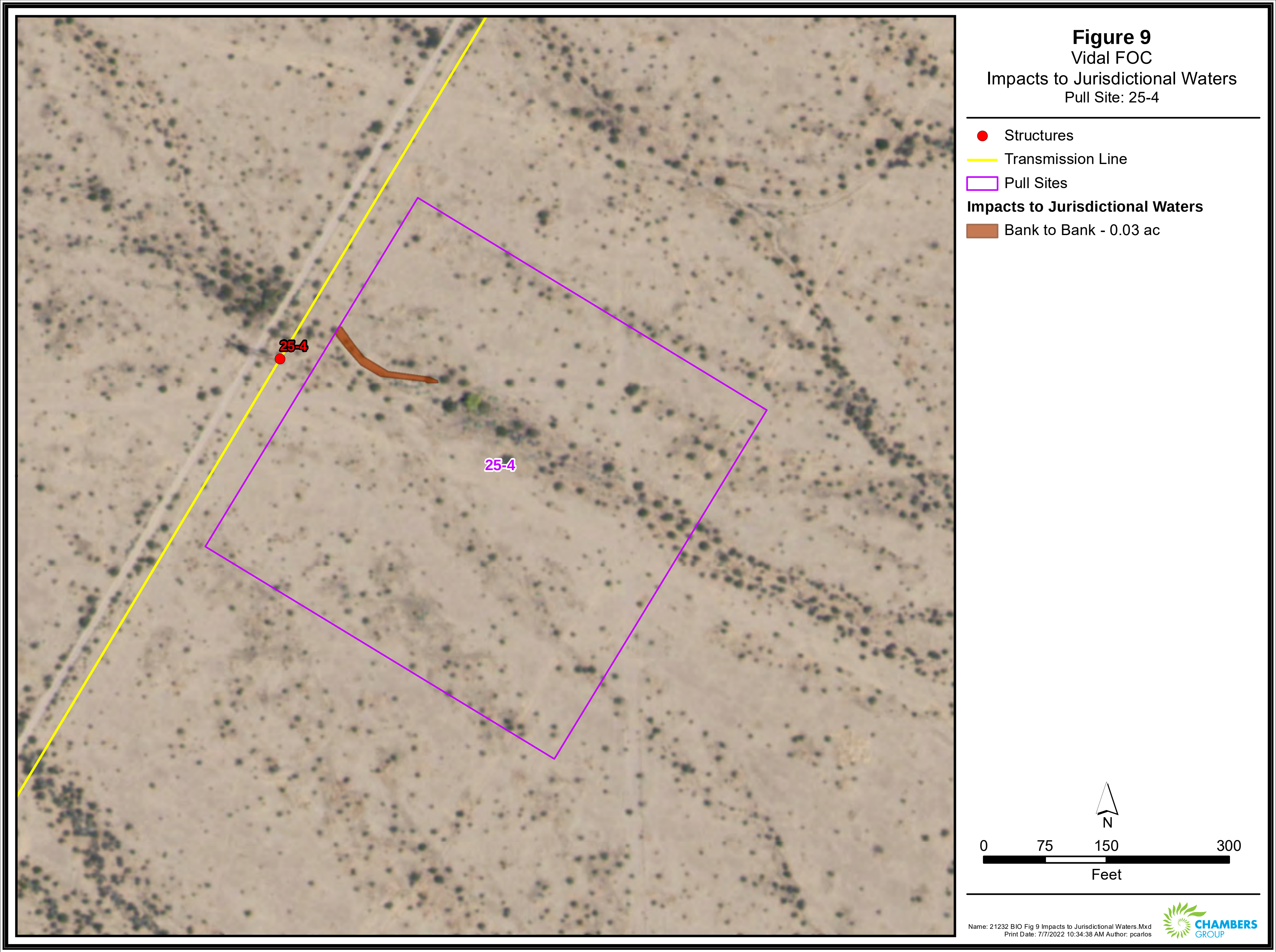
25-4
25-4
Figure 9
Vidal FOC
Impacts to Jurisdictional Waters
Pull Site: 25-4
Structures
Transmission Line
Pull Sites
Impacts to Jurisdictional Waters
Bank to Bank - 0.03 ac
N
0
75
150
300
Feet
Name: 21232 BIO Fig 9 Impacts to Jurisdictional Waters.Mxd
Print Date: 7/7/2022 10:34:38 AM Author: pcarlos
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Figure 9
Vidal FOC
Impacts to Jurisdictional Waters
Pull Site: 31-3

Structures
Transmission Line
Pull Sites
Impacts to Jurisdictional Waters
Bank to Bank - 0.36

N

0 75 150 300
Feet

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Figure 9
Vidal FOC
Impacts to Jurisdictional Waters
Pull Site: 33-5

Structures
Transmission Line
Pull Sites
Impacts to Jurisdictional Waters
Bank to Bank - 0.003 ac

N

0 75 150 300
Feet

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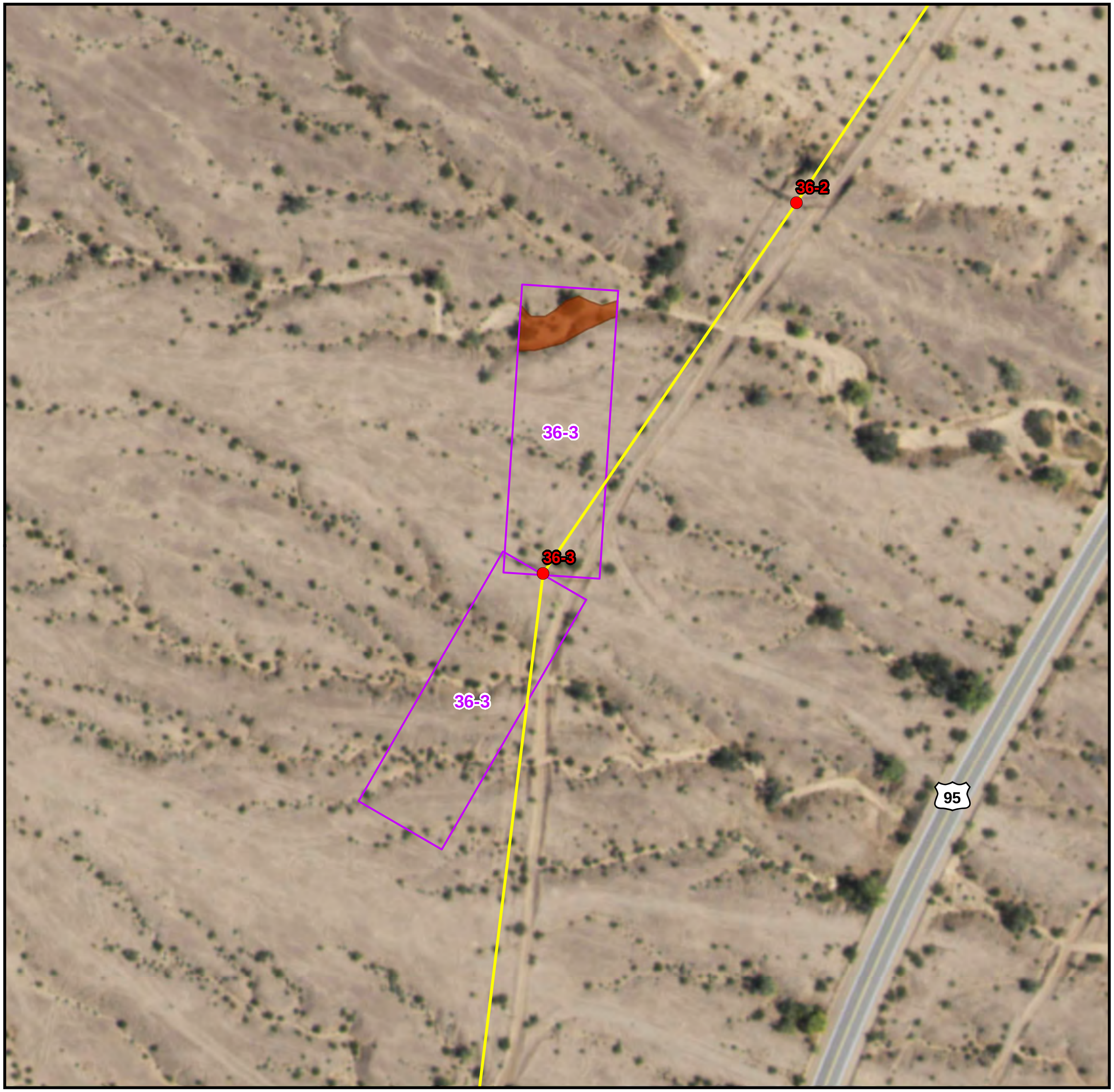

Figure 9
Vidal FOC
Impacts to Jurisdictional Waters
Pull Site: 36-3

Structures
Transmission Line
Pull Sites
Impacts to Jurisdictional Waters
Bank to Bank - 0.07 ac

N

0 75 150 300
Feet

Name: 21232 BIO Fig 9 Impacts to Jurisdictional Waters.Mxd
Print Date: 7/7/2022 10:34:38 AM Author: pcarlos

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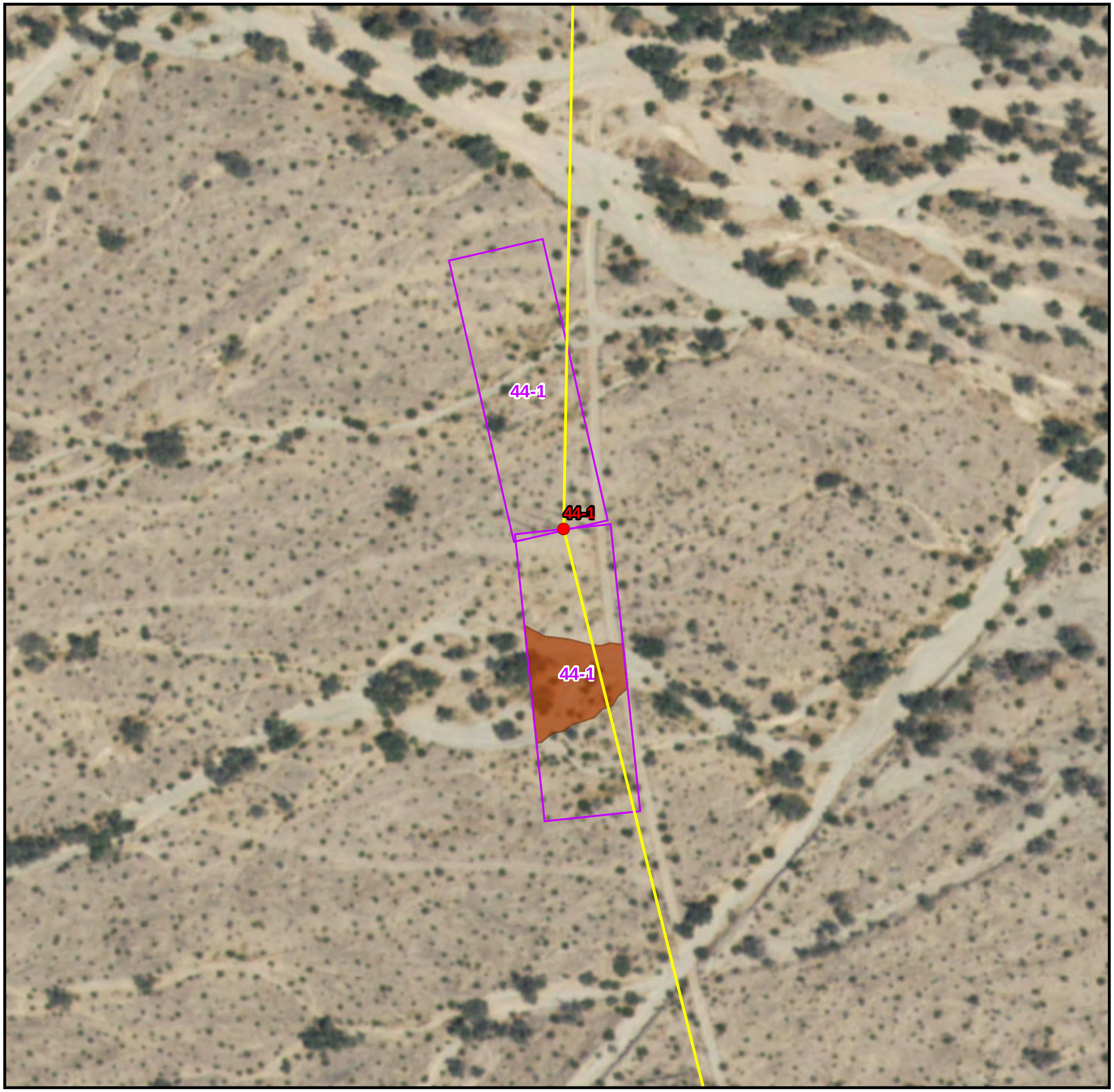

Figure 9
Vidal FOC
Impacts to Jurisdictional Waters
Pull Site: 44-1

Structures
Transmission Line
Pull Sites
Impacts to Jurisdictional Waters
Bank to Bank - 0.19 ac

N

0 75 150 300
Feet

Name: 21232 BIO Fig 9 Impacts to Jurisdictional Waters.Mxd
Print Date: 7/7/2022 10:34:38 AM Author: pcarlos

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Figure 9
Vidal FOC
Impacts to Jurisdictional Waters
Pull Site: 49-4

- Structures
- Transmission Line
- Pull Sites

Impacts to Jurisdictional Waters

- Wetland Results - 1.11 ac

N

0 75 150 300
Feet

Name: 21232 BIO Fig 9 Impacts to Jurisdictional Waters.Mxd
Print Date: 7/7/2022 10:34:38 AM Author: pcarlos

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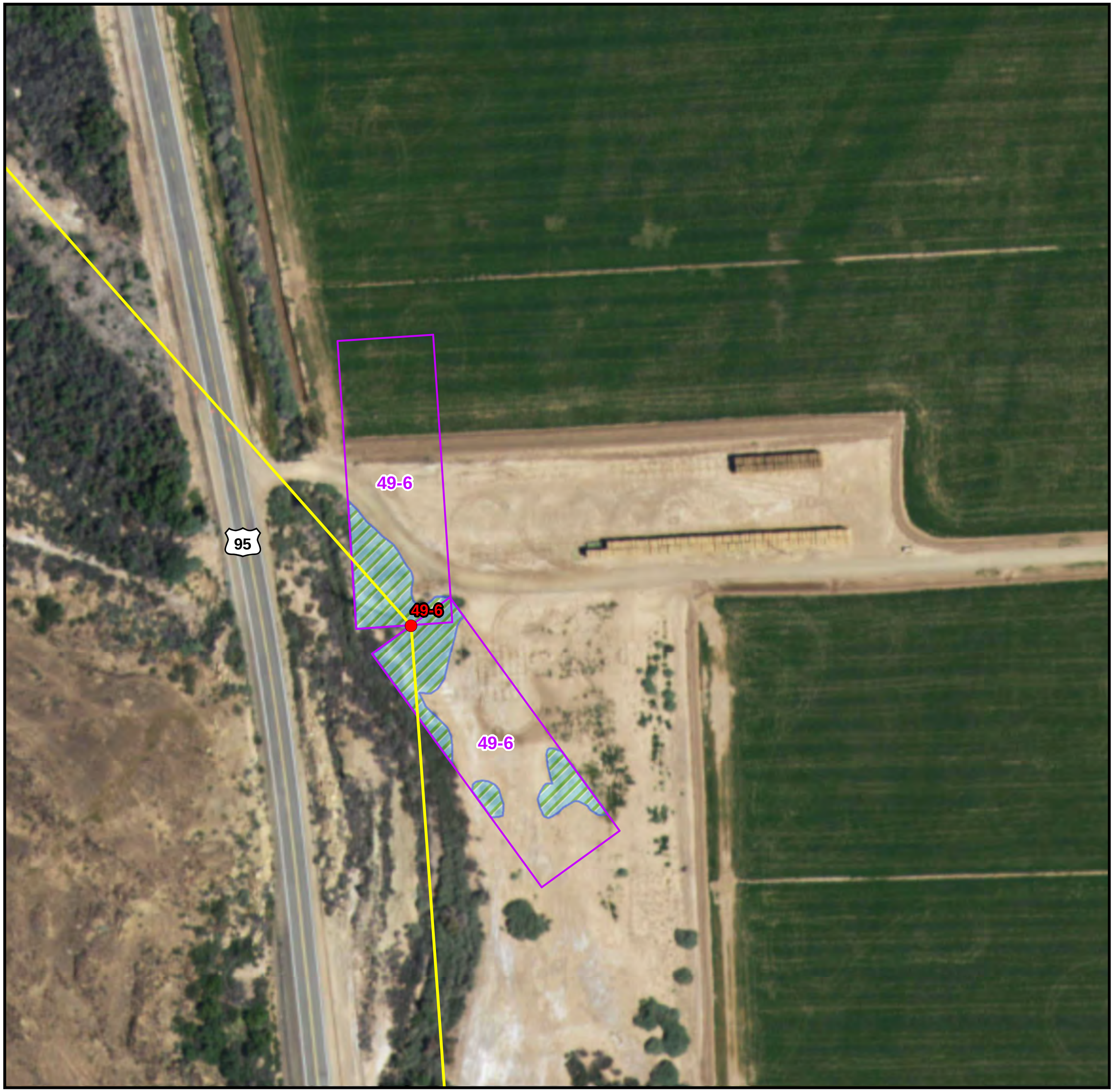

Figure 9
Vidal FOC
Impacts to Jurisdictional Waters
Pull Site: 49-6

Structures
Transmission Line
Pull Sites

Impacts to Jurisdictional Waters

Wetland Results - 0.37 ac

N

0 75 150 300
Feet

Name: 21232 BIO Fig 9 Impacts to Jurisdictional Waters.Mxd
Print Date: 7/7/2022 10:34:38 AM Author: pcarlos

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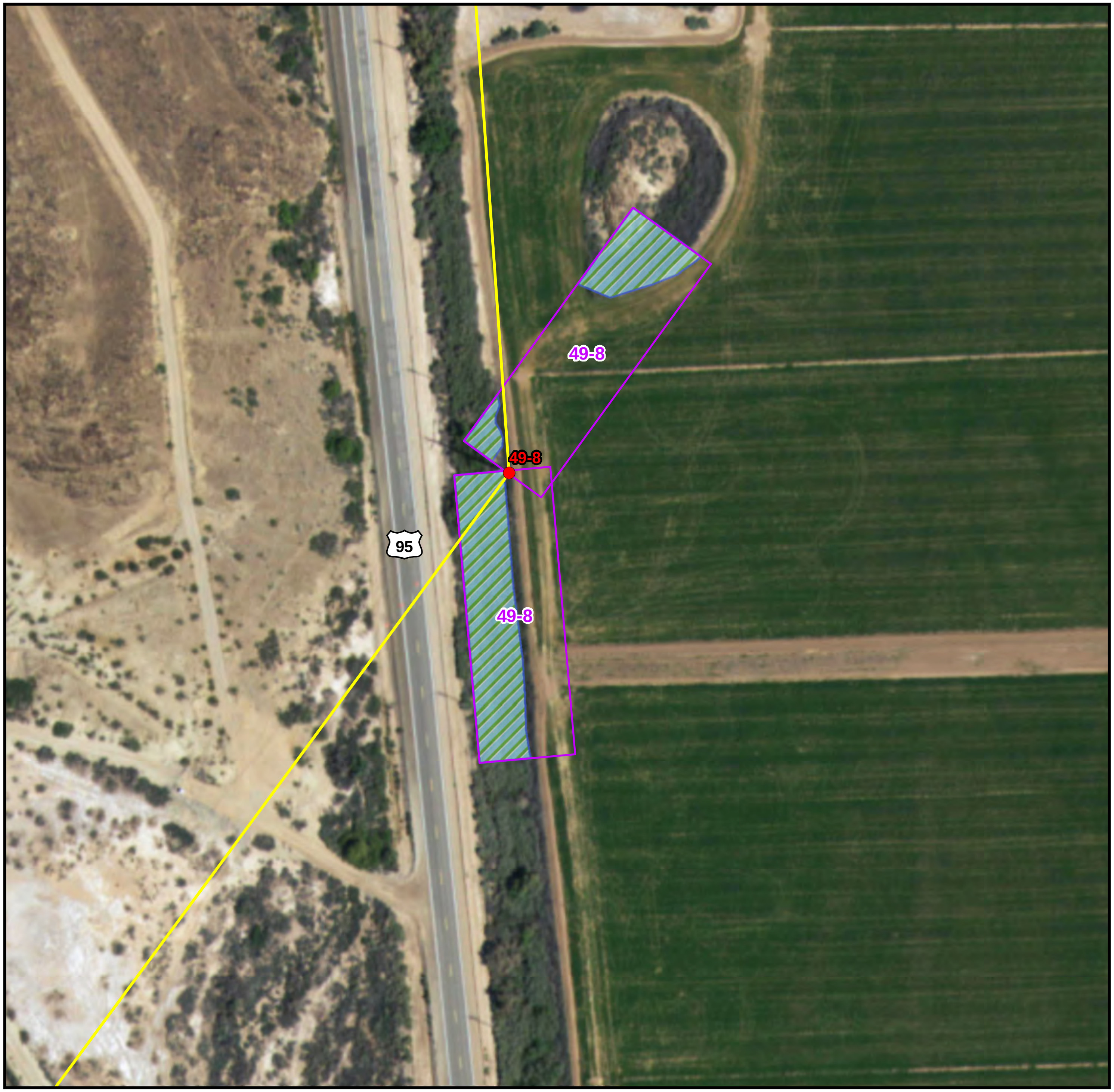
Figure 9
Vidal FOC
Impacts to Jurisdictional Waters
Pull Site: 49-8



- Structures
- Transmission Line
- Pull Sites

Impacts to Jurisdictional Waters

- Wetland Results - 0.53 ac

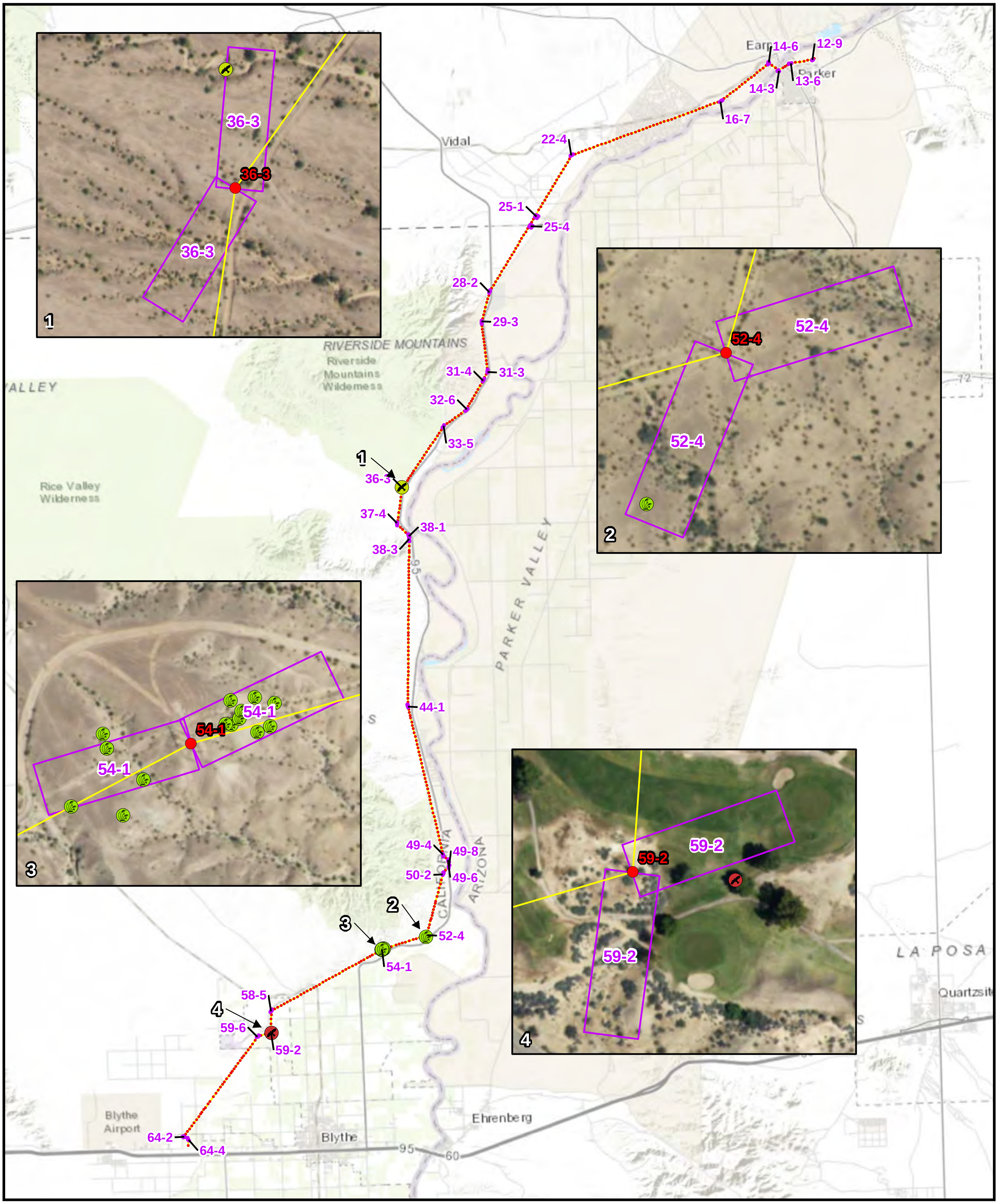
N

0 75 150 300

Feet

Name: 21232 BIO Fig 9 Impacts to Jurisdictional Waters.Mxd
Print Date: 7/7/2022 10:34:38 AM Author: pcarlos

CHAMBERS GROUP



Structures
Pull Sites
Transmission Line

Sensitive Species Results

Brown-crested flycatcher
Vermillion Flycatcher
Alverson's foxtail cactus

N

0 1.5 3 6
Miles

Figure 10
Vidal Energy FOC
Sensitive Species Results

Name: 21232 BIO Fig 10 Sensitive Species Results.Mxd
Print Date: 7/6/2022, Author: pcarlos

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ATTACHMENT 2 – PLANT SPECIES OBSERVED

ATTACHMENT 2 – PLANT SPECIES OBSERVED

Scientific Name	Common Name
ANGIOSPERMS (EUDICOTS)	
ANACARDIACEAE	**SUMAC OR CASHEW FAMILY**
*Schinus terebinthifolius**	Brazilian pepper tree
APOCYNACEAE	**DOGBANE FAMILY**
Asclepias subulata	rush milkweed, ajamete
ASTERACEAE	**SUNFLOWER FAMILY**
Ambrosia salsola var. *salsola*	cheesebush
Bebbia juncea var. *aspera*	sweetbush
Encelia farinosa	brittlebush
Peucephyllum schottii	pygmy-cedar
Pluchea sericea	arrow weed
Stephanomeria pauciflora	wire lettuce
BRASSICACEAE	**MUSTARD FAMILY**
*Brassica tournefortii**	Sahara mustard
CACTACEAE	**CACTUS FAMILY**
Coryphantha alversonii	foxtail cactus
Cylindropuntia echinocarpa	golden cholla
Cylindropuntia ramosissima	pencil cholla
Ferocactus cylindraceus	California barrel cactus
Mammillaria tetrancistra	Yaqui mammillaria
Opuntia basilaris	beavertail cactus
CHENOPODIACEAE	**GOOSEFOOT FAMILY**
Allenrolfea occidentalis	iodine bush
Atriplex canescens	four-wing saltbush
Atriplex lentiformis	big saltbush
Atriplex polycarpa	allscale
Suaeda nigra	bush seepweed
FABACEAE	**LEGUME FAMILY**
*Medicago sativa**	alfalfa
Olneya tesota	ironwood
Parkinsonia florida	blue palo verde
Prosopis glandulosa var. *torreyana*	honey mesquite
Senegalia greggii	cat claw acacia
POLYGONACEAE	**BUCKWHEAT FAMILY**
Chorizanthe rigida	rigid spineflower
Eriogonum fasciculatum	California buckwheat
Eriogonum inflatum	desert trumpet
Eriogonum sp.	annual buckwheat

ATTACHMENT 2 – PLANT SPECIES OBSERVED

Scientific Name	Common Name
SOLANACEAE	**NIGHTSHADE FAMILY**
Datura wrightii	Jimsonweed
Lycium andersonii	Anderson's wolfberry
TAMARICACEAE	**TAMARISK FAMILY**
*Tamarix ramosissima**	Mediterranean tamarisk
VISCACEAE	**MISTLETOE FAMILY**
Phoradendron californicum	desert mistletoe
ZYGOPHYLLACEAE	**CALTROP FAMILY**
Larrea tridentata	creosote bush
ANGIOSPERMS (MONOCOTS)	
POACEAE	**GRASS FAMILY**
Hilaria rigida	big galleta
Leptochloa fusca subsp. *uninervia*	Mexican sprangletop
*Polypogon monspeliensis**	annual beard grass
*Schismus barbatus**	Mediterranean schismus

*Non-Native Species

ATTACHMENT 3 – WILDLIFE SPECIES OBSERVED/DETECTED

ATTACHMENT 3 – WILDLIFE SPECIES LIST

Scientific Name	Common Name
CLASS AVES	**BIRDS**
ARDEIDAE	**HERONS, BITTERNS**
Ardea herodias	great blue heron
Ardea alba	great egret
CATHARTIDAE	**NEW WORLD VULTURES**
Cathartes aura	turkey vulture
ACCIPITRIDAE	**HAWKS, KITES, EAGLES**
Buteo jamaicensis	red-tailed hawk
FALCONIDAE	**FALCONS**
Falco sparverius	American kestrel
ODONTOPHORIDAE	**NEW WORLD QUAIL**
Callipepla gambelii	Gambel's quail
COLUMBIDAE	**PIGEONS & DOVES**
Zenaida asiatica	White-winged Dove
Zenaida macroura	mourning dove
CUCULIDAE	**CUCKOOS & ROADRUNNERS**
Geococcyx californianus	greater roadrunner
CAPRIMULGIDAE	**NIGHTHAWKS**
Chordeiles acutipennis	lesser nighthawk
TROCHILIDAE	**HUMMINGBIRDS**
Calypte costae	Costa's hummingbird
TYRANNIDAE	**TYRANT FLYCATCHERS**
Myiarchus tyrannulus	brown-crested flycatcher
Pyrocepalus rubins	vermilion flycatcher
Sayornis saya	Say's phoebe
HIRUNDINIDAE	**SWALLOWS**
Petrochelidon pyrrhonota	cliff swallow
CORVIDAE	**JAYS & CROWS**
Corvus corax	common raven
REMIZIDAE	**VERDINS**
Auriparus flaviceps	Verdin
TROGLODYTIDAE	**WRENS**
Catherpes mexicanus	canyon wren
POLIOPTILIDAE	**GNATCATCHERS**
Polioptila melanura	black-tailed gnatcatcher
MIMIDAE	**MOCKINGBIRDS, THRASHERS**
Mimus polyglottos	northern mockingbird
PARULIDAE	**WOOD WARBLERS**
Cardellina pusilla	Wilson's warbler

ICTERIDAE	**BLACKBIRDS**
Agelaius phoeniceus	red-winged blackbird
Quiscalus mexicanus	great-tailed grackle
EMBERIZIDAE	**EMBERIZIDS**
Amphispiza bilineata	black-throated sparrow
Pipilo chlorurus	green-tailed towhee
Zonotrichia leucophrys	white-crowned sparrow
FRINGILLIDAE	**FINCHES**
Haemorhous mexicanus	house finch
CLASS MAMMALIA	**MAMMALS**
LEPORIDAE	**HARES & RABBITS**
Lepus californicus	black-tailed jackrabbit
Lynx rufus	bobcat

ATTACHMENT 4 – SITE PHOTOGRAPHS

ATTACHMENT 4 - SITE PHOTOGRAPHS

Photo 1

Pull site 13-6 looking at ephemeral drainage near the eastern end of the site. This area can be avoided.

Photo 2

Pull site 14-3 bare ground area looking south. Wetland vegetation in area can be avoided.

	**Photo 3** Pull site 14-3, looking at Main Canal that can be avoided during pull site operations.
	**Photo 4** Pull site 16-7 looking southwest. Scattered Tamarisk Thickets and wetlands in area can be avoided.

	**Photo 5** Pull site 25-1 (staging area) has scattered creosote bushes. A small area of Blue Palo Verde – Ironwood Woodland and Mesquite Thickets can be avoided in the northern area of the site.
	**Photo 6** Pull site 25-4 (staging area) has scattered creosote bushes. A small area of Blue Palo Verde – Ironwood Woodland can be avoided in the central area of the site.

Photo 7

Pull site 31-3 looking at the ephemeral drainage with Blue Palo Verde – Ironwood Woodland vegetation that can be avoided.

Photo 8

Pull site 31-3 looking south within pull site.

	**Photo 9** Pull site 36-3 looking from the Blue Palo Verde – Ironwood Woodland within a drainage from the northern portion of the site. This area can be avoided.
	**Photo 10** Pull site 36-3 looking at erosional areas due to topography in the area.

	**Photo 11** Pull site 44-1 looking at a portion of the braided wash that can be avoided.
	**Photo 12** Pull site 49-4 showing access road and bare ground area through Tamarisk Thickets and Arrow Weed Thickets that can be avoided.

Photo 13

Pull site 49-6 looking at bare ground areas. Wetland areas can be avoided in this area.

Photo 14

Pull site 49-8 showing bare ground areas near Arrow Weed Thickets that can be avoided.

Photo 15

Pull site 49-8 looking at bare ground areas and agricultural areas that can be used during operations. The mound in the background is no longer a NWI Open Water area.

Photo 16

Pull site 54-1 showing Creosote Scrub and topography in the area. Alverson's foxtail cactus was found in several locations within this pull site. These cacti should be flagged for avoidance.

Photo 17

Pull site 64-2 looking at historic NWI freshwater pond that is no longer in area due to human disturbance and agriculture practices.

Photo 18

Pull site 64-4 looking at historical NWI on right side of photo that is no longer present. The NWI is an access road for agricultural practices.

APPENDIX E – Supplemental Wetland Delineation and Joshua Tree inventory Study Report

Stantec

AQUATIC RESOURCES ASSESSMENT AND PRELIMINARY JURISDICTIONAL DELINEATION REPORT

Vidal Energy Project – Jurisdictional Delineation Field Verification

January 12, 2023

Prepared for:

Aypa Power

Prepared by:

Stantec Consulting Services Inc.

Project Number:

185806317

The conclusions in the Report titled Aquatic Resources Assessment and Preliminary Jurisdictional Delineation Report are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

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Prepared by: Ryan Blaich, Project Biologist

Reviewed by: Stan C. Glowacki, Senior Biologist

Approved by: Jared Varonin, Senior Principal Biologist

Table of Contents

LIST OF APPENDICES

Acronyms / Abbreviations

CDFW	California Department of Fish and Wildlife
CFGC	California Fish and Game Code
CFR	Code of Federal Regulations
CWA	Clean Water Act
FAC	Facultative Plants
FACU	Facultative Upland Plants
FACW	Facultative Wetland Plants
LSAA	Lake and Streambed Alteration Agreement
NRCS	National Resources Conservation Service
NWPL	National Wetland Plant List
NWPR	Navigable Waters Protection Rule
OBL	Obligate Wetland Plants
OHWM	Ordinary High-Water Mark
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
Project	Vidal Energy Project
Rapanos	Rapanos v. United States and Carabell v. United States
RWQCB	Regional Water Quality Control Board
SWRCB	Stater Water Resources Control Board
UPL	Upland Plants
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
WDR	Waste Discharge Requirements
WIS	Wetland Indicator Status
WOTUS	Waters of the United States
WQC	Water Quality Certification

1 Introduction

This Jurisdictional Delineation (JD) field verification Report is intended to verify impacts to biological resources associated with construction of the proposed Vidal Energy Project (Project). The proposed Project consists of an approximately 1,100-acre solar photovoltaic (PV) component and associated battery energy component. The survey conducted and discussions presented within this JD are intended to support planning and regulatory agency permitting and associated documentation.

A field verification of jurisdictional aquatic features as well as a presence/absence Joshua tree (*Yucca brevifolia*) survey was conducted on December 21, 2023, by Stantec Consulting Services Inc. (Stantec) Biologists Ryan Blaich and Lysa DuCharme within accessible portions of the Project site. This site visit describes the existing aquatic resources that occur within the Survey Area (BSA) and documents changes to previously mapped aquatic resources as well as recording aquatic resources not previously mapped in the 2020 Jurisdictional Delineation (JD) Report.

1.1 Project Description

The Vidal Energy Project includes the construction and operation of an approximately 1,100-acre photovoltaic (PV) and battery energy storage system (BESS) facility to generate and store renewable energy in the form of electricity. The project will be supported by the Western Area Power Administration (WAPA) 161-kV overhead transmission corridor and would supply 160 megawatts of alternating current energy. The energy generated onsite will be collected and converted by the constructed on-site substation facility for transmission in an overhead or underground line to the WAPA transmission system and interconnection location. The Project's permanent impacts will include PV panels, BESS, fencing, service roads, a power collection system, communication cables, overhead and underground transmission lines, electrical switchyards, a project substation, and operations and maintenance facilities.

Because the Project occurs adjacent to or within the bed and banks of potentially jurisdictional aquatic resources, focused aquatic surveys and reporting are required to support regulatory permitting.

1.2 Project Location

The Project area is surrounded by Sonoran/Mojave Desert scrub plant community, with agricultural lands and the Colorado River approximately 1.8-miles to the east and Highway-95 approximately 0.8-miles to the west. The unincorporated town of Vidal is approximately 2.5-miles to the northwest of the Project area in San Bernardino County, California (Appendix A: Figure 1). The Project location as depicted in Figure 1 is referred to throughout this report as the Project Area. It is located within the United States Geologic Survey (USGS) Vidal, California, and Parker SW, California-Arizona quadrangles. The Figure 1 area straddles the Arizona-California border, and is located approximately 9.0 km (5.6 mi) west-southwest of Parker, CA, immediately south of the unincorporated communities of Vidal and Vidal Junction, CA.

The site occurs at an elevation of approximately 470 feet above mean sea level in an area of mostly creosote bush (*Larrea tridentata*) scrub vegetation. Average annual temperatures range from a minimum of 59 degrees Fahrenheit (°F) to a high of 89°F. Annual precipitation averages approximately 5.09 inches (U.S. Climate Data 2023).

2 Regulatory Background

2.1 CLEAN WATER ACT SECTION 404 AND FEDERAL JURISDICTIONAL WATERS

The Clean Water Act (CWA), introduced in 1977 via amendatory legislation of the Federal Water Pollution Control Act, is the primary federal law in the United States (U.S.) regulating water pollution. Section 404 of the CWA regulates the discharge of dredged material, placement of fill material, or certain types of excavation within federal waters of the United States (WOTUS) and authorizes the Secretary of the Army, through the Chief of Engineers, to issue permits for such actions. Permits can be issued for individual projects (individual permits) or for general categories of projects (general permits). Terrestrial WOTUS as defined by the CWA have typically included rivers, creeks, streams, and lakes extending to their headwaters and any associated wetlands. Wetlands are defined by the CWA as “areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are transitional areas between well-drained upland habitats and permanently flooded (deepwater) habitats, and generally include swamps, marshes, bogs, and similar areas. The definition of WOTUS has changed over time, and U.S. Army Corps of Engineers (USACE) has adopted several revisions to their regulations in order to more clearly define WOTUS. The protection of federal jurisdictional WOTUS has been particularly contentious and subject to numerous legal decisions since 2001.

2.1.1 1986 REGULATIONS

Waters of the U.S. are divided into several categories as defined by the Code of Federal Regulations (CFR). In 1986, the federal agencies (USACE and U.S. Environmental Protection Agency [USEPA]) implemented historic regulations (the 1986 Regulations) that defined WOTUS (under CFR 33 §328.3) to mean traditional navigable waters, the territorial seas, interstate waters, intrastate waters whose use or degradation could affect interstate or foreign commence, as well as tributaries (streams that flow into larger streams or other bodies of water) of, and wetlands adjacent to any of those waters.

2.1.2 2001 SWANCC RULING

Until the beginning of 2001, WOTUS included isolated wetlands and lakes, intermittent streams, prairie potholes, and other waters that are not part of a tributary system to interstate waters or to navigable WOTUS. The jurisdictional extent of USACE regulation changed with the 2001 Solid Waste Agency of Northern Cook County (SWANCC) v. U.S. Army Corps of Engineers ruling. The U.S. Supreme Court held that the USACE could not apply Section 404 of the CWA to extend their jurisdiction over an isolated quarry pit. The Court ruled that the CWA does not extend federal regulatory jurisdiction over non-navigable, isolated, intra-state waters. However, the Court made it clear that non-navigable wetlands adjacent to navigable waters are still subject to USACE jurisdiction.

2.1.3 2006 RAPANOS RULING

In 2006, the U.S. Supreme Court issued its seminal decision in the consolidated cases Rapanos v. United States and Carabell v. United States (collectively referred to as Rapanos). Justice Scalia narrowly interpreted the statutory term “waters of the United States” in a four-Justice plurality opinion, holding that CWA jurisdiction extended over only “relatively permanent, standing or continuously flowing bodies of water” that are connected to traditional navigable waters, plus wetlands with a “continuous surface connection” to such relatively permanent water bodies. Justice Kennedy wrote separately, concurring with the Court’s judgment with respect to the facts of the case, but interpreted “waters of the United States” to include wetlands that possess a “significant nexus” to waters that are or were navigable in fact or that could reasonably be so made.

The Court’s split decision and lack of a commanding majority opinion in Rapanos created confusion among the federal agencies and public. On December 2, 2008, the federal agencies released a regulatory guidance document, Clean Water Act Jurisdiction Following the U.S. Supreme Court’s Decision in Rapanos v. United States & Carabell v. United States (USACE and USEPA 2008), addressing common questions about federal jurisdiction over WOTUS and clarifying the two jurisdictional standards from Rapanos. In the 2008 Rapanos Guidance, the federal agencies concluded that federal jurisdiction existed over certain waterbodies that meet the “relatively permanent” standard from Justice Scalia’s plurality opinion or Justice Kennedy’s “significant nexus” standard, the latter of which would be determined by a fact-specific analysis.

2.1.4 2015 CLEAN WATER RULE

The 1986 Regulations as interpreted by the 2008 Rapanos Guidance were later replaced by the 2015 Clean Water Rule. The federal agencies attempted to provide clarification on jurisdiction following the Rapanos ruling by replacing the numerous categories of waterbodies found in the 1986 Regulations with four broader categories: (1) waters that are categorically “jurisdictional by rule” without the need for further analysis, including traditional navigable waters, interstate waters, the territorial seas, and impoundments of these waters; (2) waters that are jurisdictional by rule, if they meet the definitions for tributaries and adjacent waters established in the 2015 Clean Water Rule; (3) waters that are subject to case-specific jurisdictional analysis under the “significant nexus” standard; and (4) waters that are categorically excluded from jurisdiction. The 2015 Clean Water Rule therefore resulted in an expansion in federal jurisdiction over waterbodies that might have otherwise been excluded from the definition of WOTUS on a case-by-case basis under the 1986 Regulations and the Rapanos ruling.

After the final 2015 Clean Water Rule was published, the Sixth Circuit Court of Appeals issued an order staying the rule nationwide, pending a determination by the court on jurisdiction to review the rule. While the 2015 Clean Water Rule was stayed, the pre-2015 regulatory regime remained in effect. Following additional litigation and administrative processes, the 2015 Clean Water Rule was briefly in effect in select states beginning in August 2018.

2.1.5 2020 NAVIGABLE WATERS PROTECTION RULE

In 2017, the Trump Administration issued Executive Order 13778, “Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the ‘Waters of the United States’ Rule.” The executive order directed the federal agencies to review the 2015 Clean Water Rule for consistency with the policy "to ensure that the nation’s navigable waters are kept free from pollution, while at the same time promoting economic growth, minimizing regulatory uncertainty, and showing due regard for the roles of the Congress and the States under the Constitution.” It further directed the federal agencies to issue a proposed rule rescinding or revising the 2015 Clean Water Rule as appropriate and consistent with law.

On December 11, 2018, the federal agencies proposed a revised definition of WOTUS, which would repeal the 2015 Clean Water Rule. On December 23, 2019, the federal agencies repealed the 2015 Rule and restored the previous regulatory regime as it existed prior to finalization of the 2015 Clean Water Rule with the publication of a final rule described as “Definition of ‘Waters of the United States’—Recodification of Pre-Existing Rules.”

On April 21, 2020, the federal agencies published the Navigable Waters Protection Rule (NWPR) to redefine WOTUS. The agencies streamlined the definition to include four simple categories of jurisdictional waters:

1. Traditional navigable waters and the territorial seas;
2. Tributaries of traditional navigable waters and the territorial seas;
3. Lakes, ponds, and impoundments of the first two categories of waters; and
4. Wetlands adjacent to the first three categories of waters.

The NWPR provided clear exclusions for many water features that traditionally have not been regulated, and defined terms in the regulatory text that had never been defined before. Congress, in the CWA, explicitly directed the federal agencies to protect “navigable waters.” The intent of the NWPR was to regulate waters and the core tributary systems that provide perennial or intermittent flow and excluded ephemeral waters. The final NWPR fulfilling Executive Order 13788 became effective on June 22, 2020. However, on August 30, 2021, the U.S. District Court for the District of Arizona vacated the NWPR finding ““fundamental, substantive flaws that cannot be cured without revising or replacing the NWPR’s definition.” The federal agencies subsequently announced that they would interpret WOTUS consistent with the pre-2015 regulatory regime until further notice.

2.1.6 2023 REVISED DEFINITION OF “WATERS OF THE UNITED STATES” RULE

On June 9, 2021, the USACE and USEPA under the Biden Administration announced their intent to revise the definition of WOTUS to protect more waterways, beginning a new rulemaking process that restores protections put in place before 2015.

On January 18, 2023, the federal agencies published the final "Revised Definition of 'Waters of the United States'" rule (2023 Rule) in the Federal Register, which became effective on March 20, 2023 (USACE and USEPA 2023). The 2023 Rule generally returns to the pre-2015 definition. The implications of the final 2023 WOTUS rule are such that many ephemeral waters not considered protected under the former 2020 NWPR would now be protected.

The 2023 Rule defines WOTUS to include:

1. Traditional navigable waters, the territorial seas, and interstate waters;
2. Impoundments of other jurisdictional WOTUS, except for those that qualify under category 5, below;
3. Tributaries to either of the above waters and tributaries that meet the “relatively permanent” standard or the “significant nexus” standard, (collectively, “jurisdictional tributaries”);
4. Wetlands adjacent to traditional waters, wetlands adjacent and with a continuous surface connection to relatively permanent tributaries and impoundments, and wetlands adjacent to other jurisdictional tributaries when those wetlands meet the “significant nexus” standard; and
5. Intrastate lakes and ponds, streams, or wetlands that are not identified in categories 1–4 above that meet either the “relatively permanent” standard or the “significant nexus” standard.

For purposes of characterizing a “jurisdictional adjacent wetland” under the 2023 WOTUS Rule, a wetland may be considered “adjacent” to WOTUS if it is bordering, contiguous, or neighboring a WOTUS, including wetlands separated from other WOTUS by man-made dikes or barriers, natural river berms, beach dunes, and similarly situated wetlands.

However, a wetland, even if “adjacent,” must satisfy either the “relatively permanent” standard or the “significant nexus” standard to be considered WOTUS. The federal agencies have not necessarily defined "relatively permanent" or “significant nexus” and will likely determine the applicability of these standards on a case-by-case basis.

On March 19, 2023, the U.S. District Court for the Southern District of Texas enjoined the 2023 Rule in Texas and Idaho pending its consideration of those states’ legal challenges to the rule. On April 12, 2023, the U.S. District Court for the District of North Dakota similarly issued a preliminary injunction preventing the application of the 2023 Rule in 24 states: Alabama, Alaska, Arkansas, Florida, Georgia, Indiana, Iowa, Kansas, Louisiana, Mississippi, Missouri, Montana, Nebraska, New Hampshire, North Dakota, Ohio, Oklahoma, South Carolina, South Dakota, Tennessee, Utah, Virginia, West Virginia, and Wyoming. The federal agencies announced that, pending resolution of the litigation, they will apply the pre-2015 regulatory regime in the 26 states subject to injunctions and the 2023 Rule in the remaining 24 states, including California.

2.1.7 2023 SACKETT RULING

On May 25, 2023, the U.S. Supreme Court issued its ruling in Sackett v. Environmental Protection Agency (Sackett), which established a more stringent test to determine whether the CWA applies to certain categories of wetland. With Sackett, the U.S. Supreme Court unanimously reversed the previous Rapanos guidance regarding waters that are adjacent or have a significant nexus to a WOTUS. The new Sackett ruling states that the CWA applies to a particular wetland only if it blends or flows into a neighboring water that is a channel for interstate commerce. While the Court decided that some “adjacent” wetlands will also qualify under the CWA as “waters of the United States,” wetlands that are entirely separate from traditional bodies of water will not qualify. The CWA will apply only to wetlands that are “as a practical matter indistinguishable from waters of the United States” because they have a “continuous surface connection” with a larger body of water, “making it difficult to determine where the ‘water’ ends and the ‘wetland’ begins.”

The result of the Sackett ruling is that certain adjacent wetlands formerly protected under the CWA will no longer be federally protected. The USACE and USEPA have acknowledged the Sackett ruling and indicated they will interpret the phrase “waters of the United States” consistent with the U.S. Supreme Court’s decision in Sackett.

2.1.8 AMENDMENT TO THE 2023 WOTUS RULE

On August 29, 2023, the USEPA and USACE issued a final rule amending the 2023 definition of WOTUS to conform with the recent Sackett decision. While EPA’s and USACE’s 2023 WOTUS rule defining

WOTUS was not directly before the Supreme Court, the decision in Sackett made clear that certain aspects of the WOTUS 2023 rule are no longer valid. The amendments issued are limited and change only parts of the 2023 rule that are invalid under the Sackett decision. For example, the final rule removes the significant nexus test from consideration when identifying tributaries and other waters as federally protected under the CWA.

2.1.9 EXEMPTIONS UNDER CLEAN WATER ACT SECTION 404

Activities that are exempt under CWA Section 404(f) include

1. Nominal farming, silviculture and ranching activities,
2. (Emergency) maintenance activities that would not change the original fill design;
3. Construction and maintenance of farm ponds, stock ponds, or irrigation ditches or the maintenance of drainage ditches;
4. Construction of temporary sedimentation basins;
5. Any activity with respect to which a State has an approved program under CWA Section 208(b)(4) which meets the requirements of sections 208(b)(4) (B) and (C) (this pertains to certain applicable statewide waste treatment management programs); and
6. Construction or maintenance of farm roads, forest roads, or temporary roads for moving mining equipment.

Exceptions to these exemptions (USACE 2023b) include:

1. Discharge of toxic pollutants, and
2. If it is part of an activity whose purpose is to convert an area of a WOTUS into a use to which it was not previously subject, where the flow and/or circulation of waters may be impaired or the reach of the waters reduced.

2.1.10 EXTENT OF JURISDICTION

The extent of CWA Section 404 jurisdiction for non-tidal waters includes non-isolated aquatic features (including wetlands qualifying under the original federal 1986 standards and non-wetland WOTUS) bound by an “ordinary high water mark” (OHWM) as defined by 33 CFR 328.3(e):

> *“The term ordinary high water mark means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes*

in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

Features considered isolated from traditional navigable waters and the exemptions listed above are not considered WOTUS under the jurisdiction of CWA Section 404.

2.2 CLEAN WATER ACT SECTION 401, PORTER-COLOGNE WATER QUALITY CONTROL ACT, AND WATERS OF THE STATE OF CALIFORNIA

2.2.1 CLEAN WATER ACT SECTION 401 WATER QUALITY CERTIFICATION

Section 401 of the CWA ensures that federally permitted activities comply with the federal CWA and state water quality laws. Under CWA Section 401, an applicant for a federal permit or license for any activity which may result in a discharge to federal waters must obtain a Water Quality Certification (WQC) certifying that the proposed activity will comply with applicable water quality standards. WQCs are generally issued by the state or tribe with jurisdiction over the area in which the activity will occur. If there is not a state or tribe with authority over the activity, the EPA will issue a WQC.

In California, CWA Section 401 is implemented either by the State Water Resources Control Board (SWRCB) or the applicable Regional Water Quality Control Board (RWQCB), with most WQCs issued in connection with USACE CWA Section 404 permits for dredge and fill discharges. The SWRCB or RWQCB issues a WQC via the CWA Section 401 process verifying that a proposed project complies with water quality standards and other conditions of California law. CWA Section 401 certification typically precedes USACE CWA Section 404 permit issuance.

In addition, the Porter-Cologne Water Quality Control Act (Porter-Cologne Act) serves as the primary water quality state law in California and addresses two primary functions: water quality control planning and waste discharge regulation. The SWRCB and various RWQCBs are charged with protecting all waters of the state of California (waters of the state), broadly defined as "any surface water or groundwater, including saline waters, within the boundaries of the State." This encompasses all waters of the state, including those waters not under federal jurisdiction; therefore, the State of California's jurisdiction expands beyond federal jurisdiction. The Porter-Cologne Act does not include physical descriptors or interstate commerce limitations in defining "waters of the state."

2.2.2 PORTER-COLOGNE ACT WASTE DISCHARGE REQUIREMENTS

Under the Porter-Cologne Act, discharges of dredged or fill material to waters of the state not subject to CWA Section 404 (i.e., non-USACE jurisdictional) are regulated under the Porter-Cologne Act Chapter 3, Article 4 via Waste Discharge Requirements (WDRs). The WDR permit requirements ensure that the permitted activities comply with state water quality standards over the term of the action and are consistent with the requirements of the Porter-Cologne Act, CEQA, and the California Endangered Species Act. There are two types of WDRs: individual WDRs, which are tailored to specific dischargers, and general WDRs, which are for a similar group of dischargers. The applicable RWQCB (for respective regions) or the SWRCB (for statewide applicability) can adopt general WDRs for categories of discharges if they involve similar operations, types of waste, and monitoring. Applicants must file an application with the Water Boards for any activity that could result in the discharge of dredged or fill material to waters of the state in accordance with Title 23 California Code of Regulations Section 3855. Procedures for complying with WDR regulations, including submittal of an application with a project description and impact assessment, are similar to CWA Section 401 procedures.

2.2.3 STATE WETLAND DEFINITION AND PROCEDURES FOR DISCHARGES OF DREDGED OR FILL MATERIAL TO WATERS OF THE STATE

On April 2, 2019, the California Water Boards (including the SWRCB and the nine RWQCBs) adopted the State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State (Procedures) (SWRCB 2021). The Procedures became effective on May 28, 2020, and were subsequently revised on April 6, 2021. Additional Implementation Guidance for the State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State was released in April 2020 (SWRCB 2020); this implementation guidance has been considered during the preparation of this ARDR.

The Procedures define wetlands as follows:

> *"An area is wetland if, under normal circumstances, (1) the area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both; (2) the duration of such saturation is sufficient to cause anaerobic conditions in the upper substrate; and (3) the area's vegetation is dominated by hydrophytes or the area lacks vegetation."*

Per the Procedures, the following wetlands are considered waters of the state (SWRCB 2021):

1. Natural wetlands,
2. Wetlands created by modification of a surface water of the state, and
3. Artificial wetlands (that result from human activity) that meet any of the following criteria:
    a. Approved by an agency as compensatory mitigation for impacts to other waters of the state, except where the approving agency explicitly identifies the mitigation as being of limited duration;

b. Specifically identified in a water quality control plan as a wetland or other water of the state;

c. Resulted from historic human activity, is not subject to ongoing operation and maintenance, and has become a relatively permanent part of the natural landscape; or

d. Greater than or equal to one acre in size, unless the artificial wetland was constructed, and is currently used and maintained, primarily for one or more of the following purposes (i.e., the following artificial wetlands are not waters of the state unless they also satisfy the criteria set forth in 2, 3a, or 3b);

i. Industrial or municipal wastewater treatment or disposal,

ii. Settling of sediment,

iii. Detention, retention, infiltration, or treatment of stormwater runoff and other pollutants or runoff subject to regulation under a municipal, construction, or industrial stormwater permitting program,

iv. Treatment of surface waters,

v. Agricultural crop irrigation or stock watering,

vi. Fire suppression,

vii. Industrial processing or cooling,

viii. Active surface mining – even if the site is managed for interim wetlands functions and values,

ix. Log storage,

x. Treatment, storage, or distribution of recycled water, or

xi. Maximizing groundwater recharge (this does not include wetlands that have incidental groundwater recharge benefits); or

xii. Fields flooded for rice growing.

All artificial wetlands that are less than an acre in size and do not satisfy the criteria set forth in 2, 3.a, 3.b, or 3.c as outlined above are not waters of the state. If an aquatic feature meets the wetland definition, the burden is on the applicant to demonstrate that the wetland is not a water of the state (SWRCB 2021).

2.2.4 ACTIVITIES AND AREAS EXCLUDED FROM THE APPLICATION PROCEDURES FOR REGULATION OF DISCHARGES OF DREDGED OR FILL MATERIAL TO WATERS OF THE STATE

The Procedures do not apply to proposed discharges of dredged or fill material to waters of the state from the following activities or to the following areas (SWRCB 2021):

1. Activities excluded from application procedures:
    a. Activities that are exempt under CWA section 404(f) include:
        i. Nominal farming, silviculture and ranching activities,
        ii. (Emergency) maintenance activities,
        iii. Construction and maintenance of farm ponds, stock ponds, or irrigation ditches or the maintenance of drainage ditches,
        iv. Construction of temporary sedimentation basins,
        v. Any activity with respect to which a State has an approved program under CWA Section 208(b)(4) which meets the requirements of sections 208(b)(4) (B) and (C) (this pertains to certain applicable statewide waste treatment management programs), and
        vi. Construction or maintenance of farm roads, forest roads, or temporary roads for moving mining equipment.
        vii. Exceptions to these exemptions (USACE 2023b) include:
            1. Discharge of toxic pollutants, and
            2. If it is part of an activity whose purpose is to convert an area of a WOTUS into a use to which it was not previously subject, where the flow and/or circulation of waters may be impaired or the reach of the waters reduced.
    b. Suction dredge mining activities for mineral recovery regulated under CWA Section 402.

   c. Routine and emergency operation and maintenance activities conducted by public agencies, water utilities, or special districts that result in discharge of dredged or fill material to artificial, existing waters of the state:

      i. Currently used and maintained primarily for one or more of the purposes previously listed in 3.d. (ii), (iii), (iv), (x), or (xi) of Section 3.2.3 of this ARDR; or

      ii. For the purpose of preserving the line, grade, volumetric or flow capacity within the existing footprint of a flood control or stormwater conveyance facility.

   d. Routine operation and maintenance activities that result in discharge of dredged or fill material to artificially-created waters currently used and maintained primarily for one or more of the purposes previously listed in section II.3.d. (i), (ii), (iii), (vi), (vii), (x), or (xi) of this ARDR. This exclusion does not apply to the discharge of dredged or fill material to (a) a water of the U.S., (b) a water specifically identified in a water quality control plan, (c) a water created by modification of a water of the state, or (d) a water approved by an agency as compensatory mitigation.

2. Areas excluded from application procedures:

   a. Wetland areas that qualify as prior converted cropland (PCC) within the meaning of 33 CFR 507 Section 328.3(b)(2). The applicant may establish that the area is PCC by providing relevant documentary evidence that the area qualifies as PCC and has not been abandoned due to five consecutive years of non-use for agricultural purposes, or by providing a current PCC certification by the National Resources Conservation Service (NRCS), the USACE, or the USEPA to the permitting authority;

   b. Wetlands that are, or have been, in rice cultivation (including wild rice) within the last five years as of April 2, 2019 and have not been abandoned due to five consecutive years of non-use in rice production;

   c. The following features used for agricultural purposes:

      i. Ditches with ephemeral flow that are not a relocated water of the state or excavated in a water of the state;

      ii. Ditches with intermittent flow that are not a relocated water of the state or excavated in a water of the state, or that do not drain wetlands other than any wetlands described in (iv) or (v) below;

      iii. Ditches that do not flow, either directly or through another water, into another water of the state;

iv. Artificially irrigated areas that would revert to dry land should application of waters to that area cease; or

v. Artificial, constructed lakes and ponds created in dry land such as farm and stock watering ponds, irrigation ponds, and settling basins.

These exclusions do not apply to discharges of dredged or fill material that convert wetland areas to a non-agricultural use.

2.2.5 EXTENT OF JURISDICTION

The extent of CWA Section 401 jurisdiction is identical to CWA Section 404 jurisdiction (i.e., up to the OHWM of a federal wetland or non-wetland WOTUS); Porter-Cologne jurisdiction may extend beyond CWA Section 401 jurisdiction. If there happens to be both CWA Section 404/401 WOTUS and non-WOTUS waters of the state that could be impacted by a proposed project, the Water Boards may issue coverage under a single CWA Section 401 WQC permitting action, rather than separate WQC and WDR permitting actions.

2.3 JURISDICTIONAL AQUATIC RESOURCES UNDER CALIFORNIA FISH AND GAME CODE SECTION 1602

2.3.1 NOTIFICATION

Section 1602 of the California Fish and Game Code (CFGC) requires a proponent proposing a project that may affect a “river, stream, or lake” to notify the California Department of Fish and Wildlife (CDFW) before beginning the project, within a format similar to a permit application process. Any activities that result in one or more of the following require a CDFW notification (CDFW 2023):

1. Substantially divert or obstruct the natural flow of any river, stream, or lake;

2. Substantially change or use any material from the bed, channel, or bank of any river, stream, or lake; or

3. Deposit or dispose of debris, waste or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

Note that "any river, stream, or lake" includes those features that are dry for periods of time (e.g., intermittent and ephemeral features) as well as those that flow perennially year-round. If an applicant is not certain a particular activity requires notification, CDFW recommends the applicant notify. CDFW has historically required a Lake and Streambed Alteration Agreement (LSA) for activities within a feature that has a definable “bed and bank.” In addition, CDFW does not necessarily distinguish between a “pond” and a “lake;” therefore, natural and artificial pond features may be regulated under CFGC Section 1602.

2.3.2 LAKE AND STREAMBED ALTERATION AGREEMENT

Once a Section 1602 notification is processed, CDFW may issue a draft LSA. An LSA is an agreement between the applicant and CDFW for the performance of activities subject to CFGC Section 1602. An LSA lists the conditions relative to a proposed project that CDFW identifies as necessary to protect applicable water quality, plants, and wildlife. If the parties agree to the conditions, they will execute the LSA, which will govern the activities described in the agreement.

2.3.3 EXTENT OF JURISDICTION

CFGC Section 1602 jurisdiction typically extends from the thalweg (deepest portion) of a river or stream, or from a lake surface up to the top of bank and the outer edge of associated riparian vegetation, or outer edge of the associated floodplain (whichever is greater).

3 Jurisdictional Waters/Wetlands Assessment and Western Joshua Tree Survey

3.1 Description of Federal and State Waters/Wetlands

Various agencies regulate activities within inland streams, wetlands, and riparian areas in California. The USACE Regulatory Program regulates activities pursuant to Section 404 of the federal CWA; the CDFW regulates activities under CFGC Section 1600-1607; and the SWRCB/RWQCB regulate activities under Section 401 of the CWA and the Porter-Cologne Act.

Positive indicators for each of the three parameters outlined below are required for a wetland to meet the USACE criteria for jurisdictional wetland determination, as follows:

- Hydrophytic vegetation is defined as macrophytic vegetation that is adapted to, and occurs in, areas where soils are frequently or permanently saturated of sufficient duration to exert a controlling influence on the plant species present. Plant species adjacent to the sample points were identified and included following the “50/20 rule,” meaning that plant species in each vegetation stratum (i.e., tree, sapling/shrub, herb, and woody vine) were included in order of abundance until at least 50% of the total vegetation cover was accounted for, plus any other species that, by itself, accounts for at least 20% of the total. Plants are assigned a Wetland Indicator Status (WIS) based on frequency of occurrence in wetland habitats following the 2020 National Wetland Plant List (NWPL) (USACE 2020) and using the Indicator Ratings Definitions (Lichvar et al. 2012) as follows:

- OBL (Obligate Wetland Plants): Almost always occur under natural conditions in wetlands. With few exceptions, these plants (herbaceous or woody) are found in standing water or seasonally saturated soils (14 or more consecutive days) near the surface;

- FACW (Facultative Wetland Plants): Usually occur in wetlands but may occur in non-wetlands. These plants predominately occur with hydric soils, often in geomorphic settings where water saturates the soils or floods the soil surface at least seasonally;

- FAC (Facultative Plants): Occur in wetlands and non-wetlands. These plants can grow in hydric, mesic, or xeric habitats. The occurrence of these plants in different habitats represents responses to a variety of environmental variables other than just hydrology, such as shade tolerance, soil pH, and elevation, and they have a wide tolerance of soil moisture conditions;

- FACU (Facultative Upland Plants): Usually occur in non-wetlands but may occur in wetlands. These plants predominately occur on drier or more mesic sites in geomorphic settings, where water rarely saturates the soils or floods the soil surface seasonally; and

- UPL (Upland Plants): Almost never occur under natural conditions in wetlands. These plants occupy mesic to xeric non-wetland habitats. They almost never occur in standing water or saturated soils. Typical growth forms include herbaceous, shrubs, woody vines, and trees.

The hydrophytic vegetation parameter is met when at least one of the following tests is fulfilled:

- The prevalent vegetation (more than 50% of the dominant plant species) is typically adapted to areas having wetland hydrology and hydric soil conditions and rated OBL, FACW, or FAC.

- The prevalence index, which is a value determined by accounting for the relative cover and WIS and ranges from 1 (only OBL species present) to 5 (only UPL species present), is less than or equal to 3.

- Vegetation has morphological adaptations to growing in inundated or saturated conditions.

In the text that follows, the abbreviations for the WIS categories have been inserted after the initial use of Latin/scientific names for identified dominant plants to reflect the hydrophytic indicator status as most recently presented by USACE (2020). Plants not listed (NL) in USACE (2020) are treated as UPL.

- Hydric Soils are defined as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (U.S. Department of Agriculture [USDA] Soil Conservation Service [SCS] 1994). Hydric soils are identified based on observable properties that result from prolonged saturated-anaerobic conditions. To assess whether hydric soil was present at each sample point, soil attributes (including color [hue, value, and chroma], redoximorphic features [color patterns in a soil formed by oxidation/reduction of iron and/or manganese that are caused by loss/depletion], or gain/concentration of pigment compared to the matrix color, mottling, texture, grain size, structure, streaking, etc.) were recorded on the delineation forms. Soil colors were assessed using Munsell Soil Color Charts (Munsell 2009).

- Wetland hydrology refers to inundation and/or saturation of the soil by flooding or a shallow water table for a prolonged period during the growing season, such that the character of the soil and vegetation are substantially different from areas that do not experience inundation/saturation in this manner. The identification of wetland hydrology follows the Wetlands Delineation Manual (Environmental Laboratory 1987) and Arid West Regional Supplement (USACE 2008). Visual evidence among the positive indicators of wetland hydrology include surface water, high water table, or soil saturation; geomorphic features associated with inundation (e.g., channels, shorelines); and water marks, sediment deposits, or drift deposits.

Regarding the types of federal Waters of the U.S. (WOTUS) regulated by the USACE:

- The term “wetlands” includes WOTUS in the instances where all three wetland parameters (i.e., hydrophytic vegetation, hydric soil, and wetland hydrology) are present.

- The term “other waters” typically encompasses drainages and other features bound by a definable OHWM with connectivity to jurisdictional waters and includes WOTUS lacking one or more of the three wetland parameters.

Potential jurisdictional boundaries for waters of the State under SWRCB jurisdiction were delineated using the latest available recommended procedures per the *State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State* (SWRCB 2019). While there is no standard definition in place for “Waters of the State,” typically they are accepted to extend from the channel bed to the top of a bank or outer edge of riparian canopy dominated by hydrophytic vegetation (whichever is greater) and also include adjacent waters, non-federal isolated waters (if present), and certain anthropogenic features (such as concrete drainage ditches) that are not considered to be jurisdictional federal WOTUS.

For the purposes of this delineation, CDFW jurisdiction has been conservatively considered to extend from the channel bed to the top of a bank or outer edge of adjacent riparian canopy (whichever is greater) and also may include certain anthropogenic drainage features not considered to be jurisdictional federal WOTUS.

3.2 Methodology

On December 21, 2023, Stantec Biologists Ryan Blaich and Lysa DuCharme conducted a site visit to determine the accuracy and verify mapped aquatic resources of the 2020 Vidal Solar Jurisdictional Delineation (JD) prepared in support of the EIR for the Project. Each previously mapped aquatic resource was visited to determine presence of bed and bank and ordinary high-water mark (OHWM) and to assess current jurisdictional status. Additionally, aerial imagery was reviewed to assess potentially unmapped drainages. Any unmapped potential drainage that was observed from aerial imagery was visited, assessed for potential jurisdiction, and their jurisdictional boundaries mapped, if applicable.

Please review Appendix B: Photos 1 through 6 to see examples of aquatic resources that were observed during the December 21, 2023, site visit that were previously unmapped, and aquatic resources that no longer show evidence of an OHWM.

Potential jurisdictional aquatic resources are mapped and presented in Appendix A, Figure 2.

3.3 Resulting Delineation and Preliminary Jurisdictional Determination

3.3.1 RATIONALE FOR PRELIMINARY JURISDICTIONAL DETERMINATION

All mapped drainages fall under potential state and CDFW jurisdiction due to the clear evidence of bed, bank, and presence of an OHWM. Under the new Amendment to the 2023 WOTUS Rule, any ephemeral aquatic resources no longer fall under federal jurisdiction. Due to the arid environmental conditions of the Survey Area, where most rain events are flashy in nature, all drainages observed were ephemeral and are presumed to be exempt from potential federal jurisdiction. The landform on site is indicative of the lower region of a bajada where several alluvial fan-like drainages coalesce before entering the Colorado River to the east of the Project Area. Because of this, most channels observed within the Project Area exhibit a clear bed and bank and OHWM at the top of bank margins due to the hydrology and geology of the site characteristic of arid environments. Additionally, the drainages that were not mapped during the 2020 JD (Figure 1; Drainages 3, 4, 5, 6, 12, 14, 15, 16, 17, & 18) exhibit clear bed and bank and an OHWM at the top of bank margins. Like the features from the 2020 JD that exhibit an OHWM at the top of bank margins, these aquatic resources experience differing levels of erosion and deposition due to the infrequent and flashy rain events that are characteristic of the region. The aquatic resources that were not mapped during the 2020 JD that exhibit clear evidence of bed and bank and a well-established OHWM below the top of bank margins (Drainages 1, 2, 7, 8, 9, 10, 11, & 13), are either closer in proximity to a more established compound channel system, or form from a compound channel-like system that then begins to braid as the elevational gradient decreases. Since there is both evidence of OHWM and bed and bank, each drainage will fall under the potential jurisdiction of the state and CDFW. Thus, it will be necessary to obtain a general Waste Discharge Requirements Permit from the SWRCB and Lake and Streambed Alteration Agreement Permit from CDFW.

It should be noted that Stantec's assessments regarding areas of potential jurisdiction are subject to final verification and approval by the regulatory agencies, including the USACE, SWRCB, and CDFW.

3.4 Western Joshua Tree Survey Results

During the survey conducted on December 21, 2023, the Survey Area was assessed for presence or absence of western Joshua tree. No Joshua trees were observed within the Survey Area.

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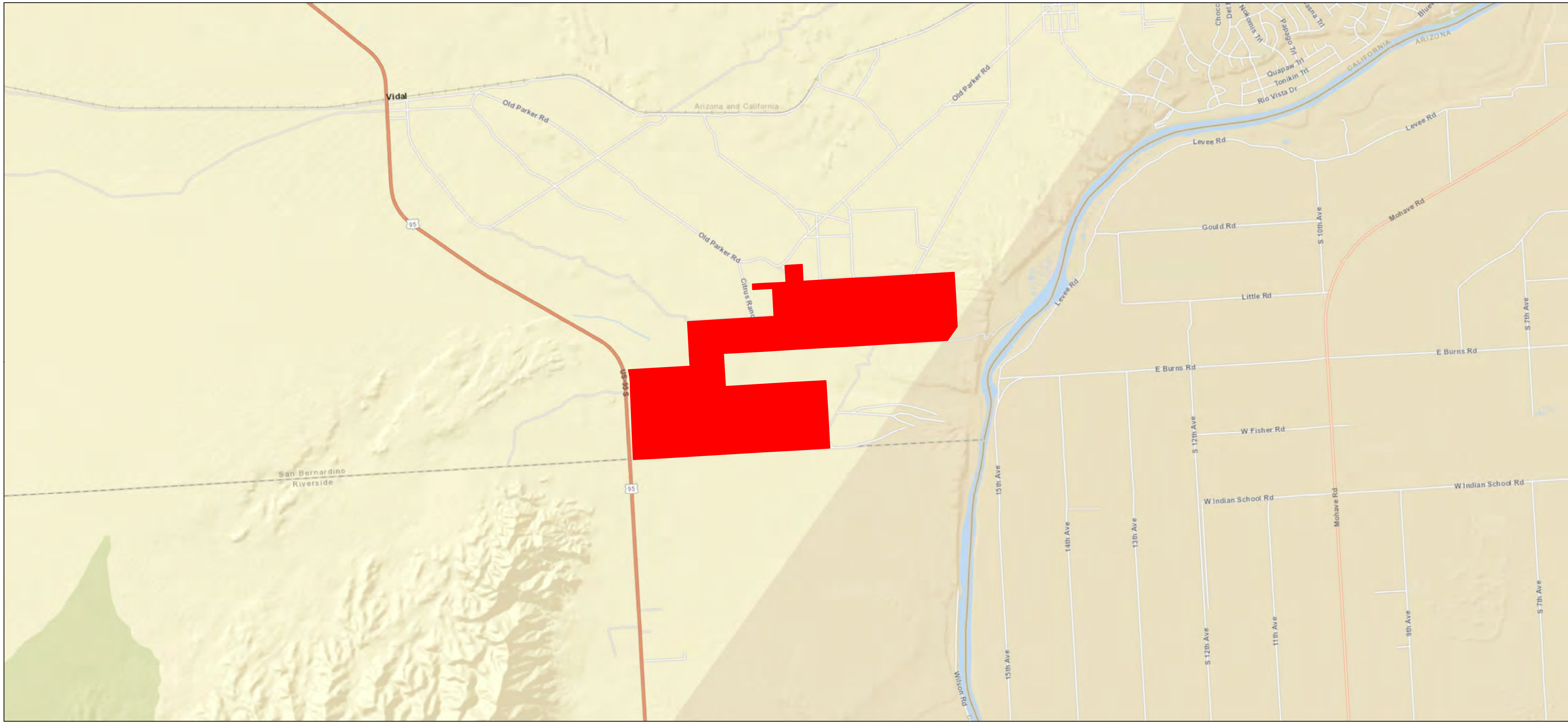
APPENDICES

Appendix A Figures



Project Location

0 4,000 8,000 Feet

(At original document size of 11x17)
1:48,000

N

Stantec

Project Location
San Bernardino County, California

Prepared by DL on 2024-01-03
TR by SET on 2024-01-03
IR by RB on 2024-01-03

Client/Project
185806317
CDH VIDAL LLC
Vidal Energy Project
Jurisdictional Delineation Field Verification

Figure No.
1

Title
Project Location Map

Notes
1. Coordinate System: NAD 1983 California Teale Albers
2. Data Sources: Stantec 2024. Chambers Group 2020.
3. Background: Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors California 60cm NAIP Imagery 2022.

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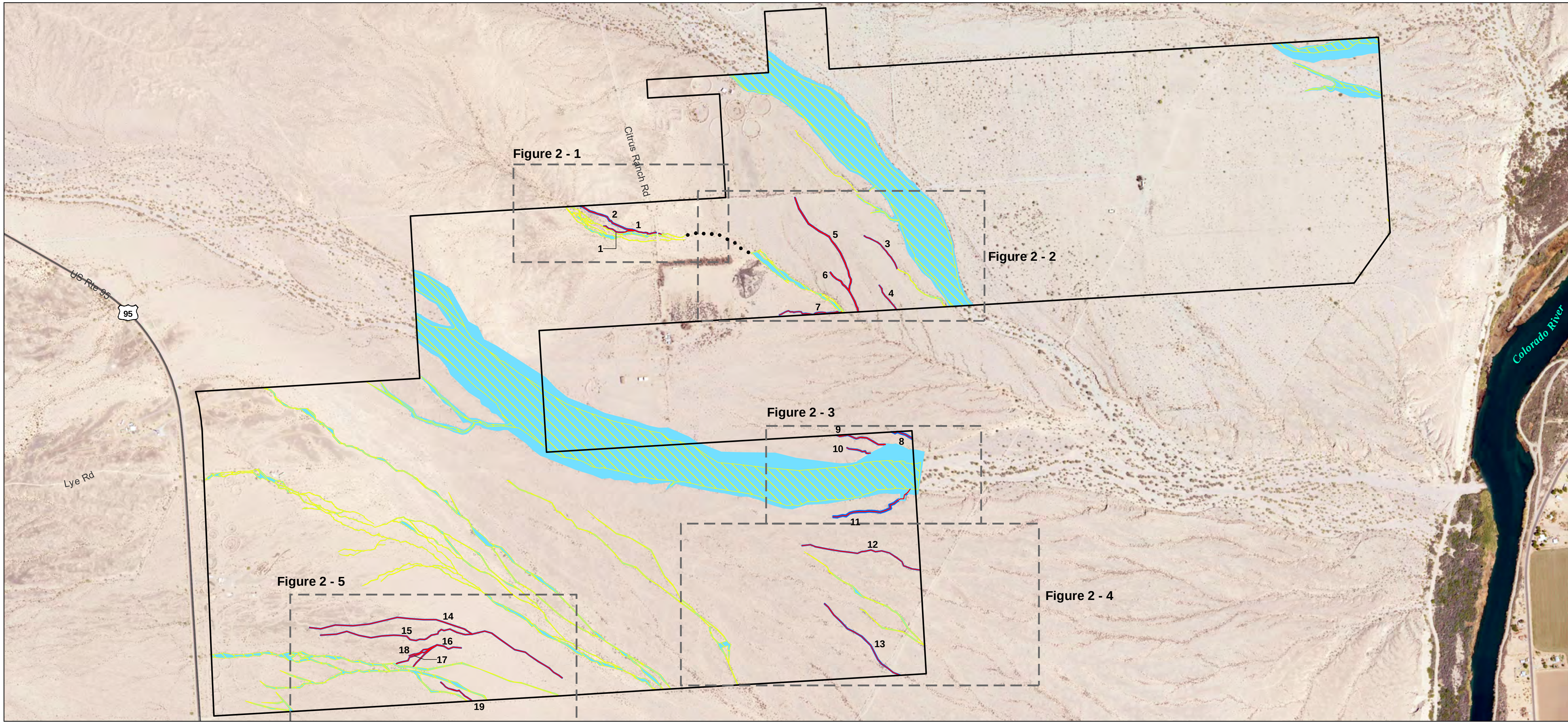


Project Location

Previously Mapped 2020 Feature No Longer Existent

Potential CDFW Jurisdictional Waters

Chambers Group Drainage Data (133.711 ac.)

Stantec Updated Drainage Data (1.789 ac.)

Potential State Jurisdictional Waters

Chambers Group Drainage Data (100.453 ac.)

Stantec Updated Drainage Data (1.168 ac.)

0 1,100 2,200 Feet

(At original document size of 11x17)
1:13,200

N

Stantec

Project Location
San Bernardino County, California

Prepared by DL on 2024-01-03
TR by SET on 2024-01-03
IR by RB on 2024-01-03

Client/Project 185806317

CDH VIDAL LLC
Vidal Energy Project
Jurisdictional Delineation Field Verification

Figure No.
2 - 0

Title
Potential Jurisdictional Features

Notes
1. Coordinate System: NAD 1983 California Teale Albers
2. Data Sources: Stantec 2024. Chambers Group 2020.
3. Background: California 60cm NAIP Imagery 2022.

V:\1858\Active\Vidal_Solar\03_data\gis_cad\gis\Figure2_WatersMap_20240103.mxd Revised: 2024-01-11 By: dalaw

- Project Location
- Previously Mapped 2020 Feature No Longer Existent

Potential CDFW Jurisdictional Waters

- Chambers Group Drainage Data (133.711 ac.)
- Stantec Updated Drainage Data (1.789 ac.)

Potential State Jurisdictional Waters

- Chambers Group Drainage Data (100.453 ac.)
- Stantec Updated Drainage Data (1.168 ac.)

Notes
1. Coordinate System: NAD 1983 California Teale Albers
2. Data Sources: Stantec 2024. Chambers Group 2020.
3. Background: California 60cm NAIP Imagery 2022.

0 150 300 Feet
(At original document size of 11x17)
1:1,800

N

Stantec

Project Location
San Bernardino County, California

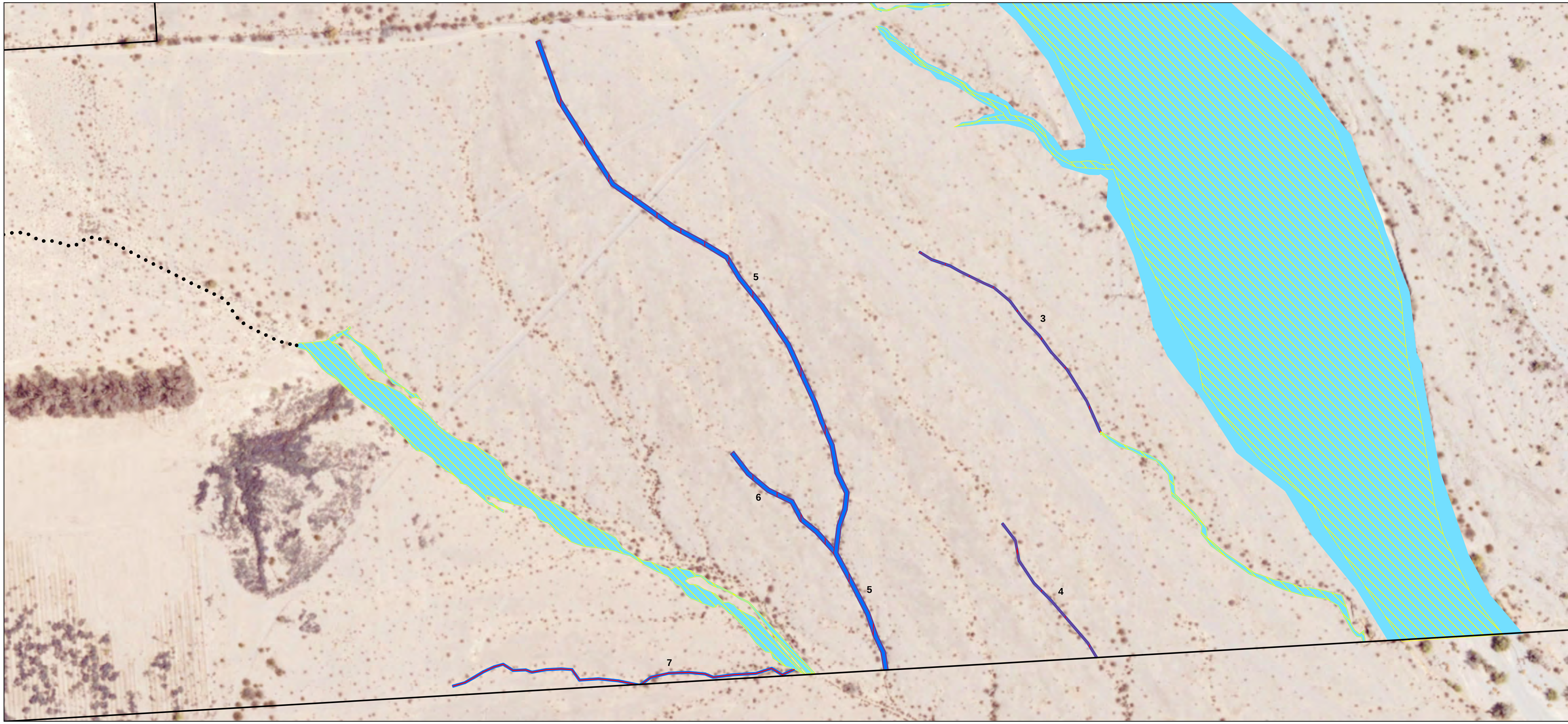
Prepared by DL on 2024-01-03
TR by SET on 2024-01-03
IR by RB on 2024-01-03

Client/Project
185806317
CDH VIDAL LLC
Vidal Energy Project
Jurisdictional Delineation Field Verification

Figure No.
2 - 1

Title
Potential Jurisdictional Features

V:\1858\Active\Vidal_Solar\03_data\gis_cad\gis\Figure2_WatersMap_DDP_20240103.mxd Revised: 2024-01-11 By: dalaw



Project Location
Previously Mapped 2020 Feature No Longer Existent
Potential CDFW Jurisdictional Waters
Chambers Group Drainage Data (133.711 ac.)
Stantec Updated Drainage Data (1.789 ac.)
Potential State Jurisdictional Waters
Chambers Group Drainage Data (100.453 ac.)
Stantec Updated Drainage Data (1.168 ac.)

0 200 400 Feet
(At original document size of 11x17)
1:2,400

N

Stantec

Project Location
San Bernardino County, California

Prepared by DL on 2024-01-03
TR by SET on 2024-01-03
IR by RB on 2024-01-03

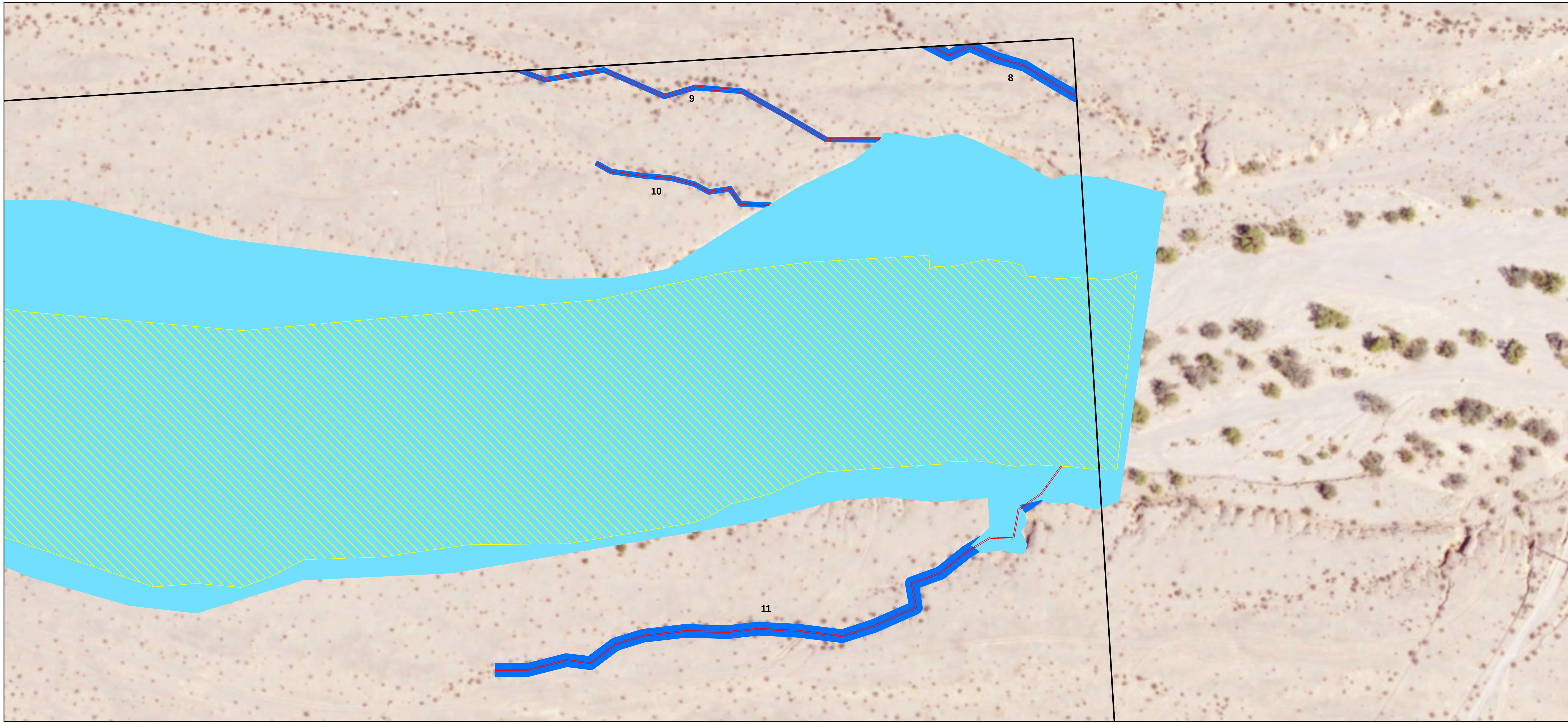
Client/Project 185806317
CDH VIDAL LLC
Vidal Energy Project
Jurisdictional Delineation Field Verification

Figure No.
2 - 2

Title
Potential Jurisdictional Features

Notes
1. Coordinate System: NAD 1983 California Teale Albers
2. Data Sources: Stantec 2024. Chambers Group 2020.
3. Background: California 60cm NAIP Imagery 2022.

V:\1858\Active\Vidal_Solar\03_data\gis_cad\gis\Figure2_WatersMap_DDP_20240103.mxd Revised: 2024-01-11 By: dalaw



Project Location

Potential CDFW Jurisdictional Waters

Chambers Group Drainage Data (133.711 ac.)

Stantec Updated Drainage Data (1.789 ac.)

Potential State Jurisdictional Waters

Chambers Group Drainage Data (100.453 ac.)

Stantec Updated Drainage Data (1.168 ac.)

0 150 300 Feet

(At original document size of 11x17)
1:1,800

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Notes
1. Coordinate System: NAD 1983 California Teale Albers
2. Data Sources: Stantec 2024. Chambers Group 2020.
3. Background: California 60cm NAIP Imagery 2022.

Stantec

Project Location
San Bernardino County, California

Prepared by DL on 2024-01-03
TR by SET on 2024-01-03
IR by RB on 2024-01-03

Client/Project
185806317
CDH VIDAL LLC
Vidal Energy Project
Jurisdictional Delineation Field Verification

Figure No.
2 - 3

Title
Potential Jurisdictional Features

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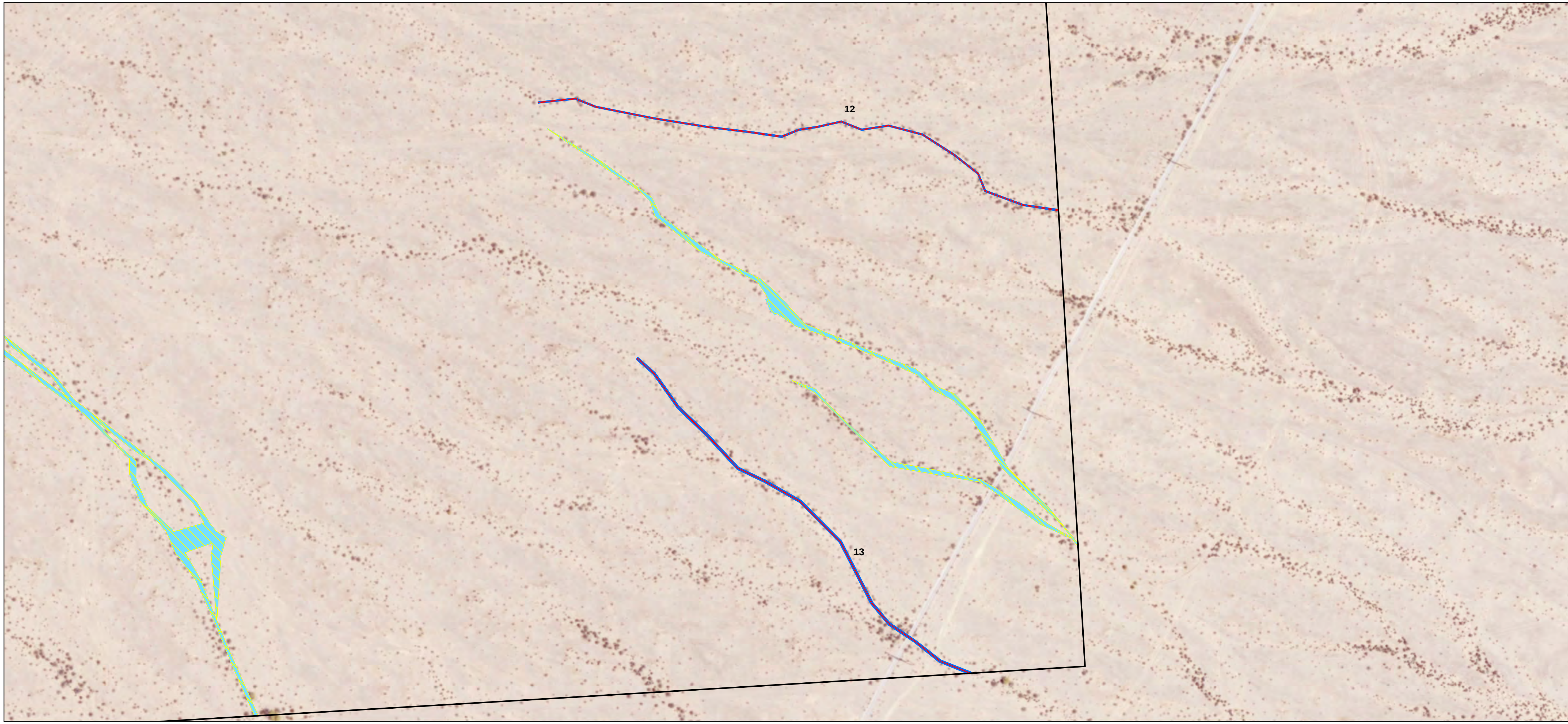


Project Location

Potential CDFW Jurisdictional Waters

Chambers Group Drainage Data (133.711 ac.)

Stantec Updated Drainage Data (1.789 ac.)

Potential State Jurisdictional Waters

Chambers Group Drainage Data (100.453 ac.)

Stantec Updated Drainage Data (1.168 ac.)

0 250 500 Feet

(At original document size of 11x17)
1:3,000

N

Stantec

Project Location
San Bernardino County, California

Prepared by DL on 2024-01-03
TR by SET on 2024-01-03
IR by RB on 2024-01-03

Client/Project 185806317
CDH VIDAL LLC
Vidal Energy Project
Jurisdictional Delineation Field Verification

Figure No.
2 - 4

Title
Potential Jurisdictional Features

Notes
1. Coordinate System: NAD 1983 California Teale Albers
2. Data Sources: Stantec 2024. Chambers Group 2020.
3. Background: California 60cm NAIP Imagery 2022.

V:\1858\Active\Vidal_Solar\03_data\gis_cad\gis\Figure2_WatersMap_DDP_20240103.mxd Revised: 2024-01-11 By: dalaw

Project Location

Potential CDFW Jurisdictional Waters

Chambers Group Drainage Data (133.711 ac.)

Stantec Updated Drainage Data (1.789 ac.)

Potential State Jurisdictional Waters

Chambers Group Drainage Data (100.453 ac.)

Stantec Updated Drainage Data (1.168 ac.)

0 200 400 Feet

(At original document size of 11x17)
1:2,400

N

Stantec

Project Location
San Bernardino County,
California

Prepared by DL on 2024-01-03
TR by SET on 2024-01-03
IR by RB on 2024-01-03

Client/Project
185806317
CDH VIDAL LLC
Vidal Energy Project
Jurisdictional Delineation Field Verification

Figure No.
2 - 5

Title
Potential Jurisdictional Features

Notes
1. Coordinate System: NAD 1983 California Teale Albers
2. Data Sources: Stantec 2024. Chambers Group 2020.
3. Background: California 60cm NAIP Imagery 2022.

V:\1858\Active\Vidal_Solar\03_data\gis_cad\gis\Figure2_WatersMap_DDP_20240103.mxd Revised: 2024-01-11 By: dalaw

Appendix B Photographic Log

Client:	CDH Vidal LLC	Project:	Vidal Energy Project
Site Name:	Vidal Energy	Site Location:	San Bernardino County, CA

Photograph ID: 1 **Photo Location:** San Bernardino County, CA **Survey Date:** 12/21/2023 **Comments:** 2020 mapped drainage that was located in the southwest corner of the Survey Area. Most drainages mapped in 2020 have matching TOB and OHWM margins.	
Photograph ID: 2 **Photo Location:** San Bernardino County, CA **Survey Date:** 12/21/2023 **Comments:** Drainage 1	

Client:	CDH Vidal LLC	Project:	Vidal Energy Project
Site Name:	Vidal Energy	Site Location:	San Bernardino County, CA

Photograph ID: 3 **Photo Location:** San Bernardino County, CA **Survey Date:** 12/21/2023 **Comments:** Drainage 2	
Photograph ID: 4 **Photo Location:** San Bernardino County, CA **Survey Date:** 12/21/2023 **Comments:** Drainage 3	

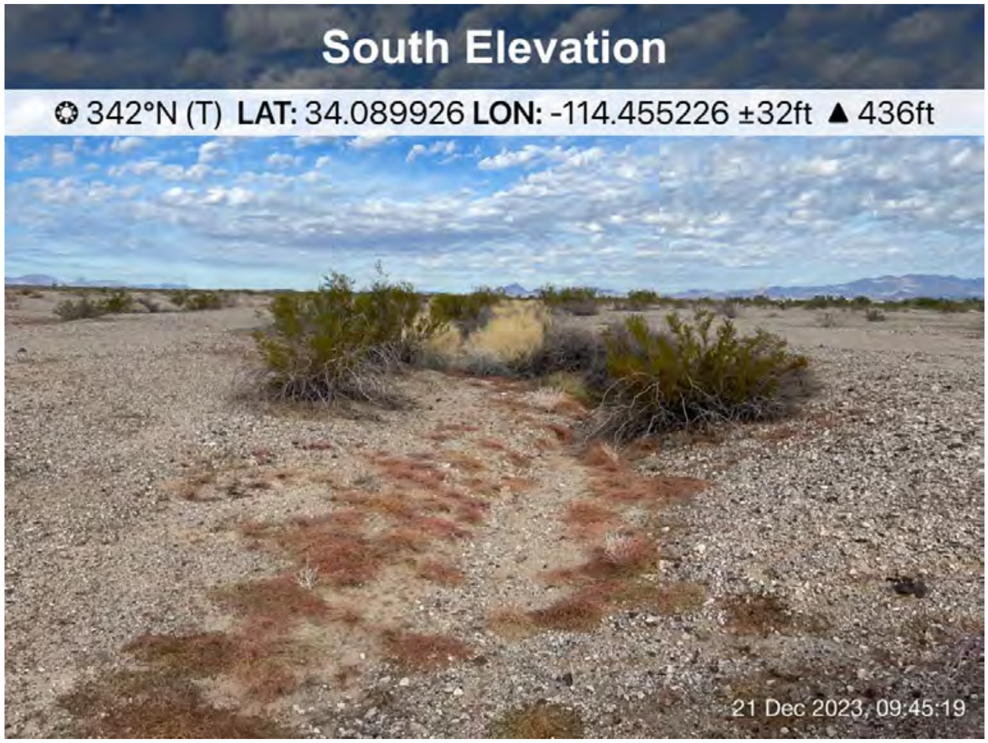
Client:	CDH Vidal LLC	Project:	Vidal Energy Project
Site Name:	**Vidal Energy**	**Site Location:**	**San Bernardino County, CA**

Photograph ID: 5

Photo Location:
San Bernardino County, CA

Survey Date:
12/21/2023

Comments:
Drainage 4

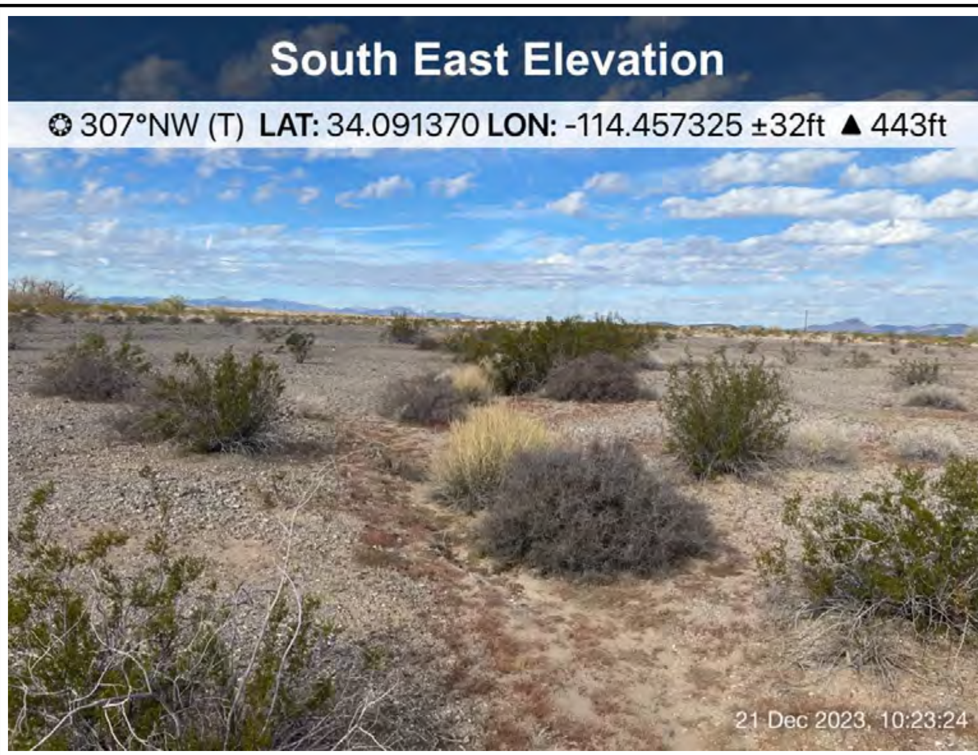


Photograph ID: 6

Photo Location:
San Bernardino County, CA

Survey Date:
12/21/2023

Comments:
Drainage 6



Client:	**CDH Vidal LLC**	**Project:**	**Vidal Energy Project**
Site Name:	**Vidal Energy**	**Site Location:**	**San Bernardino County, CA**

Photograph ID: 7

Photo Location:
San Bernardino County, CA

Survey Date:
12/21/2023

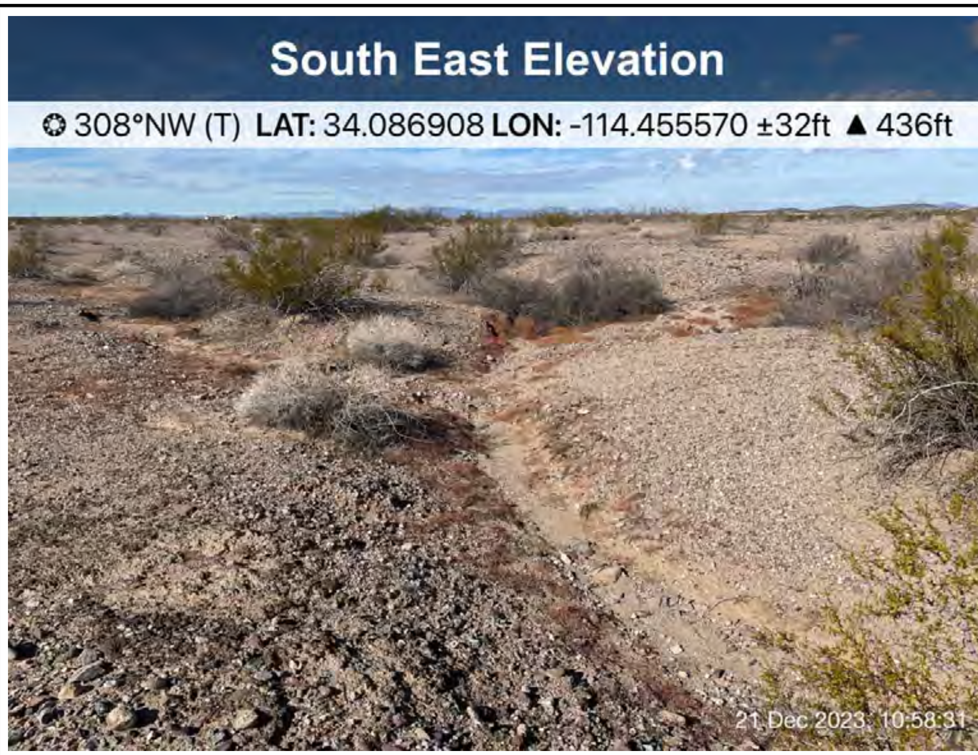
Comments:
Drainage 7

Photograph ID: 8

Photo Location:
San Bernardino County, CA

Survey Date:
12/21/2023

Comments:
Drainage 8



Client:	**CDH Vidal LLC**	**Project:**	**Vidal Energy Project**
Site Name:	**Vidal Energy**	**Site Location:**	**San Bernardino County, CA**

Photograph ID: 9

Photo Location:
San Bernardino County, CA

Survey Date:
12/21/2023

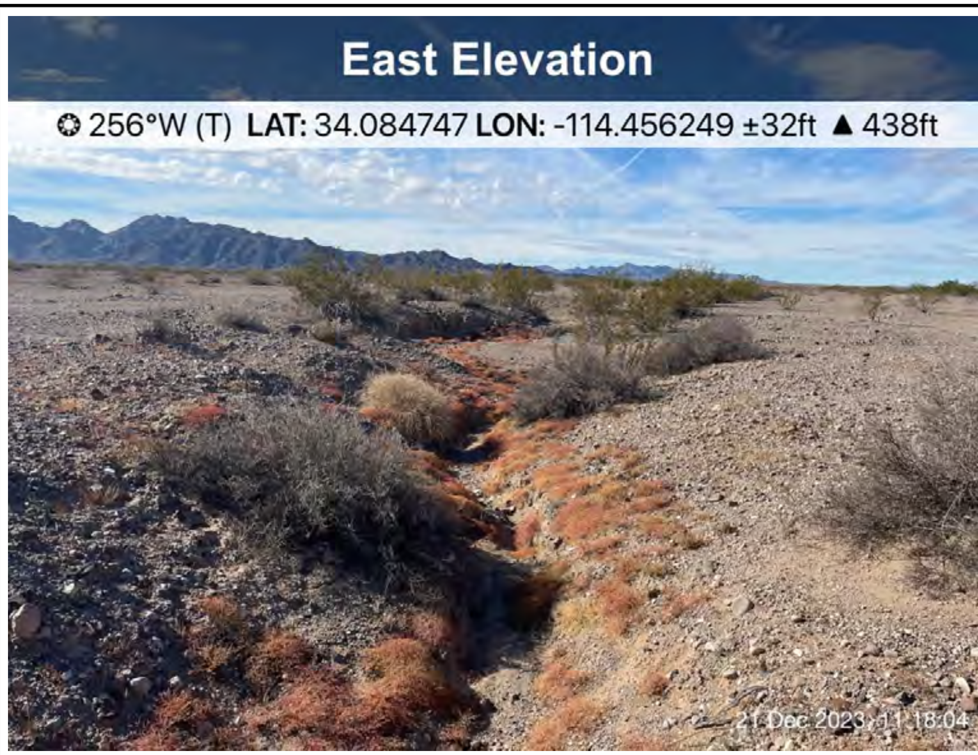
Comments:
Drainage 9

Photograph ID: 10

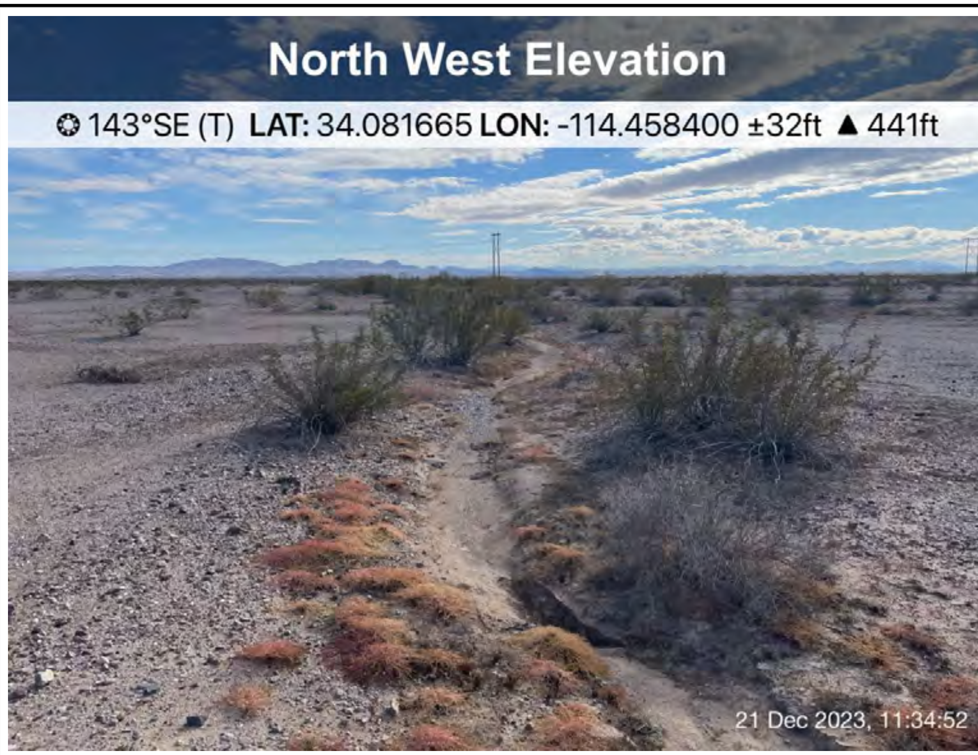
Photo Location:
San Bernardino County, CA

Survey Date:
12/21/2023

Comments:
Drainage 11



Client:	CDH Vidal LLC	Project:	Vidal Energy Project
Site Name:	Vidal Energy	Site Location:	San Bernardino County, CA

Photograph ID: 11 **Photo Location:** San Bernardino County, CA **Survey Date:** 12/21/2023 **Comments:** Drainage 12	
Photograph ID: 12 **Photo Location:** San Bernardino County, CA **Survey Date:** 12/21/2023 **Comments:** Drainage 13	

Client:	CDH Vidal LLC	Project:	Vidal Energy Project
Site Name:	Vidal Energy	Site Location:	San Bernardino County, CA

Photograph ID: 13 **Photo Location:** San Bernardino County, CA **Survey Date:** 12/21/2023 **Comments:** Drainage 14	
Photograph ID: 14 **Photo Location:** San Bernardino County, CA **Survey Date:** 12/21/2023 **Comments:** Drainage 15	

Client:	CDH Vidal LLC	Project:	Vidal Energy Project
Site Name:	Vidal Energy	Site Location:	San Bernardino County, CA

Photograph ID: 15

Photo Location: San Bernardino County, CA

Survey Date: 12/21/2023

Comments: Drainage 16

Photograph ID: 16

Photo Location: San Bernardino County, CA

Survey Date: 12/21/2023

Comments: Drainage 18

Client:	CDH Vidal LLC	Project:	Vidal Energy Project
Site Name:	Vidal Energy	Site Location:	San Bernardino County, CA

Photograph ID: 17	
Photo Location: San Bernardino County, CA	
Survey Date: 12/21/2023	
Comments: Drainage 19	

Appendix F – Cultural Resources

CULTURAL RESOURCES SURVEY REPORT
FOR THE VIDAL ENERGY PROJECT
SAN BERNARDINO COUNTY, CALIFORNIA

Prepared for:

CDH VIDAL LLC
860 Wyckoff Avenue, Suite 200
Mahwah, New Jersey 07430

Prepared by:

CHAMBERS GROUP, INC.
9620 Chesapeake Drive, Suite 202
San Diego, California 92123

Revised March 2022

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NATIONAL ARCHAEOLOGICAL DATABASE INFORMATION

Authors: Richard D. Shultz, M.A., RPA, Sandra Pentney, M.A., RPA, Kellie Kandybowicz, B.A., and Eduvijes Davis-Mullens, B.A.

Firm: Chambers Group, Inc.

Client/Project Proponent: CDH Vidal LLC

Report Date: November 2020; revised March 2022

Report Title: Draft Cultural Resources Survey Report for the Vidal Energy Project San Bernardino County, California.

Type of Study: Cultural Resources Survey

New Sites: 53

New Isolated Occurrences: 11

Updated Sites: None

USGS Quad: *Parker SW* 7.5-minute quadrangle

Acreage: 1,090

Permit Numbers: N/A

Key Words: County of San Bernardino, Colorado River, Solar, Battery Storage, Mojave Desert, Sonoran Desert, Cultural Resources Survey, Positive Survey, Single Reduction Locus, Calzona, Vidal, Desert Training Center, California-Arizona Maneuver Area, World War II, Exercise Desert Strike, Cold War, Elko point, Lake Mojave point, buff ware, red-on-buff.

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SECTION 1.0 – INTRODUCTION

Chambers Group, Inc. (Chambers Group) was contracted by CDH Vidal LLC to complete an archaeological literature review and cultural resources inventory survey for the proposed Vidal Energy Project (Project). The proposed Project consists of an approximately 1,090-acre solar photovoltaic (PV) component and 7.1-acre battery energy component and is located approximately 3 miles southeast of Vidal in San Bernardino County, California (Figure 1). The Project location as depicted in Figure 1 is referred to throughout this report as the Project Area. The survey area for the cultural resources survey is the same as the Project Area. Construction is anticipated to commence in the second quarter of 2021.

Chambers Group submitted a request to the South-Central Coastal Information Center, a member of the California Historical Resources Information System (CHRIS), on July 9, 2020, as part of the Archaeological Literature Review process prior to site survey of the approximately 1,090-acre Project Area. Results of the records search are documented in Section 3 (and Confidential Appendix A). The following study has been conducted in accordance with the Secretary of the Interior Professional Qualification Standards, the National Historic Preservation Act, and the California Environmental Quality Act (CEQA).

1.1 PROJECT DESCRIPTION

CDH Vidal LLC (CORE) plans to construct and operate an approximately 1,090-acre photovoltaic (PV) and battery energy storage system (BESS) facility to generate renewable energy in Vidal, San Bernardino County (the Project). The Project will provide 160 megawatts of alternating current (MW-AC) of renewable energy and would be supported by the existing, adjacent Western Area Power Administration (WAPA) 161 kV overhead transmission corridor. The facility would include the construction of one on-site substation facility which would collect and convert the power generated onsite for transmission in an overhead or underground line to the WAPA transmission system and interconnection location. The Project's permanent facilities would include PV panels, BESS, fencing, service roads, a power collection system, communication cables, overhead and underground transmission lines, electrical switchyards, a Project substation, and operations and maintenance facilities.

The purpose of this investigation is to identify cultural resources and assess their significance and eligibility for listing in the National Register of Historic Places (NRHP).

1.2 PROJECT LOCATION

The Project site is located approximately 2.5 miles southeast of Vidal, an unincorporated area of San Bernardino County (County) that is located just east of U.S. Route 95, just north of the Riverside County border, and just west of the Colorado River (Figure 1). The Project site encompasses approximately 1,090 acres within 23 privately-owned parcels (in their entirety and portions of) that are in the process of lease acquisition by CORE (Table 1). The owned parcels encompass approximately 783 acres, property pending ownership covers approximately 120 acres, and properties for sub-lease cover approximately 317 acres. The owned parcels are located on the western side of the Project site and the sub-lease area is located adjacent to the Colorado River Indian Reservation on the eastern side of the Project site. The Project is located on the United States Geological Survey (USGS) *Parker SW*, California, 7.5-minute quadrangle.

The Project site is located within the Desert Region's East Desert Fundamental Community planning area of the County. The County's Zoning Map identifies the zoning of the Project site as Resource Conservation (RC; County Zoning Map). The RC land use zoning district provides sites for open space and recreational activities, single-family homes on very large parcels, and similar and compatible uses. Commercial renewable energy facilities are an allowable land use within the RC land use zoning district (County Development Code 2007). Existing development in the area includes rural access roads and scattered rural residences. Current land use within the Project site includes one rural residence and several WAPA towers. Legal descriptions are noted in Table 1 and shown on Figure 2.

Table 1: Assessor's Parcel Numbers Associated with the Project

APN	APN	
064-705-108	064-706-109	064-708-137
064-705-111	064-706-113	064-708-141
064-706-101	064-706-115	064-708-142
064-706-102	064-706-116	064-709-103
064-706-103	064-706-120	064-709-104
064-706-104	064-706-122	064-709-105
064-706-105	064-706-129	064-709-106
064-706-108	064-706-130	

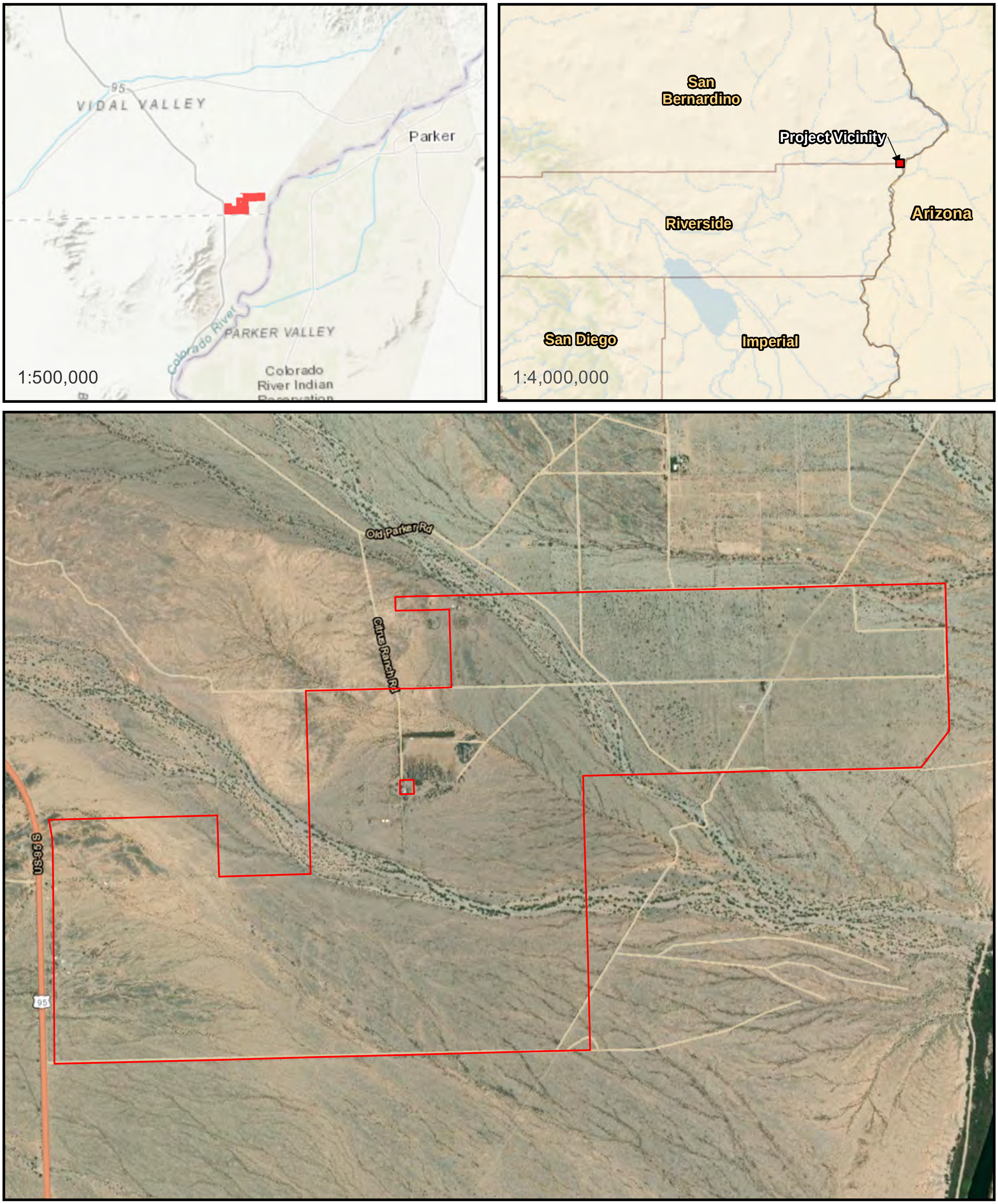
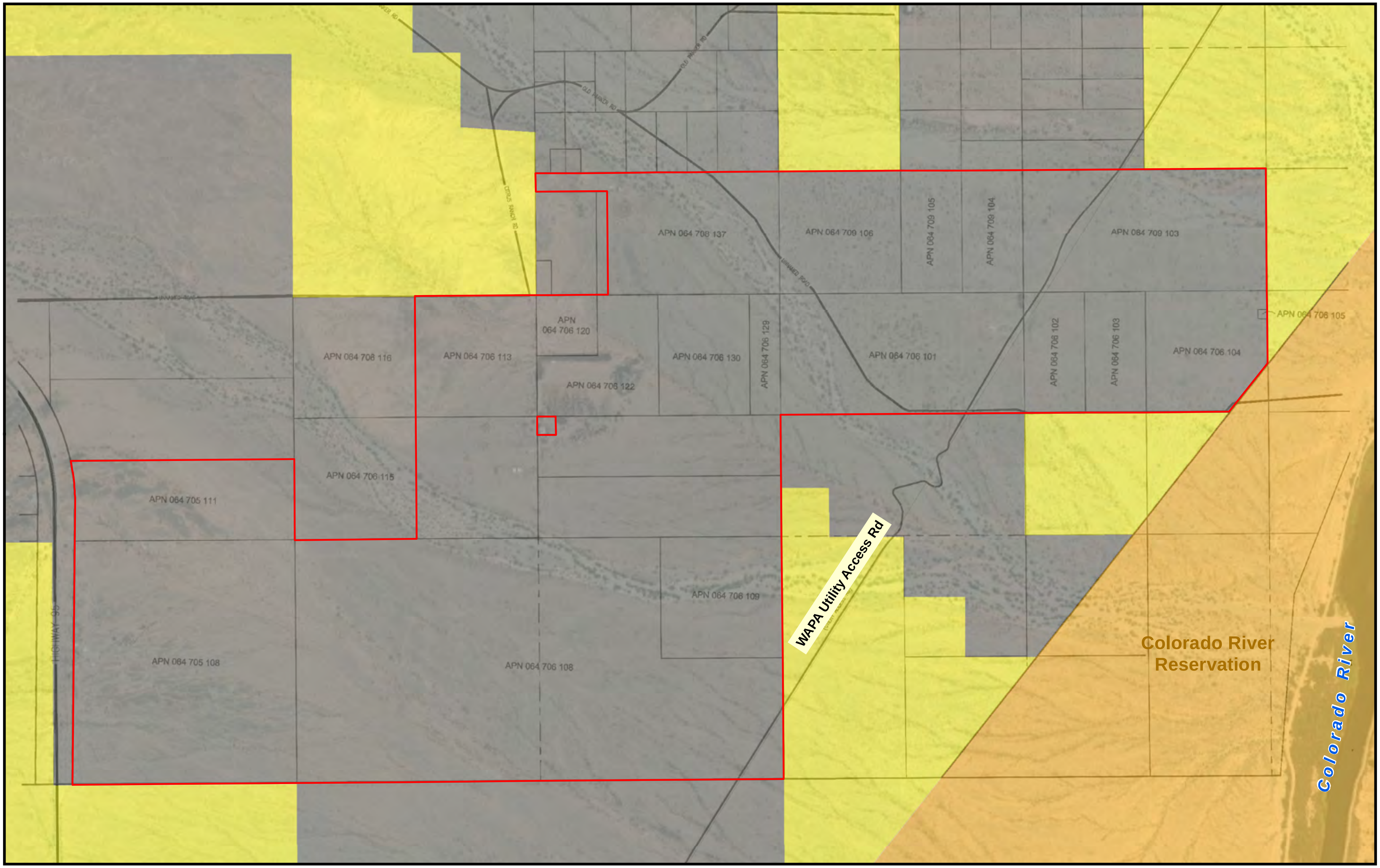


Figure 1
Vidal Energy
Project Location & Vicinity

Name: 21232 CULT Fig 1 Project Location & Vicinity.Mxd
Print Date: 11/11/2020, Author: pcarlos

CHAMBERS GROUP



Project Location

Land Ownership

Bureau of Land Management

Bureau of Indian Affairs

Private Land

Figure 2
Vidal Energy Project
Parcel Addition

4

Name: 21232 PROJ Parcel Change.Mxd
Print Date: 3/3/2022, Author: pcarlos

CHAMBERS GROUP

SECTION 2.0 – SETTINGS

2.1 ENVIRONMENTAL SETTING

As noted in Section 1.0, the proposed Project is in southeastern San Bernardino County, along the western margin of the Colorado River Indian Tribes Reservation, immediately adjacent to the Colorado River, and is approximately 41 miles north of Blythe and 58 miles south of Needles, California. This area is located within the northernmost section of the Sonoran Desert physiography. Average temperatures in nearby Vidal range in January from 41 degrees Fahrenheit (°F) (5 degrees Celsius [°C]) to 67 °F (19 °C), and July average temperatures range from 78 °F (26 °C) to a high of 108 °F (42 °C). The region receives very little rainfall and, on average, receives just 5.17 inches (131 millimeters [mm]) of precipitation per year, with July and January averaging just 0.27 and 0.87 inches (22 mm), respectively.

2.1.1 Geology

During the late Miocene and Pliocene, the Vidal area was submerged in a brackish estuary that reached beyond Needles, California, and resulted in the deposit of the Bouse Formation. Following the retreat of the sea, fluvial deposits issued by the Colorado River backfilled the valley, with older deposits dating to 3.4 to 5.1 m.y, and intermediate age deposits dating to greater than 730,000 years (Carr 1991:17, 19).

Some of the oldest sediments within and immediately adjacent to the Project Area are Old Fluvial deposits (QTr), dating to the Pleistocene and Pliocene. These are described as moderately to poorly indurated clay, silt, sand, pebbles, cobbles, and marl deposited by the Colorado River. Colors are predominantly shades of red and brown. In places riverine ostracods and fossil wood have been identified. Fine-grained deposits near the Mesquite Mountains have normal paleomagnetic polarity, indicating an age younger than 700,000 years. Terraces at different levels exhibit different degrees of soil formation, indicating a wide range of ages. Some deposits channel into underlying units such as the Fanglomerate of Osborne Wash (To), or the Bouse Formation (Tb), or other river deposits. Old Fluvial deposits can be as much as 30 m in thickness. A terrace associated with these deposits occurs at an altitude of 480 ft (144 m) on the west side of the Colorado River (Carr and Dickey 1980).

Some minor fingering of Old Alluvium Unit B (Q2b), dating to the Pleistocene, is mapped in the western-most corner of the Project Area. This deposit is described as consisting of angular to subrounded, fairly well sorted silt, sand, and gravel of local origin. Cobbles and boulders are much less common than in the younger and older units. Surface of Q2b deposits is smooth, darkly varnished, well-sorted, tightly packed pavement. A well-developed soil profile consists of a vesicular silty A2 horizon more than 3 cm thick; a reddish-orange B horizon, usually 10-20 cm thick with very minor day formation; and a Calcium Carbonate horizon as much as 10-12 cm thick containing scattered small soft calcite nodules or filaments, and pebbles coated on the underside with as much as 5 mm of calcite. ^{230}Th-^{234}U and ^{14}C dates in the area of the Whipple Mountains are 61,000 years and 20,000-25,000 years, which is in general agreement with the 11,000--50,000 years age estimated from soil development. Surface is usually less than 5 m above present drainage, except in and near mountains, and deposit thickness is generally less than 3 m (Carr and Dickey 1980).

The majority of the Project Area consists of Young Alluvium (Q3) entwining with Recent Alluvium (Q4) mapped as both Q4+Q3, where the two are interlaced in such detail that separate mapping was impractical (the order of the units listed indicates which unit predominates in areal distribution), and as

$\frac{Q4+Q3}{QTr}$, where a veneer of the younger unit(s) masks, but may not completely conceal, the underlying unit (Carr and Dickey 1980).

Young alluvium (Q3) is a Holocene deposit and is described as a poorly sorted silt, sand, angular to subrounded pebbles, cobbles, and boulders. The deposits form bars and channels and have a slight to occasional dark desert varnish. An incipient soil formation consists of a vesicular, silty A2 horizon, a few centimeters of very light orange-tinted silt and sand with a few pebbles having a very thin partial coating of calcite. In the area south of the Whipple Mountains ^{230}Th-^{234}U and ^{14}C dates gave ages of 6,000 and 7,000 years, respectively, which agree with the age estimated from soil development of 2,000-11,000 years. Q3 deposits are usually less than 1 m higher than unit Q4 except in and very near the mountains, where the elevation difference may be several meters, and deposit thickness is usually less than 2 m (Carr and Dickey 1980).

Recent alluvium (Q4) is a late Holocene deposit and is described as silt, sand, pebbles, cobbles, and boulders located within modern drainage areas. The deposits consist of poorly sorted, angular to subrounded, unconsolidated material of local origin, with deposit depths generally less than 2 m. Age estimates for Q4 deposits range between 0-2,000 years (Carr and Dickey 1980).

2.1.2 Soils

After review of USDA Soil Conservation Service and by referencing the USDA NRCS Web Soil Survey (USDA 2020), it was determined that the Survey Area is located within the Colorado Desert Area (CA803) and the Colorado River Indian Reservation; Parts of La Paz County, Arizona; and Riverside and San Bernardino Counties Area (AZ656). Based on the results of the database search, no digital soil data exists for this area; however, soil data exists just east of the Project Area that visually appears to be contiguous with the soils found within the Project Area. Assuming the soils are the same or similar to adjacent soils, the following three soils types may be present in the Project Area:

- Badland-Torriorthents-Torripsamments complex, 10 to 60 percent slopes is a soil complex composed of 35 percent Badland, 30 percent Torriorthents and similar soils, 20 percent Torripsamments and similar soils, and 15 percent of other minor components. Torriorthents are hillslopes formed from unconsolidated alluvium derived from claystone and/or unconsolidated sediment alluvium derived from sandstone and siltstone with 20 to 45 percent slopes. A typical soil profile consists of very gravelly sandy loam to a depth of 10 inches and extremely gravelly sandy loam below 10 inches. Torriorthents are characterized by high runoff and low water storage profile. Torripsamments are hillslopes formed from the same parent material as Torriorthents with 10 to 30 percent slopes. A typical soil profile consists of fine sand to a depth of 60 inches. Torripsamments are also characterized by high runoff and low water storage profile.

- Carrizo extremely gravelly coarse sand, 0 to 3 percent slopes is a soil found on floodplains and is derived from stratified mixed igneous alluvium. A typical soil profile consists of extremely gravelly coarse sand to a depth of 5 inches, followed by very gravelly coarse sand to a depth of 60 inches. This excessively drained soil type is characterized by low runoff and a very low water storage profile. Carrizo Series soils are used for rangeland and recreation and provide wildlife habitat. Vegetation typical of this soil series includes creosote (*Larrea tridentata*), bur-sage and burrobrush species (*Ambrosia* spp.), and range rhatany (*Krameria erecta*).

- Superstition gravelly loamy fine sand, 0 to 3 percent slopes comprises somewhat excessively drained soils found on terraces and is derived from alluvium and sandy eolian deposits. A typical soil profile consists of gravelly loamy fine sand to a depth of 1 inch followed by loamy fine sand to a depth of 60 inches. This soil type is characterized by very low runoff and a low water storage profile. Superstition Series soils are important for livestock grazing and irrigated cropland. Vegetation typical of this soil series includes creosote and bur-sage.

2.1.3 <u>Habitats / Vegetation Communities</u>

Six vegetation communities in addition to Bare Ground and Developed areas were mapped within the Project Area: Blue Palo Verde – Ironwood Woodland, Creosote Bush Scrub, Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance, Disturbed Creosote Bush Scrub, Disturbed, and Tamarisk Thickets. The dominant vegetation community within the Project Area is Creosote Bush Scrub, with two large washes dominated by Blue Palo Verde – Ironwood Woodland.

Blue Palo Verde – Ironwood Woodland

Blue Palo Verde – Ironwood Woodland as described by Sawyer et al. (2009), is dominated by blue palo verde (*Parkinsonia florida*), ironwood, or smoke tree (*Psorothamnus spinosa*) less than 60 feet in height. The tree canopy is continuous to open where shrubs are common, and seasonal annuals are present in the herbaceous layer. Blue Palo Verde – Ironwood Woodland habitat occurs along desert arroyo margins, seasonal watercourses and washes, bottomlands, middle and upper bajadas and alluvial fans, and lower slopes that are occasionally flooded or saturated at elevations between 30 and 1,600 feet above mean sea level (amsl). Blue Palo Verde – Ironwood Woodland is consistent with Desert Dry Wash Woodland as described by Holland (1986).

Blue Palo Verde – Ironwood Woodland is present within the Project Area along two large washes that generally flow from west to east in the northern and central portions of the Project Area. In addition, this habitat is associated with a number of smaller drainages along the southern border of the Project Area. Plant species found on the Project Area typical of this vegetation community include: white bur-sage (*Ambrosia dumosa*), cheesebush (*Ambrosia salsola* var*. salsola),* sweetbush (*Bebbia juncea* var. *aspera*), silver cholla (*Cylindropuntia echinocarpa*), brittlebush (*Encelia farinosa*), desert lavender (*Condea emoryi*), creosote bush, Anderson's wolfberry (*Lycium andersonii*), and cat's claw (*Senegalia greggii*). There are 81.44 acres of Blue Palo Verde – Ironwood Woodland in the Project Area.

Creosote Bush Scrub

Creosote Bush Scrub as described by Sawyer et al. (2009) consists of widely spaced shrubs less than 10 feet in height dominated by creosote bush or co-dominant with white bur-sage, cheesebush, and/or brittlebush, frequently with bare ground between shrubs. Growth occurs from winter to early spring if rainfall is sufficient. Ephemeral herbs typically flower from late February to March. Creosote Bush Scrub can be found on alluvial fans, bajadas, upland slopes, and minor intermittent washes with well-drained secondary soils and sometimes desert pavement at elevations between 245 and 4,256 feet amsl. Creosote Bush Scrub is consistent with the Sonoran Creosote Bush Scrub and Mojave Creosote Bush Scrub communities as described by Holland (1986).

Creosote Bush Scrub habitat is located in the northeastern portion of the Project Area that was previously used for dry-land and irrigated farming and contains a high amount of non-native species; however, the level of disturbance and non-native species cover does not rise to the level of being considered a disturbed form of this habitat. Plant species found within the Project Area that are typical of this vegetation community include: cheesebush, sweetbush, pencil cholla (*Cylindropuntia ramosissima*), silky dalea (*Dalea mollissima)*, barrel cactus (*Echinocactus polycephalus)*, brittlebush, and bush encelia (*Encelia frutescens*). Emergent trees or tall shrubs may be present at low cover. There are 913.57 acres of Creosote Bush Scrub within the Project Area.

A disturbed form of this habitat is located in proximity to two now-abandoned residential areas. This vegetation type has been disturbed by human activities such as off-road vehicle use, the introduction of non-native species, past development, compaction, and/or littering; and it is considered of lower quality than the Creosote Bush Scrub habitat described above. Non-native, weedy species found in these areas include: Saharan mustard (*Brassica tournefortii*), foxtail brome (*Bromus rubens*), and Mediterranean schismus (*Schismus barbatus*). A total of 30.75 acres of Disturbed Creosote Bush Scrub is located within the Project Area.

Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance

The Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance as described by Sawyer et al. (2009) can be found in broad alluvial fans and lower slopes in the desert and are associated with areas of desert pavement. The ground surface is sandy and gravelly mixed alluvium, with various rocks and gravel along with interstitial fine sediments. The herb layer is sparse to intermittent, and the non-vascular (cryptogamic crust) layer is sparse to intermittent. The shrub layer is often sparse or non-existent. Rigid spineflower (*Chorizanthe rigida*) and/or hairy desert sunflower (*Geraea canescens*) is characteristically present in the herbaceous layer. Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance is consistent with Sonoran Desert Scrub or Mojave Creosote Bush Scrub communities as described by Holland (1986).

Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance is present within the Project primarily along the western edge of the Project Area and within 0.5 mile of US-95. Plant species found on the Project Area typical of this vegetation community include: rigid spineflower with lesser amounts of trailing windmills (*Allionia incarnata*), Saharan mustard, foxtail brome, primrose (*Camissonia* spp.), pincushion (*Chaenactis* spp.), spurge (*Euphorbia* spp.), brittle spineflower (*Chorizanthe brevicornu*), cryptantha (*Cryptantha* spp.), and common Mediterranean grass (*Schismus* spp.). Shrub cover is very sparse, if present at all, and when present includes bur-sage, desert holly (*Atriplex hymenelytra*), silver cholla, brittlebush sunflower, white rhatany (*Krameria grayi*), creosote bush, beavertail cactus (*Opuntia basilaris*), and/or honeysweet (*Tidestromia suffruticosa*). There are 20.26 acres of this vegetation type located within the Project Area.

Tamarisk Thickets

Tamarisk Thickets as described by Sawyer et al. (2009) can be located in a variety of riparian and upland areas and is generally dominated by any number of tamarisk species. Tamarisk are known to be strongly phreatophytic, and they often supplant native vegetation following a major disturbance. Soil is usually sandy or gravelly in braided washes or intermittent streams, often in areas where high evaporation increases the stream's salinity. Tamarisk Thickets is consistent with the Tamarisk Scrub community described by Holland (1986).

Tamarisk Scrub is present as a windbreak along the northern and western edges of a former agricultural area in the central portion of the Project Area. Plant species found within the Project Area typical of this vegetation community include a nearly monotypic makeup dominated by Mediterranean tamarisk

(*Tamarix ramosissima*) with scattered annual species including schismus, Saharan mustard, and cryptantha along the periphery of the habitat. There are 1.53 acres of Tamarisk Thickets within the Project Area.

Disturbed

Areas classified as Disturbed habitat tend to be dominated by pioneering herbaceous species that readily colonize disturbed ground and that are typically found in temporary, often frequently disturbed habitats (Barbour et al. 1999) that have a high percentage of non-native weedy species (i.e., greater than 25 percent of the species cover). The soils in Disturbed areas are typically characterized as heavily compacted or frequently disturbed. The vegetation in these areas is adapted to living in compacted soils where water does not readily penetrate the soil. Plant species found within the Project Area typical of this vegetation community include non-native annual species such as Arabian schismus, Mediterranean schismus, sand peppergrass (*Lepidium lasiocarpum* subsp. *lasiocarpum*), and Saharan mustard. This habitat is associated with areas along the extreme western edge of the Project Area along US-95 as well as within a previous agricultural area within the central portions of the Project Area. There are 24.95 acres of Disturbed habitat within the Project Area.

Bare Ground

Bare Ground areas are devoid of vegetation. These areas are generally associated with the existing dirt access roads located throughout the Project Area. A total of 16.61 acres of Bare Ground are located within the Vegetation Survey Area.

Developed

Developed areas are areas that have been altered by humans and now display man-made structures such as houses, paved roads, buildings, parks, and other maintained areas.

Developed areas are present within the Project Area and are associated with existing residential structures located along the western edge and eastern-central portions of the Project Area. There are 1.79 acres of Developed areas within the Project Area.

Table 2 below summarizes the vegetation communities within the Project Area and the acreage of each community.

Table 2: Vegetation Communities within Project Area

Vegetation Community	Project Area (acres)
Blue Palo Verde – Ironwood Woodland	81.44
Creosote Bush Scrub	913.57
Disturbed Creosote Bush Scrub	30.75
Rigid Spineflower – Hairy Desert Sunflower Desert Pavement Sparsely Vegetated Alliance	20.26
Tamarisk Thickets	1.53
Disturbed	24.95
Total Vegetation Communities	***1,072.50***
Bare Ground	16.61

Table 2: Vegetation Communities within Project Area

Vegetation Community	Project Area (acres)
Developed	1.79
Total	**1,090.90**

*Data from biological survey and detailed in the biological report for this project.

2.2 CULTURAL SETTING

2.2.1 PREHISTORY

The Vidal Solar Project Area is situated at the northern edge of the Sonoran Desert, near its intersection with the Mojave Desert. At this location, the Mojave Desert encompasses a thin wedge of Sonoran Desert extending along the Colorado River, stretching only a few miles west of the river. The Sonoran Desert is composed of several subregion deserts for which this aspect is defined as part of the Colorado Desert.

Because the Project Area is situated near the convergence of these two great desert systems, the cultural sequences that have been developed for these two deserts are best described individually. However, these sequences do not have clear lines of demarcation within the vicinity of the Project Area; desert evolution and human occupation in the desert region have been varied and dynamic over the course of millennia, and no delineation of where one ends and the other begins has been definitively established.

As one of the first researchers in the Southern California deserts, Malcolm Rogers and his cultural chronologies have influenced and confounded subsequent researchers for decades. Rogers (1966) was among the first to synthesize and propose a regional overview; but because he frequently added new data to his thesis, several revisions—often contrary to a previous iteration—were produced (Warren 1984; Weide 1976; Schaefer 1994; Hall 2000). Rogers proposed a sequence beginning with the San Dieguito Complex, which he subdivided into San Dieguito I, II, and III. This cultural complex spanned from 11000 to 9000 before present (B.P.). After a 2000-year hiatus, the Amargosa Complex (Amargosa I–III) followed, dating from 7000 to 1950 B.P. Rogers then proposed the introduction of Basketmaker III and Pueblo II Periods, dating from 1950 to 1450 B.P. This was then followed by Prehistoric Yuman and Shoshonean Groups from approximately 1450 to 450 B.P., and then by the Paiute and Mojave groups after 450 B.P. Numerous additional regional chronologies have followed Rogers's original work, some of which are presented here (Figure 3).

Mojave Desert

The Mojave Desert cultural sequence had been divided into five major periods by Warren (1984:413-424) and Warren and Crabtree (1986). This sequence includes Lake Mojave, Pinto, Gypsum, Saratoga Springs, and Shoshonean/Protohistoric periods. Warren (1984:413) describes the Lake Mojave period, from 10000 to 7000 B.P., as being "a generalized hunting and gathering subsistence system." The Pinto Period which follows, dating approximately from 7000 to 4000 B.P., is defined by its characteristic Pinto-style projectile point as well as by scrapers and knives. Warren also suggested that this period lacked ground stone implements. Schroth [1994:79], however, states "Ground stone, principally cobble manos and block metates, are present at 16" of 22 Pinto-period sites in the Pinto Basin. Campbell and Campbell (1935:28-29) also noted ground stone at Pinto Basin sites, though they could not necessarily place these within the Pinto-period. Nevertheless, Campbell and Campbell noted that given the numerous associations of ground stone within these sites they could not disclaim their contemporaneity with the other Pinto-period artifacts. These factors suggest that Pinto-period occupation comprised small bands of people, as evidenced by the non-intensive seasonal encampments that date to this period. By 4000 B.P. Humboldt Concave Base, Gypsum Cave, Elko Eared, and Elko Corner-notched projectile points are evident in the archaeological record. Additionally, ground stone tools suggest a shift toward a changing economy based on processing hard seed goods.

Figure 3: Cultural Sequence Concordance

date based on 1950 14C baseline	Rogers' (1966) sequence for the Central Aspect	Warren's (1984) chronology for the Mojave Desert	Sutton's (1996) update of Warren's (1984) chronology	Hall's (2000) sequence for the Mojave Desert	Schaefer's (1994) sequence for the Colorado Desert	A second sequence for the Colorado Desert (Altschul 1994)	A second version of Rogers' cultural se-quence (Weide 1976)	Weide's (1976) chronology for the Yuha Desert	Sequence for the Indian Hill Rockshelter site (McDonald 1992)
100 B.P.	Paiute and Mojave	Shoshonean/ Protohistoric	Late Prehistoric	Tecopa	Late Prehistoric	Patayan I-III	Yuman I-III	Increased population growth	Late Prehistoric
450	Prehistoric Yuman and Shoshonean Groups								
		Saratoga Springs		Saratoga				Very little archaeological remains; low population densities	
950			Rose Springs						Sporadic occupation
						Late Archaic	Amargosa		
1450	Basketmaker III and Pueblo II	Gypsum	Gypsum	Newberry	Late Archaic				Early period II
1950	Amargosa								
2950									
3950		Pinto	Pinto	?	Early Archaic		Pinto		Early period I
				Pinto					
4950						Early Archaic			
5950									?
6950	?	Lake Mojave	Lake Mojave						
				Lake Mojave			San Dieguito		
7950					Paleoindian				
8950	San Dieguito					Paleoindian		San Dieguito	
9950		?	Paleoindian	?					
10950	?					?		Pre-projectile point	
11950					?		Pre-projectile point		
			?						
12950									
13950									

After Love and Dahdul, 2002

Indications of long-range trade or travel are also suggested, based on coastal California shell ornaments (Warren 1984:419). By 1450 B.P. use of ground stone and bow and arrow technologies suggests further shifts in desert adaptations. With the introduction of the Rose Spring and Eastgate projectile points through much of the desert region and brownware and buffware ceramics as well as Cottonwood and Desert Side-notched projectile points in the southern desert region, Warren proposed the Saratoga Springs Period. Dating from 1450 to 750 B.P. this period is characterized by "more complex settlement-subsistence system with large permanent villages" (Warren 1984:424) and increased long-distance networks. Warren further suggests that the artifact types associated with the Saratoga Springs Period see continued use through the Shoshonean/Protohistoric time period, from 750 B.P. up to the historic period.

Following on from Warren, Sutton (1996:225-240) presents a slightly altered chronology for the Mojave Desert region. Though claims for a very early "Pre-Projectile Point" occupation of the desert region have been made (Simpson 1958; Davis et al. 1980), Sutton suggests that evidence for these claims is wanting. The first clearly definable period of occupation occurs during the Paleoindian Period. Dating from 12,000 to 10,000 B.P, the Paleoindian Period is characterized by Clovis, or Clovis-style, fluted points, which have been associated with the Big Game Hunting Tradition. Sutton notes, however, that while taking megafauna may have been the primary subsistence strategy, smaller game as well as vegetal foods would have also been procured. Sutton's Pre-Projectile Period cultural sequence is followed by Warren's outline for the Lake Mojave, Pinto, and Gypsum Periods. Sutton nuances Warren's Saratoga Springs Period with his own Rose Springs Period. Dating from 1450 to 950 B.P., the Rose Spring Period follows the Gypsum Period and is characterized by Rose Springs and Eastgate projectile points. These point types—indicating use of bow and arrow technologies along with the use of ground stone tools, imported marine shell artifacts and obsidian, and evidence of more developed middens within sites—suggest more intensive and extensive use of desert resources. Sutton's Late Prehistoric Period, from 950 B.P. to contact, is an extension of the previous Rose Springs Period with a continuation of similar subsistence strategies, but with a replacement of projectile point forms with Cottonwood Triangular and Desert Side-notched points and the introduction of ceramic technology.

Like others, Hall (2000:14-16) suggests a five-stage chronology. Hall begins with the Lake Mojave Period beginning around 10,000 B.P. and extending to 7500 B.P. Hall suggests that during this period the Mojave Desert region was occupied by small bands of hunters and gatherers. Great Basin stemmed points and flaked stone crescents mark this period (Hall 2000:14). Continuing on into the Pinto Period (approximately 7500 B.P. to 4500 B.P.), these mobile bands evidenced an intensified occupation with the advent of ground stone tools, a reliance on large and small game, and an assortment of vegetal resources. Long-range travel or trade is also noted for this period, as illustrated by the presence of *Olivella* sp. spire-lopped beads in archaeological sites.

Following a brief hiatus, a culture adopting a different strategy emerges. Hall (2000:16) describes the Newberry Period, dating from 4000 to 1450 B.P., as one which has "geographically expansive land-use pattern[s]…involving small residential groups moving between select localities." As with the Pinto Period, there is evidence of long-distance trade or travel, along with a diffusion of trait characteristics from other groups. Defining artifact types from this period include Elko and Gypsum contracting stem points and split oval beads. Hall then adopts Warren's Saratoga Springs Period (1450 to 750 B.P) and adds a Tecopa Period (750 B.P to contact) as defining the last 1500 years of cultural development. Like Warren's Saratoga Springs Period, Hall (2000:17) notes an apparent restriction in geographic use area as a consequence of an increasing population. Anasazi grayware ceramics and Rose Springs and Eastgate projectile points are characteristic artifact types for the period. The Tecopa Period sees a continuation of similar patterns noted during the Saratoga Springs Period; and, like Sutton's Late Period, Cottonwood Triangular and Desert Side-notched projectile points replace earlier iterations. Furthermore, buff and brownwares are introduced into the archaeological record, as well as beads of steatite, glass, and *Olivella* sp., including Thin Lipped, Tiny Saucer, Cupped, and Cylinder styles.

Colorado Desert

Schaefer (1994), using numerous northern Colorado Desert area studies, presents a four-period cultural sequence. Incorporating Rogers' earlier definition of the Malpais Pre-Projectile Period (Rogers 1939:6-7), Schaefer identifies a Paleoindian Period, dating prior to 10,000 B.P. and lasting to 8000 B.P. It is characterized by settlements atop mesas and terraces occupied by small, mobile bands of hunters and gatherers who subsisted on small and large game and a variety of vegetal materials. Key indicators of this period include cleared circular areas in the desert gravels, sometimes called "house sites" or "sleeping circles" (Rogers 1939:6-7; 1966:45-47); gravel pictographs of both the rock alignment and intaglio type (Rogers 1939:9-16); and very simple stone tools.

Schaefer next describes an Early Archaic Period dating from 8000 B.P. to 4000 B.P. and a Late Archaic Period dating from 4000 to 1450 B.P. Both periods appear to have been thinly populated with a population decline beginning in the Early Archaic. Both periods indicated highly flexible group sizes that practiced a seasonally adjusted settlement pattern based on available food resources. Ground stone tool production and use greatly expands during this period. In a work presented by Altschul (1994:27-23), Schaefer elaborates on these periods, shifting the time frame out to 10,000 B.P. and 1350 B.P. and inserting a Middle Archaic Period. While both Early and Late Archaic periods are indicated by low population densities, Schaefer suggests that the Middle Archaic witnessed a population increase. Based on interpretations of increased projectile point variability, some have suggested that social group membership, resource competition, and development of defenses along territorial borders were taking place during this period. Following a return to warmer and drier conditions, the Late Archaic Period appears to indicate a return to small, mobile groups focusing on ground stone technology and seasonally available resources. Characteristic artifact types include large spear and dart points, basketry, nets, traps, split-twig figurines (which were also noted in Warren's Gypsum Period), and other perishable items (Altschul 1994:29).

Schaefer's last cultural phase, the Late Prehistoric, has been termed the Patayan and has been subdivided into Patayan I, II, and III. Particular characteristic features of this period are the use of ceramic technology, cremation funerary patterns, and an extensive trail system. Schaefer dates Patayan I from 1150 to 900 B.P., noting that people organized in small mobile groups along the Lower Colorado River and utilized a Hohokam-style tool kit. The Patayan II Period is dated from 900 to 450 B.P. and is notable for the infilling of Lake Cahuilla. The lake encouraged population shifts toward the floodplain and along the western and eastern regions of the desert. Ceramic production also shifted from the Lower Colorado River toward a more local manufacture. Subsequent desiccation of Lake Cahuilla (Altschul 1994:30) marks the Patayan III Period (approximately 450 B.P. to historic times). Populations return to the Lower Colorado River as small, mobile bands subsisting on seasonal hunting and gathering as well as on small-scale agriculture. During this period contact with European explorers is made, giving rise to the Protohistoric Period.

2.2.2 ETHNOGRAPHY

The Project Area is located within the ancestral territory of the Mohave and the Chemehuevi. The Colorado River Indian Tribe is the closest reservation to the Project, though the reservation is a modern construct of the American government and does not reflect the culture history of the area. The population of the reservation comprises people from the Mohave, Chemehuevi, Hopi, and Navaho. While the Hopi and Navaho were forced into the reservation from further east, both the Mohave and Chemehuevi have been in this region since the tribe split off from the Southern Paiute in the area of current-day Las Vegas (Bean and Vane 2002). Although the origins of the Chemehuevi are of the Southern Paiute, their culture has been heavily influenced by the Mohave (Deur and Confer 2012), testifying to the close relationship between the two tribes. Relationships between the Chemehuevi and the Mohave have not always been peaceful; however, the Mohave retained the rights to travel through the newly established Chemehuevi territory (Bean and Vane 2002).

The subsistence pattern of the Chemehuevi was agriculturally based. Maize, squash, melons, gourds, beans, cowpeas, winter wheat, and some grasses were key crops grown in the floodplain areas along the Colorado River. Hunting and gathering were also important elements of the subsistence strategy undertaken by younger adults while the elderly stayed in the village to tend to the crops (Deur and Confer 2012).

Spiritually, the Chemehuevi were tied to their land, with spiritual power coming from particular landmarks within their territory such as mountain peaks, caves, or springs. Puha trails link the landmarks together and are also considered to have spiritual power (Deur and Confer 2012). The manner in which ceremonies were practiced showed the tribe’s close ties with the Mohave. Hunting and gathering traditions followed the traditional Paiute pattern, as did burial practices. Other ceremonial practices testify to the Mohave influence (Deur and Confer 2012).

The Mohave were agrarian and had a reliance on fishing in the Colorado River. It should be noted that the Chemehuevi deferred fishing rights to the Mohave (Deur and Confer 2012). The Mohave people during the protohistoric and historic times were semi-sedentary. Floodplain farming was common, and the Colorado River made up the center of their territory. The extent of their territory extended on either side of the Colorado River to the east as far as the highest crest of the Black Mountains, the Buck Mountains, and the Mohave Mountains, and to the west to the Sacramento, Dead, and Newberry Mountains. From north to south their territory ran from the Mohave Valley to south of what is now the City of Blythe (Bean and Vane 2002).

The Mohave peoples were nationalistic, considering their home territory to be their own country (Deur and Confer 2012). Frequently warring with the Halchidoma, the Mohave and Quechan joined forces to evict the Halchidoma from their territory. The Mohave then encouraged the Chemehuevi to move into the river area (Russell et al. 2002). Trade was of particular importance to the Mohave, who had extensive trail networks to take them to the Pacific Coast in the west, and with the Cahuilla in the south and east (Bean and Vane 2002).

In the spring and summer months the Mohave lived along the banks of the Colorado River to tend to crops and to fish. Crops were planted in the spring as the river, swollen from the winter rains, receded. Seeds were planted in the newly exposed and saturated mud. While the Mohave peoples relied on their crops, their major food staple was mesquite and screwbean pods, which were gathered. In the winter they moved their settlement areas to rises above the river to avoid seasonal flooding (Russell et al 2002).

The closest aspect of the Project Area is approximately 1,800 feet (0.34 mile) from the Colorado River, as presently aligned, and is situated on a mesa terrace approximately 85 feet above the river and approximately 75 feet above the adjacent sandy river margin. It is not expected that riverine farmlands at the higher mesa elevations will be identified. Similarly, the closest aspect of Vidal Wash within the Project

Area is approximately 6,200 feet (1.17 miles) from the current river course and is approximately 85 feet higher in elevation. However, this, and an unnamed wash to the north are not noted for supporting mesquite and screwbean habitat, nor are the adjacent lands. Therefore, activity areas associated with these habitats are not expected within the Project Area.

2.2.3 HISTORY

The first significant European settlement of California began during the Spanish Period (1769 to 1821) when 21 missions and four presidios were established between San Diego and Sonoma. Although located primarily along the coastal margin, the missions dominated economic and political life over the greater California region. The purpose of the missions was primarily for political control and forced assimilation into Spanish society and conversion of the Native American population to Catholicism, along with economic support to the presidios (Castillo 1978).

The Mexican Period (1821-1848) began with the success of the Mexican Revolution in 1821, but changes to the mission system were slow to follow. When secularization of the missions occurred in the 1830s, their vast land holdings in California were divided into large land grants called ranchos. The Mexican government granted ranchos throughout California to Spanish and Hispanic soldiers and settlers (Castillo 1978; Cleland 1941). Even after the decree of secularization was issued in 1833 by the Mexican Congress, missionaries continued to operate a small diocesan church. In 1834, the San Gabriel Mission, including over 16,000 cattle, was turned over to the civil administrator (Hoover et al. 1990:150-177).

In 1848, The Treaty of Guadalupe Hidalgo ended the Mexican-American War and marked the beginning of the American Period (1848 to present). The discovery of gold that same year sparked the 1849 California Gold Rush, bringing thousands of miners and other new immigrants to California from various parts of the United States as well as the rest of the world, most of whom settled in the northern gold fields. For those settlers who chose to come to southern California, much of their economic prosperity was fueled by cattle ranching rather than by gold. This prosperity, however, came to a halt in the 1860s as a result of severe floods and droughts as well as legal disputes over land boundaries and property ownership, which put many rancho owners into bankruptcy (Castillo 1978; Cleland 1941).

Shortly after the turn of the twentieth century, gold and other mineral prospecting in the Riverside Mountains led to a bevy of activity in the vicinity of the Project Area. Gold discoveries in the Calzona mining district during the first decade of the new century brought an influx of people and capital. Per the June 22, 1911, edition of the *Los Angeles Times*, a headline read:

> PROMISING RIVERSIDE MINE
>
> The recent rich strike at the Calzona mine, in Riverside County, seventeen miles from Parker, Arizona, is attracting much attention. The vein is seven feet wide with samples running $200 per gold, with high copper contents. The Calzona is shipping ore to the Humboldt smelter. The Sanborn is also shipping ore, and the Steece is expected to make its first shipment by the end of the month. The mines are located on Riverside Mountain, and promise to become the most important in the Southern section of California. Developments are active at all three properties.

Vredenburgh et al. (1980) discussed the Riverside Mountains mining deposits as part of the Bendigo District. They noted that the Calzona Mines Company took over the McKesson group of claims in 1898, and by 1911 Calzona property was owned by Dr. Robert Vermilyea of Redlands. Additional deposits were mined by the Steece Mines Company of Springfield, Massachusetts. Ore from the Steece mine were:

> trammed to the river then loaded on boats and floated to Yuma where it was transferred to [railroad] cars … This company [Steece Mines] has had it about 2 years." By May, 1911, the company had sunk a shaft to a depth of 350 feet (other reports put the depth at 800 feet). Sinking of the shaft continued all summer with a large force of men expected to be employed by late November, with the arrival of Mr. Steece from the East Coast. Activity continued at least until the winter of 1913 (Vredenburgh et al. 1980).

At the Calzona mine works a shaft was sunk in September 1911 to a depth of 300 feet, with a cross-cut established at the 100-foot level where an ore body "running $500 per ton" was located. During that year, at the Calzona camp, an assay office, equipment and office buildings as well as a company store were established. Water was pumped 5,000 feet from the Colorado River, providing 10 men working the mine with water during the summer and 30 men during the winter (Vredenburgh et al. 1980).

In October 1912, the Republic Smelting Corporation purchased the Calzona mine, with the Calzona Mines Company continuing to operate the property until 1916, bringing with them several improvement plans. First was a wagon road costing several thousands of dollars. Then they surveyed a spur line route from mine to the Santa Fe tracks in Vidal; this was never constructed. In 1920, the property was sold to the Mountaineer Mining Company of Los Angeles. During 1930s technological improvements in equipment had been brought in, increasing production, and requiring additional labor. By 1934, 12 men were employed in construction and mining. By 1935, with the mill processing 50 tons a day, 26 men worked two shifts at the mine and three shifts at the mill. The improved mill operated only about a month, however, and operations at the mine were suspended in October 1935 due to low recovery of the price of gold. In 1938, 15 men were employed at the mine, with high-grade ore being shipped to the Magna Smelting Company (Vredenburgh et al. 1980).

Some of the results of this mining activity in the area is illustrated on the 1911 USGS topographic map (Figure 4) showing the location of roads in the vicinity of the Project Area, indicating the importance of these travel corridors to the local populations. A number of these roads cross through the Project Area; however, at this scale, it is not possible to trace them exactly on the landscape. The convergence of three of these roads within the mouth of Vidal Wash is interesting as it indicates a possible ferry crossing to a location named Doyle's Landing on the Arizona side of the Colorado River. At the present time no additional information is known describing this possible ferry site. On a 1914 General Land Office (GLO) map, this feature is absent, which is curious given the great amount of detail of other features within and in close proximity to the Project Area. Some interesting information on the GLO map to note is the location of two residences within the Project Area (Figure 5) as well as a telephone line to the Calzona mine (Figure 6) and a multitude of roads to Calzona and other mines and other landmarks (Figure 7). Again, however, at this scale the exact location of particular features can be quite inaccurate, and not infrequently maps included built environment features such as roads and residences more as schematic references, rather than accurate mapping markers. Therefore, it is reasonable to assume that features such as these may be identified on the landscape within the Project Area; however, they also may not.

Figure 4: 1911 USGS Topographic 15-Minute Quadrangle

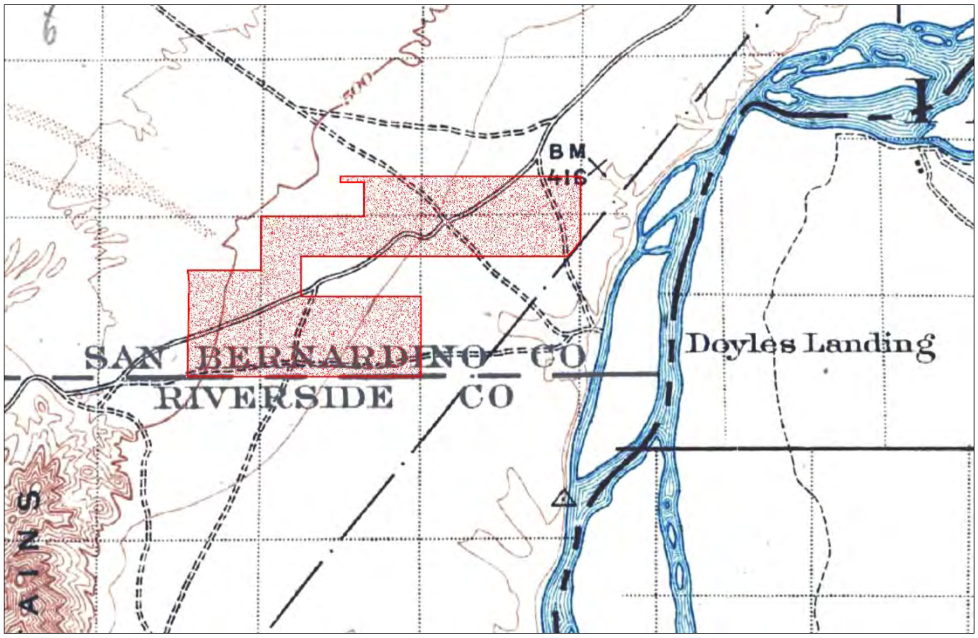


Figure 5: Location of Residences within Project Area on 1914 GLO Map

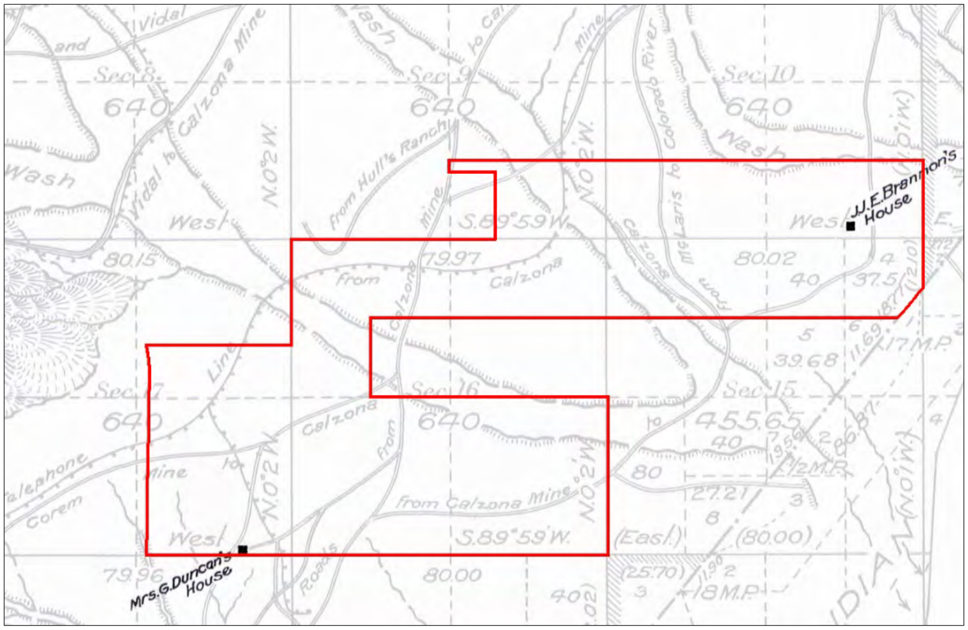


Figure 6: Location of Telephone Line within Project Area on 1914 GLO Map

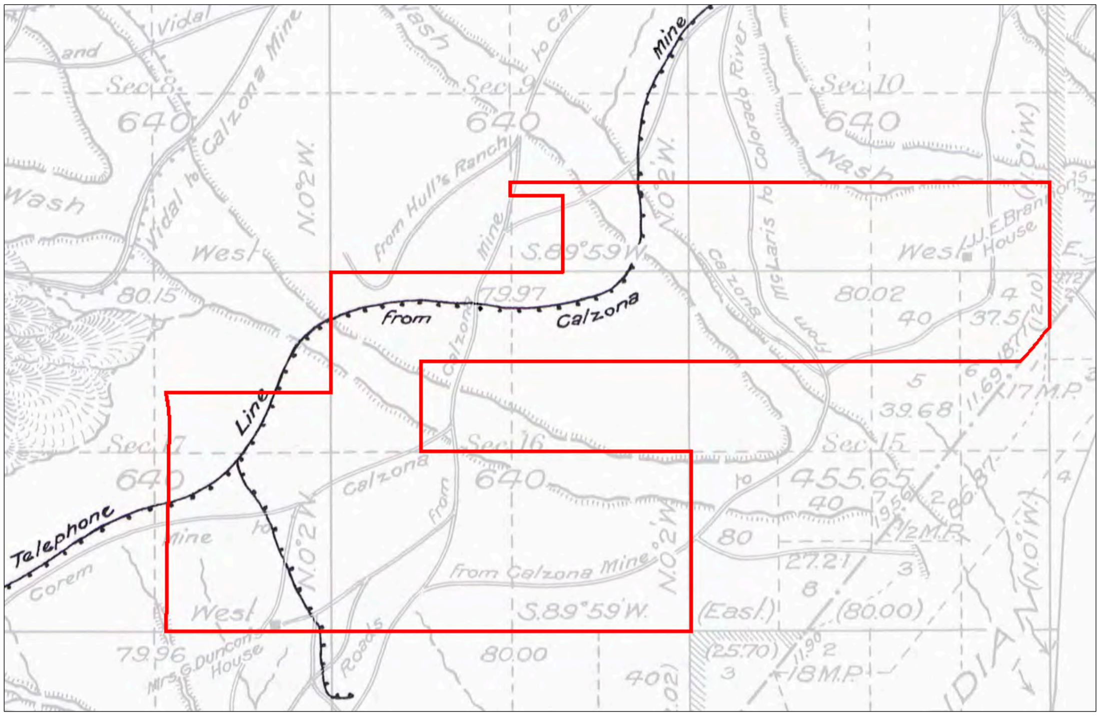
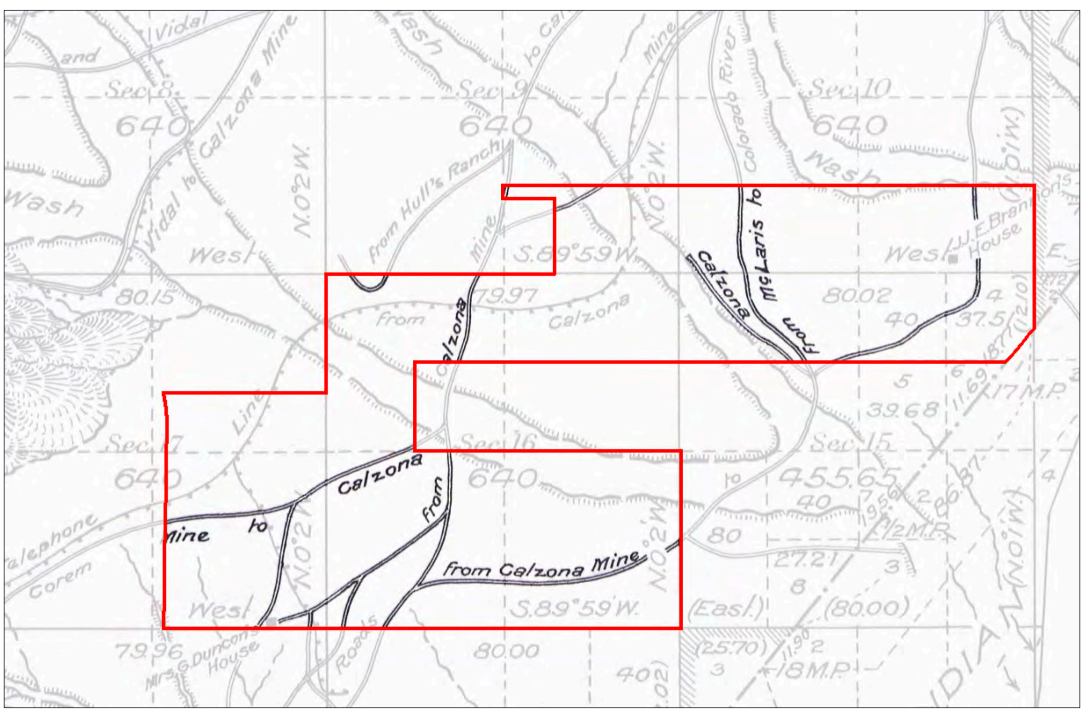


Figure 7: Location of Roads within Project Area on 1914 GLO Map



During this period, a number of speculators filed for patents under the Homestead Act of 1862 on several of the parcels within the Project Area. Limited research of the names of the patent holders did not result in the identification of anyone of note. Most of the Homestead patents were granted between 1919 and 1920, primarily within the area of the northeastern section of the Project Area (the south half of the southwest quarter and southeast quarter of Section 10, and the north half of the northwest quarter and the northeast quarter of Section 15). Additional patents were issued in 1932 and 1935 (the southeast quarter of Section 9 and the southeast quarter of Section 17 respectively). It is not known how the stipulations of the Homestead Act of 1862 were met to enable the landholder to succeed in receiving the patent, as only one parcel appears to have had physical improvements of the kind called for in the act. A farmstead is noted on the 1947 aerial in the middle of the southeast quarter of the southwest quarter of Section 10. It is not known at this time if these two facts are related. By 1969 this property appears to have been demolished and removed and the area reclaimed as agricultural fields.

Very shortly after the United States formally began engagement in the Second World War, the U.S. Army sought to broaden its training capacity outside the eastern states and instructed General George S. Patton to identify training areas in the desert West in an effort to simulate combat situations expected in North Africa and southern Europe. The Desert Training Center (DTC), later the California-Arizona Maneuver Area (CAMA), encompassed an area stretching from Searchlight, Nevada, in the north, to Yuma, Arizona, in the south, just east of Indio, California, in the west, and east to the Colorado River at first, then eastward again along Bill Williams River to Ives Peak and south to Montezuma, north of the Gila River (Figure 8). Over 30,000 square miles of desert was thus encompassed and divided into training areas with camps measuring 3.0 miles by 1.0 mile on average, various small arms ranges, airfields, target areas, and maneuver areas. No official camp, training area, or maneuver area was designated in the Vidal area, but several proximate camps had virtual free range to use the desert region as deemed necessary. The closest camps to the Vidal area are Camp Rice, established in 1942, approximately 18 miles to the west; Camp Granite, established in 1943; and Camp Iron Mountain, established in 1942, 37 and 40 miles to the west, respectively. Camp Rice was in use for only a brief period between August 24 to October 18, 1942, by the 5th Armored Division. Another Division followed, but details for much of Camp Rice is sparse. By 1944 the need for the training center waned as the parameters of the war changed, and the last rotation departed the training center in April 1944. Between its establishment two years earlier until its closure some 2,210,178 military personnel had trained and rotated through the DTC/C-AMA (Bischoff 2008; 2009). It does not appear, despite the proximity of known Divisional Camps and lesser camps and airfields; that any maneuver areas have been designated in or near the Project Area (Figure 9).

In the 1930s large dams were constructed along the Colorado River, supplying both a stable water supply and electric power to the desert southwest. During World War II the electric network was tapped to provide needed power to factories and foundries that supplied war materiel. Following the war, the system continued to be upgraded and built out to supply power to growing metropolitan communities in Arizona and southern California. Among these networks was Parker Dam to Blythe 1 (PAD-BLY 1). This line draws power from Parker Dam, which was constructed by the Bureau of Reclamation between 1934 and 1938. Designed as a diversion dam Parker Dam supplies water from the Colorado River into the Colorado Aqueduct traveling across the Mojave Desert to greater Los Angeles and San Diego, and to the Central Arizona Project for their water needs. Energy generated at the dam was originally designed for irrigation projects and other general usage in southwestern Arizona and southeastern California. PAD-BLY 1 is part of the Parker-Gila Number 2 (PAD-GLA 2) network, which comprises three sections - Parker-Blythe No.1, Blythe-Pilot Knob (Knob), and Gila-Knob segments – all of which are 161-kV transmission lines (Meyer 2014).

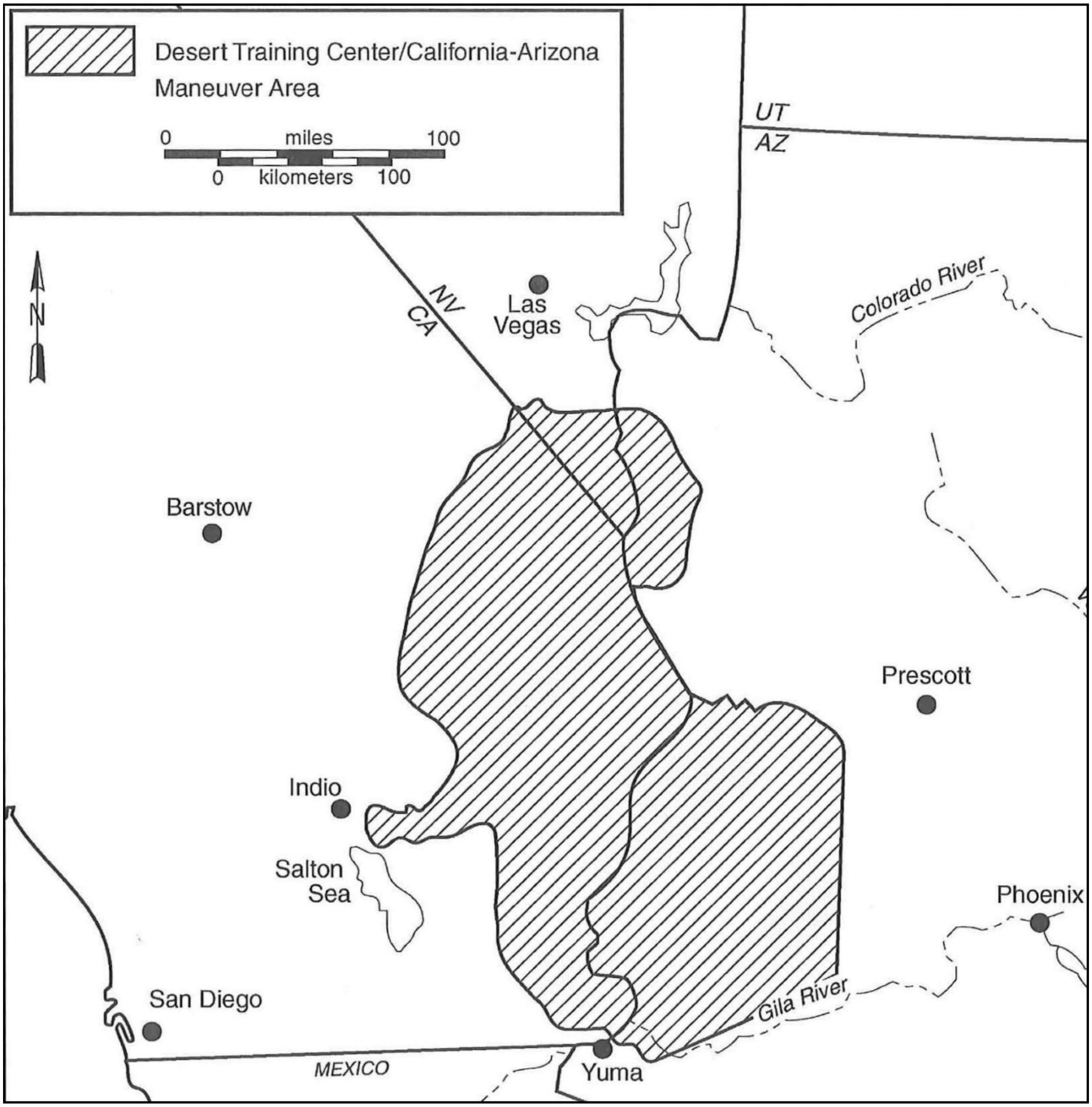
PAD-BLY 1 is an H-frame type line, approximately 60.4 miles long, and was constructed in 1950 by J and J Construction Company. A notice to proceed was received by the contractor on July 1, 1948, and by June 1950, all pole holes had been excavated, H-frames had been erected, and overhead ground wire had been strung. All additional work was completed and accepted on August 31, 1950, and the transmission line was released to operations and maintenance on February 9, 1951. The line was energized and put into service on May 15, 1951. Parker-Blythe No.1 transmission line was eventually interconnected with lines from Hoover, Davis, and Glen Canyon dams as part of the Bureau of Reclamation/Western Area Power Administration system in the Southwest (SWCA 2003).

During the subsequent years the transmission line has undergone routine maintenance and has been updated where needed for continued operations. Loss of structures due to meteorological events have required replacement of poles at 61-3 in 1969, 27-6, 27-7, 53-3, 92-2 through 92-8, and 93-1 in 1970, and 53-3 and 53-4 in 1976. Structures also have been relocated, such as 9-2, 9-3, 9-6, 10-1 and 10-2 or replaced such as at 20-5. In 1977 957 poles were inspected and treated for continued service (Meyer 2014).

In 2003 SWCA analysts evaluated the Parker-Blythe No.1 line noting that it was “built with standard wood-pole, H-frame structures and other standard materials and design that had been in use for many years prior to 1951.” SWCA indicated that they did not identify evidence “that the line included features that might be considered innovative or otherwise significant in the history of engineering or the narrower context of electrical transmission.” While the “transmission line contributed marginally to the post-World War II industrial and agricultural expansion of the region, …evidence has not been found that the line significantly affected or influenced any historic event or pattern” (SWCA 2003). SWCA recommended the Parker-Blythe No.1 line to be not eligible for the National Register of Historic Places. California State Historic Preservation Officer (SHPO) determined the transmission line as not eligible due to its lack of integrity on July 11, 2018, via a Programmatic Agreement, as well as on February 13, 2019 (CA SHPO WAPA_2019_0123_001), and again on January 31, 2022 (CA SHPO WAPA_2021_1028_001). The Arizona SHPO also determined the line as not eligible on February 19, 2019 (2019-0333(147138)).

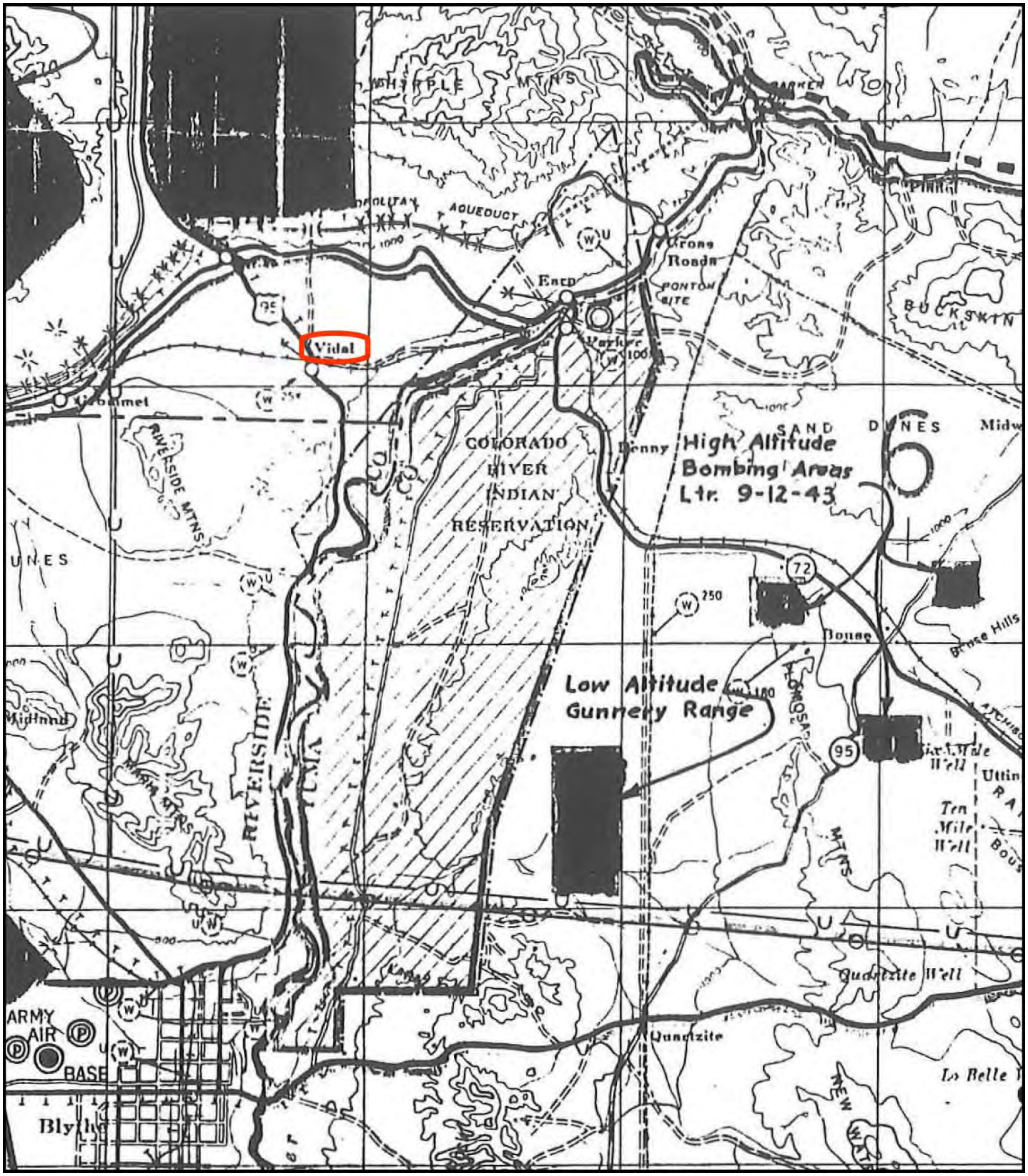
Some 20 years following the close of operations at the DTC a Cold War exercise was implemented within the same general region of the Mojave Desert. Joint Exercise Desert Strike, also known as Operation Desert Strike or simply Desert Strike, was conducted in 1964 as a simulated battlefield exercise located within much of the previous DTC/C-AMA footprint (Figure 10). The ground maneuver area extended from Barstow, California, just east of Edwards Air Force Base, eastward 170 miles to Kingman, Arizona, and from a point approximately 40 miles south of Las Vegas, Nevada, southward 160 miles to Blythe, California. The area was used for “a semi-controlled exercise under the direction of U.S. Strike Command that allowed opposing joint task forces, comprised primarily of armored and mechanized forces with full air support but including airborne units, a maximum of ‘free play’ initiative to develop, perfect, and test combat techniques and tactics” (USAF 1964a:4). As executed “[t]wo joint task forces with a total of over 100,000 personnel of the U.S. Air Force and Army, over 900 aircraft, and more than 500 tanks battled for nearly two weeks on a ground maneuver area of some 13 million acres in the desert region of southwestern United States. As in past joint exercises, tactical nuclear weapons training was conducted during the play of the exercise” (USAF 1964a:2).

Figure 8: Location and Extent of the DTC/C-AMA, 1942-1944



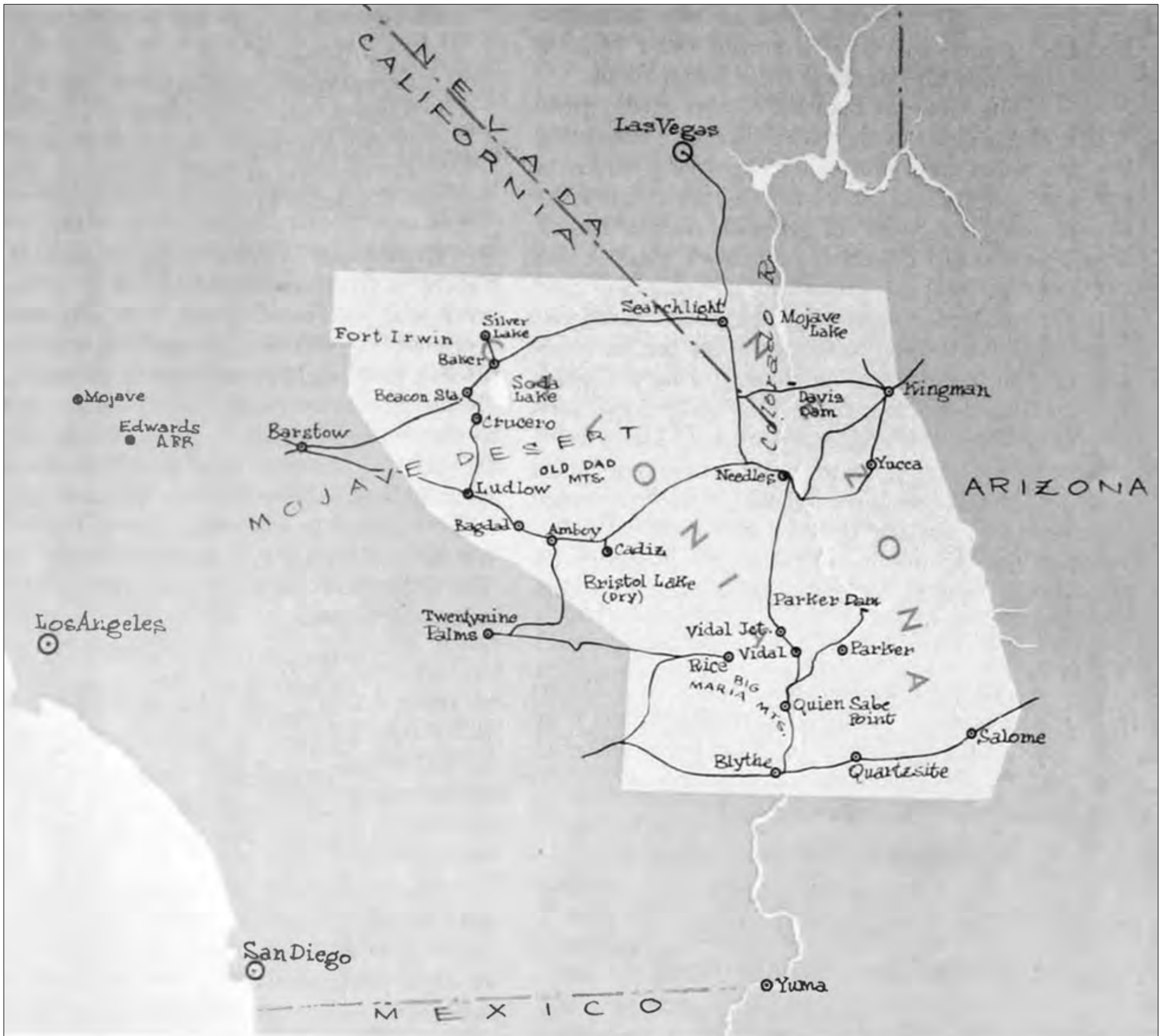
Source: Bischoff 2009:2

Figure 9: Mapped Location of Maneuver and Bombing Areas around Vidal, CA.



Source: Bischoff 2008:116

Figure 10: Location and Extent of the Exercise Desert Strike Battleground



In May of 1964, a 22,000-square-mile slash of southwestern desert (light area) was the battleground for U.S. Strike Command's Joint Exercise Desert Strike.

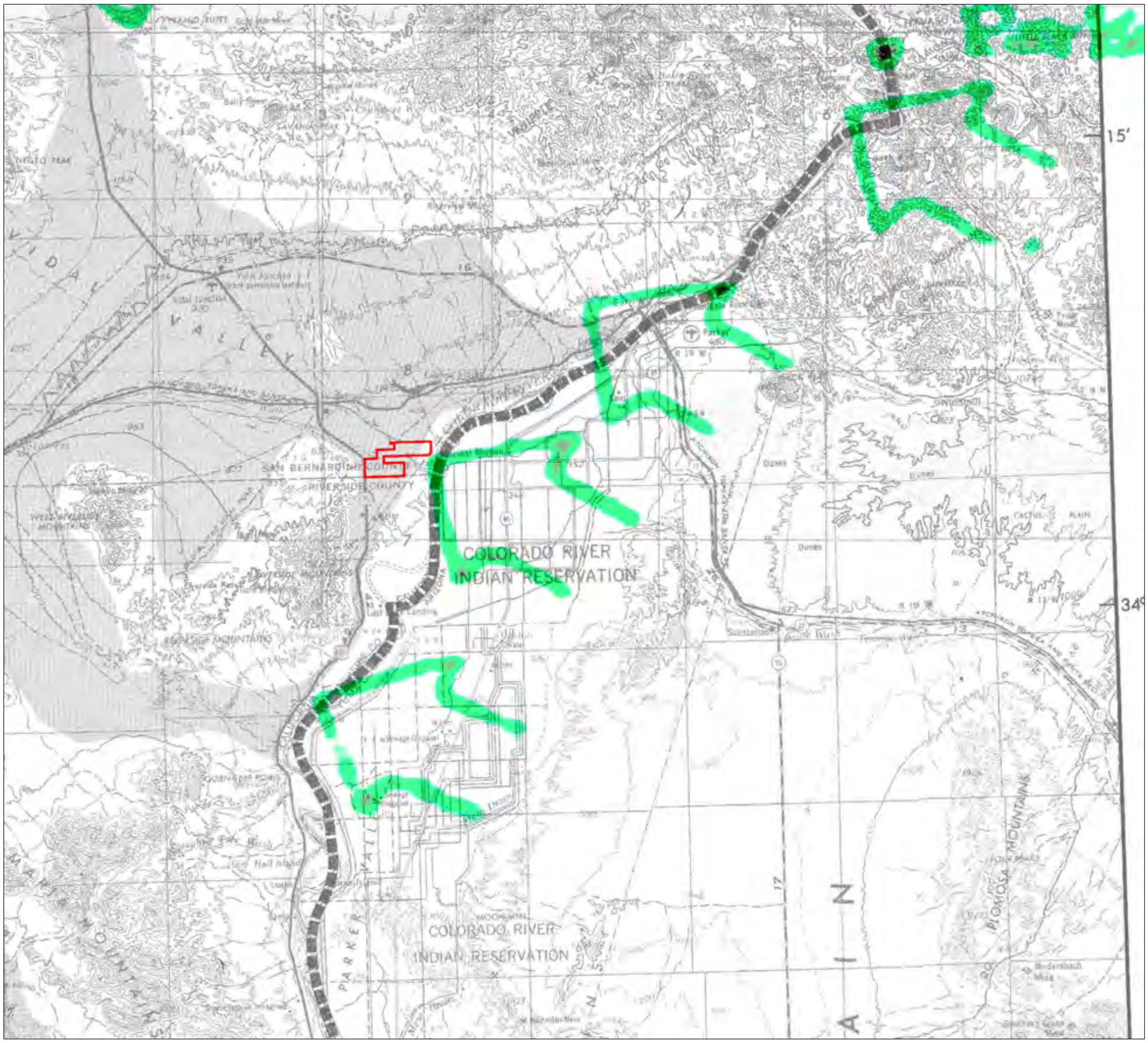
Source: USAF 1964a:6

As part of the exercise JTF Phoenix launched an assault along a front of 140 miles along the Colorado River. Because existing dams and bridges were deemed destroyed or out of bounds by official umpires, attacks across the river were all land-based. Seven tactical crossing sites were chosen, each two to three miles wide (Figure 11) (Kennedy 1964). One such crossing point may have been located opposite the mouth of Vidal Wash as suggested in Figure 11, and certain geographic and built environment features located on the landscape captured in a photograph taken at the time JTF Phoenix staged its invasion of Calonia as part of the Desert Strike war game (Figure 12). These same features, including a three-pole set power line, a single pole set along the shoreline, and a pole-lined road in the background, appear to have been present on a 2012 aerial photograph (Figure 13), which may confirm the crossing area in the 1964 photograph as being opposite Vidal Wash.

Following World War II desert environments began to see an influx of post-war leisure activities such as seasonal sport hunting, rock-hounding, off-road activities such as jeep trailing or dune scaling, and fishing and pleasure crafting on the Colorado River. These activities were and are supported by towns such as Blythe and Needles, California, and Parker, Arizona.

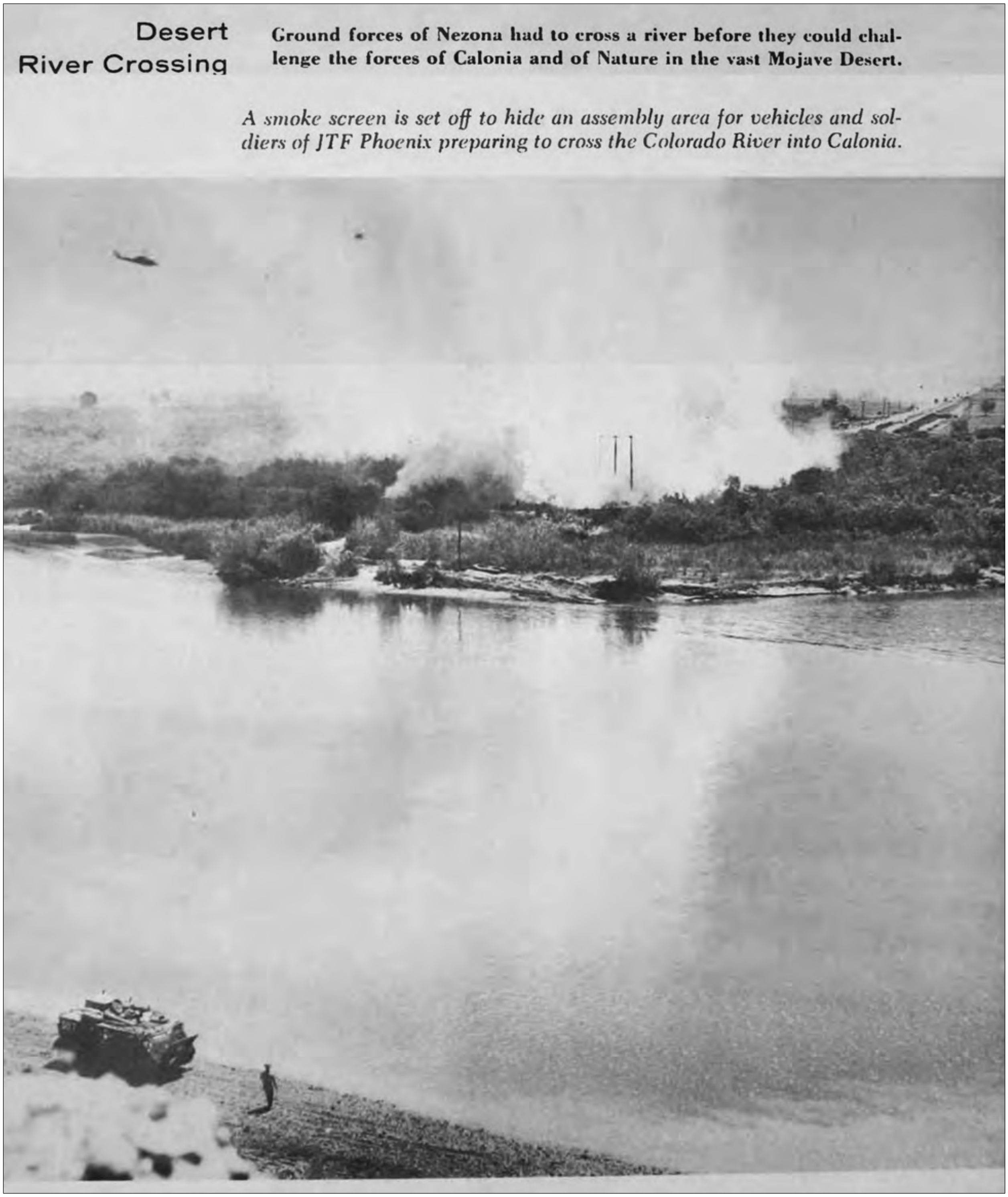
The nearby town of Vidal was named by Hansen Brownell for his son-in-law. The locale was developed as a supply stop for the Arizona and California Railway, also known as the Parker branch of the Atchison, Topeka & Santa Fe Railway, in 1907 (Gudde 1998; Myrick 2001). The line was originally constructed between 1903 and 1910 by the Arizona and California Railway. In 1908 the bridge over the Colorado River near Parker was completed, with the track connecting to Cadiz, California, on June 10, 1910. Service to Cadiz soon followed, starting on July 1 (Myrick 2001). With the completion of the construction of State Route 62 linking Twentynine Palms with Arizona, and the establishment of Vidal Junction at the intersection of US-95, Vidal was bypassed by major east-west traffic and sees only irregular traffic along the US-95 corridor.

Figure 11: Georeferenced Locations of Colorado River Crossing Areas during Exercise Desert Strike



Source: Prose 1986 (base map); USAF 1964a: Map 1 (overlay) with arrows indicating projected crossing points

Figure 12: Preparation for Crossing the Colorado River during Exercise Desert Strike


Desert River Crossing

Ground forces of Nezona had to cross a river before they could challenge the forces of Calonia and of Nature in the vast Mojave Desert.

A smoke screen is set off to hide an assembly area for vehicles and soldiers of JTF Phoenix preparing to cross the Colorado River into Calonia.

Source: USAF 1964b:20

Figure 13: Potential Crossing Point on the Colorado River during Exercise Desert Strike

Source: Google Earth 2012

SECTION 3.0 – RESEARCH DESIGN

The primary focus of this effort is to locate and identify all potential cultural resources within the Project Area and to document these finds at the survey level, as part of an environmental document package to be submitted to local decision-makers. The cultural sequence discussed in the previous section and the records search results presented below served as a guiding framework through which cultural resources may be identified.

3.1 REPORTS WITHIN THE STUDY AREA

A records search request was submitted to the South Central Coastal Information Center (SCCIC) at California State University, Fullerton, on July 9, 2020. The records search results were received on August 27, 2020.

The records search indicates that three studies have taken place within the proposed Project Area, and three studies are located within a 1.0-mile radius of the Project Area (Table 3).

Per reports by Killam and Glass (1994) and Moreno et al. (1995) Parker-Blythe #1 traverses the eastern portion of the Project Area. Neither author indicates whether the Parker-Blyth #1 line is an historic resource. Additional research of Meyer's (2014) comprehensive "Western Area Power Administration Desert Southwest Region's Facilities Historic Context Statement" indicates that, while the 1950 transmission line is noted and discussed, it does not appear to have been evaluated.

Heidelberg (2010) reported on a monitoring program associated with a 12 kV pole replacement project that included one pole in the eastern portion of the northern part of the Project Area. Given that the pole was replaced, and no resources were recorded, it is likely that the pole, or the pole line, was not considered significant.

Reports located outside the Project Area were not requested, and their subject matter is not discussed in this report.

Table 3: Reports within a 1.0-Mile Radius

Report Date	Authors	Report No. and Title	Subject Matter
1994	Killam, William R. and Stephen Glass	SB-03665 - *Cultural Resource Investigations for the Parker-Blythe #1 Transmission Line*	Parker-Blythe #1 161 kV Transmission Line: does not appear to have been evaluated
1995	Moreno, Jeryll L., Renee Kolvet, Dawn S. Snell, and Geoff Cunnar	SB-07201 - *Intensive Cultural Resources Inventory for the Western Area Power Administration on the Parker-Blythe #1 161 kV Transmission Line, La Paz County, Arizona, Riverside and San Bernardino Counties, California*	Survey of the Parker-Blythe #1 161 kV Transmission Line: No identified resources within the Project Area
2010	Heidelberg, Kurt	SB-0761 - *Archaeological Survey Report for Southern California Edison's Service Pole Replacements on the Crossing 12 kV Line near Vidal, San Bernardino County, California*	Project appears to have replaced two poles within the northeastern portion of the Project Area. No resources recorded in association with the monitoring report

Table 3: Reports within a 1.0-Mile Radius

Report Date	Authors	Report No. and Title	Subject Matter
2009	Parr, Robert E.	SB-06430 - *Cultural Resource Assessment for the Southern California Edison Company Needles School District Distribution Substation Plan (DSP) Project, San Bernardino County, California*	Outside the Project Area: report not requested
2000	Telus, Carol	SB-05296 - *A Class III Cultural Resources Survey for Routine Bankline Maintenance of Four Areas along the Arizona and California Sides of the Colorado River La Paz County, Arizona Riverside County, California San Bernardino County, California*	Outside the Project Area: report not requested
2004	Lambert, Meranda	SB-05295 - *Invitation to Comment on the Proposed Telecommunications Project: LSANCA8135D/950-044-541D/9250 HWY 95*	Outside the Project Area: report not requested

3.2 PREVIOUSLY RECORDED CULTURAL RESOURCES WITHIN THE STUDY AREA

None of the reported studies within the Project Area, or within a 1.0-mile radius of the Project Area resulted in the identification of cultural resources within the Project Area. One unreported study resulted in the identification of a road segment (P-36-024757) along the eastern margin of US- 95, which is directly connected to a longer dirt road that crosses through the east-west axis of the northern third of the Project Area. No indication as to the status of this road segment on the California Register of Historical Resources (CRHR) is given (Kremkau 2012a). Two other resources were identified (Gardner 1975a and b) outside the Project Area. These include a prehistoric lithic reduction station, which was destroyed during a geological testing program, and three prehistoric sleeping circles, the current status of which are unknown. While no cultural resources were identified within the Project Area, Table 4 summarizes those located within a 1.0-mile radius of the proposed Project.

Table 4: Previously Recorded Resources within a 1.0-Mile Radius

Primary No.	Trinomial	Description	Date Recorded	Recorder	Within Project Area?	Status
P-36-001518	CA-SBR-001518	Site, Prehistoric - lithic scatter	1975	Gardner	Outside	Destroyed
P-36-001519	CA-SBR-001519	Site, Prehistoric – three sleeping circles	1975	Gardner	Outside	Unknown
P-36-024757		Dirt road segment along east margin of U.S. Route 95	2012	Kremkau	Outside, but links to a road that proceeds through Project Area	CRHR* status unknown

Table 4: Previously Recorded Resources within a 1.0-Mile Radius

Primary No.	Trinomial	Description	Date Recorded	Recorder	Within Project Area?	Status
P-36-024758		Dirt road segment along west margin of U.S. Route 95	2012	Kremkau	Outside, and does not link to a road that proceeds through Project Area	CRHR* status unknown
*CRHR: California Register of Historical Resources						

3.3 NATIVE AMERICAN HERITAGE COMMISSION AND TRIBAL SCOPING

Sacred Lands File Search

Chambers Group submitted a request for a search of the Sacred Lands Files (SLF) housed at the California Native American Heritage Commission (NAHC) on July 9, 2020. The results of the search were returned on July 10, 2020, and were positive, indicating that sacred areas are known within or around the Project Area that may be impacted by Project development. The NAHC response included a recommendation to reach out to the Chemehuevi Indian Tribe for more information. The NAHC provided contact information for the Chemehuevi Indian Tribe, the Colorado River Indian Tribes, the Fort Mojave Indian Tribe, the Quechan Tribe of the Fort Yuma Reservation, and the Twenty-Nine Palms Band of Mission Indians, who may have information on cultural resources on the Project Area..

Informal project scoping letters requesting information were sent via certified mail on August 14, 2020 (Confidential Appendix B). E-mails were also sent to the contacts in an effort to elicit a quicker response. The Quechan Tribe of the Fort Yuma Reservation responded and has declined involvement. An e-mail was received from the Tribal Historic Preservation Office (THPO) of the Colorado River Indian Tribes requesting information on the Project Area. This response was received on November 11, 2020. Formal Tribal consultation under Section 106 of the National Historic Preservation Act (NHPA) remains the responsibility of the lead federal agency, and is not addressed in this report.

SECTION 4.0 – METHODS

4.1 FIELD METHODS

Chambers Group survey teams are trained in established field methods and adept at identifying the entire range of cultural resources likely to be found for each project. Cultural materials encountered may include prehistoric artifacts (e.g., flaked stone tools, tool-making debris, stone milling tools), historic-period artifacts (e.g., metal, glass, ceramics), sediment discoloration that might indicate the presence of a cultural midden, as well as depressions and other features indicative of the former presence of structures or buildings (e.g., post holes, foundations).

Survey of the Project Area took place over the course of three weeks in two separate rotations. The first rotation occurred between July 27 and July 31, 2020, and included Chambers Group archaeologists Evelyn Hildebrand, B.A.; Kellie Kandybowicz, B.A.; John McDermott, M.A.; Clark Austin, M.S. (Biology); and Richard Shultz, M.A. The second rotation occurred between October 5 and October 14, 2020, and included Chambers Group archaeologists Kellie Kandybowicz; John McDermott; Julian Armen; Sarah Roebel, B.A.; and Richard Shultz. The Project Area was surveyed at 15-meter intervals, and crews were equipped with sub-meter accurate Global Positioning Systems (GPS) units for recording spatial data and to document the survey area and all findings through ArcGIS Collector and Survey 123. A prior visit by Chambers Group biologists – Clark Austin; Brian Cropper, B.S.; Colin Durkin, B.S.; Jessica Calvillo, B.A.; and subconsultant Andrew Pigniolo, M.A. (Anthropology; Laguna Environmental) – conducting targeted plant and desert tortoise surveys earlier in the year, identified approximately 15 historic-period and prehistoric-period resources. All of these possible resources were revisited by the cultural resources survey teams.

The archaeologists examined exposed ground surface for artifacts (e.g., flaked stone tools, tool-making debris, milling tools, ceramics), ecofacts (e.g., marine shell and bone), soil discoloration that might indicate the presence of a cultural midden, and features indicative of the former presence of structures or buildings (e.g., standing exterior walls, postholes, foundations) or historic debris (e.g., metal, glass, ceramics). Ground disturbances such as burrows were visually inspected for archaeological resources. In addition, previously identified possible historic properties were visited and photographed for inclusion in this report. These properties were assessed in the field and through post-field analysis of historic aerial photographs.

4.2 EVALUATIVE METHODS

Resource significance is assigned to districts, sites, buildings, structures, and objects that possess exceptional value or quality or those illustrating or interpreting the heritage of San Bernardino County in history, architecture, archaeology, engineering, and culture. Several criteria are used in demonstrating resource significance. The following section details the criteria that a resource must meet to be determined significant.

4.2.1 National Register of Historic Places

The NRHP was established by the NHPA of 1966 as "an authoritative guide to be used by federal, state, and local governments, private groups, and citizens to identify the Nation's cultural resources and to indicate what properties should be considered for protection from destruction or impairment." The NRHP recognizes properties that are significant at the national, state, and local levels. To be eligible for listing in the NRHP, a resource must be significant in American history, architecture, archaeology, engineering, or culture. Districts, sites, buildings, structures, and objects of potential significance must also possess integrity of location, design, setting, materials, workmanship, feeling, or association. A property is eligible for the NRHP if it is significant under one or more of the following criteria:

A: It is associated with events that have made a significant contribution to the broad patterns of our history.

B: It is associated with the lives of persons who are significant in our past.

C: It embodies the distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic values; or represents a significant and distinguishable entity whose components may lack individual distinction.

D: It has yielded, or may be likely to yield, information important in prehistory or history.

Notwithstanding Criteria Considerations, in general cemeteries, birthplaces, or graves of historic figures; properties owned by religious institutions or used for religious purposes; structures that have been moved from their original locations; reconstructed historic buildings; and properties that are primarily commemorative in nature are not considered eligible for the NRHP unless they satisfy certain conditions.

In addition to the four National Register Criteria noted above, qualifying resources must retain aspects of integrity. Integrity is the ability of a property to convey its significance. “The evaluation of integrity is sometimes a subjective judgment, but it must always be grounded in an understanding of a property's physical features and how they relate to its significance” (NPS 1997:44). The National Park Service Bulletin 15 (1990, revised 1997) identifies seven aspects of integrity that a property should retain, and include: Location, Design, Setting, Materials, Workmanship, Feeling, and Association. While maintenance of all aspects of integrity is not required, a property should possess most of the aspects that are integral to its ability to convey its significance. Understandably, not all aspects of integrity are applicable across the range of buildings, structure, objects, or sites under evaluation. Aspects such as design, workmanship or feeling likely may not be integral to understanding the significance of an archaeological deposit, whereas these would be essential in understanding a significant building, or structure.

The NPS Bulletin 15 further exemplifies how to broadly assess the integrity of eligible resources when applying the qualifying NRHP Criteria. Under Criteria A and B, a property that is significant for its historic association is eligible if it retains the essential physical features that made up its character or appearance during the period of its association with the important event, historical pattern, or person(s). If the property is a site (such as a treaty site) where there are no material cultural remains, the setting must be intact. Eligible archaeological sites must be in overall good condition with excellent preservation of features, artifacts, and spatial relationships to the extent that these remains are able to convey important associations with events or persons.

Under Criterion C, a property important for illustrating a particular architectural style or construction technique must retain most of the physical features that constitute that style or technique. A property that has lost some historic materials or details can be eligible if it retains the majority of the features that illustrate its style in terms of the massing, spatial relationships, proportion, pattern of windows and doors, texture of materials, and ornamentation. The property is not eligible, however, if it retains some basic features conveying massing but has lost the majority of the features that once characterized its style. Eligible archaeological sites must be in overall good condition with excellent preservation of features, artifacts, and spatial relationships to the extent that these remains are able to illustrate a site type, time period, method of construction, or work of a master.

Properties eligible under Criterion D, including archaeological sites and standing structures studied for their information potential, less attention is given to their overall condition, than if they were being considered under Criteria A, B, or C. Archaeological sites, in particular, do not exist today exactly as they were formed. There are numerous cultural and natural processes that may have altered the deposited materials and their spatial relationships. For properties eligible under Criterion D, integrity is based upon the property's research value to yield important information that addresses important research questions, such as those identified in the historic context documentation, or in the research design, for projects meeting the *Secretary of the Interior's Standards for Archeological Documentation* (NPS 1997:46) or that has yielded important information that furthered our understanding of prehistory.

4.2.2 California Environmental Quality Act (CEQA) and the California Register of Historical Resources

According to CEQA Guidelines (§15064.5a), the term "historical resource" includes the following:

(1) A resource listed in, or determined to be eligible by, the State Historical Resources Commission, for listing in the California Resister of Historical Resources (CRHR) (Public Resources Code [PRC] §5024.1, Title 14 California Code of Regulations Section 4850 et seq.).

(2) A resource included in a local register of historical resources, as defined in PRC Section 5020.1(k) or identified as significant in an historical resource survey meeting the requirements of PRC Section 5024.1(g), shall be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.

(3) Any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be an historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing on the CRHR (PRC §5024.1, Title 14, Section 4852) including the following:

    (1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

    (2) Is associated with the lives of persons important in our past;

    (3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

    (4) Has yielded, or may be likely to yield, information important in prehistory or history.

(4) The fact that a resource is not listed in, or determined eligible for listing in the CRHR, not included in a local register of historical resources (pursuant to PRC Section 5020.1(k)), or identified in an historical resources survey (meeting the criteria in PRC Section 5024.1(g)) does not preclude a lead agency from determining that the resource may be an historical resource as defined in PRC Section 5020.1(j) or 5024.1.

SECTION 5.0 – RESULTS

Chambers Group conducted a cultural resources survey of the Project Area in July and October 2020. The primary goal of the archaeological investigations was to gather and analyze information needed to determine if the Project would impact cultural resources.

An archival records search, background studies, and intensive pedestrian survey of the Project Area were conducted as part of a Phase I cultural resource study. The NAHC SLF search returned a positive result and indicated that there are known sacred sites or tribal cultural resources within the 1.0-mile-search radius. A records search request was submitted to the SCCIC at California State University, Fullerton, on July 9, 2020. The records search results (Confidential Appendix A) were received on August 27, 2020. The results indicate that no cultural resources were previously identified within the Project Area; three resources, however, were identified within a 1.0-mile radius of the Project Area. These results were summarized in Table 4 above. In addition, several cultural resources studies were conducted in the vicinity, with three occurring within the Project Area (Table 3).

As a result of the current cultural resources survey, a total of 53 archaeological resources and 11 isolates (IO, or Isolated Occurrences) were identified (Tables 5 and 6). Twenty-one sites are identified as historic-period resources, and 32 are prehistoric resources. All of the isolates are prehistoric. A California Department of Parks and Recreation (DPR) Form 523 was completed for each site and IO, and are located in Confidential Appendix C. Additionally, each site and IO is located on a 1:24,000 USGS topographic quadrangle Project Area map (Figure 14), and on an aerial photograph (Figure 15) (Confidential Appendix D).

Table 5: Newly Identified Sites and Isolates within Project Area

Temp #	Period	Site Type
PF-004	Prehistoric	Lithic reduction station
PF-005	Prehistoric	Lithic reduction station
PF-008	Historic	Encampment
PF-009	Prehistoric	Lithic reduction station
PF-011	Prehistoric	Ceramic scatter
PF-012	Historic	Mining trash scatter
PF-013	Prehistoric	Lithic reduction station
PF-015	Prehistoric	Lithic reduction station
PF-016	Prehistoric	Lithic reduction station
PF-017	Prehistoric	Lithic reduction station
VS-001	Historic	Ranching
VS-002	Historic	Homestead trash scatter
VS-004	Historic	Homestead trash scatter
VS-006	Historic	Homestead
VS-008	Historic	Encampment
VS-010	Historic	Encampment
VS-011	Prehistoric	Desert pavement quarry

Table 5: Newly Identified Sites and Isolates within Project Area

Temp #	Period	Site Type
VS-012	Prehistoric	Lithic reduction station
VS-013	Prehistoric	Lithic reduction station
VS-014	Historic	Survey monument
VS-015	Prehistoric	Lithic reduction station
VS-016	Prehistoric	Lithic reduction station
VS-017	Prehistoric	Ceramic scatter
VS-019	Historic	Trash scatter
VS-020	Historic	Encampment
VS-021	Historic	Encampment
VS-023	Historic	Encampment
VS-025	Historic	Encampment
VS-026	Prehistoric	Lithic reduction station
VS-027	Prehistoric	Lithic reduction station
VS-028	Historic	Encampment
VS-029	Historic	Encampment
VS-030	Prehistoric	Lithic reduction station
VS-031	Prehistoric	Lithic reduction station
VS-032	Historic	Survey monument
VS-033	Prehistoric	Lithic reduction station
VS-034	Historic	WWII DTC*/Cold War EDS**
VS-035	Prehistoric	Artifact scatter
VS-036	Prehistoric	Artifact scatter
VS-037	Prehistoric	Temporary camp
VS-038	Prehistoric	Lithic reduction station
VS-039	Historic	WWII DTC*/Cold War EDS**
VS-040	Prehistoric	Lithic reduction station
VS-041	Prehistoric	Lithic reduction station
VS-042	Prehistoric	Lithic reduction station
VS-043	Prehistoric	Lithic reduction station
VS-044	Historic	Encampment
VS-047	Prehistoric	Lithic reduction station
VS-048	Prehistoric	Lithic reduction station
VS-049	Prehistoric	Lithic reduction station
VS-050	Prehistoric	Lithic reduction station
VS-051	Historic	WWII DTC*/Cold War EDS**
VS-052	Prehistoric	Ceramic scatter
ISO-100620-01	Prehistoric	Red-on-buff ceramic
ISO-100720-02	Prehistoric	White MCQ (chert) core

Table 5: Newly Identified Sites and Isolates within Project Area

Temp #	Period	Site Type
ISO-100720-04	Prehistoric	White MCQ (chalcedony) Elko point
ISO-100720-06	Prehistoric	Rhyolite flake
ISO-100820-01	Prehistoric	Retouched rhyolite flake
ISO-100820-02	Prehistoric	Buffware ceramic
ISO-100820-03	Prehistoric	Basalt bifacial core
ISO-100920-01	Prehistoric	2 unidentified ceramics
ISO-100920-02	Prehistoric	Rhyolite core
ISO-101320-01	Prehistoric	MCQ (chert) flake
ISO-101320-02	Prehistoric	MCQ (chert) edge modified flake
*DTC: Desert Training Center **EDS: Exercise Desert Strike		

Table 6: Count of Resource Type

Period and Type	Number of Resources
Historic	
Encampment	10
Homestead	1
Homestead trash scatter	2
Mining trash scatter	1
Ranching	1
Survey monument	2
Trash scatter	1
WWII DTC/Cold War EDS	3
Total Historic Sites	21
Prehistoric	
Artifact scatter	2
Ceramic scatter	3
Desert pavement quarry	1
Lithic reduction station	25
Temporary camp	1
Total Prehistoric Sites	32
Total Prehistoric Isolates	11
Total All Resources	64

Resource and Isolate Descriptions

The following resource descriptions are recounted in the DPR Form 523 site forms (Confidential Appendix C), and are illustrated in corresponding photographs located in Confidential Appendix E.

PF-004 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 3.0 by 3.0 meters. Materials identified include over 50 pieces of microcrystalline quartz (chert) debitage, one core measuring 63 by 33 by 17 mm, and two edge modified flakes. The deposit is situated on an alluvial terrace with an open aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

PF-005 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 3.0 by 3.0 meters. Materials identified include over 30 black vesicular basalt, 25 white quartz, 20 purple rhyolite, ten gray volcanic, five yellow microcrystalline quartz (chert), and one white microcrystalline quartz (chert) debitage. One rhyolite core measures 70 by 55 by 25 mm, and one quartz core measures 65 by 60 by 35 mm. The deposit is situated on an older elevated terrace with a slightly western aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

PF-008 is a newly identified historic-period encampment. The deposit measures approximately 19.2 by 10.2 meters. Materials identified include a possible aspirin tin, a razor blade, ceramic table ware, drinking glasses, and bottle glass including manganese, amber, aqua, milk, and clear types. Also identified were at least 100 cans, including rectangular key-wind hole-in-cap meat tins, rectangular key-wind cans from Argentina, 12 oz church key opened all steel cans, an oil can, friction lid paint or fat can, and scores of pint and quart whiskey bottles. Some bottles are manufactured by Owens-Illinois with liquor license code 90, and date code of 1937 or 1947. One amber bottle has a maker's mark for W.J. Latchford Glass Company, Los Angeles, CA, which dates between 1925 and 1938. Milk cans (typically noted as Vent Hole, Solder Dot, or Matchstick Filler [MSF] are tins of evaporated milk requiring Pasteurization and the application of a dot of solder at the venting hole at the top of the can) measuring 215d by 314h (these measurements are used in accordance with the manufacturing industry short-hand whereby 215d is 2 and 15/16ths of an inch in diameter and 3 and 14/16ths of an inch in height – all cans are recognized in 16ths of an inch and are measured diameter by height) were noted, and correspond with Simonis' type 12, dating between 1917 and 1929. Other MSF cans include 208d by 208h Simonis type 8, dating between 1915 and 1925.

The deposit is situated on an alluvial terrace near the southern margin of Vidal Wash, and is within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

PF-009 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 2.1 by 1.6 meters. Materials identified include 25 pieces of white microcrystalline (chert) debitage, and one rhyolite hammerstone measuring 120 by 80 by 55 mm. The hammerstone exhibits bifacial edge damage. The deposit is situated on a deflated gravel terrace/desert pavement within a Desert Pavement vegetation community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

PF-011 is a newly identified prehistoric ceramic scatter. The deposit measures approximately 1.3 by 1.0 meters. Materials identified include 30 Colorado Red or Palomas buff sherds. The buff ware possesses a red outer slip, a slight carbon streak, with fine attrition, and crushed quartz temper. The deposit is situated on a remnant deflated gravel terrace/desert pavement within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

PF-012 is a newly identified historic-period trash scatter; two separate periods may be represented. The deposit measures approximately 36.7 by 20.7 meters. Materials identified include approximately 45 pieces of a large manganese clarified glass bottle, the form of which is suggestive of a whiskey container, though the base and finish were not identified, along with a round ferrous pipe that had been beaten at one end to a pinched, chisel-like point. Items of an apparent later period include a quart can of 30 wt. HD oil, two bimetallic pull-tab cans, and a rectangular, key-wind cans. Both the bottle and pipe turned chisel/drift are in close proximity to each other, while the other components are located adjacent but not immediately proximate. An older disused unimproved two-track road is immediately adjacent to the deposit. The road may be representative of a road illustrated on the 1911 topographic map.

The manganese bottle manufacture dates between 1880 and 1920, while the oil can post-dates 1930, and the bimetallic cans post-date 1960. The deposit is situated on an alluvial terrace with an open aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

PF-013 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 20 by 20 cm. Materials identified include five basalt flakes; no core was observed. The deposit is situated on an alluvial terrace with an open aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

PF-015 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 3.0 by 4.0 meters. Materials identified include 25 pieces of microcrystalline quartz (chalcedony), and one unifacial, multimarginal core measuring 87 by 70 by 45cm. The deposit is situated on a deflated gravel terrace/desert pavement within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

PF-016 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 90 by 80 cm. Materials identified include approximately 16 microcrystalline quartz (chalcedony) debitage fragments, few of which are flakes. No core was observed. The deposit is situated on a deflated gravel terrace/desert pavement within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

PF-017 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 1.5 by 1.1 meters. Materials identified include 28 primary and secondary black basalt flakes; no core was observed. The deposit is situated on a deflated gravel terrace/desert pavement within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-001 is a newly identified historic-period livestock pen complex and trash scatter. The deposit measures approximately 190 by 165 meters. The complex appears to be a livestock feed lot with partial fences and internal pens. An underground weigh scale structure, and a chicken coop are adjacent at the "front" (south side) of the lot. Feed troughs run east-west along the north and south margins of the complex. These have a poured-in-place concrete floors, and a series of 8 by 8-inch posts cut at an angle, supporting stacked 1 by 4 board on knee braces acting as manger troughs. A series of concreted steel posts possibly served as framework for overhead shade, and a series of six water troughs are located throughout the complex. One trough is dated 1953. Two collapsed wood-frame outbuildings were also identified, one in the northeast corner and one in the northwest corner of the complex. Materials identified in a nearby trash scatter include wire nails, shot shell casings, and 1970s era bottles.

Several features comprise VS-001. These are described as a series of seven types, some with multiple examples or parts located across the landscape.

Feature 1 consists of six water troughs (Features 1a through 1f). Although there are variations between each sub-feature, in general each water trough is constructed of unreinforced, poured-in-place, board formed, unrefined concrete cement utilizing on-site or nearby local sand and small gravel aggregate – no sorted round pebble or crushed rock aggregate as found in commercial mix. The trough is rectangular shaped, roughly 15 ft-06 inch long by 4 ft-06 feet wide, sides 2 ft-00 inch high and 7-3/4 inches thick. Water supply pipes are usually located at one end of the feature, with a drainpipe someplace opposite. All features exhibit some damage and subsequent repairs. Feature 1A was date stamped 1953, with an illegible signature. No other troughs indicated dates or signatures.

Feature 2 is a composite device used to provide an efficient means to supply feed to stock animals located inside the pen enclosure. It is composed of a poured-in-place concrete floor approximately 2 feet wide with segments along the southern margin of the lot spanning from the west and east corners of the enclosure to the corners of the central paddock bisecting the southern half of the lot, and a single, dilapidated segment spanning the entire length along the north side of the lot. Along the outer margin of the concrete are a series of 8 by 7 inch (7 by 6-1/4 inches) pressure-treated posts placed in the ground and cut at a steep decline towards the concrete floor – each approximately 21-1/4 inches in height. On either side of the posts are attached 2 by 4 inch stretchers that angle toward the concrete floor in the same manner. Atop the 2 by 4 inch stretchers were place 1 by 4 inch board linking several posts at a time and forming an angled trough margin. Along the inside margin of the concrete floor is another series of pressure treated posts, cut lower to the ground surface, not angled, and which backed a low 2 by 4 inch or 2 by 6 inch board that formed the opposite margin of the feed trough. The northern feed trough appears to have suffered a greater degree of damage and loss, with structural repairs that have resulted in either a different construction of the feature, or a complete loss of the feature in that area.

Feature 3 is a collapsed outbuilding located in the northeast corner of the site, immediately west of a large palo verde tree, at the southern edge of the unnamed wash. It is a collapsed wooden outbuilding whose function remains unknown at this time. It appears to be constructed of 2 by 3 inch dimensional lumber and plywood sheets fastened with wire nails. No foundation or slab is apparent, and the building appears to have been constructed directly on the toe of slope sediments. The disarticulated building could not be measured for size or dimensions.

Feature 4 is a collapsed outbuilding located in the northwest corner of the site, between a pair of a large palo verde trees, at the southern edge of the unnamed wash. The feature appears to be a collapsed wooden outbuilding whose function remains unknown at this time; however, it is also possible that it is a collected pile of dimensional lumber and plywood, with other miscellaneous site debris. The area has undergone several flooding events and components that may offer additional clues as to form and function may be buried in alluvial sediments. No foundation or slab is apparent, and the building appears to have been constructed directly on the toe of slope sediments. The disarticulated building could not be measured for size or dimensions.

Feature 5 is located in the southwest corner of the feed lot and uses part of the feed lot fence structure as the eastern section of the enclosure. A concrete water trough is located in the southwest corner of the feature, and a series of "8 by 8" pressure-treated posts appear to form a perimeter to which smaller dimensional lumber and "chicken wire" were attached. The function of the feature is unknown, but is suspected to be a poultry coop.

Feature 6 appears to be the remnants of a weigh bridge and associated building, located along the mid-point of the southern margin of the feed lot complex. A portion of the feature is located in an underground concrete structure that houses an industrial sized balance beam scale. Surface aspects of the feature include the wooden weigh bridge, and a foundation structure for a weigh house.

The perimeter of the scale machine is constructed with concrete cement, with walls set into the ground approximately 3 ft-04 inch deep, and a concrete floor; all concrete structural items are board-formed and poured-in-place. Large 2 by 8 inch wood plank boards cover part of the assembly and acted as treads for weighing animals as they walked across the scale – weigh bridge. An underground concrete structure to the south allows the balance beam to register the weight on the scale. An at-ground level concrete perimeter foundation is located immediately to the south of these features and likely supported and enclosed wood structure for the scale register assembly and personnel.

The weigh house perimeter foundation measures approximately 22 ft-00 inch east-west by 13 ft-00 inch north-south, with foundations walls approximately 7-3/4 inches thick. The main scale structure measures approximately 18 ft-03 inch east-west by 7 ft-04 inch north-south; the compartment for the beam structure located between the scale and the weigh house is approximately 8 ft-00 inch east-west by 7 ft-03 inch north-south; a series of 2 by 4 inch stringers hold up 2 by 6 inch wood plank boards over the top of the enclosure.

Feature 7 is located south of the feed lot perimeter and consists of a partially dispersed trash scatter. The bulk of the consumer items appear to date to the late 1960s and 1970s based on beverage can construction and bottle base maker's marks. Also noted were wire nails, bailing wire, 12 gauge shot shells, and wood fragments. As the period of use for the feed lot appears to be between 1953 (date stamp on water trough) and the middle 1960s (a 1969 aerial indicates that the lot had been abandoned by that time) the trash scatter may post-date the use of the aforementioned property. Numerous bimetallic pull tab cans indicate the deposit dates as early as the early 1960s and to as late as the early 1970s, prior to the complete phasing out of the bimetallic beverage can. Bases for liquor bottles indicate a 1970s era of deposition based on date codes associated with a number of maker's marks.

The deposit is situated on an alluvial terrace, within a Creosote Bush Scrub community. Sediments are Carrizo extremely gravelly coarse sand, 0 to 3 percent slopes, and comprise soils found in washes and wash margins.

VS-002 is a newly identified historic-period homestead trash scatter. The deposit measures approximately 23.7 by 16.4 meters. Materials identified include household and consumer goods, with items that appear to be similar to those at observed at VS-004. This suggests that these two deposits are contemporaneous, or at least from the same primary source. Artifacts identified at VS-004 are likely derived from a well-established homestead as seen on a 1947 aerial photograph. Datable items include12 oz all steel church key opened beer cans, glass and ceramic fragments, and undescribed sanitary cans.

The deposit is situated on an alluvial terrace, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-004 is a newly identified historic-period homestead trash scatter. The deposit measures approximately 150m by 90m. Materials identified include a sparse scatter of the historic household trash, including a non-ferrous spoon, a manganese medicine bottle finish, broken cast iron plumbing pipe, broken clay pipe, Euro-American ceramic wares, yellow glazed and red glazed counter/bath tile, bottle and plate glass fragments. A 1947 aerial photograph indicates an established homestead immediately south of this location.

The deposit is situated on an alluvial terrace, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-006 is a newly identified historic-period homestead and agricultural landscape. The deposit measures approximately 1,613 by 802 meters. This is a large historic-era agricultural site situated in the northeast corner of the Project Area. The designation encompasses all the improved lands, which have been intensively modified to include wellheads, slide-gated 36-inch cast concrete weirs, numerous rows of 12-inch cast concrete valves with Fresno orchard valve gates, a large poured-in-place concrete detention basin used to collect excess water prior to returning it to the Colorado River, perimeter fencing, a poured concrete slab formerly occupied by a shed garage, now occupied by a 1970s single-wide mobile home, the remains of a concrete block house and attendant pump-house and cistern, and two adjacent foundations for no longer extant out buildings, possibly used for ranch hands or extended family.

The site encompasses a trash scatter (VS-004) possibly associated with a house observed on the 1947 aerial. No indications of a residence or other outbuildings, or agricultural improvements outside the immediate area of the homestead are observed on the 1947 aerial, but the majority of the items described as part of VS-006 are observed on the 1969 aerial. No date stamps were observed at any of the associated features; however, based on aerial photographs VS-006 was developed between 1947 and 1969. A 12 oz pull-tab bimetallic beer can scatter is associated with a wellhead located at the western edge of the property. These cans date between 1958 and 1978. The wellhead is located near a power drop pole and irrigation weir. A concrete pad has been formed around the well and probably supported a pony engine. The Parker-Blythe #1 transmission line traverses the property in a northeasterly-southwesterly direction, with structures 23-7, and 24-1 through 24-4 located within the site.

VS-006 encompasses several features related to the function of the ranch in concert with the homestead. The concrete block house (Feature 1), and adjacent house pads (Features 2 and 3) comprise the heart of the homestead. Feature 4 appears to be the garage and repair shop. Feature 5 is a wellhead, pumphouse, and cistern that supplied water to the residential areas. Feature 6 is a large diameter mechanical water pump, drawing either from a well, or a connection to the nearby Colorado River. Feature 7 is another large diameter mechanical water pump, likely drawing from a well. Feature 8 is another large diameter mechanical water pump, drawing from a well. Feature 9 is the location of a former large diameter mechanical water pump, drawing from a well. Feature 10 is the connected irrigation system connecting 36-inch diameter weirs with smaller 12-inch diameter field gates and valves. Feature 11 is a concrete lined detention basin used to stock water prior to releasing the irrigation excess back to the Colorado River.

Feature 1 appears to be the main residence on the property. It is currently derelict and in ruin. The plan is roughly rectangular, measuring approximately 59 feet east-west by 32 feet north-south, at the widest section, and approximately 26 feet north-south at the narrowest. At the southwest corner the building is constructed with a double 45-degree bevel corner rather than a 90-degree corner. A fireplace is located approximately eight feet east of the west wall along the north side of the building, and an 11-foot-wide bump out is located approximately 15 feet west of the east wall along the north side of the building.

Walls are constructed of concrete cement block in running bond pattern and are located on a concrete cement pad – no apparent footing is noted. Piercings for windows and doors are semi-round with short straight sides in design and fitted with parallel column bars with minor flourish details. In the larger piercings these bars are set in fixed and hinged doors. No evidence of window frames or plate glass was observed in these locations.

No roof is extant, and only ghost lines around the chimney point to a style of construction, which appears to have been a very low-pitched type. Reinforcing bar parades around the perimeter of the top of the walls, and it is not clear how these were used to tie into the roof.

The interior of the building is completely open and is constructed of a concrete cement slab; ghost lines suggest partitions for rooms or partially secluded areas.

Period of construction is between 1947 and 1969, but is likely to pre-date 1969, as the aerial photograph indicates numerous well-established ornamental trees and shrubs adjacent to the building, and a well-established orchard under cultivation. The building appears to be extant in 1980; however, the land use appears to have changed from orchards to grass/hay/alfalfa crop, and some of the sectors of the ranch appear to have been abandoned. By 2002 the building appears to have been partially demolished, and by 2005 the entire property appears to have been abandoned.

Feature 2 is presently the remaining features of a small building, possibly residential in nature. The remaining features consists of a concrete cement block perimeter foundation with remnant posts and piers for joist spans supporting a likely residential building. Lag bolts are set in concrete at intervals around the perimeter. The foundation measures approximately 30 feet east-west by 20 feet north-south. A portion of a step feature is located approximately at midpoint of the southern length of the foundation. A cast-iron sewer/septic connection is observed above ground level within the foundation perimeter. A concrete cement capped concrete block perimeter wall supports remnant fencing forming a yard approximately 71 feet by 71 feet. The six-by-six-inch wire mesh fencing is embedded into the concrete cap of the perimeter block wall.

Period of construction is between 1947 and 1969, but is likely to pre-date 1969, as the aerial photograph indicates numerous well-established ornamental trees and shrubs adjacent to the building, and a well-established orchard under cultivation. The building appears to be extant in 1980, however, the land use appears to have changed from orchards to grass/hay/alfalfa crop, and some of the sectors of the ranch appear to have been abandoned. By 2002 the building appears to have been demolished and the debris appear to have been cleared by 2005.

Feature 3 is presently the remaining features of a small building, possibly residential in nature. The remaining features consists of a concrete cement block perimeter foundation with an intrusively constructed concrete cement pad bisecting the original perimeter foundation. Lag bolts are set in concrete at intervals around the perimeter. The original block foundation measures approximately 35 feet east-west by 30 feet north-south. The intrusive concrete pad measures approximately 10 feet east-west by 36 feet north-south. Lag bolts are noted along the edge suggesting the fastening of sill plates that supported vertical walls. Several ghost lines suggest interior structuring of the former building, including water/sewer services. A concrete cement capped concrete block perimeter wall supports remnant fencing forming a yard approximately 71 feet by 71 feet. The six-by-six-inch wire mesh fencing is embedded into the concrete cap of the perimeter block wall.

Period of construction is between 1947 and 1969, but is likely to pre-date 1969, as the aerial photograph indicates numerous well-established ornamental trees and shrubs adjacent to the building, and a well-established orchard under cultivation. The original building appears to be extant in 1980, but by 2002 that building appears to have been demolished and the concrete intrusive pad and building were located in the central aspect of the original footing. By 2005 the secondary building and former building debris appear to have been cleared away.

Feature 4 is the location of what appears to have been the maintenance shed and ancillary facilities for servicing heavy equipment and farm machinery. Measurements and details of building construction are unknown at this time as none of the buildings are extant. All that remains are concrete cement foundation pads. All pads are board-formed and poured in place, with sill plate anchor bolts inserted during the pour. Cast iron plumbing is also present in the smaller outbuildings. Presently the larger pad, presumably used as a workshop and maintenance shed based on aerial photographs, is supporting a dilapidated mobile home built in the 1970s, and first observed on a 2004 aerial photograph. The pad measures approximately 20 feet east-west by 55 feet north-south. The smaller pads were overladened with stacked debris, making measurements difficult. The southernmost pad measures approximately 10 feet east-west by 10 feet north-south, with the next pad to the north measuring approximately 10 feet east-west by 40 feet north-south, with a 10 feet east-west by 11 feet north-south addition (likely bathroom) immediately adjacent at the midpoint of the west side of the pad.

Feature 5 comprises a wellhead and cistern with two ballast tanks to supply the residential areas with pressure-fed water. No measurements of the feature elements were taken and by all appearances the feature appeared to have been installed or updated not much before abandonment of the property.

Feature 6 is a pumpstation with electrical power drop, like to power an electrical pump drawing water either from subsurface water or directly from the Colorado River. A1969 aerial photograph indicates a linear ground disturbance from the pump location to the river. The feature appears differently from a nearby dirt road, which is less than straight, and soil displacement along the road appears structurally different from the straight line between the pump and river. The Pomona Turbine Pump was manufactured by Fairbanks-Morse of Chicago, Illinois. No date of manufacture was noted but a patent number indicates award in 1944, providing a reliable *terminus post quem*. The pump feeds a 12-inch steel supply pipe, which in turn supplies a series of 36-inch cast concrete pipe weirs with slide gate controls (see Feature 10).

Feature 7 appears to be one of the last operational well heads on the property, and is located along the northern property margin, approximately 1385 feet (422 meters) north of Feature 4, and approximately 2330 ft (710 meters) west of VS-001. The adjacent field (approximately 20 acres) appears to have been the most recently utilized of all the areas within the site, with aerial photographs indicating a renewed agricultural endeavor sometime between June 2007 and June 2009, at which point the exercise appears to have been abandoned. It is at about this same timeframe that renewed activity is indicated at a nearby residence along the terminus of Citrus Ranch Road.

The feature consists of a recently poured in place concrete pad upon which sits a 12-inch vertical shaft well pump feeding dual 12-inch steel pipes; one to a stacked 36-inch cast concrete pipe weir, and one to an underground feed. Each line is controlled by a Walworth gate valve. The well pump is a Johnson Gear H300 vertical shaft pump which is driven by a GMC 7000 diesel cab and chassis truck utilizing a modified driveshaft as power take off.

Feature 8 is an abandoned well head located along the western property margin, approximately 650 feet (200 meters) south of the northwest corner of the property. A power drop pole supplied power to a no longer extant motor to draw water from the well, which remains open due to missing supporting infrastructure such as the pump base covering the 12-inch steel well encasement and the supply line to the adjacent cast concrete weir. A concrete cement pad bears witness to these infrastructural items. The concrete pad measures approximately 8 ft by 2 ft-06 inch with the long axis running northeast-southwest. The pad appears to have been poured in place, but construction techniques were obscured by surrounding sediments. No period of construction could be determined; however, the feature appears to be contemporaneous with other agricultural infrastructure installed across the landscape.

Feature 9 is an abandoned well head located along the southwestern property margin, approximately 1280 feet (390 meters) west-northwest corner of Feature 11. No power drop was noted nearby. The concrete pad for the no longer extant pump was poured in place using board forms, some of which are still in place, using concrete cement mixed with local aggregate. The pad measures approximately 10 ft-06 inch by 4 ft-06 inch with the long axis running in a 145°/325° bearing. Two metal strips are laid lengthwise into the pad, which likely supported and anchored the pump and ancillary equipment; weld scars are noted on one of the metal strips. A 12-inch steel well encasement is located in the center of the pad, and a nearby four- or six-inch overflow pipe is set at an angle. A partially deconstructed 36-inch cast concrete weir is located approximately four feet to the northeast. The open encasement allowed an elapsed time calculation to measure depth to waterline which revealed an approximate depth of 58 feet. No period of construction could be determined; however, the feature appears to be contemporaneous with other agricultural infrastructure installed across the landscape.

Feature 10 comprises the in-ground irrigation features. These include several widely spaced 36-inch cast concrete segmented pipe weirs with manually controlled slide gates. These weirs supply regularly spaced 12-inch cast concrete irrigation points controlled with Fresno Orchard Valves, which supply water in flood form. The smaller valve boxes form linear features the length of the fields in an east-west fashion. The large weirs are irregularly spaced, presumably based on the volume of head necessary to supply a given number of smaller valves and coverage area. None of these items appear to be manufactured in place, or are of a vernacular nature, and were likely sourced from readily available suppliers.

Feature 11 is a concrete cement retention basin used to collect excess agricultural water and meter its release into a nearby drainage for its return to the Colorado River. The basin measures approximately 75 by 42 feet, with the long axis running in a 145°/325° bearing. It is located along the southern boundary of the property near the center of the agricultural areas. Depth of the basin is approximately six feet. A set of concrete stairs is located at the southern end of the basin where two cast concrete pipes with cast concrete vents located at the bottom direct water out of the feature to the southeast. A smaller cast concrete pipe is located near the top of the basin and acts as an overflow valve. The construction of the basin appears to be poured-in-place concrete cement with no obvious reinforcement or forms, and illustrates a smooth, but rustic finish.

The resource is situated on an alluvial terrace, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-008 is a newly identified historic-period encampment with at least four loci, which may or may not be contemporaneous with one another. The deposit measures approximately 202 by 34 meters. Each locus was located in a siding arroyo draining into the northern unnamed wash. Materials identified include:

Locus A: sanitary can scatter with aqua glass. Welch's Junior (4 oz) bottle with "F" makers mark, a 12oz bimetallic pull-tab beer can (circa 1958-1978), key wind meat cans, a sanitary can measuring 301d by 315h (type No. 1 short), matchstick filler (MSF) can measuring 208d by 206h, coffee cans 500d by 309h, a large square can measuring 309l by 309w by 605h, and a Prince Albert can 301w by 404h. Also noted was an improved whiteware bowl with "K. T. & K / S-----V/China" makers mark.

The 208d by 206h MSF can is representative of Simonis' type 13, dating between 1917 and 1930, or type 17, dating between 1931 and 1948 (Simonis 1997).

The F makers mark is possibly Fairmont Glass, which was in operation between 1889 and 1968. The Welch's embossment style is similar to that observed in a 1915 advertisement.

The 500d by 309h coffee cans are likely 1-pound cans by Folgers, which sold their product in this can size between 1950 and 1958 (Rock 1989).

The China bowl fragment with "K. T. & K / S-----V/China" makers mark relates to Knowles, Taylor & Knowles, who operated out of East Liverpool, Ohio, USA, between 1870 and 1929. The S----V marking was used circa 1925.

Locus B: several sanitary and MSF cans. Sanitary cans, usually punch and pry opened, typically measure 211d by 400h (size No. 1 Picnic), 301d by 411h (size No. 1 Tall) and 307d by 411h, which has no known match. The MSF cans, usually knife opened or pierced, include seven cans measuring 215d by 314h, two measuring 215d by 315h, and one measuring 208d by 208h.

The 208d by 208h MSF can is representative of Simonis' type 8, which date between 1915 and 1925. The 215d by 315h cans are representative of Simonis' type 19, which date between 1930 and 1975. The 215d by 314h are representative of Simonis' type 12, which date between 1917 and 1929.

Locus C: contains approximately 30 cans, both sanitary and milk (MSF). Identification included thirteen milk cans measuring 215d by 404h; one quart- and one pint-sized internal friction lid can; one bimetallic 12oz pull-tab beer (circa 1958-1978); two knife opened sanitary cans measuring 307d by 409h (size No. 2); and two sanitary cans measuring 400d by 411h (size No. 2½). The MSF cans measuring 215d by 404h are representative of Simonis' type 10, which date between 1917 and 1929.

Locus D: Glass and can scatter including bromo seltzer cobalt jar. Four sanitary cans measuring 307d by 409h (size No. 2); a "large tuna" can (possibly size 8Z Short - 7oz); three 64 oz jars; one 20 oz jar; and one-quart liquor bottle. All bottles were manufactured by Owens-Illinois and used the "Duraglas" designation. Date codes 2 and 3 were observed at the date code location, suggesting a manufacturing date of 1942/3 or 1952/3.

In addition, several isolated cans were observed on the attendant mesa, between the road and the wash. These isolates appear to date to the same period in general, however, later period ejecta is also noted, and are likely representative of people passing through the area via automobile or other conveyance, and not stopping to create a larger deposit of materials.

The deposits are situated on an alluvial terrace margin, overlooking an unnamed wash to the south, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-010 is a newly identified historic-period encampment. The deposit measures approximately 19 by 13.2 meters. Materials identified include a manganese medicine bottle (Ben Hur), a teapot with brown interior and white exterior glaze, and brown paste, white porcelain teacup, a manganese glass tumbler, and approximately 30 matchstick filler milk cans measuring 215d by 406h, which correspond to Simonis' type 9 (1915-1930) description. The medicine bottle had been buried for such a time that it was only partially solarized.

The deposit is situated on an older elevated desert pavement terrace with a southern aspect, just below flat of the terrace, and is located within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-011 is a newly identified prehistoric quarry site with several single reduction loci. The deposit measures approximately 100 by 63 meters. The older elevated terrace contains at least eight loci with numerous individual flakes and cobbles. Materials identified include:

Locus A: approximately 30 microcrystalline quartz (chalcedony) flakes.

Locus B: brown-gray microcrystalline quartz (chert) and white microcrystalline quartz (chert) flakes.

Locus C: at least four fine-grained rhyolite flakes.

Locus D: approximately 50 basalt and two volcanic flakes.

Locus E: at least 30 vesicular basalt flakes.

Locus F: five tan-brown rhyolite flakes.

Locus G: one assayed cobble

Locus H: one microcrystalline quartz (chalcedony) assayed cobble.

The deposit is situated on an elevated older terrace within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-012 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 1.0 by 1.0 meters. Materials identified include a large, assayed basalt cobble, five basalt debitage and one core in two pieces. The bifacial core measures 36 by 16 by 12 cm. The deposit is situated on an older elevated desert pavement terrace within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-013 is a newly identified prehistoric lithic reduction station. One aspect of the deposit measures approximately 50 by 30 cm. Materials identified include six microcrystalline quartz (chert); a previously identified microcrystalline quartz (chalcedony) pebble was not relocated at the time of recording, but it is certain that it had not been lost or moved. The deposit is situated on an older elevated desert pavement terrace within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-014 is a 1913 brass button on a brass post General Land Office quarter section survey monument. A small mound of pebbles, and an old lath are associated. It is in good condition and unobstructed. The marker is located on an alluvial terrace, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-015 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 4.2 by 2.5 meters. Materials identified include 27 pieces of quartz debitage with one core measuring 100 by 74 by 68 mm, and 14 pieces of banded microcrystalline quartz (chert) debitage. The deposit is situated on an elevated older terrace within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-016 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 1.0 by 1.0 meters. Materials identified include approximately 15 total primary and secondary debitage, and a large core of reddish metavolcanic/rhyolite. The unifacial core measures 48 by 36 by 25 cm. The debitage and core appear to rest on the surface in a manner that suggests that the artifacts were recently created. Their characteristics are suggestive of intentional flaking, as opposed to mechanical manufacture, but few of the debitage are embedded in the surrounding sediments as observed at other lithic reduction sites. The deposit is situated on an alluvial terrace near the southern margin of Vidal Wash, and is within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-017 is a newly identified prehistoric ceramic scatter. The deposit measures approximately 5.5 by 1.8 meters. Materials identified include 50 Black Mesa/Tumco buff ware sherds. At least two rim sherds are present, which appear to represent a bowl with a direct or pinched finish. The deposit is situated on an alluvial terrace, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-019 is a widely dispersed incidental trash scatter composed of a variety of temporally disparate items all in secondary contexts. The deposit measures approximately 333 by 115 meters. Materials are randomly distributed and generally follow hydraulic flow lines such as rivulets, minor drainages, and sheet washes. Materials identified include glass bottles, bimetallic and aluminum cans, church key opened cans both 12 and 16 oz all steel cans, and all aluminum cans. Datable materials identified between 1958 and 1980s. Also includes material from temporary number VS-018, which includes three milk cans, a sanitary can, and a bimetallic pull-tab. The sanitary can is possibly a key-wind opened C-ration tin. The milk cans are matchstick filler that measure 215d by 315h and are consistent with Simonis' type 19, which date between 1930 and 1975.

The deposit is situated on an alluvial terrace, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-020 is a newly identified historic-period encampment. The deposit measures approximately 37.2 by 12.7 meters. Materials identified include at least 35 sanitary and MSF cans, along with plate glass, green glass measuring cup, two condiment jars (Hazel Atlas and Kimble Glass Company). A large percentage of the sanitary cans are open around outside of the cap seam.

Among the measured cans are six sanitary cans measuring 207d by 315h with punch-and-pry opening. One sanitary can measuring 307d by 409h (size No. 2), also punch-and-pry. Five sanitary cans measuring 307d by 409h (size No. 2) with outside rotary cut. The outside perimeter rotary can opener was invented by Edwin Anderson, receiving a patent in 1920.

One sanitary can measuring 300d by 410h (size "1 lb. Salmon."). Two 2-pound, and one 1-pound coffee cans. Four match-stick filler cans measuring 215d by 314h, which corresponds to Simonis' type 12, dating between 1917 and 1929.

Glass container makers marks include H over A (Hazel-Atlas) and K-in-a-hexagon (Kimble Glass Company). H over A was reportedly first used in 1923 and is believed to be last used in 1964. The K-in-a-hexagon mark was first used in 1947.

The deposit is situated on an alluvial terrace with an open aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-021 is a newly identified historic-period encampment. The deposit measures approximately 82.3 by 14.9 meters. Materials identified include at least 30 cans, predominantly sanitary, most are punch-and-pry/knife opened, many of which are crushed. At least four Prince Albert-style tobacco tins were noted. Sanitary cans that could be measured include two 307d by 409h (size No. 2), two 300d by 407h (size No. 300), one 301d by 411h (size No. 1 Tall), and two 401d by 411h (size No. 2-1/2). Also identified were five church-key opened 12 oz all steel beer containers, a key wind meat hole-in-cap can, a 1-pound coffee can, and a zinc mason jar lid w/ semi opaque milk glass liner. Seven match-stick filler cans measuring 215d by 315h corresponding to Simonis' type 19, which date between 1930 and 1975, were also identified in the site.

The deposit is situated along a small seasonal channel on an alluvial terrace with an open aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-023 is a newly identified historic-period encampment. The deposit measures approximately 42.1 by 13.8 meters. Materials identified include at least four unmeasurable sanitary cans, one knife opened sanitary can measuring 404d by 306h (no known type), one rotary opened sanitary can measuring 401d by 411h (size No. 2-1/2), one can measuring 603d by 700h (size No. 10), and at least one MSF can measuring 215d by 314h, which corresponds to Simonis' type 12, dating between 1917 and 1929. Other items noted include a crushed paint can (quart), a pry lid, a Prince Albert tin, a citrine glass dish, a red clay brick fragment, a zinc toothpaste tube, and at least two crown bottle caps.

The deposit is situated on the margin of an older alluvial terrace within a Desert Pavement vegetation community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-025 is a newly identified historic-period encampment. The deposit measures approximately 15 by 3.8 meters. Materials identified include six bimetallic 12 oz beer cans with circa 1963 pull-tab openings, and two 215d by 200h (no known size type) rotary opened sanitary cans. The deposit is situated in a minor drainage on an older alluvial terrace within a Desert Pavement vegetation community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-026 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 6.7 by 6.6 meters. Materials identified include 25 black vesicular basalt flakes, two black vesicular basalt assayed cobbles, one tan rhyolite assayed cobble, and one gray rhyolite core measuring 28 by 18 by 10 cm. The deposit is situated on an alluvial terrace near the southern margin of Vidal Wash, and is within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-027 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 2.0 by 1.2 meters. Materials identified include six black vesicular basalt debitage, without core, one black vesicular basalt assayed cobble, one gray rhyolite assayed cobble, one rhyolite secondary flake, and one gray basalt hammerstone measuring 22 by 15 by 12 cm. The deposit is situated on an alluvial terrace within a Desert Pavement vegetation community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-028 is a newly identified historic-period encampment. The deposit measures approximately 27.0 by 14.5 meters. Materials identified include 16 quart and 15-pint liquor bottles. Nearly all the glass bottles were manufactured by Owens-Illinois and indicated a "101" designation, which was given to Hiram Walker Distillers as part of the U. S. government licensing system between 1933 and 1964. A date code of 8 observed on many of the bottles indicate a year of production of 1938 or 1948 (1958 is also possible but by this time the new maker's mark had already been established). Also identified were at least 16 sanitary cans measuring 300d by 407h (size No. 300), three "tuna"-sized cans, three kipper or fish fillet key-wind cans, of which two are rectangular, and one oval. Ceramics include one porcelain cup and one whiteware bowl fragment. A maker's mark of Poxon China, Vernon, California suggests a production date between 1912 and 1931. Three matchstick filler cans that measure 208d by 206h correspond to Simonis' types 8 (1915-1925) or 13 (1917-1930). Other items include one "quart" size olive green wine bottle, and three or four condiment jars with indecipherable coding data.

The deposit is situated in an arroyo and on an alluvial terrace near the southern margin of Vidal Wash, and is within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-029 is a newly identified historic-period encampment. The deposit measures approximately 25.9 by 23.4 meters. Materials identified include over 40 rotary opened sanitary cans measuring 300d by 407h (size No. 300) with a debossed “C” on the bottom lid, four rotary opened sanitary cans measuring 211d by 400h (size No. 1 Picnic), and seven rotary opened sanitary cans measuring 404d by 414h (size No. 3). Other cans include a rectangular key-wind fish tin, Prince Albert tins, and one MSF can, measuring 215d by 315h, which corresponds to Simonis’ type 19, dating between 1930 and 1975. A whiteware ceramic and a drinking glass were also noted, as was a discarded axe head.

The deposit is situated in an arroyo and on an alluvial terrace near the southern margin of Vidal Wash, and is within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-030 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 1.2 by 1.0 meters and consists of a collection of assayed cobbles, a core, and flakes. Materials identified include one light gray basalt assayed cobble with two flakes, one dark gray basalt assayed cobble and one flake, and one light tan rhyolite core measuring 32 by 29 by 11 cm with four flakes. The deposit is situated on an alluvial terrace with an open aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-031 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 3.3. by 2.8 meters. Materials identified include a fine-grained porphyritic metavolcanic hammerstone measuring 105 by 95 by 90 mm; a rhyolite hammerstone measuring 110 by 115 by 75 mm; a bifacial, bimarginal, rhyolite core measuring 23 by 15.5 by 8.5 cm; a unifacial, bimarginal, rhyolite core measuring 19 by 13 by 8 cm; three basalt and two rhyolite assayed cobbles. The collection of cobbles, cores, and hammerstone appear as if part of a random amalgamation of recently collected cobble artifacts rather than as if part of a prehistoric reduction station; however, the associated 29 flakes, predominantly rhyolite, do appear arrayed as if part of a lithic reduction station. The deposit is situated on an alluvial terrace with an open aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-032 is a 1912 brass button on a brass post General Land Office section survey monument, locating the intersection of Sections 15, 16, 21, and 22 of Township 1 South, and Range 24 East. A small mound of pebbles and an old lath are associated. The marker is located on an alluvial terrace, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-033 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 2.0 by 1.5 meters. Materials identified include a dark gray rhyolite hammerstone measuring 14.5 by 15 by 10 cm; a dark gray basalt hammerstone measuring 17 by 13 by 9.5 cm; a gray rhyolite hammerstone measuring 15 by 10 by 8 cm; a gray rhyolite hammerstone measuring 12 by 7 by 7 cm. In addition, several fine-grained porphyritic metavolcanic/rhyolite and basalt flakes were observed. The deposit is situated on an alluvial terrace with an open aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-034 is a newly identified historic-period trash scatter. The deposit measures approximately 14.8 by 5.9 meters. Materials identified include four key wind opened C-ration cans measuring 306d by 308h. These cans appear to be 12 oz. "B" units, which were standardized in 1940. The deposit is situated on an alluvial terrace with an open aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-035 is a newly identified prehistoric artifact scatter. The deposit measures approximately 12.4 by 6.2 meters. Materials identified include a red modified microcrystalline quartz (chert) flake tool, which exhibits bifacial retouching around tip margin and measures 50 by 20 by 7 mm, a buffware sherd, a basalt Lake Mojave projectile point that measures approximately 60 by 25 by 6 mm, one assayed basalt cobble measuring 23 by 17 by 10 cm, and a couple of basalt primary flakes. The deposit is situated on a deflated gravel terrace/desert pavement within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-036 is a newly identified prehistoric artifact scatter. The deposit measures approximately 19.0 by 10.2 meters. Materials identified include 40 or more Parker buff ceramic sherds, with at least one direct shaped rim sherd that measures a radius of 4 cm with 15 percent of the rim present. Also identified was an assayed cobble. The deposit is situated on an alluvial terrace with an open aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-037 is a newly identified prehistoric artifact scatter. The deposit measures approximately 31.0 by 7.8 meters. Materials identified include a basalt assayed cobble, a quartzite secondary flake, and a buff ware ceramic scatter of at least 30 sherds. The deposit is situated on an elevated desert pavement terrace, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-038 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 3.8 by 2.1 meters. Materials identified include a tan rhyolite bifacial core that measures 17 by 18 by 15 cm; a basalt assayed cobble measuring 14 by 13 by 9 cm; and six purple vesicular basalt flakes, and one tan rhyolite flake. The deposit is situated on an elevated desert pavement terrace, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-039 is a newly identified historic-period trash scatter. The deposit measures approximately 1.0 by 1.0 meters. Materials identified include two 1942 dated Twin Cities head stamped 30 cal. blank cartridges, and a key wind opened C-ration cans measuring 300d by 308h. These cans appear to be 12 oz. "B" units, which were standardized in 1940. The deposit is situated on an alluvial terrace, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-040 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 8.2 by 7.1 meters. Materials identified include over 100 pinkish rhyolite and five gray rhyolite flakes; one fine-grained porphyritic metavolcanic flake; one fine-grained porphyritic metavolcanic, bifacial, unimarginal core measuring 135 by 80 by 43 mm; one volcanic, unifacial, unimarginal core measuring 105 by 65 by 75 mm; and one volcanic hammer-core, with bifacial, multimarginal edge damage measuring 18 by 17 by 11 cm. The deposit is situated on an alluvial terrace near the southern margin of Vidal Wash, and is within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-041 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 1.5 meters by 1.5 meters. Materials identified include 14 black basalt and seven purple rhyolite flakes. The deposit is situated on an alluvial terrace near the southern margin of Vidal Wash, and is within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-042 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 1.5 by 1.5 meters. Materials identified include more than 25 pieces of debitage consisting of rhyolite and fine-grained metavolcanic primary and secondary flakes, with a few tertiary flakes, and one fine-grained metavolcanic assayed cobble. No core was identified. The deposit is situated on an alluvial terrace near the southern margin of Vidal Wash, and is within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-043 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 1.4 meters by 0.8 meters. Materials identified include three purple rhyolite debitage, one rhyolite and one basalt assayed cobble, and one grayish-green metavolcanic hammerstone measuring 17 by 14 by 8 cm. The deposit is situated on an alluvial terrace near the southern margin of Vidal Wash, and is within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-044 is a newly identified historic-period encampment. The deposit measures approximately 34.0 by 6.7 meters. Materials identified include older style, knife-opened, hole-in-cap cans: two 306d by 409h (size No.2), one 400d by 412h (size No.2 ½), one 315d by 606h, one 215d by 303h; two whiteware ceramic sherds, a recently looking metal wire diagonal cutter, bailing wire, and a metal tack strip. This deposit is in the vicinity of the 1914 mapped location of Mrs. G Duncan's House (Figure 5) and does appear to have cans manufactured before the rise of fully machine-made tin cans (after circa 1904), with large, soldered hole-in-cap tops. However, apart from a small measure of steel window screen, typical of older historic-period homes, no foundations or other building material was identified in the area.

The deposit is situated on an alluvial terrace with an open aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-047 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 1.0 by 1.0 meters. Materials identified include four white microcrystalline quartz (chert) and two red microcrystalline quartz (chert) flakes, and a red microcrystalline quartz (chert) core measuring 65 by 50 by 40 mm. The deposit is situated on an older elevated desert pavement terrace within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-048 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 1.8 meters by 1.7 meters. Materials identified include at least 18 pieces of quartz debitage. The deposit is situated on an older elevated desert pavement terrace within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-049 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 1.3 by 0.8 meters. Materials identified include 15 vesicular basalt flakes, and no identified core. The deposit is situated on an alluvial terrace with an open aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-050 is a newly identified prehistoric lithic reduction station. The deposit measures approximately 1.3 meters by 0.8 meters. Materials identified include more than 25 black vesicular basalt flakes, a gray rhyolite assayed cobble measuring 23 by 18 by 10 cm, and a tan rhyolite assayed cobble measuring 18 by 9 by undetermined thickness (cm). The deposit is situated on an alluvial terrace with an open aspect, within a Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

VS-051 is an array of military vehicle tracks traversing the lower latitudes of the Project Area. These appear to be part of a broader array of vehicle tracks visible on the landscape from north of highway 62 to a short distance south of the Project Area. Within the Project Area most of the tracks are in the southern region, though a few tracks are discernable in the northern area as well. The tracks appear in a sweeping syncline arch pinching in the east at a no longer extant fence line gap along the eastern property line near Vidal Wash, broadening within the center of the southern Project Area, and coalescing near the western property line. The direction of travel is not particularly clear and remains equivocal. Similar tracks appear to emanate from, or descend upon, Camp Rice, located approximately 17 miles to the west, and west of Parker, Arizona, north of California 62, approximately 9 miles, northeast. Camp Rice was part of the greater Desert Training Center/California-Arizona Maneuver Area (DTC/C-AMA) developed in the early 1940s (April 1942 to May 1944) to train military personnel in desert, and later, European Theater warfare The DTC/C-AMA is listed as California Historical Landmark No. 985. This area is dominated by Creosote Bush Scrub community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

The tracks, now between 57 and 80 years old, remain visible on the landscape, and in aerial photographs, but details have weathered. Tread width appears to be approximately 22 to 24 inches, with a center-on-center track width of approximately 9.5 feet, and a maximum width of outside edge-to-edge of approximately 12 feet; however, the sample size of these dimensions is small, and additional data may improve the resolution of these measurements.

Very few tracked military vehicles fit this mechanical profile, especially those that date to the early phases of the use of the DTC/C-AMA. Two vehicles that may have been wide enough to create such tracks include the Landing Vehicle, Tracked (LVT) and the M10 Tank Destroyer. It seems unlikely that the LVT would have been utilized at the DTC/C-AMA given that the vehicle was adopted for production by the US Navy and Marines, even though one of the training exercises at the DTC/C-AMA was river crossings, usually along the Colorado River. Thus, the most likely candidate for this era would be the M10 Tank Destroyer – most tanks used at the training center were of the Lee, Stuart, and Sherman Classes, which had a tread width of 16- to 16-9/16-inchs on an 83-inch (6’-11”) track – wider treads were not used until late into the war, and few if any tread-widened M4 tanks would have been located at the DTC in early 1944 given the earlier proposed decommissioning of the facility by military command. In addition to visible tracks are a few, light scatters of post-1940 C-ration cans, one of which includes a 1942 dated Twin-Cities headstamp 30-06 rifle cartridge case (see VS-039).

Operations at the DTC that involved use of the M10 Tank Destroyer include the 606th and 704th Tank Destroyer Battalions of the IV Armored Corps (8 November 1942 - 29 March 1943), which maneuvered from February 18 to March 6, 1943 (Meller 1946:39); the 5th and 6th Tank Destroyer Groups of IX Corps (29 March - 23 July 1943), which maneuvered from June 27 until July 15, 1943 (Meller 1946:41); the 185th Tank Destroyer Battalion of XV Corps (23 July - 13 November 1943), which maneuvered from October 25 until November 13, 1943 (Meller 1946:42); and the 15th Tank Destroyer Group of X Corps (17 January - 30 April 1944), which maneuvered from February 15 to March 3, 1944 (Meller 1946:43). No locational data has been identified to note where these particular maneuvers took place, and military and Formerly Used Defense Sites (FUDS) maps locating bombing and small arms ranges do not include the Project Area, or areas in the immediate vicinity of Vidal. A 1962 letter noted that a FUDS dedudding program cleared 2,560 acres in the Vidal area; however, none of the recorded cleared sections include the Project Area (USACOE 1996:266-279). A 1986 USGS publication did note, however, that the Project Area was within an area of military operations that may have been part of the DTC/C-AMA, or a subsequent operation called Desert Strike (Prose 1986).

The 1964 Exercise Desert Strike (sometimes also cited as Operation Desert Strike, or simply Desert Strike) was a simulated battlefield exercise conducted within much of the previous DTC/C-AMA footprint. The ground maneuver area extended from Barstow, California, just east of Edwards Air Force Base, eastward 170 miles to Kingman, Arizona, and from a point approximately 40 miles south of Las Vegas, Nevada, southward 160 miles to Blythe, California. “Desert Strike was a semi-controlled exercise under the direction of U.S. Strike Command that allowed opposing joint task forces, comprised primarily of armored and mechanized forces with full air support but including airborne units, a maximum of ‘free play’ initiative to develop, perfect, and test combat techniques and tactics” (USAF 1964a:4). Tracked vehicles used in this operation that may have fit dimensions observed in the field include the M60 Tank, which had a width of 11.9 feet.

As part of the exercise Joint Task Force (JTF) Phoenix launched an assault along a front of 140 miles of the Colorado River. Because existing dams and bridges were deemed destroyed or out of bounds by official umpires, attacks across the river were all land-based. Seven tactical crossing sites were chosen, each two to three miles wide (Kennedy 1964) (see Figure 11). “As elements of the 2d Armored Division got across the [pontoon] bridge, they picked up speed immediately and fanned out on roads and on trails into the desert country… [and] as they fanned out in the desert with armored columns in the direction of Rice and Vidal Junction they encountered only sporadic slash-and-run resistance. The Mojave forces fell back in the face of the headlong frontal assault” (USAF 1964a:10).

Perhaps contradicting the supposition that the area was traversed during Operation Desert Strike, with tracks made by M60 tanks, the presence of C-ration can scatters and the occasional 1942 dated 30-06 caliber rifle casing could well argue for use during the earlier training operations associated with the DTC. However, because armories supplying the military during WW II and the Korean conflict produced common calibers in the billions of rounds, these items were likely as available to the military as they were to the general public where they were regularly obtained in military surplus stores well into the 1970s and even into the 1980s. The presence of these items, unfortunately, may be equivocal on the subject of a precise period of deposition.

VS-052 is a newly identified prehistoric ceramic scatter. The deposit measures approximately 75 cm in diameter. Materials identified include 10 Colorado Red or Palomas buff sherds. The buff ware possesses a red outer slip, a slight carbon streak where a fire cloud is observed on the surface, with fine attrition, and crushed quartz temper. The interior surface indicates striae and a slight polish where the surface was scraped as part of the manufacturing process. The deposit is situated on a deflated gravel terrace/desert pavement within a Desert Pavement vegetation community. Sediments are Superstition gravelly loamy fine sand, 0 to 3 percent slopes, and comprise soils found on terraces and is derived from alluvium and sandy aeolian deposits.

In addition to the sites listed above, several isolated items were identified, mostly within that portion of the Project Area south of Vidal Wash. These items are described below.

ISO-100620-01 is a small, ceramic, red-on-buff body sherd with characteristics typical of Black Mesa/Tumco. The buffware sherd exhibits a broad, red paint patterning similar to those observed on Arizona specimens; however, the sherd was too small to readily detect a particular style. The sherd was identified at the southern margin of a slightly elevated desert pavement south of Vidal Wash. Vegetation is Creosote Bush Scrub community. Aspect is open, with a slight gradient to the east.

ISO-100720-02 is a white microcrystalline quartz (chert), multidirectional core, measuring 55 by 53 by 40 mm. The core was identified on a large, open terrace, south of Vidal Wash, consisting of Superstition gravelly loamy fine sand with 0 to 3 percent slopes. Vegetation is Creosote Bush Scrub community. Aspect is open, with a slight gradient to the east.

ISO-100720-04 is an Elko point made of white microcrystalline quartz (chalcedony) with a broken tip and one broken ear, measuring 31 by 31 by 5 mm. Tip damage is suggestive of impact with a hard feature, while ear loss and other damage appear to be the result of trampling with indicative lunate fractures. The point was identified on a large, open terrace, south of Vidal Wash, consisting of Superstition gravelly loamy fine sand with 0 to 3 percent slopes. Vegetation is Creosote Bush Scrub community. Aspect is open, with a slight gradient to the east.

ISO-100720-06 is a secondary rhyolite flake measuring 65 by 45 by 7 mm. The flake was identified on a terrace south of the Vidal Wash consisting of Superstition gravelly loamy fine sand, 0 to 3 percent slopes. Vegetation is Creosote Bush Scrub community. Aspect is open, with a slight gradient to the east.

ISO-100820-01 is a retouched rhyolite flake with unifacial and unimarginal flaking, measuring 68 by 35 by 30 mm. The flake was identified in an open alluvial deposit consisting of Superstition gravelly loamy fine sand, 0 to 3 percent slopes, south of Vidal Wash. Vegetation is Creosote Bush Scrub community. Aspect is open, with a slight gradient to the east.

ISO-100820-02 is a small ceramic body sherd with characteristics typical of Black Mesa/Tumco. The sherd exhibits a slightly burnished interior surface which is light gray in color. The sherd was identified in an open alluvial deposit consisting of Superstition gravelly loamy fine sand, 0 to 3 percent slopes, south of Vidal Wash. Vegetation is Creosote Bush Scrub community. Aspect is open, with a slight gradient to the east.

ISO-100820-03 is a basalt bifacial core measuring 155 by 135 by 30 mm. The core was identified in an open alluvial deposit consisting of Superstition gravelly loamy fine sand, 0 to 3 percent slopes, south of

Vidal Wash. Vegetation is Creosote Bush Scrub community. Aspect is open, with a slight gradient to the east.

ISO-100920-01 consists of two small ceramic body sherds, reddish-brown in color, with characteristics typical of Black Mesa/Tumco. The sherds were identified on a small terrace between two east-sloping drainages consisting of Superstition gravelly loamy fine sand, 0 to 3 percent slopes, south of Vidal Wash. Vegetation is Creosote Bush Scrub community. Aspect is open, with a slight gradient to the east.

ISO-100920-02 is a rhyolite core, with unifacial and unimarginal characteristics, measuring 145 mm by 147 mm by 140 mm. The core was identified on a small terrace between two east-sloping drainages consisting of Superstition gravelly loamy fine sand, 0 to 3 percent slopes, south of Vidal Wash. Vegetation is Creosote Bush Scrub community. Aspect is open, with a slight gradient to the east.

ISO-101320-01 is a secondary, white microcrystalline quartz (chert) flake, located on a small terrace between two south-sloping arroyos consisting of Superstition gravelly loamy fine sand, 0 to 3 percent slopes, north of Vidal Wash. Vegetation is Creosote Bush Scrub community. Aspect is open, with a slight gradient to the south/southeast.

ISO-101320-02 is a microcrystalline quartz (chert) edge-modified flake with multidirectional and multifacial characteristics, measuring 58 mm by 57 mm by 35 mm. It is located on a small terrace between two south/southeast-sloping arroyos consisting of Superstition gravelly loamy fine sand, 0 to 3 percent slopes, north of Vidal Wash. Vegetation is Creosote Bush Scrub community. Aspect is open, with a slight gradient to the south/southeast.

SECTION 6.0 – DISCUSSION/INTERPRETATION

The Project Area exhibits three general periods of use. The earliest is the prehistoric period. The many archaeological sites and isolated artifacts recorded across the Project Area illustrate a pattern of repeated, extensive use of the area by prehistoric Native American populations. The presence of an Elko projectile point reveals human use of the Project Area sometime between 3,500-1,500 BP, while the presence of a Lake Mohave projectile point indicates a presence as far back as 11,000-9,600 BP. The late prehistoric to early contact periods are represented by the numerous pot drops and isolated pot sherds.

The ephemeral nature of the archaeological sites documented indicate that residential habitation areas are located outside of the Project Area. With the Colorado River less than 0.5 miles away, this patterning corresponds to settlements of the Chemehuevi and the Mohave tribes described in section 2.2.2 above. The presence of a Lake Mohave projectile point represents a population utilizing the landscape deep in time. Lake Mohave points are associated with Early Holocene deposits and pre-date any known agricultural or horticulturally based cultures. Even so, Lake Mohave points are commonly found around lakes (currently referred to as playas or dry lakes). It is likely that the Colorado River would have also made for a suitable habitation area, similar to the earlier pluvial lakes of the region.

The middle period of use of the Project Area is represented by sites that date to early twentieth century (e.g., PF-012). The Calzona Mine Road supposedly coursed through the Project Area, as indicated on a 1911 USGS map (Figure 7). Although the mine itself is not within the Project Area, an artifact scatter adjacent to the road was identified and has historic-period tools indicative of mining activities. Historic-period sites situated along the bank of Vidal Wash (e.g., PF-008, VS-028, VS-029), where a hatchet head was identified within one of the sites may also be associated with the mining area, and may represent wood gathering camps supplying wood either for timbering the mines, or supplying fuel for the camps.

The last period of use is representative of World War II and post-war developments. The Project Area may have been subjected to use by General George Patton's Desert Training Center – California/Arizona Maneuver Area. The Project Area does not appear to contain any of the camp areas or other major maneuver areas documented in the region; however, the southern portion of the Project Area has many linear features that appear to have been made by tracked vehicles (VS-051). The tracks have a maximum width of approximately 12 feet and military C-Ration cans dating to that era were found near some of the tracks. The width of the tracked vehicle driven across the Project Area is wider than the Sherman tanks that were commonly used in WWII; however, the tracks may match the width of the LVT-1 vehicles that were used in the Pacific Theater, or the M10 Tank Destroyer, which were also deployed during maneuvers at the DTC. Similarly, the area may have been utilized during the Cold War training exercise named Operation Desert Strike. This military operation was played out across much of the former DTC landscape, operationalized maneuvers across the Colorado River in attack and defensive operations, and used the M-60 tank as part of the exercise; the M-60 tank fits the vehicle profile that may have produced the track traces visible on the landscape.

In addition, the remains of at least two homesteads from the historic era are still present in the Project Area. The oldest one, represented by sites VS-002 and VS-004, is visible on 1947 historic aerials, and may have pre-dated DTC use of the area. The parcel encompassing the homestead on the 1947 aerial was patented by Truesdell L. Locke on July 16, 1919, under the 1862 Homestead Act. It remains unclear if Locke or some other person(s) homesteaded the property. The second homestead, VS-006, dates to approximately 1953, and was abandoned by the 1980s based on aerial photograph evidence. VS-006 encompasses lands patented to Locke, see above, and to Albert J. Munn, and to Nettie E. Munn, who were individually awarded patents for various parcels on February 27, 1920. Like the Locke homestead, it is unknown if either Munn homesteaded their parcels, or merely acquired the properties through the Homestead Act of 1862. The 1940 census indicates that an Albert J. Nunn and wife Grace Reneck Munn were living in Glendale, California. Nevertheless, given that the latter homestead was occupied in the mid-1960s there may be some possibility of acquiring an oral history of the event if a suitable informant could be identified.

SECTION 7.0 – MANAGEMENT CONSIDERATIONS

7.1 MANAGEMENT CONSIDERATION

The primary lens by which properties are evaluated when a project is a result of a Federal undertaking, (36 CFR § 800.16(y); 42 CFR § 137.289), is through the National Register of Historic Places (NRHP). The NRHP was established under the NHPA. Because the Project requires allowance by Western Area Power Administration to interconnect with the Parker-Blythe #1 161-kV Transmission Line, the proposed Project is considered an undertaking, and subject to Section 106 of the NHPA (36 CFR Part 800). Additionally, the proposed Project is located within San Bernardino County, California, and is subject to CEQA and County regulations. The CEQA Guidelines require consideration of archaeological sites through the lens of answering particular questions, specifically, whether a resource is eligible for the CRHR or the NRHP, or meets the definition of a 'unique archaeological resource' and has the potential to contribute data to previously defined research questions. Several resources can be eliminated from formal evaluation due to their limited nature.

Preliminary analysis of the prehistoric data implies that the Project Area was used ephemerally, likely by people living along the banks of the Colorado River. Dropped and broken ceramic vessels, small lithic reduction areas, and the occasional tool are on par with expectations of land use patterns for the region, in light of the ethnographic data presented earlier in this report.

Table 7 below presents all of the newly identified sites within the Project Area, and eligibility recommendations. A total of 64 new resources were identified and recorded (Table 5). Out of the 64 resources recorded, 11 are identified as IOs, and as such, are recommended as not eligible for inclusion on the NRHP and require no further work. The remaining 53 resources were identified as either historic or prehistoric sites that are further categorized in Table 6 and described above in Section 5. These 53 sites and the associated recommendations are included in Table 7 below. Not included in Table 7 are several IO, which, by their singular nature, lack association and or research value that would further our understanding of prehistory, and are not recommended eligible for inclusion on the National Register. Additionally, the Parker-Blythe #1 161-kV Transmission Line has been previously evaluated and determined not eligible for inclusion on the National Register.

Table 7: Newly Identified Resources Eligibility Recommendations

Temp #	Period	Resource Type	Condition	NRHP/CRHR Recommendation
PF-004	Prehistoric	Lithic reduction station	Good	Not Eligible
PF-005	Prehistoric	Lithic reduction station	Good	Not Eligible
PF-008	Historic	Encampment	Good	Not Eligible
PF-009	Prehistoric	Lithic reduction station	Good	Not Eligible
PF-011	Prehistoric	Ceramic scatter	Fair	Not Eligible
PF-012	Historic	Mining trash scatter	Fair	Not Eligible
PF-013	Prehistoric	Lithic reduction station	Good	Not Eligible
PF-015	Prehistoric	Lithic reduction station	Fair	Not Eligible
PF-016	Prehistoric	Lithic reduction station	Good	Not Eligible
PF-017	Prehistoric	Lithic reduction station	Good	Not Eligible

Table 7: Newly Identified Resources Eligibility Recommendations

Temp #	Period	Resource Type	Condition	NRHP/CRHR Recommendation
VS-001	Historic	Ranching	Fair	Not Eligible
VS-002	Historic	Homestead trash scatter	Fair	Not Eligible
VS-004	Historic	Homestead trash scatter	Poor	Not Eligible
VS-006	Historic	Homestead	Poor	Not Eligible
VS-008	Historic	Encampment	Good	Not Eligible
VS-010	Historic	Encampment	Good	Not Eligible
VS-011	Prehistoric	Desert pavement quarry	Good	Not Eligible
VS-012	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-013	Prehistoric	Lithic reduction station	Fair	Not Eligible
VS-014	Historic	Survey monument	Excellent	Not Eligible
VS-015	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-016	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-017	Prehistoric	Ceramic scatter	Poor	Not Eligible
VS-019	Historic	Trash scatter	Poor	Not Eligible
VS-020	Historic	Encampment	Good	Not Eligible
VS-021	Historic	Encampment	Poor	Not Eligible
VS-023	Historic	Encampment	Good	Not Eligible
VS-025	Historic	Encampment	Poor	Not Eligible
VS-026	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-027	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-028	Historic	Encampment	Good	Not Eligible
VS-029	Historic	Encampment	Good	Not Eligible
VS-030	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-031	Prehistoric	Lithic reduction station	Poor	Not Eligible
VS-032	Historic	Survey monument	Excellent	Not Eligible
VS-033	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-034	Historic	WWII DTC*/Cold War EDS**	Good	Not Eligible
VS-035	Prehistoric	Artifact scatter	Poor	Not Eligible
VS-036	Prehistoric	Artifact scatter	Good	Not Eligible
VS-037	Prehistoric	Temporary camp	Fair	Not Eligible
VS-038	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-039	Historic	WWII DTC*/Cold War EDS**	Good	Not Eligible
VS-040	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-041	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-042	Prehistoric	Lithic reduction station	Good	Not Eligible

Table 7: Newly Identified Resources Eligibility Recommendations

Temp #	Period	Resource Type	Condition	NRHP/CRHR Recommendation
VS-043	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-044	Historic	Encampment	Poor	Not Eligible
VS-047	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-048	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-049	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-050	Prehistoric	Lithic reduction station	Good	Not Eligible
VS-051	Historic	WWII DTC*/Cold War EDS**	Fair	Not Eligible
VS-052	Prehistoric	Ceramic scatter	Fair	Not Eligible

*DTC: Desert Training Center **EDS: Exercise Desert Strike

Survey-level Assessment and Recommendations

Historic-period encampments PF-008, VS-008, VS-010, VS-020, VS-023, VS-028, and VS-029 may contain information related to the historic-period use of the regional landscape during the first decades of the twentieth century. However, while these deposits appear to be intact and retain some aspects of integrity, including setting and feeling, the sites cannot be attributed to a significant event or events, or patterns in history, or to a significant person or craftsman, and the data contained within these deposits are unlikely to significantly further our understanding of history, and therefore, are not recommended eligible for inclusion on the NRHP/CRHR. Historic-period encampment VS-044 contains the oldest historic-period surface deposits within the Project Area, and may have connections to “Mrs. G. Duncan’s house” noted on the 1914 USGS GLO map (Figure 5); however, VS-044 is a dispersed deposit of a limited number of items, and does not appear to be representative of a deposit associated with a historic-period homestead, of which little evidence was identified. VS-044 cannot be attributed to a significant event or events, or patterns in history, or to a significant person or craftsman, and the data contained within the deposit is unlikely to significantly further our understanding of history, and therefore, is not recommended eligible for inclusion on the NRHP/CRHR. Historic-period encampments VS-021, and VS-025 lack research value and retain little integrity. Neither deposit appears to be attributable to a significant event or events, or patterns in history, or to a significant person or craftsman, and the data contained within are unlikely to significantly further our understanding of history, and therefore, are not recommended eligible for inclusion on the NRHP/CRHR under any Criteria.

Homestead VS-006 is broadly configured across the northeast quadrant of the Project Area; however, substantive aspects of the ranch, both the domestic and working buildings, and the attendant agricultural infrastructure are lost through dismantlement and destruction. Thus, the site lacks integrity of design, materials, workmanship, and feeling, and is not recommended eligible for inclusion on the NRHP/CRHR under any Criteria.

Homestead trash scatters VS-002 and VS-004 are likely associated based on similar items contained in both deposits. However, neither site is likely to provide important information to better our understanding of history. Both sites lack integrity of association, setting, feeling, and materials, and are in poor condition. Neither are recommended eligible for NRHP/CRHP listing under any Criteria.

The mining trash scatter PF-012 lacks integrity with subsequent deposition of trash deposited over decades. While the condition of the site is fair, it lacks evidence to support significance under any NRHP/CRHP Criteria.

Ranching site VS-001 is in poor condition and retains little integrity of design, workmanship, setting, feeling or association and is therefore recommended not eligible for inclusion on the NRHP/CRHR under any Criteria.

General Land Office survey monuments VS-014 and VS-032 appear to be unaltered, though visited since installation. Condition is defined as excellent. Neither item is considered eligible under any Criteria.

The amorphous trash scatter VS-019 is an amalgamation of detritus flowing across the landscape, and is derived from a general waste stream of castoffs, ejecta, and illicit dumps. The deposit represents no singular event or episode, and contains items across a broad spectrum of time. The deposit lacks integrity of association and is not significant under any NRHP/CRHP Criteria.

Three resources represent sites associated with the World War II-era Desert Training Center or the Cold War-era Exercise Desert Strike, which utilized large portions of the Sonoran and Mojave Deserts. Site VS-051 is the largest and most complex site representing military equipment maneuvers within the Project Area; however, the site is composed mostly of military vehicle tracks created during active maneuvers, and a few C-ration cans, and a couple of 30-06 blank cartridges. While the DTC/C-AMA is listed as California Historical Landmark No. 985, VS-051 does not appear to possess any distinctive elements that would imbue the site with significance leading to eligibility for inclusion on the National Register. The overall condition of the site is poor, retains little integrity with respect to materials, condition, setting and feeling, and the limited extent of the vehicle tracks within the Project Area may not be especially representative of either DTC or EDS activity. Both VS-034 and VS-039 represent bivouacs where C-rations were consumed, and their packaging left behind. It is presumed that these three resources are contemporaneous and not representative of separate events. While the research value of VS-034 and VS-039 is limited, they both retain integrity of location and association. While both the DTC and Exercise Desert Strike are associated with military training in response to momentous global events, these sites are recommended as not eligible under Criterion A.

Prehistoric period artifact scatters are represented by VS-035 and VS-036. The Lake Mojave projectile point and the buffware sherd identified in VS-035 exemplify vastly different time periods of occupation. The flake tool and assayed cobble do not greatly add to the detail. VS-035 does not retain integrity of materials, association, feeling or setting, and lacks evidence to support significance under any NRHP/CRHP Criteria. VS-036, predominately comprises a ceramic scatter with an assayed cobble, indicating a late prehistoric to historic period of occupation. The site is in good condition and retains integrity of location, materials, and setting; however, VS-036 has not been attributed to a significant event or events, or patterns in history, or to a significant person or craftsman, and the data contained within the deposit is unlikely to significantly further our understanding of history, and therefore, is not recommended eligible for inclusion on the NRHP/CRHR.

Prehistoric ceramic scatters PF-011, VS-017, and VS-052 represent a late prehistoric to historic period of occupation. All three deposits have been impacted by property development, use, and vehicle traffic, and are in fair to poor condition. While these retain integrity of materials and location, other aspects of integrity are lacking and the data contained within the deposits are unlikely to significantly further our understanding of history or prehistory, and therefore, are not recommended eligible for inclusion on the NRHP/CRHR.

VS-011 is an array of single and multi-reduction loci recorded within a desert pavement area described as a quarry. An adjacent road, which marked the Project boundary, cuts across the larger pavement terrace, and additional lithic reduction loci are possibly located thereon. The quarry appears to retain aspects of integrity relating to materials, setting, and location; however, these expedient reduction loci do not appear to represent a significant event or events, or patterns in history, or are related to a significant person or craftsman, and the data contained within the site is unlikely to significantly further our understanding of history, and therefore, is not recommended eligible for inclusion on the NRHP/CRHR.

Some 25 additional lithic reduction stations were identified within the Project Area, including site VS-011 with numerous loci; however, none of these expedient reduction loci are associated with a significant event or events, or patterns in history, or are associated with significant person or craftsman, and the data contained within these sites are unlikely to further our understanding of history, and therefore, are recommended as not eligible for inclusion on the NRHP/CRHR under any Criteria.

VS-037 is interpreted as a temporary camp. The site retains integrity of setting, location and materials; however, the site is not associated with a significant event, or pattern in history, or associated with a significant person or craftsman, and the data contained within the site is unlikely to further our understanding of history, and therefore, the site is recommended not eligible for inclusion on the NRHP/CRHR under any Criteria.

Recommended Conservation Measures

LEGAL REQUIREMENTS – HUMAN REMAINS: In the event that human remains are discovered during ground-disturbing activities, the proposed Project would be subject to California Health and Safety Code 7050.5, CEQA Section 15064.5, and California Public Resources Code Section 5097.98. If human remains are found during ground-disturbing activities, State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the County Coroner shall be notified immediately. If the human remains are determined to be prehistoric, the County Coroner shall notify the NAHC, which shall notify a most likely descendant (MLD). The MLD shall complete the inspection of the site within 48 hours of notification and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials (NPS 1983).

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APPENDIX F1 – Cultural Resources Desktop Inventory

APPENDIX F-1: DESKTOP INVENTORY

Context for the Parker-Blythe No.1 Transmission Corridor

In the 1930s large dams were constructed along the Colorado River, supplying both a stable water supply and electric power to the desert southwest. During World War II the electric network was tapped to provide needed power to factories and foundries that supplied war materiel. Following the war, the system continued to be upgraded and built out to supply power to growing metropolitan communities in Arizona and southern California. Among these networks was Parker Dam to Blythe 1 (PAD-BLY 1). This line draws power from Parker Dam, which was constructed by the Bureau of Reclamation between 1934 and 1938. Designed as a diversion dam Parker Dam supplies water from the Colorado River into the Colorado Aqueduct traveling across the Mojave Desert to greater Los Angeles and San Diego, and to the Central Arizona Project for their water needs. Energy generated at the dam was originally designed for irrigation projects and other general usage in southwestern Arizona and southeastern California. PAD-BLY 1 is part of the Parker-Gila Number 2 (PAD-GLA 2) network, which comprises three sections - Parker-Blythe No.1, Blythe-Pilot Knob (Knob), and Gila-Knob segments – all of which are 161-kV transmission lines (Meyer 2014).

PAD-BLY 1 is an H-frame type line, approximately 60.4 miles long, and was constructed in 1950 by J and J Construction Company. A notice to proceed was received by the contractor on July 1, 1948, and by June 1950, all pole holes had been excavated, H-frames had been erected, and overhead ground wire had been strung. All additional work was completed and accepted on August 31, 1950, and the transmission line was released to operations and maintenance on February 9, 1951. The line was energized and put into service on May 15, 1951. Parker-Blythe No.1 transmission line was eventually interconnected with lines from Hoover, Davis, and Glen Canyon dams as part of the Bureau of Reclamation/Western Area Power Administration system in the Southwest (SWCA 2003).

During the subsequent years the transmission line has undergone routine maintenance and has been updated where needed for continued operations. Loss of structures due to meteorological events have required replacement of poles at 61-3 in 1969, 27-6, 27-7, 53-3, 92-2 through 92-8, and 93-1 in 1970, and 53-3 and 53-4 in 1976. Structures also have been relocated, such as 9-2, 9-3, 9-6, 10-1 and 10-2 or replaced such as at 20-5. In 1977 957 poles were inspected and treated for continued service (Meyer 2014).

In 2003 SWCA analysts evaluated the Parker-Blythe No.1 line noting that it was "built with standard wood-pole, H-frame structures and other standard materials and design that had been in use for many years prior to 1951." SWCA indicated that they did not identify evidence "that the line included features that might be considered innovative or otherwise significant in the history of engineering or the narrower context of electrical transmission." While the "transmission line contributed marginally to the post-World War II industrial and agricultural expansion of the region, …evidence has not been found that the line significantly affected or influenced any historic event or pattern" (SWCA 2003). SWCA recommended the Parker-Blythe No.1 line to be not eligible for the National Register of Historic Places. California State Historic Preservation Officer (SHPO) determined the transmission line as not eligible due to its lack of integrity on July 11, 2018, via a Programmatic Agreement, as well as on February 13, 2019 (CA SHPO WAPA_2019_0123_001), and again on January 31, 2022 (CA SHPO WAPA_2021_1028_001). The Arizona SHPO also determined the line as not eligible on February 19, 2019 (2019-0333(147138)).

Records Search Desktop Review Results

This desktop survey relied on existing documents that encompasses the Project Right-of-Way. These include Moreno et al. 1995, SWCA 2003, Lonardo 2021, and Chambers Group 2022. Data presented in these documents and files were collated and entered into Microsoft Excel to analyze the data and construct tables.

After collating data from the sources above a total of 171 resources were identified within or adjacent to the Parker-Blythe #1 Right of Way (ROW) (Table 1). A total of 122 resources have been identified within the ROW (Tables 2, 3, 4, and 5). Of these one is listed on the National Register of Historic Places (CA-RIV-000014 – The Blythe Intaglios); 34 have been recommended eligible for inclusion on the Register; 84 have been recommended not eligible; and one resource's eligibility is unknown. A total of 46 resources have been identified outside of, but in proximity to the ROW. Of these, two have been listed on the National Register; seven have been recommended eligible; 22 have been recommended not eligible; and the eligibility of 14 resources is unknown. Two resources (CA-RIV-005545 and -005551) could not be relocated during a 2021 survey (EPG 2021), and were not discussed by WCRM (Moreno et al. 1995); their location and other details are not defined at this time. One other resource (CA-RIV-002349) could not be relocated during a 1994 survey (Moreno et al. 1995), and its precise location is unknown.

Prehistoric resources comprise the greatest number of identified resources, accounting for 150 archaeological deposits. One hundred and four prehistoric resources are located within the ROW; 45 are located outside of, but in proximity to the ROW. A single resource, CA-RIV-002349 noted above, could not be relocated and has not been determined to be within or without the ROW. Lithic scatters, trails, geoglyphs, also known as intaglios, cleared circles, ceramic scatters, and cairns are the most frequently cited archaeological components. Of the 104 resources within the ROW 32 have been listed or recommended eligible for the Register, while 10 of the 45 resources located outside the ROW are similarly listed or recommended eligible.

Nine historic-period resources have been identified during this study – one resource, the Parker-Blythe No.1 transmission line, is counted as a single entity, though it has two separate trinomial associations, CA-SBR-016198 and CA-RIV-010706, each reflecting the county within which it has been recorded; seven are located within the ROW, and two are located outside. In addition to the transmission line, which has been determined not eligible for inclusion on the National Register (CA SHPO WAPA_2019_0123_001; CA SHPO WAPA_2021_1028_001; AZ SHPO 2019-0333(147138)), historical resources include trash scatters, road alignments, a farm/ranch, a military parcel, and a series of footings for an unidentified structure. Both the military parcel and the footings (since destroyed) are located outside the ROW. Three resources contain both prehistoric and historic-period components, all are located within the ROW, and two of the three have been recommended eligible. Two trails, two rock cairns, and a rock ring were recorded without temporal assignment due to ambiguities of the particular resources; all are located within the ROW. None of the historic-period, or undefined period resources, whether within or without the ROW have been listed or recommended eligible for the Register.

Siting of the proposed switchyard interconnecting the proposed Vidal Energy Project with the Parker-Blythe 161 kV overhead transmission corridor would result in direct effects on four recently identified resources – VS-030, -031, -033, and -049. These archaeological deposits were identified in advance of the proposed Vidal Energy Project (Chambers Group 2022). All consist of small lithic scatters and have been recommended not eligible for inclusion on the National Register.

Table 1: Identified Resources along Parker-Blythe No. 1 Corridor

State	County	Resource Number	Period	Type	ROW Status	Eligibility Status
AZ	La Paz	AZ L:15:07 (ASM)	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
AZ	La Paz	AZ L:15:08 (ASM)	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
AZ	La Paz	AZ L:15:09 (ASM)	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
AZ	La Paz	AZ L:15:10 (ASM)	Historic	AH4. Trash scatter	**Within**	Not eligible
AZ	La Paz	AZ L:15:11 (ASM)	Prehistoric	AP2. Lithic scatter; AP13. Trail	**Within**	**Eligible**
AZ	La Paz	AZ L:15:12 (ASM)	Historic	AH4. Trash scatter; AH16 Other: Possible camp	**Within**	Not eligible
CA	Riverside	CA-RIV-000013	Prehistoric	AP2. Lithic scatter; AP5. Petroglyphs; AP8. Geoglyph	**Within***	Not eligible
CA	Riverside	CA-RIV-000014	Prehistoric	AP2. Lithic scatter; AP5. Petroglyphs	**Within**	**Listed**
CA	Riverside	CA-RIV-000870	Prehistoric	AP8. Geoglyphs	Not within	**Eligible**
CA	Riverside	CA-RIV-000876	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-000877/H	Multicomponent	AH2. Foundations; AH4. Trash scatter; AP2. Lithic scatter; AP3. Ceramic scatter; AP7. Cleared circles; AP8. Geoglyphs	**Within**	**Eligible**
CA	Riverside	CA-RIV-001088	Prehistoric	AP5. Petroglyphs; AP13. Trails	**Within**	**Eligible**
CA	Riverside	CA-RIV-001114	Prehistoric	AP8. Rock Alignment	Not within	*Unknown*
CA	Riverside	CA-RIV-001242	Prehistoric	AP13. Trail; AP16. Projectile Point	Not within	*Unknown*
CA	Riverside	CA-RIV-001797	Prehistoric	AP15. Temporary camp	Not within	*Unknown*
CA	Riverside	CA-RIV-002324	Prehistoric	AP7. Cleared circles	Not within	*Unknown*
CA	Riverside	CA-RIV-002326	Prehistoric	AP8. Geoglyphs	Not within	*Unknown*
CA	Riverside	CA-RIV-002330	Prehistoric	AP8. Geoglyphs	Not within	*Unknown*
CA	Riverside	CA-RIV-002331	Prehistoric	AP8. Rock Alignment	Not within	*Unknown*
CA	Riverside	CA-RIV-002336	Prehistoric	AP15. Temporary camp	Not within	*Unknown*
CA	Riverside	CA-RIV-002349	Prehistoric	AP15. Temporary camp	*Unknown*	*Unknown*
CA	Riverside	CA-RIV-002352	Prehistoric	AP8. Geoglyphs	Not within	*Unknown*
CA	Riverside	CA-RIV-002354	Prehistoric	AP7. Cleared circles; AP8. Geoglyphs; AP13. Trail	**Within**	**Eligible**
CA	Riverside	CA-RIV-002360	Prehistoric	AP8. Geoglyphs	Not within	*Unknown*
CA	Riverside	CA-RIV-002361	Prehistoric	AP8. Geoglyphs	Not within	*Unknown*
CA	Riverside	CA-RIV-002368	Prehistoric	AP7. Cleared circles; AP13. Trail	Not within	*Unknown*

State	County	Resource Number	Period	Type	ROW Status	Eligibility Status
CA	Riverside	CA-RIV-002377	Prehistoric	AP8. Geoglyphs; AP15. Temporary camp	Not within	**Listed**
CA	Riverside	CA-RIV-002378	Prehistoric	AP8. Geoglyphs	Not within	**Listed**
CA	Riverside	CA-RIV-003032	Prehistoric	AP2. Lithic scatter; AP8. Rock Alignment	Not within	*Unknown*
CA	Riverside	CA-RIV-005190	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Not within	*Unknown*
CA	Riverside	CA-RIV-005248	Prehistoric	AP2. Lithic scatter	**Within**	*Unknown*
CA	Riverside	CA-RIV-005289	Historic	AH2. Footings	Not within	Not eligible
CA	Riverside	CA-RIV-005290	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005526	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	**Within**	**Eligible**
CA	Riverside	CA-RIV-005527	Prehistoric	AP2. Lithic scatter; AP8. Cairn; AP8. Cleared circles	**Within**	**Eligible**
CA	Riverside	CA-RIV-005528	Prehistoric	AP2. Lithic scatter	**Within**	**Eligible**
CA	Riverside	CA-RIV-005529	Prehistoric	AP2. Lithic scatter; AP8. Cairn; AP13. Trail	**Within**	**Eligible**
CA	Riverside	CA-RIV-005545	*Unknown*	*Unknown*	*Unknown*	*Unknown*
CA	Riverside	CA-RIV-005546	Prehistoric	AP2. Lithic scatter; AP3. Ceramics; AP7. Cleared circles; AP8. Geoglyph; AP13. Trail	**Within**	**Eligible**
CA	Riverside	CA-RIV-005547	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Not within	**Eligible**
CA	Riverside	CA-RIV-005548	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005549	Prehistoric	AP2. Lithic scatter	**Within**	**Eligible**
CA	Riverside	CA-RIV-005550	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005551	*Unknown*	*Unknown*	*Unknown*	*Unknown*
CA	Riverside	CA-RIV-005552	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005553	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005554	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005555	Prehistoric	AP2. Lithic scatter; AP13. Trail	**Within**	Not eligible
CA	Riverside	CA-RIV-005556	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005557	Prehistoric	AP2. Lithic scatter	**Within**	**Eligible**
CA	Riverside	CA-RIV-005558	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005559	Prehistoric	AP2. Lithic scatter	**Within**	**Eligible**
CA	Riverside	CA-RIV-005560	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005561	Prehistoric	AP2. Lithic scatter; AP7. Cleared circle; AP16. Other	**Within**	**Eligible**
CA	Riverside	CA-RIV-005562	Prehistoric	AP2. Lithic scatter	**Within**	**Eligible**
CA	Riverside	CA-RIV-005563	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	Riverside	CA-RIV-005564	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	Riverside	CA-RIV-005565	Prehistoric	AP2. Lithic scatter; AP13. Trail	**Within**	Not eligible

State	County	Resource Number	Period	Type	ROW Status	Eligibility Status
CA	Riverside	CA-RIV-005566	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	Riverside	CA-RIV-005567	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	Riverside	CA-RIV-005568/H	Multicomponent	AP2. Lithic scatter; AP16. Other; AH16. Mining claim	**Within**	Not eligible
CA	Riverside	CA-RIV-005569	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005570	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005571	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005572	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005573	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Not within	Not eligible
CA	Riverside	CA-RIV-005574	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	**Within**	**Eligible**
CA	Riverside	CA-RIV-005575	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005576	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	Riverside	CA-RIV-005577	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	Riverside	CA-RIV-005578	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005579	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005580	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005581	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005582	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005583	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005584	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005585	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005586	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005587	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005588	Prehistoric	AP2. Lithic scatter, cleared circle, geoglyph	**Within**	**Eligible**
CA	Riverside	CA-RIV-005589	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005590	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005591	Prehistoric	AP2. Lithic scatter	**Within**	**Eligible**
CA	Riverside	CA-RIV-005592	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005593	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005594	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005595	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005596	Prehistoric	AP2. Lithic scatter; AP13. Trail	**Within**	Not eligible
CA	Riverside	CA-RIV-005597	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005598	Prehistoric	AP2. Lithic scatter; AP13. Trail	**Within**	**Eligible**
CA	Riverside	CA-RIV-005599	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005600	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005601	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005602	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005603	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005604	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005605	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005606	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005607	Unknown	AP13. Trail	**Within**	Not eligible

State	County	Resource Number	Period	Type	ROW Status	Eligibility Status
CA	Riverside	CA-RIV-005608	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005609	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005610	Prehistoric	AP2. Lithic scatter; AP7. Cleared circles; AP13. Trails	**Within**	**Eligible**
CA	Riverside	CA-RIV-005611	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005612	Prehistoric	AP2. Lithic scatter; AP8. Cairn	**Within**	**Eligible**
CA	Riverside	CA-RIV-005613	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	Riverside	CA-RIV-005614	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005615	Undetermined	AP8. Rock ring	**Within**	**Eligible**
CA	Riverside	CA-RIV-005616	Prehistoric	AP2. Lithic scatter	**Within**	**Eligible**
CA	Riverside	CA-RIV-005617	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005618	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005619	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	Riverside	CA-RIV-005620	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	Riverside	CA-RIV-005621	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	Riverside	CA-RIV-005622	Prehistoric	AP2. Lithic scatter; AP8. Cairn	Not within	**Eligible**
CA	Riverside	CA-RIV-005623	Prehistoric	AP2. Lithic scatter; AP13. Trail	**Within**	**Eligible**
CA	Riverside	CA-RIV-005624	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	Riverside	CA-RIV-005625	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005626	Prehistoric	AP3. Ceramics; AP7. Cleared circles; AP13. Trail	**Within**	**Eligible**
CA	Riverside	CA-RIV-005627	Prehistoric	AP2. Lithic scatter; AP13. Trail	Not within	Not eligible
CA	Riverside	CA-RIV-005628	Prehistoric	AP8. Rock alignment or geoglyph	Not within	**Eligible**
CA	Riverside	CA-RIV-005629	Prehistoric	AP13. Trails	**Within**	Not eligible
CA	Riverside	CA-RIV-005630	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005631	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Not within	**Eligible**
CA	Riverside	CA-RIV-005632	Prehistoric	AP2. Lithic scatter; AP7. Cleared circles	Not within	**Eligible**
CA	Riverside	CA-RIV-005633	Prehistoric	AP2. Lithic scatter; AP8. Cairn	**Within**	**Eligible**
CA	Riverside	CA-RIV-005634	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005635	Undetermined	AP8. Cairn	**Within**	Not eligible
CA	Riverside	CA-RIV-005636	Prehistoric	AP13. Trails	**Within**	Not eligible
CA	Riverside	CA-RIV-005637	Prehistoric	AP2. Lithic scatter; AP13. Trail	**Within**	**Eligible**
CA	Riverside	CA-RIV-005638	Unknown	AP8. Cairn	**Within**	Not eligible
CA	Riverside	CA-RIV-005639	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005640	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005641	Prehistoric	AP3. Ceramic scatter; AP13. Trail	**Within**	Not eligible
CA	Riverside	CA-RIV-005642	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005643	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible

State	County	Resource Number	Period	Type	ROW Status	Eligibility Status
CA	Riverside	CA-RIV-005644	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	Riverside	CA-RIV-005645	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005646	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005647	Prehistoric	AP2. Lithic scatter; AP13. Trail	**Within**	Not eligible
CA	Riverside	CA-RIV-005648	Prehistoric	AP2. Lithic scatter	**Within**	**Eligible**
CA	Riverside	CA-RIV-005649	Prehistoric	AP2. Lithic scatter; AP13. Trail	**Within**	**Eligible**
CA	Riverside	CA-RIV-005650	Prehistoric	AP2. Lithic scatter	Not within	**Eligible**
CA	Riverside	CA-RIV-005651	Prehistoric	AP13. Trail	Not within	Not eligible
CA	Riverside	CA-RIV-005652	Prehistoric	AP13. Trails	**Within**	Not eligible
CA	Riverside	CA-RIV-005653	Undetermined	AP13. Trail	**Within**	Not eligible
CA	Riverside	CA-RIV-005654	Prehistoric	AP2. Lithic scatter	**Within**	**Eligible**
CA	Riverside	CA-RIV-005655	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter; AP13. Trail	**Within**	**Eligible**
CA	Riverside	CA-RIV-005656	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter; AP13. Trail	**Within**	**Eligible**
CA	Riverside	CA-RIV-005657/H	Multicomponent	AH4. Trash scatter; AP2. Lithic scatter; AP3. Ceramic scatter; AP5. Petroglyphs; AP7. Cleared circles; AP8. Rock piles; AP13. Trail	**Within**	**Eligible**
CA	Riverside	CA-RIV-005658	Prehistoric	AP2. Lithic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-005659	Prehistoric	AP2. Lithic scatter; AP8. Cairn	**Within**	**Eligible**
CA	Riverside	CA-RIV-005660	Prehistoric	AP13. Trails	**Within**	Not eligible
CA	Riverside	CA-RIV-005661	Prehistoric	AP2. Lithic scatter; AP13. Trail	Not within	**Eligible**
CA	Riverside	CA-RIV-008225	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	**Within**	Not eligible
CA	Riverside	CA-RIV-010706	Historic	AH16. Other: Transmission line	**Within**	Not eligible
CA	Riverside	CA-RIV-025750	Historic	HP34. Military property	Not within	Not eligible
CA	San Bernardino	CA-SBR-001163	Prehistoric	AP2. Lithic scatter; AP13. Trail	**Within**	**Eligible**
CA	San Bernardino	CA-SBR-004371H	Historic	HP37. Road	**Within**	Not eligible
CA	San Bernardino	CA-SBR-004373H	Historic	HP37. Road	**Within**	Not eligible
CA	San Bernardino	CA-SBR-008086	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	San Bernardino	CA-SBR-008087	Historic	HP33. Farm/ranch	**Within**	Not eligible
CA	San Bernardino	CA-SBR-016198	Historic	AH16. Other: Transmission line	**Within**	Not eligible

State	County	Resource Number	Period	Type	ROW Status	Eligibility Status
CA	San Bernardino	P951-2	Prehistoric	AP9. Cremation site	Not within	Not eligible
CA	San Bernardino	P952-1	Prehistoric	AP7. Cleared circle; AP13. Trail	**Within**	Not eligible
CA	San Bernardino	VS-006	Historic	HP33. Farm/ranch	**Within**	Not eligible
CA	San Bernardino	VS-030	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	San Bernardino	VS-031	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	San Bernardino	VS-032	Prehistoric	HP39. Other: Survey monument	Not within	Not eligible
CA	San Bernardino	VS-033	Prehistoric	AP2. Lithic scatter	Not within	Not eligible
CA	San Bernardino	VS-049	Prehistoric	AP2. Lithic scatter	Not within	Not eligible

* Site appears to have been recorded in two locations; one places it within the ROW, while the other is less precise and ROW status is unknown. For the purposes of this analysis the location provided in the WCRM report (Moreno et al. 1995) is used, locating it in the ROW of the 1994 survey.

Table 2: National Register of Historic Places Listed Resources along Parker-Blythe No. 1 Right-of-Way

Resource Number	Period	Type	ROW Status
CA-RIV-000014	Prehistoric	AP2. Lithic scatter; AP5. Petroglyphs	Within
CA-RIV-002377	Prehistoric	AP8. Geoglyphs; AP15. Temporary camp	Not within
CA-RIV-002378	Prehistoric	AP8. Geoglyphs	Not within

Table 3: National Register of Historic Places Eligible Resources along Parker-Blythe No. 1 Right-of-Way

Resource Number	Period	Type	ROW Status
AZ L:15:11 (ASM)	Prehistoric	AP2. Lithic scatter; AP13. Trail	Within
CA-RIV-000870	Prehistoric	AP8. Geoglyphs	Not within
CA-RIV-000877 /H	Multicomponent	AH2. Foundations; AH4. Trash scatter; AP2. Lithic scatter; AP3. Ceramic scatter; AP7. Cleared circles; AP8. Geoglyphs	Within
CA-RIV-001088	Prehistoric	AP5. Petroglyphs; AP13. Trails	Within
CA-RIV-002354	Prehistoric	AP7. Cleared circles; AP8. Geoglyphs; AP13. Trail	Within
CA-RIV-005526	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Within
CA-RIV-005527	Prehistoric	AP2. Lithic scatter; AP8. Cairn; AP8. Cleared circles	Within
CA-RIV-005528	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005529	Prehistoric	AP2. Lithic scatter; AP8. Cairn; AP13. Trail	Within
CA-RIV-005546	Prehistoric	AP2. Lithic scatter; AP3. Ceramics; AP7. Cleared circles; AP8. Geoglyph; AP13. Trail	Within
CA-RIV-005547	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Not within

Resource Number	Period	Type	ROW Status
CA-RIV-005549	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005557	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005559	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005561	Prehistoric	AP2. Lithic scatter; AP7. Cleared circle; AP16. Other	Within
CA-RIV-005562	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005574	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Within
CA-RIV-005588	Prehistoric	AP2. Lithic scatter, cleared circle, geoglyph	Within
CA-RIV-005591	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005598	Prehistoric	AP2. Lithic scatter; AP13. Trail	Within
CA-RIV-005610	Prehistoric	AP2. Lithic scatter; AP7. Cleared circles; AP13. Trails	Within
CA-RIV-005612	Prehistoric	AP2. Lithic scatter; AP8. Cairn	Within
CA-RIV-005615	Undetermined	AP8. Rock ring	Within
CA-RIV-005616	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005622	Prehistoric	AP2. Lithic scatter; AP8. Cairn	Not within
CA-RIV-005623	Prehistoric	AP2. Lithic scatter; AP13. Trail	Within
CA-RIV-005626	Prehistoric	AP3. Ceramics; AP7. Cleared circles; AP13. Trail	Within
CA-RIV-005628	Prehistoric	AP8. Rock alignment or geoglyph	Not within
CA-RIV-005631	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Not within
CA-RIV-005632	Prehistoric	AP2. Lithic scatter; AP7. Cleared circles	Not within
CA-RIV-005633	Prehistoric	AP2. Lithic scatter; AP8. Cairn	Within
CA-RIV-005637	Prehistoric	AP2. Lithic scatter; AP13. Trail	Within
CA-RIV-005648	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005649	Prehistoric	AP2. Lithic scatter; AP13. Trail	Within
CA-RIV-005650	Prehistoric	AP2. Lithic scatter	Not within
CA-RIV-005654	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005655	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter; AP13. Trail	Within
CA-RIV-005656	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter; AP13. Trail	Within
CA-RIV-005657 /H	Multicomponent	AH4. Trash scatter; AP2. Lithic scatter; AP3. Ceramic scatter; AP5. Petroglyphs; AP7. Cleared circles; AP8. Rock piles; AP13. Trail	Within
CA-RIV-005659	Prehistoric	AP2. Lithic scatter; AP8. Cairn	Within
CA-RIV-005661	Prehistoric	AP2. Lithic scatter; AP13. Trail	Not within
CA-SBR-001163	Prehistoric	AP2. Lithic scatter; AP13. Trail	Within

Table 4: Non-Eligible Resources along Parker-Blythe No. 1 Right-of-Way

Resource Number	Period	Type	ROW Status
AZ L:15:07 (ASM)	Prehistoric	AP2. Lithic scatter	Within
AZ L:15:08 (ASM)	Prehistoric	AP2. Lithic scatter	Within

Resource Number	Period	Type	ROW Status
AZ L:15:09 (ASM)	Prehistoric	AP2. Lithic scatter	Within
AZ L:15:10 (ASM)	Historic	AH4. Trash scatter	Within
AZ L:15:12 (ASM)	Historic	AH4. Trash scatter; AH16 Other: Possible camp	Within
CA-RIV-000013	Prehistoric	AP2. Lithic scatter; AP5. Petroglyphs; AP8. Geoglyph	Within
CA-RIV-000876	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Within
CA-RIV-005289	Historic	AH2. Footings	Not within
CA-RIV-005290	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005548	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005550	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005552	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005553	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Within
CA-RIV-005554	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005555	Prehistoric	AP2. Lithic scatter; AP13. Trail	Within
CA-RIV-005556	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005558	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005560	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005563	Prehistoric	AP2. Lithic scatter	Not within
CA-RIV-005564	Prehistoric	AP2. Lithic scatter	Not within
CA-RIV-005565	Prehistoric	AP2. Lithic scatter; AP13. Trail	Within
CA-RIV-005566	Prehistoric	AP2. Lithic scatter	Not within
CA-RIV-005567	Prehistoric	AP2. Lithic scatter	Not within
CA-RIV-005568 /H	Multicomponent	AP2. Lithic scatter; AP16. Other; AH16. Mining claim	Within
CA-RIV-005569	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005570	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005571	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005572	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005573	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Not within
CA-RIV-005574	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Within
CA-RIV-005575	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005576	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005577	Prehistoric	AP2. Lithic scatter	Not within
CA-RIV-005578	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005579	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005580	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005581	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005582	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005583	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005584	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005585	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005586	Prehistoric	AP2. Lithic scatter	Within

Resource Number	Period	Type	ROW Status
CA-RIV-005587	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005589	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005590	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005592	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005593	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005594	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005595	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005596	Prehistoric	AP2. Lithic scatter; AP13. Trail	Within
CA-RIV-005597	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005599	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005600	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005601	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005602	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005603	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005604	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005605	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005606	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005607	Undetermined	AP13. Trail	Within
CA-RIV-005608	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005609	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005611	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005613	Prehistoric	AP2. Lithic scatter	Not within
CA-RIV-005614	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005617	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005618	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005619	Prehistoric	AP2. Lithic scatter	Not within
CA-RIV-005620	Prehistoric	AP2. Lithic scatter	Not within
CA-RIV-005621	Prehistoric	AP2. Lithic scatter	Not within
CA-RIV-005624	Prehistoric	AP2. Lithic scatter	Not within
CA-RIV-005625	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005627	Prehistoric	AP2. Lithic scatter; AP13. Trail	Not within
CA-RIV-005629	Prehistoric	AP13. Trails	Within
CA-RIV-005630	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005634	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005635	Undetermined	AP8. Cairn	Within
CA-RIV-005636	Prehistoric	AP13. Trails	Within
CA-RIV-005638	Undetermined	AP8. Cairn	Within
CA-RIV-005639	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005640	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005641	Prehistoric	AP3. Ceramic scatter; AP13. Trail	Within
CA-RIV-005642	Prehistoric	AP2. Lithic scatter	Within

Resource Number	Period	Type	ROW Status
CA-RIV-005643	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005644	Prehistoric	AP2. Lithic scatter	Not within
CA-RIV-005645	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005646	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005647	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter; AP13. Trail	Within
CA-RIV-005651	Prehistoric	AP13. Trail	Not within
CA-RIV-005652	Prehistoric	AP13. Trails	Within
CA-RIV-005653	Prehistoric	AP2. Lithic scatter; AP13. Trail	Within
CA-RIV-005658	Prehistoric	AP2. Lithic scatter	Within
CA-RIV-005660	Prehistoric	AP13. Trails	Within
CA-RIV-008225	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Within
CA-RIV-010706	Historic	AH16. Other: Transmission line	Within
CA-RIV-025750	Historic	HP34. Military property	Not within
CA-SBR-004371H	Historic	HP37. Road (Old Parker Road)	Within
CA-SBR-004373H	Historic	HP37. Road (Old Earp Road)	Within
CA-SBR-008086	Prehistoric	AP2. Lithic scatter	Not within
CA-SBR-008087	Historic	HP33. Farm/ranch	Within
CA-SBR-016198	Historic	AH16. Other: Transmission line	Within
P951-2	Prehistoric	AP9. Cremation site	Not within
P952-1	Prehistoric	AP7. Cleared circle; AP13. Trail	Within
VS-006	Historic	HP33. Farm/ranch	Within
VS-030	Prehistoric	AP2. Lithic scatter	Not within
VS-031	Prehistoric	AP2. Lithic scatter	Not within
VS-032	Historic	HP39. Other: GLO survey monument	Not within
VS-033	Prehistoric	AP2. Lithic scatter	Not within
VS-049	Prehistoric	AP2. Lithic scatter	Not within

Table 5: Resources of Unknown Eligibility along Parker-Blythe No. 1 Right-of-Way

Resource Number	Period	Type	ROW Status
CA-RIV-001114	Prehistoric	AP8. Rock Alignment	Not within
CA-RIV-001242	Prehistoric	AP13. Trail; AP16. Projectile Point	Not within
CA-RIV-001797	Prehistoric	AP15. Temporary camp	Not within
CA-RIV-002324	Prehistoric	AP7. Cleared circles	Not within
CA-RIV-002326	Prehistoric	AP8. Geoglyphs	Not within
CA-RIV-002330	Prehistoric	AP8. Geoglyphs	Not within
CA-RIV-002331	Prehistoric	AP8. Rock Alignment	Not within
CA-RIV-002336	Prehistoric	AP15. Temporary camp	Not within
CA-RIV-002352	Prehistoric	AP8. Geoglyphs	Not within
CA-RIV-002360	Prehistoric	AP8. Geoglyphs	Not within

Resource Number	Period	Type	ROW Status
CA-RIV-002361	Prehistoric	AP8. Geoglyphs	Not within
CA-RIV-002368	Prehistoric	AP7. Cleared circles; AP13. Trail	Not within
CA-RIV-003032	Prehistoric	AP2. Lithic scatter; AP8. Rock Alignment	Not within
CA-RIV-005190	Prehistoric	AP2. Lithic scatter; AP3. Ceramic scatter	Not within
CA-RIV-005248	Prehistoric	AP2. Lithic scatter	Within

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APPENDIX G – Preliminary Drainage Study

Preliminary Drainage Report:

Vidal Solar Energy Project

Town of Vidal, Unincorporated San Bernardino County, California

October 7, 2022

In Support of Conditional Use Permit & Lot Merger

APN: 0647-051-08,-11 PROJ-2021-00012

Prepared for:

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1 INTRODUCTION

1.1 Project Overview

The proposed Vidal Solar Interconnection Project would involve the construction of a 160 megawatts (MW) photovoltaic solar energy facility and a 160 MW battery energy storage system (BESS) facility on a 1,220-acre parcel of privately-owned lands in the Town of Vidal, Unincorporated San Bernardino County, California.

CDH Vidal LLC plans to build, operate, and maintain up to a 160 MW photovoltaic solar energy facility and a 160 MW BESS facility. Construction of these facilities includes the following components:

- Installing solar panel arrays on 1,220 acres of land
- Installing underground collection lines from each panel to a collection point substation
- Installing the battery storage facility which would consist of battery storage containers, inverters/transformers, communications equipment, switchgear, and heating, ventilation, and air conditioning (HVAC) units
- Creating access roads within the facility for construction and maintenance
- Constructing an on-site collection point substation, and
- Installing and maintaining an on-site interconnection facility to the existing Headgate Rock-Blythe 161-kV transmission line

The Project Site is located approximately 2.5 miles southeast of unincorporated Vidal, just east of U.S. Route 95, north of the Riverside County boundary, and west of the Colorado River. The Project Site encompasses 1,220 acres within 21 privately owned parcels (in their entirety and portions of) that are in the process of lease acquisition by CORE. The County's Zoning Map identifies the zoning of the Project Site as Resource Conservation (RC), which provides sites for open space and recreational activities, single-family homes on very large parcels, and similar and compatible uses. A Project Location & Vicinity Map is included under Appendix A A map depicting the proposed improvements and pad locations is included under Appendix A.

Commercial renewable energy facilities are an allowable use within the RC land use zoning district. Existing development and disturbed areas within the Project Site include rural access roads that include access to the transmission line, scattered abandoned rural residences, garage (storage) areas, and several WAPA towers. The wash areas are currently being used by off-highway vehicles. Primary access to the Project would be provided via U.S. Route 95 onto a Project-controlled, dirt access road on the west side of the Project Site.

1.2 Purpose

An assessment was conducted to evaluate the flood hazard environment of the area being considered for siting the location of the photovoltaic generation station. The purpose of this report is to conduct a preliminary hydrology and hydraulic assessment and quantify any potential impacts and mitigation measures needed for the future.

The primary objectives of this assessment include the following:

- Identify (1) existing drainage features, (2) flood processes, (3) stable and unstable surfaces., and (4) flood conditions that would constrain the future development of the Site
- Quantify project-related impacts specific to increases in flood distribution, runoff yield, and flow rates for the 1-percent annual chance flood hazard.
- Perform preliminary sizing of the proposed local detention basins per County Standards. Preliminary sizing is based on the 100-year event only. Other events will be evaluated during final engineering.

1.3 Site Discussion

The proposed site consist of four pads of that will hold solar panels. The largest pad sits to the east of Highway 95, south of an unnamed new road and has the south-east corner of the pad border an existing utility access road. The second pad is north of the first pad, and is bordered by the unnamed road to the north, Citrus Ranch Road to the north-east and Old Parker Road on the west. The third pad is separated from the second pad by a wildlife corridor and is bordered by Old Parker Road on the west and the existing utility access road on the east. The last proposed pad is to the east of the existing utility access road.

1.4 Hydrology and flood control design standards

The following San Bernardino County and other publications related to hydrology hydraulics, and sedimentation serve as the standard for San Bernardino County:

- Hydrology Manual, San Bernardino County, Williamson and Schmid, Civil Engineers, Irvine, California, 1986.

The preliminary sizing of the proposed local detention basins are based on County's design parameters and procedures, as defined in:

- Detention Basin Design Criteria for San Bernardino County, Local Detention Basin, San Bernardino County, California, 1986.

Specifically, the following standards will be evaluated in the preliminary design, and are defined, as follows:

- *"When a basin (regional, local, temporary, or joint use) is to be used to mitigate downstream impacts due to increased flows generated by a development, the basin capacity and outlet size shall be such that the post-development peak flow rate generated by the site shall be less than or equal to 90% of the pre-development peak flow rate from the site for all frequency storms up to and including the 100-year (i.e. the peak 2-year post-development flow rate is equal to or less than 90% of the peak 2-year pre-development flow rate from the site and etc. for all frequency storm events through 100-year).*
    - *Only 2, 10, 25 and 100-year storms need to be analyzed."*

Given that this preliminary drainage report covers the project's concept, only the 100-year event is evaluated in this report. Other events will be evaluated during final engineering.

1.5 Watershed description

The majority of the offsite drainage area tributary to the Site is longitudinally elongated, mildly sloped and mostly confined by the neighboring ridges, which limits the amount of flow that goes to the onsite proposed pads. The physical tributary drainage area based on the USGS topographic mapping is many square miles that extend primarily north-west of the Site. The total offsite drainage area is approximately 328 square miles.

The Vidal Wash Watershed lies in southeastern San Bernardino County and northeastern Riverside County. The watershed is generally bounded by the nonwatery-bearing ricks of the West Riverside and Riverside Mountains on the south, of the Turtle Mountains on the west, of the Turtle and Whipple Mountains on the north. Typical desert washes ultimately confluence into Vidal Wash, which runs for over 29 miles before its discharge into the Colorado River.

The region is subject to temperature extremes, ranging from the 20°F in the winter months to more than 100°F in the summer, with variations based on elevation. The average annual rainfall is approximately 5.7 inches. The region is subject to intense seasonal storms, and the rainfall in a given year may vary.

Little to no flow is anticipated in the desert washes, except during larger storm events. Within the project site, the terrain generally slopes southeasterly with gradients averaging 0.015 ft/ft.

Limited drainage infrastructure exists in the drainage area. Natural drainage crossings of the Colorado River aqueduct are set at an approximate distance of one mile. Vidal Wash and its tributaries surface flow across U.S. Route 95 and other unnamed routes. Routes become flooded during storm events.

1.6 Onsite drainage description

Existing Condition - The topology of the proposed project pads is dominated by unconfined sheet flooding. Drainage flow paths are moderately well-defined, albeit braided and distributary near the apexes, but rapidly lose definition as they traverse the proposed project pads. Onsite flows have the potential to be attenuated due to storage, but also due to infiltration into the underlying soils.

Several regional desert washes traverse or are adjacent to the four proposed project pads. Each regional desert wash displays a typical discontinuous ephemeral stream planform, which is characterized by well-defined single channels that transition successively to braided multiple channel networks, unconfined flow, and finally recollected into single desert washes (or a number of single channels). This pattern repeats itself in a cyclical pattern across the proposed pads. As flow attenuation takes place onsite, sheet flooding is the more dominant process.

Desert washes are characterized by uncertain and changing flow paths, high velocity flow, and active sediment transport, scour and deposition.

Aside from a couple dirt roads graded for maintenance, the proposed site (all four pads) is currently undeveloped with native vegetation. Land cover can be characterized as Desert Shrubs with poor cover (less than 50% of vegetation cover). There is no impervious development on the existing site. Local dry desert washes drain in a southwesterly direction before their confluence with the regional dry washes.

Onsite, the four proposed pads sit on soil of hydrologic soil group B with moderate infiltration.

Proposed Condition - In the proposed condition, the drainage paths will generally maintain the onsite flow to drain in a southwesterly direction. Compaction may occur from construction equipment and the construction of unpaved dirt road that will ultimately be used for long-term maintenance and operation.

All onsite runoff will drain towards the south edge of each proposed pad. Local detention basins, of longitudinal shape, will be graded to capture onsite runoff and mitigate it to levels below the 90% existing peak discharge. Mitigated peak discharges will be discharged downstream in the main local desert wash. Local detention basins are anticipated to be relatively shallow (less than 4 feet deep including freeboard).

All pads fall outside of the regional desert washes. To minimize the potential for concentrated flows and erosion, no perimeter berm should be implemented around the perimeter of each pad. Instead, each pad should be graded to allow upstream local desert washes to traverse each respective pad. To minimize the size of proposed detention basins, run-on upstream of Onsite Drainage Areas K, L, and N should be captured in a graded, earthen, channel that traverse the proposed site. A berm should prevent onsite runoff from draining into the offsite run-on conveyance channel.

1.7 Flood Insurance Rate Map Panel #06071C9275H

The existing Federal Emergency Management Agency (FEMA) map was used to determine if the project site is located within the limits of the 100-year floodplain. Review of the existing FEMA Flood Insurance Rate Map (FIRM), panel 06071C9275H indicates that the vicinity of the project site has not been mapped by FEMA, as it falls within a Flood Designation Zone D (undetermined but possible).

Downstream of the proposed project, Vidal Wash and its tributaries discharge to the Colorado River, which has been mapped by FEMA as regulatory floodway. The Base Flood Elevation (BFE) for the 1-percent change flood event at the confluence is 338 feet.

A copy of FIRM Panel 06071C9275H is provided under Appendix A.

2 HYDROLOGY

2.1 Methodology

The hydrology was prepared in accordance with the 1986 San Bernardino County Hydrology Manual procedures, along with its 2010 Addendum that addresses the Antecedent Moisture Condition (AMC) for arid regions of San Bernardino County.

Regional Hydrology - Given the size of the regional watersheds traversing the four pads of the proposed Project, the Unit Hydrograph Method (Section E) was used to develop effective precipitation hydrographs and S-graphs. The regional drainage, existing onsite conditions and proposed onsite conditions unit hydrographs were derived from the Desert S-graph as stated in the San Bernardino Hydrology Manual. The Rational Method was deemed not applicable.

100-year, 24-hour, storm event hydrographs were generated for the regional watersheds using the unit hydrograph method in Advanced Engineering Software (AES), except for regional watershed A. The unit hydrograph for offsite watershed A was calculated from a spreadsheet in excel because of the watershed (225.7 square miles).

Local Hydrology - The hydrologic analysis was completed in accordance with the 1986 San Bernardino County Hydrology Manual and its 2010 Hydrology Manual Addendum. The rational method has been used to calculate peak flows for both the existing and proposed site conditions. The Hydrology Manual Addendum requires the use of NOAA Atlas 14 rainfall values when completing hydrologic analyses. The project site is designated as Antecedent Moisture Condition (AMC) II per Figure ADD-1 based on the NOAA Atlas statistical data. AMC II is classified as moderate runoff potential.

Peak discharge and volumetric mitigation computations were performed using the Unity Hydrograph method in AES. Both existing and proposed conditions Unit Hydrographs are derived from the Desert S-Graph, as defined in the County's Hydrology Manual.

The following sections describe the methodology used to define the watershed parameters.

2.2 Watershed Parameters

2.2.1 Regional Watershed Delineation

The National Hydrography Dataset (NHD) includes a general delineation of Vidal Wash watershed and its tributary subwatersheds. The NHD delineation was used as a general guideline and supplemented by a computerized watershed delineation process in ArcGIS. The delineation used a combination of two topographic USGS datasets, including:

- 10-foot Digital Elevation Model (DEM) for the entire watershed using the U.S. Geological Survey, 20220419, USGS 1/3 Arc Second n35w115 20220419 dataset.
- 1-meter LiDAR, 2018 contours for the vicinity of the project from the United States Geological Survey (USGS), Southern California Wildfires, dataset.

Due to the erratic nature of dry washes, including the potential to change course during major storm events, all watercourses were reviewed using the latest available aerial imagery in Google Earth. The delineation followed the ridges on the contour and concluded that there are five main regional watersheds tributary or adjacent to the proposed project pads.

The characteristics of all five regional watersheds are summarized in Table 1.

Table 1 – General Regional Watercourse Characteristics

Watershed	Area (sq.mi)	Watercourse Length (miles)	Lag Time (hrs)
A	225.7	29.45	5.09
B	24.5	17.80	3.95
C	21.4	17.58	3.74
D	39.8	17.40	3.31
E	23.8	8.98	2.46

A map delineating the five regional watersheds and respective watercourses is included under Appendix B.

2.2.2 Effective Slope of Regional Watersheds

Headwaters of the five regional watersheds culminate at elevations above 3,300 feet (NACD88). The upper reaches of the longest watercourses exhibit steep slopes over rocky terrain. As the watercourse reaches the foothills, the longitudinal slope averages 0.02 feet/feet to the confluence of Vidal Wash with the Colorado River. Because the hydrograph response generated from the UH method is dependent on the lag time, a geometric mean was used to evaluate the effective slope, or elevation difference, for input into AES.

2.2.3 Rainfall Data

NOAA Atlas 14-point precipitation was used to find the rainfall data for the 100-year. The average for each annual maximum at each duration was used for the regional watersheds, while the point precipitation was used for the onsite watersheds. The results are seen in Table 2 and Table 3.

Table 2 – Regional Rainfall-Duration Data – 100-Year

Regional Watershed	24 hr	6 hr	3 hr	60 min	30 min	5 min
A	3.88	2.74	2.38	1.75	1.31	0.537
B	3.53	2.57	2.25	1.65	1.22	0.503
C	3.51	2.58	2.26	1.64	1.21	0.499
D	3.63	2.67	2.35	1.72	1.25	0.517
E	3.47	2.50	2.17	1.57	1.18	0.48

Table 3 – Onsite Rainfall-Duration Data – 100-Year

24 hr	6 hr	3 hr	60 min	30 min	5 min
3.43	2.56	2.24	1.60	1.17	0.48

2.2.4 Soil Type

The soil data from the United States Department of Agriculture Natural Resources Conservation Service National Cooperative Soil Survey (NCSS) was used for this analysis. The regional watersheds are made primarily of hydrologic soil groups B (76.32%) and D (23.51 %) with some hydrologic soil group A. Onsite, the four proposed pads sit on soil of hydrologic soil group B with moderate infiltration.

The breakdown of the soil for each watershed can be seen in Table 4.

Table 4 – Soil Types – Regional Watersheds

Regional Watershed	Hydrologic Soil Group
A	A (0.07%) B (88.6%) D (11.3%)
B	B (93.5%) D (6.5%)
C	B (93.5%) D (6.5%)
D	B (6.5%) D (93.5%)
E	B (2.4%) D (97.6%)

An exhibit depicting the distribution of hydrologic soil groups across the watersheds is included under Appendix B.

2.2.5 Land Use

For the regional watersheds, the land use was categorized as desert brush. The condition (fair or poor) of desert brush was determined based on both the presence and density of vegetation visible from the latest available aerial imagery on Google Earth. For the upper reaches that are in the mountainous region with steeper slopes, the land use was categorized as poor desert shrub. From the foothills (shallower slopes) down to the confluence with the Colorado River, the land use was assigned as fair desert shrub.

For the onsite watersheds, the land use was categorized as desert shrub, fair condition, for the existing condition. The proposed condition land use changed to barren to reflect the proposed site plan.

2.2.6 Loss Rate

The loss rate was calculated using the San Bernardino County Hydrology Manual for a 100-year storm in AES/CH1 for the onsite drainage areas. Because of the drainage area limitations associated with the AES/CH1 program, an excel spreadsheet was used to generate the loss rate parameters for the regional watersheds. The Excel spreadsheet uses the equations and curve numbers defined in the 1986 San Bernardino County Hydrology Manual. Based on the 2010 Addendum, AMC I was used in the analyses. Based on the hydrology manual and AES the minimum loss rate that can be entered is 0.010 in./hr.

Table 5 and Table 6 list the soil loss parameters for the regional and local watersheds, respectively.

Table 5 – Soil Loss Parameters – Regional Watersheds

Regional Watershed	Low Loss Fraction (Ybar)	Maximum Loss Rate (in/hr)
A	0.894	0.275
B	0.908	0.289
C	0.918	0.290
D	0.898	0.273
E	0.903	0.276

Table 6 – Soil Loss Parameters - Onsite Existing and Proposed Conditions

Onsite Watershed	Existing		Proposed	
	Low Loss Fraction (Ybar)	Maximum Loss Rate (in/hr)	Low Loss Fraction (Ybar)	Maximum Loss Rate (in/hr)
K	0.590	0.778	0.590	0.778
			0.504	0.686
			0.590	0.778
L	0.590	0.778	0.590	0.778
			0.504	0.686
			0.590	0.778
M	0.590	0.778	0.504	0.686
			0.590	0.778
N	0.590	0.778	0.590	0.778
			0.590	0.778
			0.504	0.686
			0.504	0.686
P	0.590	0.778	0.504	0.686
			0.504	0.686
			0.590	0.778
Q	0.590	0.778	0.504	0.686
			0.590	0.778
R	0.590-	0.778	0.504	0.686
			0.590	0.778

2.2.7 Basin Factor for Regional Hydrology

Given the size of the regional watersheds, the development of a synthetic unit hydrograph is sensitive to the lag time relationship. Specifically, the lag time relationship is sensitive to the selection of an adequate basin factor. Based on the observed characteristics of the watersheds, Figure E-2 of the San Bernardino County Hydrology Manual indicates that a basin factor of 0.35 would be adequate. The 0.35 basin factor results in lag time that are unrealistically short.

Literature review was conducted to identify a basin factor for a watershed of similar characteristics. The Design of Small Dams (U.S. Department of Interior, Bureau of Reclamation, 1987) is recognized as an industry reference for basin factors. Referenced watersheds of similar land use, climate, and topography to the Vidal Wash watershed were noted and used in this study. Similar watersheds include:

Moencopi Wash nr. Tuba City, Arizona – Lag Time 0.046

Clear Cr. nr. Winslow, Arizona – Lag Time 0.053

The resulting basin factor applied in the lag time calculations is 0.050. A copy of the references can be found under Appendix C.

2.3 Results

2.3.1 Regional Watersheds

The resulting 100-year peak flow rates were computed at hydrologic nodes next or just downstream of the proposed project pads. Results are summarized in Table 7. Hydrologic computations are provided under Appendix C.

Table 7 - 100-Year Peak Discharges for Regional Watersheds

Regional Watercourse	100-Year Peak Discharge (cfs)
A	8,360 cfs
B	3,900 cfs
C	3,653 cfs
D	7,039 cfs
E	5,104 cfs

2.3.1 Onsite Hydrology

The 100-year onsite peak flow rates were evaluated at hydraulic nodes that were at the bottom of each proposed pad. Each detention basin was conceptually sized to mitigate the proposed 100-year peak discharge to levels below 90% of the existing condition. The results, including the mitigated peak discharge and the proposed detention basin capacity, are summarized in Table 8.

Because the time of concentration for onsite watersheds (less than 30 minutes) is dissociated from that of regional watersheds (over 2 hours), the onsite flows will not result in increased flowrates in the regional desert washes.

Table 8 – 100-Year Peak Discharges for Proposed Watersheds

Onsite Watershed	Existing Peak Flow (cfs)	Proposed Mitigated Peak Flow (cfs)	Proposed Detention Basin Capacity (AF)
K	218.43	173.91	3.1
L	818.12	726.79	14.6
M	180.47	105.72	5.5
N	443.13	362.31	12.1
P	110.29	51.17	4.1
Q	252.14	129.04	6.9
R	144.94	72.99	4.7

3 REGIONAL HYDRAULIC ANALYSES

The first goal of the hydraulic analyses is to define the flood plain limits based on the depths from the hydraulic model. The flood plain limits show the flow does not primarily flow onto the proposed pad locations. The depths of flow on the proposed pads, are lower than 2 feet. The second goal is to assess the erosion that will occur in the vicinity of the project pads. Both goals will be achieved by evaluating both velocity and depth of floodwaters from in the hydraulic model.

3.1 Hydraulic Model Development

An unsteady-state hydraulic model was developed for the channel through the project site based on the best available data, using the computer application, HEC-RAS Version 6.2 (USACE, 2022). A 2D flow area and relevant parameters were defined and updated as needed in the models.

3.1.1 Topographic Mapping

The following topographic mapping were used as the base for the model development:

- United States Geological Survey (USGS), Southern California Wildfires 1-meter LiDAR, May-October 2018.

The limits of the model will extend from U.S. Route 95 postmile 2.0 approximately to tie-in to the FEMA-designated floodplain of the Colorado River.

3.1.2 Hydraulic Roughness

The hydraulic roughness characteristics of the channel and floodplain were delineated based on the anticipated and proposed vegetation within the central channel areas. Based on the proposed grading plan, ground conditions were categorized and assigned representative n-values consistent with FEMA guidelines. A 0.30 n-values were applied for the entire extent of the 2D flow area.

3.1.3 Model Boundary Conditions

Multiple boundary conditions were set, including unsteady hydrographs for the five regional watersheds, downstream boundary elevations.

Unsteady hydrographs are applied at the upstream model boundaries, as listed in Table 9. Because the hydrograph were generated at a hydrologic node that is located downstream of the model domain, the 2D model is consistent with the San Bernardino County Hydrology Manual. However, a rain-on-grid approach using a hyetograph built from NOAA Atlas 14 rainfall statistics was added to the hydraulic model. The approach may be overly conversative, but allow the designer to identify the flowpath and depth of onsite flows.

Table 9 – Upstream Boundary Condition - 100-Year Peak Discharges

Regional Watercourse	100-Year Peak Discharge (cfs)
A	8,360 cfs
B	3,900 cfs
C	3,653 cfs
D	7,039 cfs
E	5,104 cfs

Downstream boundary conditions assume a Base Flood Elevation of 338 feet NAVD88 in the Colorado River, as referenced on FEMA DFIRM Panel #04012C0425C.

3.1.4 Infiltration

Infiltration over the entire model domain was modeled using the Green-Ampt infiltration model. All soils from the NRCS SSURGO2 database were discretized spatially using GIS tools. The Green-Ampt infiltration parameters that were used were derived from Rawls et al. (1983). A copy of this reference is in Appendix E. Table 10 shows the inputs used.

Table 10 – Green-Ampt Parameters

MUSYM	Initial Soil Water Content	Pore Size Distribution Index	Saturated Hydraulic Conductivity (in/hr)	Wetting Front Suction (in)
S275	0.365	0.469	0.214	5.201
S1126	0.35	0.447	0.378	4.084
S1140	0.358	0.446	0.229	5.058
2	0.35	0.451	0.386	4.049
11	0.366	0.46	0.12	6.53
12	0.366	0.46	0.12	6.53
14	0.235	0.468	0.035	9.786
14A	0.235	0.468	0.035	9.786
15	0.235	0.468	0.035	9.786
21	0.35	0.437	1.059	2.601

3.2 Hydraulic Results

A series of exhibits have been created and included in Appendix D. Exhibits depict floodwaters depths and velocities across the entire model domain for the 100-year 24-hour storm event. There are two sets of hydraulic results associated with the 2D model, this is because the peak of the desert tributary flow is different from the rain-on-grid peak.

Overall, the pads will not observe any flooding depths exceeding 6 inches during local 100-year storms. Should a 100-year storm occur consistently across the entire 328 miles of tributary area, Vidal Wash is anticipated to generate flooding depths of less than 2.5 feet onto the new proposed pad A, pad B and pad C. The design of pedestals and panels should result in the panel being above the anticipated 100-year flood elevation.

Another observation worth considering during final engineering is the existing flowpath of Onsite Watershed L. Currently, mountain desert wash L collects run-on from the southern face of the local mountain range north of Lye Road. Mountain desert wash L is only spatially separated by 100 feet from regional desert wash E. During a major storm event, there is a potential for either course to change and potentially confluence together. A hypothetical scenario would involve regional desert wash E change its course to onsite desert wash L. In this scenario, onsite pad A could be traversed by 5,825 cfs. Given that Mountain desert wash L is higher by 10 feet than regional desert wash E, a more likely scenario to occur is for mountain desert wash L to change its course and confluence with regional desert wash E. In this scenario, minimal floodwaters would occur on proposed pad A.

Onsite, the anticipated range from 0.25ft/s to 0.99ft/s on all the proposed pads as seen on figure 3-4. Erosion is generally not anticipated, so long as concentrated flowpaths are minimized using minimal grading. For the regional desert washes, the velocities can exceed 5 feet per second. Where floodwaters overtop the existing banks onto pad A, pad B and pad C, the velocities will range from 2ft/s to 2.99 ft/s. While erosive forces may be minimal under shallow flood conditions, it is recommended that pedestals and foundations be designed to accommodate these velocities.

3.3 General Drainage Design Guidelines

3.3.1 Flood Condition Considerations

The proposed project pads are subject to flooding from both regional and local desert washes. Project areas subject to desert wash flooding are considered more hazardous than areas subject to riverine conditions, and generally require a higher degree of site engineering and regulatory review. Based on the flooding maps discussed under Section 3.2, flood constraints for the development of the proposed project pads include:

- Uncertain flow paths of desert washes. Site design should reflect the potential for upstream flow paths to change course.
- Debris or mud flows. Vidal Wash have the potential to entrain large amounts of sediments and debris. Project pads should be constructed away from the thalweg of Vidal Wash.
- Flow concentration. Highly erodible soils may be adversely impacted if sheet flow is concentrated. The site design should mitigate for impacts from flow concentration. Particular care should be applied to the design of any road network or obstructions to natural desert washes that are not oriented perpendicular to the primary flow direction.
- Pedestals and foundations are the equipment pads and panels should be raised at least two feet above the said anticipated 100-year flooding depths. Deeper foundations should be designed to account for erosion where velocities exceed 2 feet per second.

3.3.2 Grading Considerations

The grading of access roads can lead to the concentration of runoff and subsequently result in localized erosion along and across these roads, and in some cases, trigger the formation of flow-cut watercourses downstream. Local scour can occur around installed obstructions, e.g. panel supports and equipment pads, if exposed to concentrated runoff.

Added impervious cover and storm water conveyance improvements associated with planned development are the typical drivers of impacts associated with storm water runoff. However, the development of the proposed project will likely add less than one percent of impervious cover. For this particular type of site development, changes in flood patterns, increases in flow intensity, and increases in runoff yield are typically related to any combination of changes in landform, soil composition, and soil compaction as a consequence of grading/construction activities.

Changes to the soil compaction conditions can influence runoff development. An increase in soil compaction will either initiate or increase runoff development if the precipitation exceeds the infiltration capacity during a storm sequence. Unless the soil composition has a low baseline infiltration capacity, limiting increases in compaction will assist in limiting the mitigation needs associated with increased runoff volume.

4 REFERENCES

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APPENDIX A

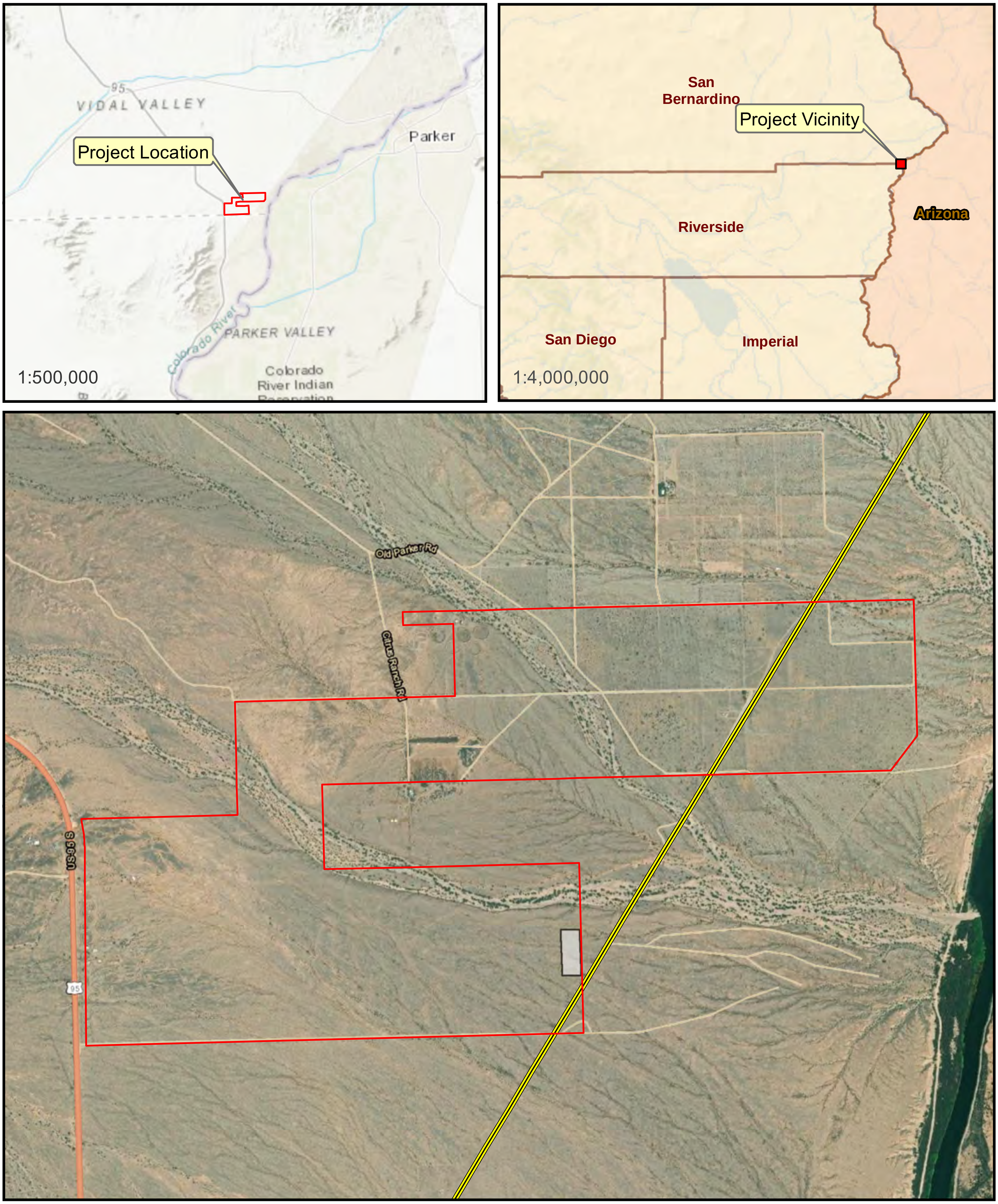


Figure 1
Project Location & Vicinity

Name: 21232 BIO Fig 1 Project Location & Vicinity.Mxd
Print Date: 10/8/2021, Author: pcarlos

CHAMBERS GROUP

SYSTEM SUMMARY

TOTAL PV DC SYSTEM SIZE:	235.123 MW–DC
TOTAL PV AC SYSTEM SIZE:	160.00 MW–AC
TOTAL BESS CAPACITY:	640.00 MWh
MODULE MANUFACTURER:	TRINA
MODULE MODEL:	TSM–DEG20C.20 (600 W)
MODULES PER STRING:	32
MODULE QUANTITY:	391,872
STRING QUANTITY:	12,246
RACKING:	SINGLE AXIS TRACKER
AXIS TILT:	0°
AXIS AZIMUTH:	180°
INVERTER MANUFACTURER:	POWER ELECTRONICS
INVERTER MODEL(S):	(48) HEM FS3350M (ONE DE–RATED TO 2550)

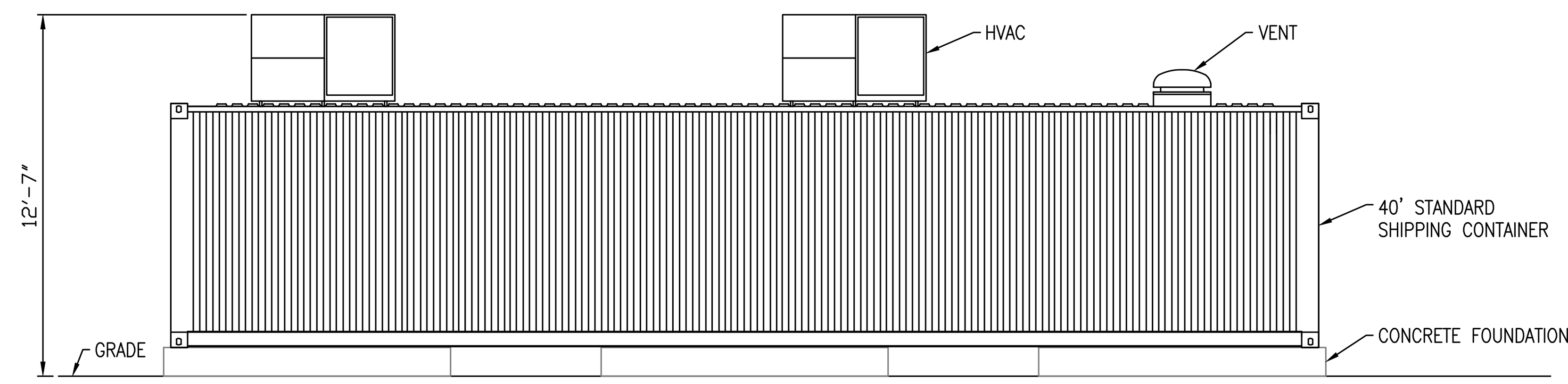
DRAWING LEGEND

- OVERHEAD ELECTRIC LINE
- WATERS OF THE STATE (BOUNDARY)
- EXISTING ROADWAY – DIRT/GRAVEL
- EXISTING ROADWAY – PAVED
- NEW ROADWAY – GRAVEL
- NEW ROADWAY – PAVED
- PROPERTY LINE / PROJECT BOUNDARY
- PARCEL LINES (INTERIOR / ADJACENT)
- EASEMENT
- FENCE
- PHOTOVOLTAIC MODULES

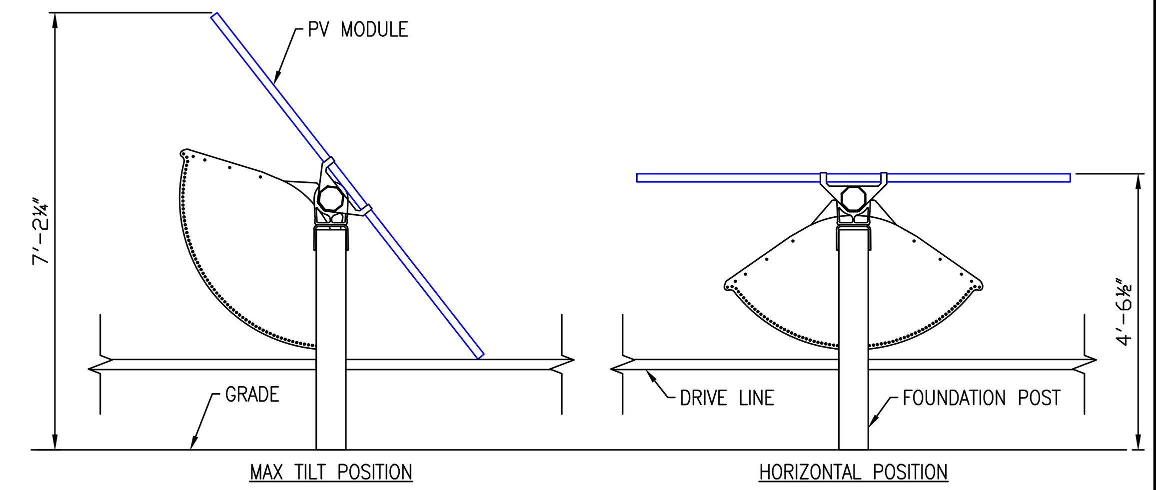
PLAN NOTES:

1. EDGE OF PAVEMENT ON EAST EDGE OF HIGHWAY 95. NO EXISTING CURBS OR SIDEWALKS EXIST ALONG PROJECT'S SIDE OF HIGHWAY 95.
2. DIMENSIONS FROM PROPERTY LINE TO EXISTING STRUCTURES ON ADJACENT PROPERTIES ARE APPROXIMATE. BUILDING FOOTPRINTS SHOWN ARE APPROXIMATE. ADDITIONAL DETAIL WILL BE AVAILABLE AFTER FULL ALTA SURVEY OF SITE.
3. WILDLIFE CORRIDORS: TWO LARGE WASHES PRESENT ARE WILDLIFE CORRIDORS PROVIDING A MIGRATION PATHWAY FOR SMALL TO LARGE MAMMAL SPECIES FROM THE SURROUNDING AREAS. THE BOUNDARIES OF THE CORRIDORS WERE DETERMINED BASED UPON EXISTING BED AND BANK ESTABLISHED THROUGH A JURISDICTIONAL DELINEATION. THE PROJECT IS DESIGNED TO AVOID THE WILDLIFE CORRIDORS THAT ARE SHOWN ON THE SITE PLAN IN THE BLUE CROSS HATCH MARKINGS. THE PROJECT FACILITIES AND ACCESS ROADS ARE DESIGNED TO AVOID THE WASHES AND WILL BE LEFT IN PLACE TO ALLOW FOR FLOW AND MIGRATION.
4. DUST CONTROL: DURING CONSTRUCTION AND OPERATIONS, THE PROJECT WILL IMPLEMENT DUST CONTROL MEASURES THAT WILL BE IDENTIFIED IN DETAIL IN THE DUST CONTROL PLAN. THESE MEASURES WILL INCLUDE REVEGETATION, WATERING, AND USE OF SOIL STABILIZERS AND POLYMERS AS DUST SUPPRESSANTS. UNPAVED ROADS AND ACCESS WAYS WILL BE GRAVELED. NO WIND BARRIERS ARE WARRANTED BECAUSE OF THE LIMITED GROUND DISTURBANCE. AREAS THAT HAVE TEMPORARY GROUND DISTURBANCES WILL BE RESTORED.
5. BUFFERS: THE PROJECT WILL PROVIDE CHAIN LINK SECURITY FENCING; NO OTHER VISUAL BUFFERS ARE PROPOSED AT THIS TIME.
6. EASEMENTS: ONE KNOWN EASEMENT IS NOTED ALONG EXISTING TRANSMISSION LINE. NO OTHER EASEMENTS ARE KNOWN.
7. FEMA FLOOD ZONE: THE ENTIRE PROJECT AREA IS WITHIN THE FEDERAL EMERGENCY MANAGEMENT AGENCY AREA ZONE D: AREAS IN WHICH FLOOD HAZARDS ARE UNDETERMINED, BUT POSSIBLE.
8. LIGHTING: LIGHTING TO BE INSTALLED WILL BE FOR SECURITY PURPOSES ONLY. THE POINT OF INTERCONNECTION SUBSTATION WILL BE ILLUMINATED. THE SITE WILL COMPLY WITH THE RENEWABLE ENERGY AND CONSERVATION ELEMENT POLICY RE 4.4.1.4

DETAIL NOTES:
1. BESS CONTAINER SOLUTION TBD UPON FINAL ENGINEERING. DIMENSIONS ARE APPROXIMATE.

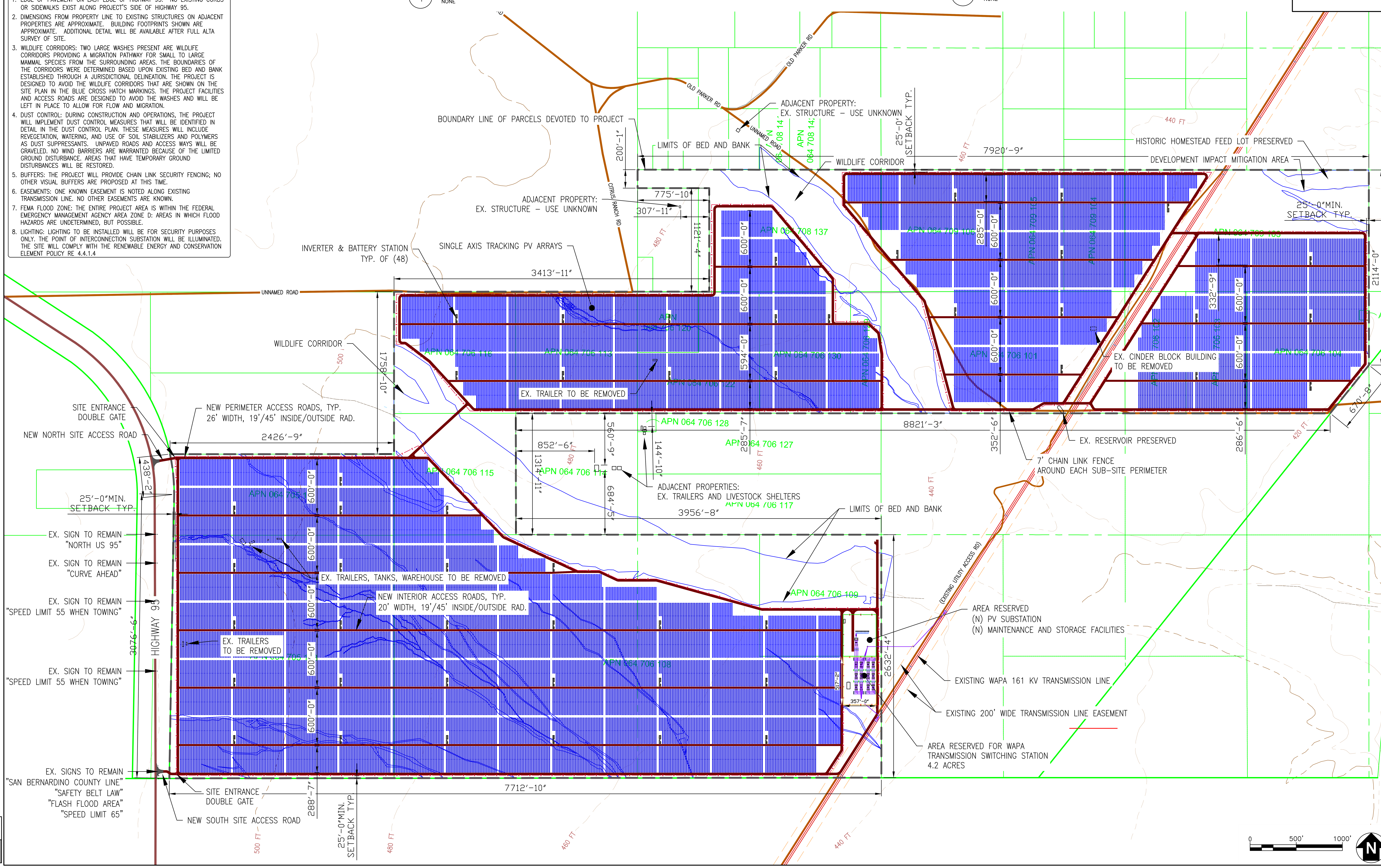


1 BATTERY STORAGE CONTAINER APPROXIMATE DIMENSIONS
NONE



2 TYP. ARRAY DIMENSIONS
NONE

OFFICIAL USE ONLY



CORE

860 WYCKOFF AVE, SUITE 200
MAHWAH, NJ 07430
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201.825.2195

REV	DATE	DESCRIPTION
B	9/27/19	BESS REVISIONS
C	5/20/20	SIS REVISIONS
D	6/8/20	NON–WETLANDS WATERS ADDITIONS
E	11/23/20	LAYOUT REVISIONS
F	12/07/20	CUP ISSUE
G	12/29/20	PARCEL UPDATES
H	6/2/21	CUP REVISIONS

VIDAL, CALIFORNIA
PHOTOVOLTAIC GENERATION STATION
HIGHWAY 95 – SAN BERNARDINO COUNTY

DRAWN BY	LRC	DATE	10/27/2021
CHECKED BY	ER.	SHEET SIZE	24" X 36"
ISSUE	CUP & WAPA	SCALE	1" = 500'

SHEET TITLE: SITE PLAN

DRAWING #: G101

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11 North. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from digital orthophotography collected by the U.S. Department of Agriculture Farm Service Agency. This imagery was flown in 2005 and was produced with a 1-meter ground sample distance.

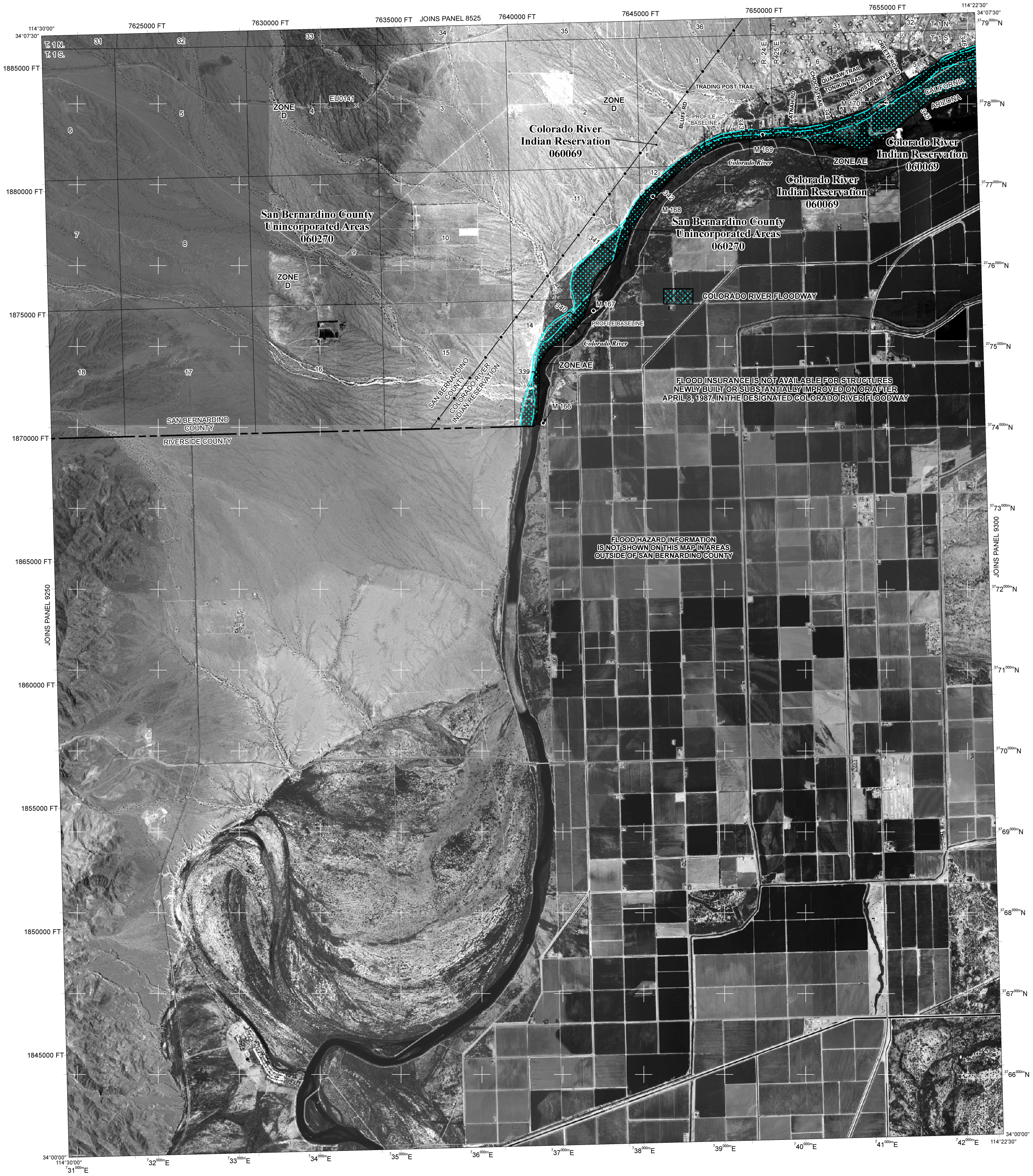
This map may reflect more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to confirm to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAS)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A: Cross section line

23 — 23: Transect line

87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

$^{24}76^{000m}$N — 1000-meter Universal Transverse Mercator grid values, zone 11N

600000 FT — 5000-foot grid ticks: California State Plane coordinate system, zone V (FIPSZONE 0405), Lambert Conformal Conic projection

DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)

● M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
March 18, 1996

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
August 28, 2008 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

N

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 9275H

FIRM

FLOOD INSURANCE RATE MAP

SAN BERNARDINO COUNTY, CALIFORNIA
AND INCORPORATED AREAS
PANEL 9275 OF 9400

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO RIVER INDIAN RESERVATION	060069	9275	H
SAN BERNARDINO COUNTY	060270	9275	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

U.S. DEPARTMENT OF HOMELAND SECURITY

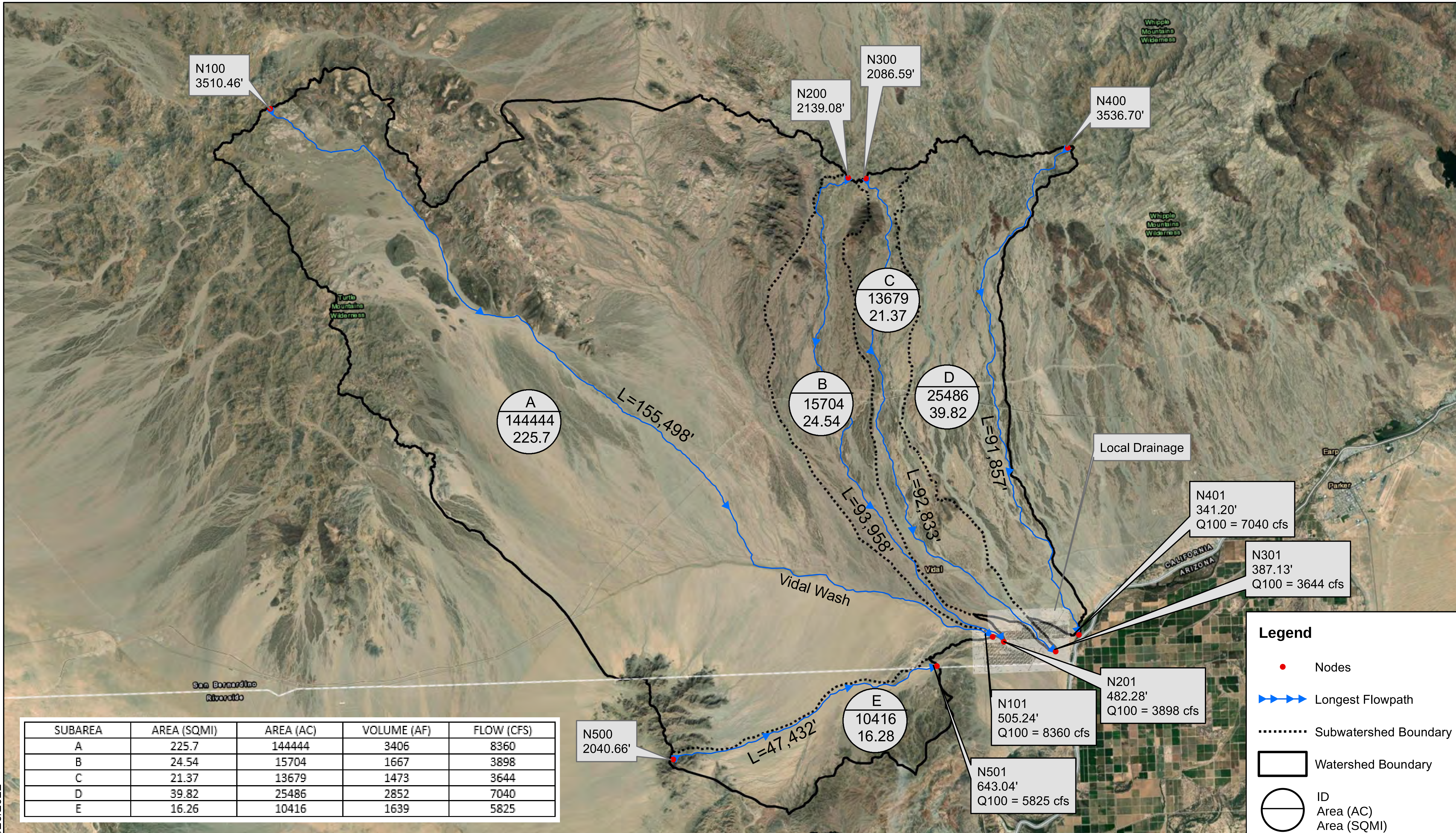
MAP NUMBER
06071C9275H

MAP REVISED
AUGUST 28, 2008

Federal Emergency Management Agency

APPENDIX B

REGIONAL



SUBAREA	AREA (SQMI)	AREA (AC)	VOLUME (AF)	FLOW (CFS)
A	225.7	144444	3406	8360
B	24.54	15704	1667	3898
C	21.37	13679	1473	3644
D	39.82	25486	2852	7040
E	16.26	10416	1639	5825

Q3 Consulting

N
0 3,500 7,000 14,000
Feet

County of San Bernardino, California

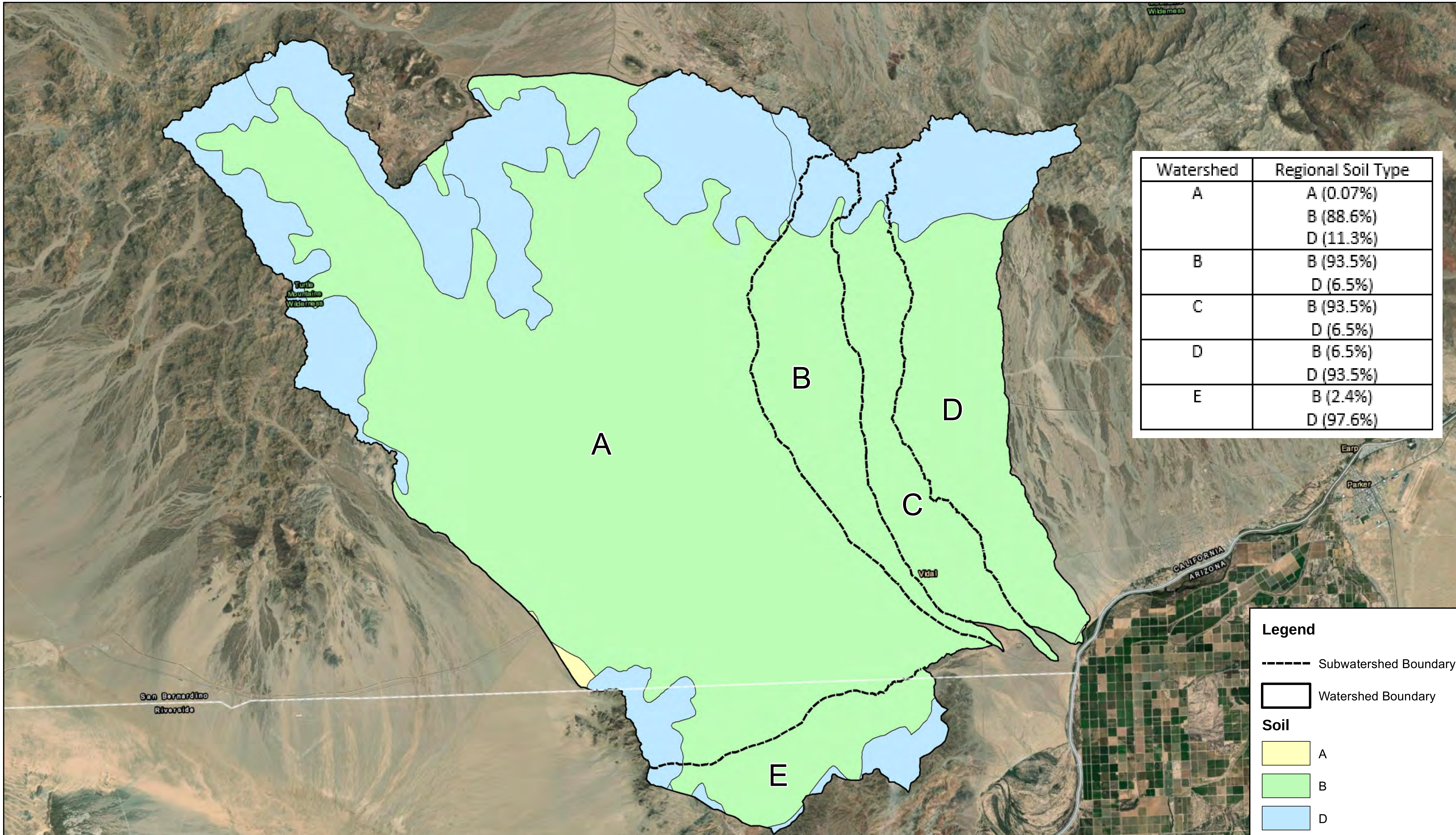
Preliminary Drainage Report

Regional Hydrology Map

Vidal Solar Energy Project - Town of Vidal

Document Path: N:\40.087.000\GIS\MXD\Regional Hydrology Map.mxd

Date Saved: 9/26/2022



Watershed	Regional Soil Type
A	A (0.07%) B (88.6%) D (11.3%)
B	B (93.5%) D (6.5%)
C	B (93.5%) D (6.5%)
D	B (6.5%) D (93.5%)
E	B (2.4%) D (97.6%)

Date Saved: 9/26/2022 Document Path: N:\40.087.000\GIS\MXD\Soil Map.mxd

Q3 Consulting

N 0 3,500 7,000 14,000 Feet

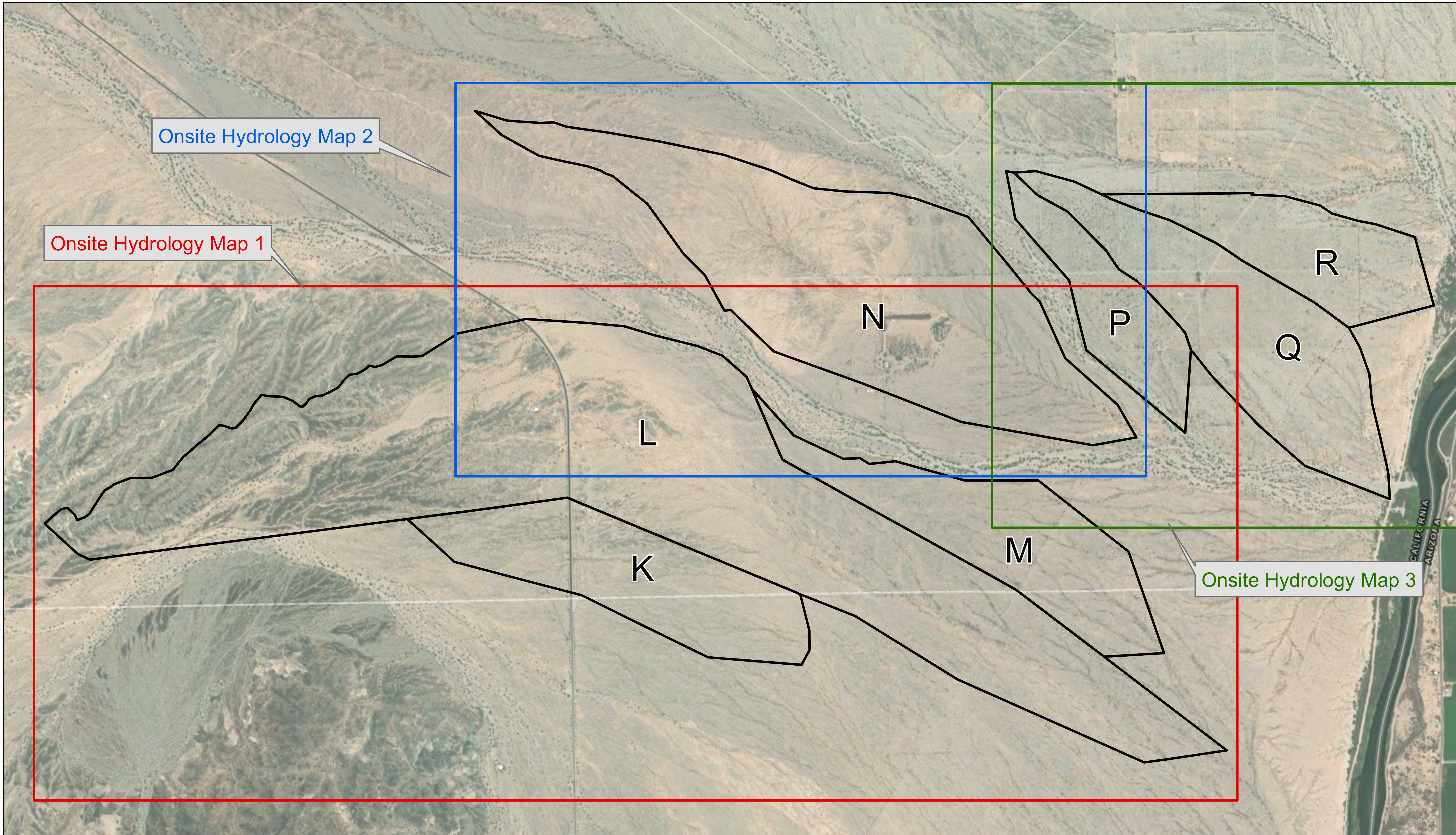
County of San Bernardino, California

Preliminary Drainage Report

Soil Type Map

Vidal Solar Energy Project - Town of Vidal

ONSITE



Date Saved: 10/5/2022 Document Path: N:\40.087.000\GIS\MXD\Index Map.mxd

Q3 Consulting

N

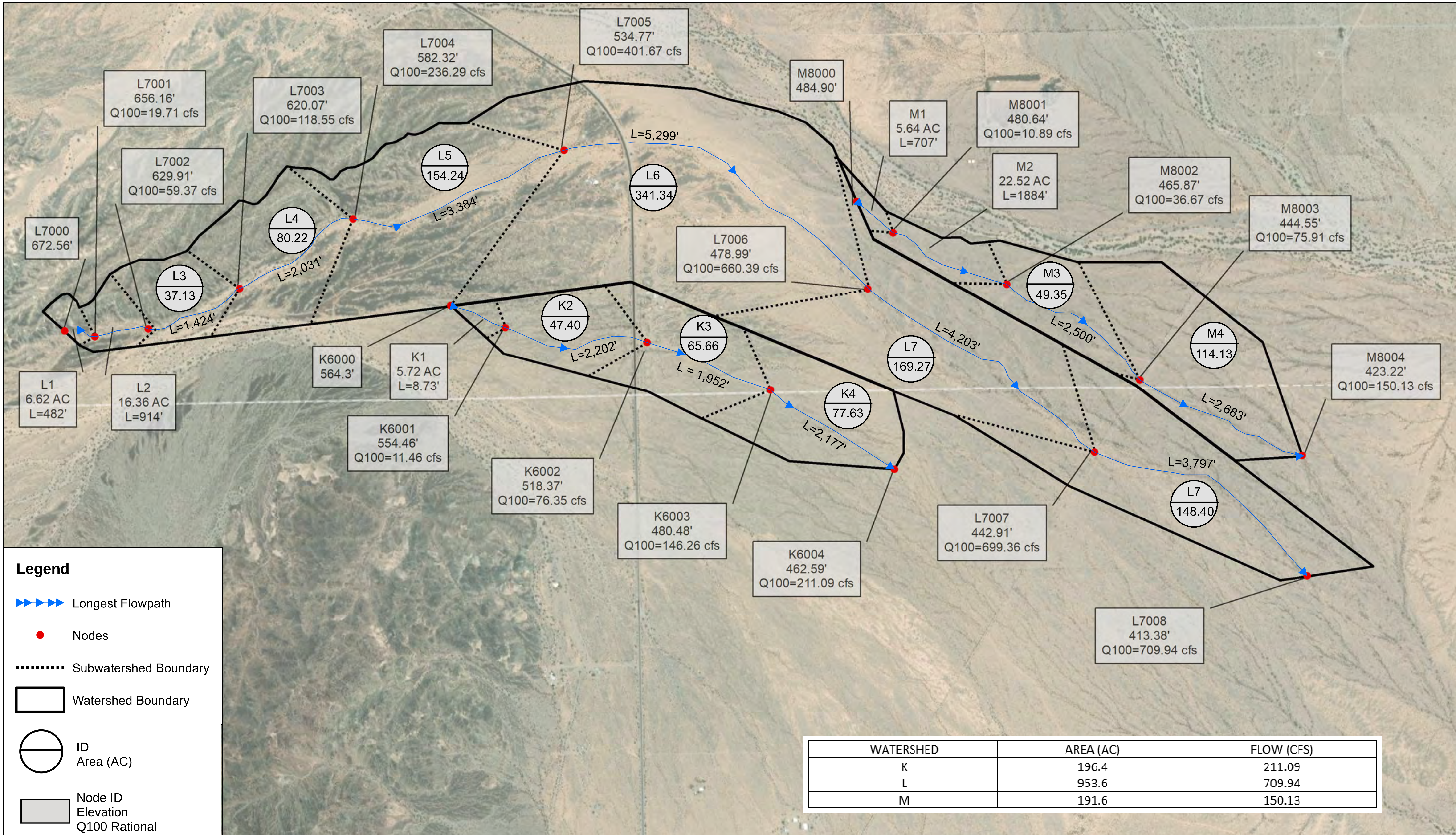
0 400 800 1,600 Feet

County of San Bernardino, California

Preliminary Drainage Report

Onsite Index Map

Vidal Solar Energy Project - Town of Vidal



WATERSHED	AREA (AC)	FLOW (CFS)
K	196.4	211.09
L	953.6	709.94
M	191.6	150.13

Q3 Consulting

County of San Bernardino, California

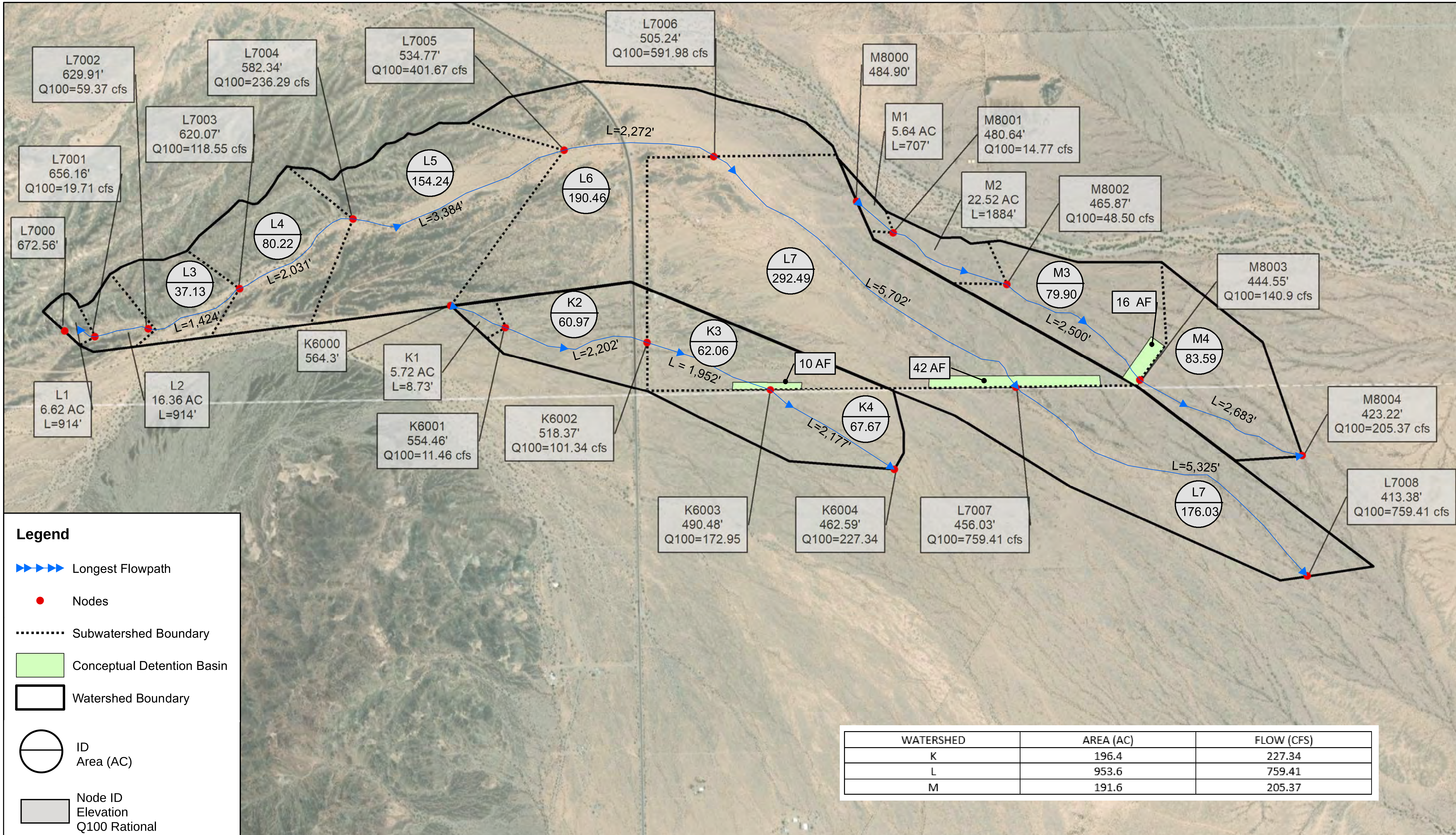
Preliminary Drainage Report

Onsite Hydrology Map 1 - Existing

Vidal Solar Energy Project - Town of Vidal

Document Path: N:\40.087.000\GIS\MXD\Onsite Hydrology Map 1.mxd

Date Saved: 10/5/2022



WATERSHED	AREA (AC)	FLOW (CFS)
K	196.4	227.34
L	953.6	759.41
M	191.6	205.37

Document Path: N:\40.087.000\GIS\MXD\Onsite Hydrology Map 1.mxd

Date Saved: 10/5/2022

Q3 Consulting

N

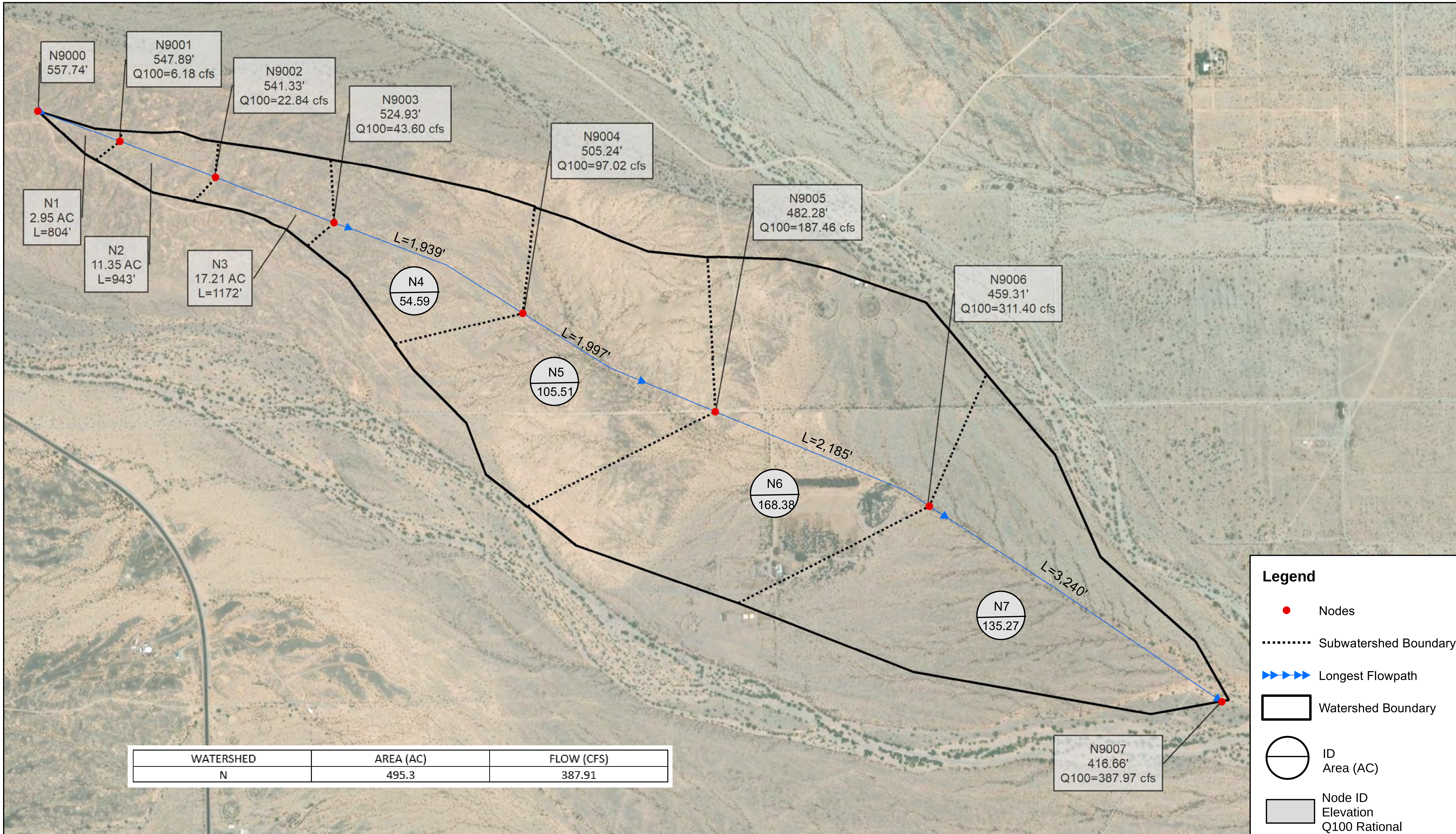
0 250 500 1,000 Feet

County of San Bernardino, California

Preliminary Drainage Report

Onsite Hydrology Map 1 - Proposed

Vidal Solar Energy Project - Town of Vidal



WATERSHED	AREA (AC)	FLOW (CFS)
N	495.3	387.91

N

County of San Bernardino, California

Preliminary Drainage Report

Onsite Hydrology Map 2 - Existing

Vidal Solar Energy Project - Town of Vidal

Q3 Consulting

Document Path: N:\40.087.000\GIS\MXD\Onsite Hydrology Map 2.mxd

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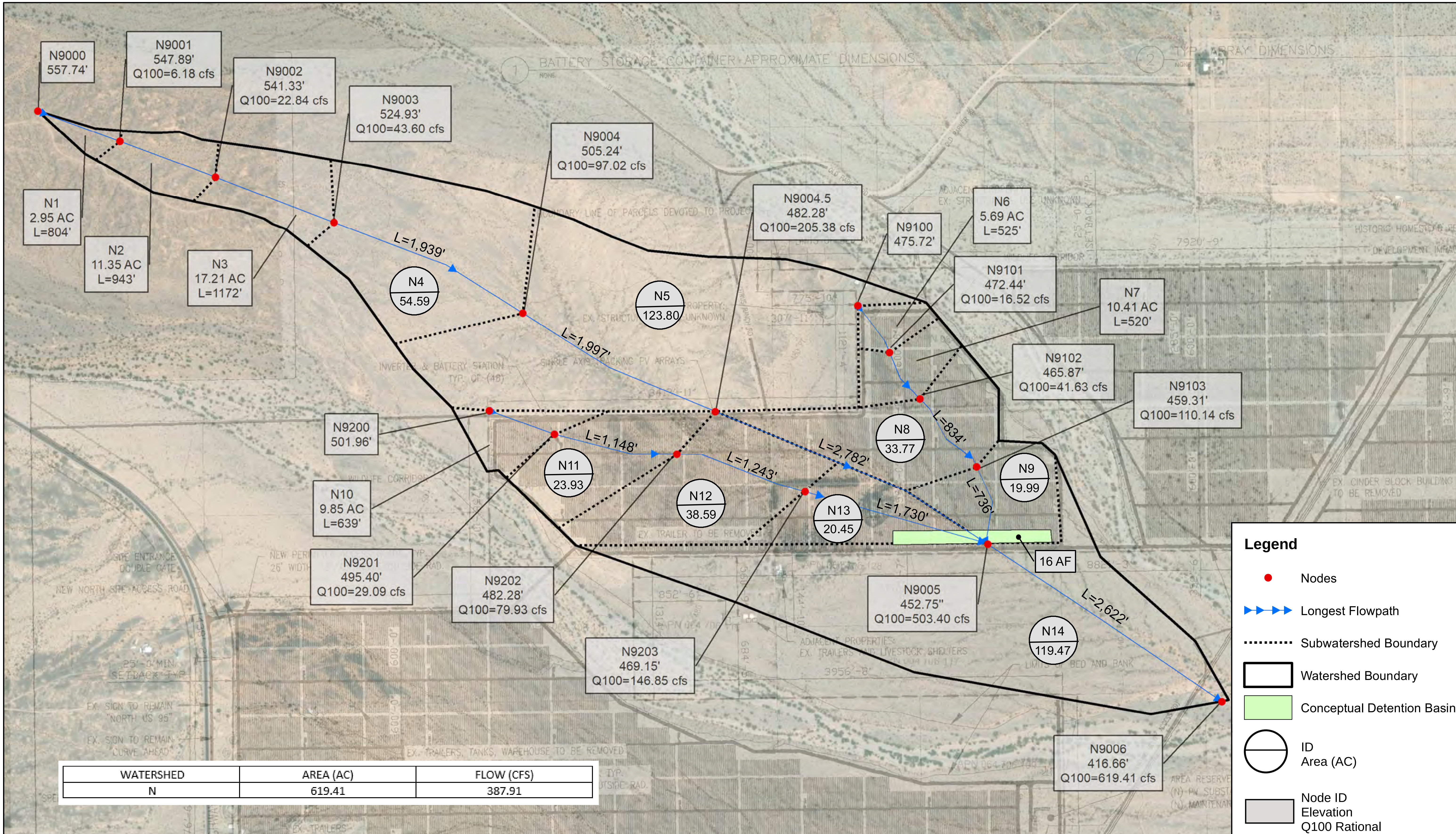

WATERSHED	AREA (AC)	FLOW (CFS)
N	619.41	387.91

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Date Saved: 10/5/2022

Q3 Consulting

N

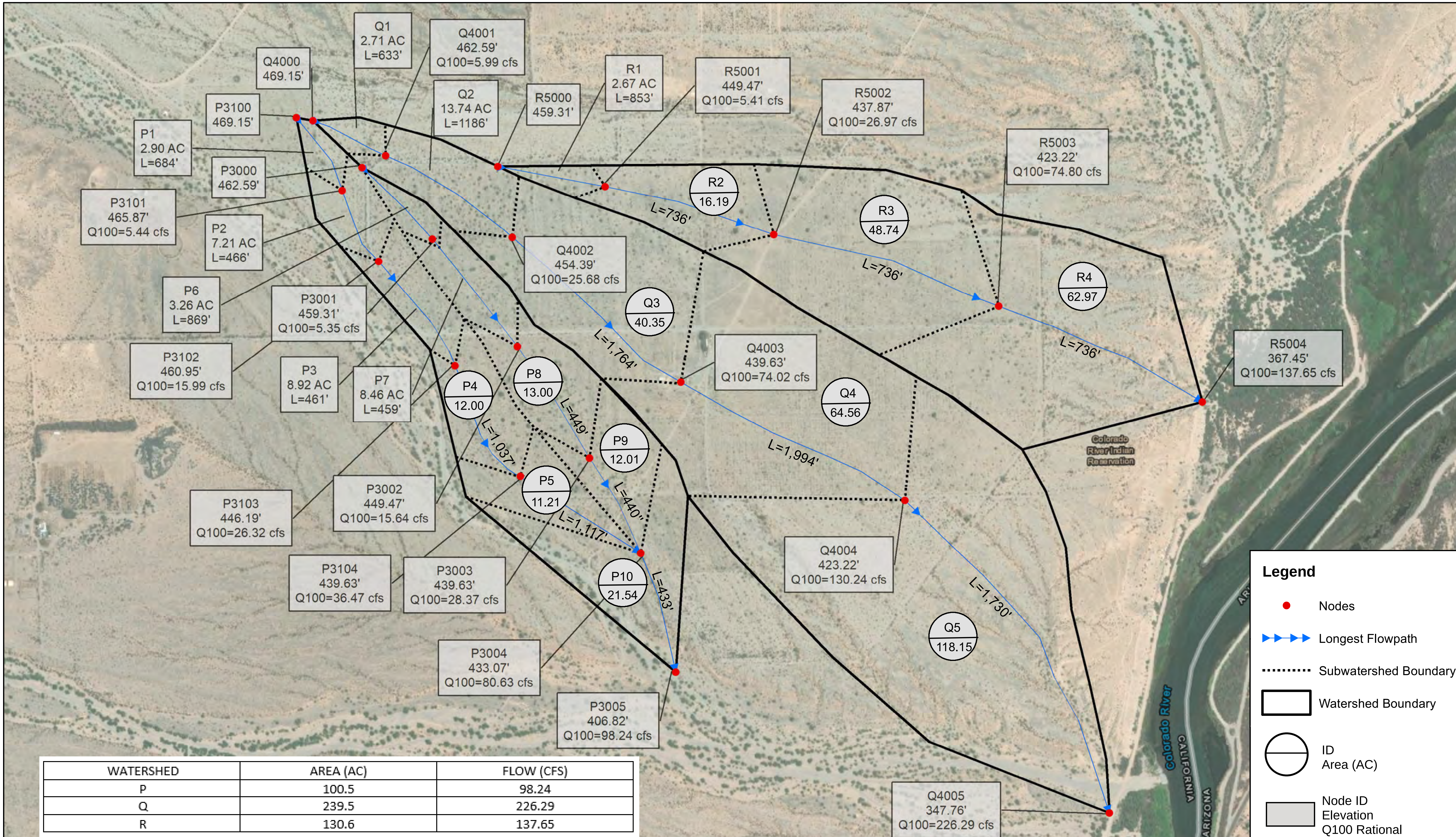
0 250 500 1,000 Feet

County of San Bernardino, California

Preliminary Drainage Report

Onsite Hydrology Map 2 - Proposed

Vidal Solar Energy Project - Town of Vidal



WATERSHED	AREA (AC)	FLOW (CFS)
P	100.5	98.24
Q	239.5	226.29
R	130.6	137.65

Q3 Consulting

County of San Bernardino, California

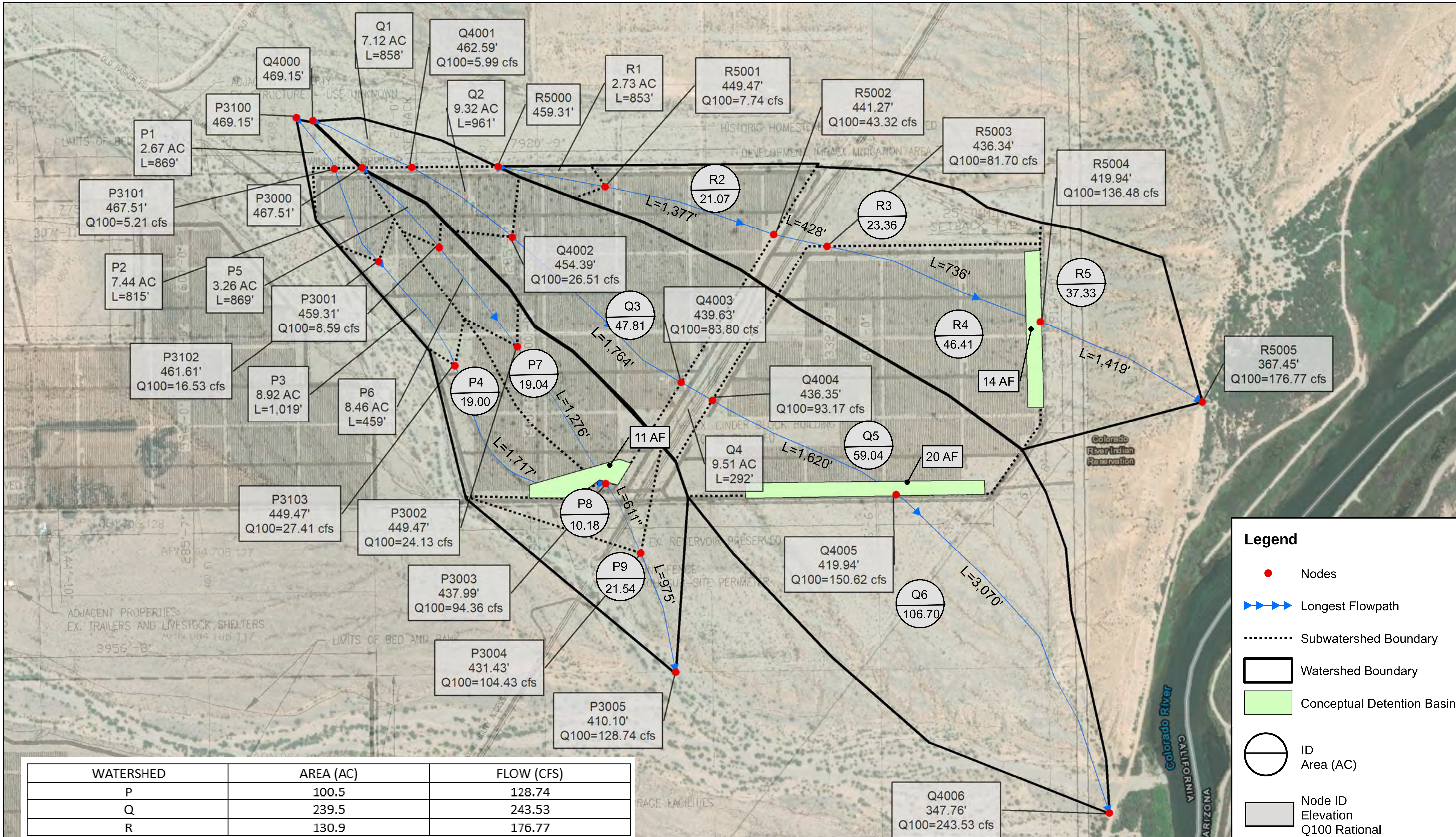
Preliminary Drainage Report

Onsite Hydrology Map 3 - Existing

Vidal Solar Energy Project - Town of Vidal

Document Path: N:\40.087.000\GIS\MXD\Onsite Hydrology Map 3.mxd

Date Saved: 10/4/2022



WATERSHED	AREA (AC)	FLOW (CFS)
P	100.5	128.74
Q	239.5	243.53
R	130.9	176.77

Q3 Consulting

County of San Bernardino, California

Preliminary Drainage Report

Onsite Hydrology Map 3 - Proposed

Vidal Solar Energy Project - Town of Vidal

Date Saved: 10/4/2022 Document Path: N:\40.087.000\GIS\MXD\Onsite Hydrology Map 3.mxd

APPENDIX C

BASIN FACTOR

ments equal to the unit duration. Time is expressed as a percentage of lag time in the second column and is found by dividing the time increment in the first column by the unit hydrograph lag time. Values entered in the third column represent ordinates read from the dimensionless S-graph at corresponding values (time in percent of lag) in the second column. Each value in the third column is multiplied by the ultimate to arrive at the summation hydrograph ordinates shown in the fourth column. Each unit hydrograph ordinate in the fifth column is the difference between the corresponding value in the fourth column and the preceding value in the fourth column.

The unit hydrograph ordinates should be plotted on graph paper for the proper time intervals, and a smooth curve should be drawn through the points. The final unit hydrograph ordinates should reflect the position of the smooth curve rather than the computed ordinates.

Table 3-3.—Unit hydrograph lag data, Southwest Desert, Great Basin, and Colorado Plateau.

Index No.	Station and location	Drainage area, mi^2	Basin factor, $LL_{ca}/\sqrt{S}$	Lag time, h	K_n
1	Salt River at Roosevelt, AZ	4341.0	1261.0	16.0	0.058
2	Verde R. above E. Verde and below Jerome, AZ	3190.0	760.0	12.0	.052
3	Tonto Cr. above Gun Cr., AZ	678.0	66.3	6.5	.063
4	Agua Fria R. nr. Mayor, AZ	590.0	63.2	5.4	.053
5	San Gabriel R. at San Gabriel Dam, CA	162.0	14.4	3.3	.053
6	West Fk. San Gabriel R. at Cogswell Dam, CA	40.4	1.8	1.6	.051
7	Santa Anita Cr. at Santa Anita Dam, CA	10.8	0.6	1.1	.050
8	Sand Dimas Cr. at San Dimas Dam, CO	16.2	2.0	1.5	.046
9	Eaton Wash at Eaton Wash Dam, CA	9.5	1.3	1.3	.046
10	San Antonio Cr. nr. Claremont, CA	16.9	0.6	1.2	.055
11	Santa Clara R. nr. Saugus, CA	355.0	48.2	5.6	.060
12	Temecula Cr. at Pauba Canyon, CA	168.0	24.1	3.7	.050
13	Santa Margarita R. nr. Fallbrook, CA	645.0	99.2	7.3	.062
14	Santa Margarita R. at Ysidora, CA	740.0	228.0	9.5	.061
15	Live Oak Cr. at Live Oak Dam, CA	2.3	0.2	0.8	.052
16	Tujunga Cr. at Big Tujunga Dam, CA	81.4	6.5	2.5	.052
17	Murrieta Cr. at Temecula, CA	220.0	28.9	4.0	.051
18	Los Angeles R. at Sepulveda Dam, CA	152.0	14.3	3.5	.056
19	Pacoima Wash at Pacoima Dam, CA	27.8	6.8	2.4	.049
20	East Fullerton Cr. at Fullerton Dam, CA	3.1	0.5	0.6	.029
21	San Jose Cr. at Workman Mill Rd. CA	81.3	24.8	2.4	.032
22	San Vincente Cr. at Foster, CA	75.0	12.8	3.2	.053
23	San Diego R. nr. Santee, CA	380.0	95.4	9.2	.078
24	Deep Cr. nr. Hesperia, CA	137.0	28.1	2.8	.036
25	Bill Williams R. at Planet, AZ	4730.0	1476.0	16.2	.056
26	Gila R. at Conner No. 4 Damsite, AZ	2840.0	1722.0	21.5	.071
27	San Francisco R. at Jct. with Blue R., AZ	2000.0	1688.0	20.6	.068
28	Blue R. nr. Clifton, AZ	790.0	352.0	10.3	.057
29	Moencopi Wash nr. Tuba City, AZ	2490.0	473.0	9.2	.046
30	Clear Cr. nr. Winslow, AZ	607.0	570.0	11.2	.053
31	Puerco R. nr. Admana, AZ	2760.0	1225.0	15.9	.058
32	Plateau Cr. nr. Cameo, CO	604.0	89.9	7.9	.069
33	White R. nr. Watson, UT	4020.0	1473.0	15.7	.054
34	Paria R. at Lees Ferry, AZ	1570.0	296.0	10.2	.060
35	New River at Rock Springs, AZ	67.3	16.5	3.1	.047
36	New River at New River, AZ	85.7	26.3	3.7	.048
37	New R. at Bell Road nr. Phoenix, AZ	187.0	108.0	5.3	.043
38	Skunk Cr. nr. Phoenix, AZ	64.6	18.7	2.4	.035

REGIONAL HYDROLOGY RESULTS

SINGLE AREA UNIT HYDROGRAPH

Node	Subarea	Area (acres)	Soil Type	Land Use	Curve Number CN			Low Loss Fraction (1-Y)					A_p	F_p	Maximum Loss Rate (F_m)			
								Storm Event (Year)										
								EV		HC								
								100	10	2	25	100			Storm Event (Year)			
					AMC			P24 (Inches)							EV			HC
					II	I	III	1.03	1.81	2.53	4.49	3.85			> 5	5	2	All
101	A	355.36	A	DS Fair	55	35	75	156.47	42.72	11.33	58.40	0.09	1.00	0.40	106.61	177.68	213.22	142.14
101	A	86323.41	B	DS Fair	72	53	89	5352.89	22.70	2208.80	34855.64	9169.83	1.00	0.30	25897.02	43161.71	51794.05	25897.02
101	A	21120.7	B	DS Poor	56	36	76	8575.35	2217.70	524.12	3718.41	26.32	1.00	0.30	6336.21	10560.36	12672.43	6336.21
101	A	3951.96	D	DS Fair	86	72	97	51.15	452.91	826.09	2635.25	1365.60	1.00	0.20	1185.59	1975.98	2371.18	790.39
101	A	32693.5	D	DS Poor	75	57	91	1029.83	208.92	1573.46	14872.67	4708.78	1.00	0.20	9808.06	16346.77	19616.12	6538.71
		144445.0						0.895	0.980	0.964	0.611	0.894			0.300	0.500	0.600	0.275

SINGLE AREA UNIT HYDROGRAPH

Node	Subarea	Area (acres)	Soil Type	Land Use	Curve Number CN			Low Loss Fraction (1-Y)					A_p	F_p	Maximum Loss Rate (F_m)			
								Storm Event (Year)										
								EV		HC								
								100	10	2	25	100			Storm Event (Year)			
					AMC			P24 (Inches)							EV			HC
					II	I	III	1.03	1.81	2.53	4.49	3.62			> 5	5	2	All
201	B	13287.9	B	DS Fair	72	53	89	823.98	3.49	340.00	5365.38	1216.87	1.00	0.30	3986.37	6643.95	7972.74	3986.37
201	B	610.96	B	DS Poor	56	36	76	248.06	64.15	15.16	107.56	0.04	1.00	0.30	183.29	305.48	366.58	183.29
201	B	1804.67	D	DS Poor	75	57	91	56.85	11.53	86.85	820.97	230.15	1.00	0.20	541.40	902.34	1082.80	360.93
		15703.5						0.928	0.995	0.972	0.599	0.908			0.300	0.500	0.600	0.289

SINGLE AREA UNIT HYDROGRAPH

Node	Subarea	Area (acres)	Soil Type	Land Use	Curve Number CN			Low Loss Fraction (1-Y)					A_p	F_p	Maximum Loss Rate (F_m)			
								Storm Event (Year)										
								EV		HC								
								100	10	2	25	100			Storm Event (Year)			
					AMC			P24 (Inches)							EV			HC
					II	I	III	1.03	1.81	2.53	4.49	3.52			> 5	5	2	All
301	C	11317.4	B	DS Fair	72	53	89	701.79	2.98	289.58	4569.75	964.28	1.00	0.30	3395.23	5658.72	6790.46	3395.23
301	C	1039.24	B	DS Poor	56	36	76	421.95	109.12	25.79	182.96	0.02	1.00	0.30	311.77	519.62	623.54	311.77
301	C	1322.57	D	DS Poor	75	57	91	41.66	8.45	63.65	601.65	159.06	1.00	0.20	396.77	661.29	793.54	264.51
		13679.3						0.915	0.991	0.972	0.609	0.918			0.300	0.500	0.600	0.290

SINGLE AREA UNIT HYDROGRAPH

Node	Subarea	Area (acres)	Soil Type	Land Use	Curve Number CN			Low Loss Fraction (1-Y)					A_p	F_p	Maximum Loss Rate (F_m)			
								Storm Event (Year)										
								EV		HC								
								100	10	2	25	100			Storm Event (Year)			
					AMC			P24 (Inches)							EV			HC
					II	I	III	1.03	1.81	2.53	4.49	3.62			> 5	5	2	All
401	D	18012.1	B	DS Fair	72	53	89	1116.92	4.74	460.88	7272.90	1649.50	1.00	0.30	5403.62	9006.03	10807.23	5403.62
401	D	476.85	B	DS Poor	56	36	76	193.61	50.07	11.83	83.95	0.03	1.00	0.30	143.06	238.43	286.11	143.06
401	D	333.18	D	DS Fair	86	72	97	4.31	38.18	69.65	222.17	108.26	1.00	0.20	99.95	166.59	199.91	66.64
401	D	6664.1	D	DS Poor	75	57	91	209.92	42.58	320.73	3031.58	849.86	1.00	0.20	1999.23	3332.05	3998.46	1332.82
		25486.2						0.940	0.995	0.966	0.584	0.898			0.300	0.500	0.600	0.273

SINGLE AREA UNIT HYDROGRAPH

Node	Subarea	Area (acres)	Soil Type	Land Use	Curve Number CN			Low Loss Fraction (1-Y)					A_p	F_p	Maximum Loss Rate (F_m)			
								Storm Event (Year)										
								EV		HC								
								100	10	2	25	100			Storm Event (Year)			
					AMC			P24 (Inches)							EV			HC
					II	I	III	1.03	1.81	2.53	4.49	3.62			> 5	5	2	All
501	E	9614.27	B	DS Fair	72	53	89	596.18	2.53	246.01	3882.05	880.45	1.00	0.30	2884.28	4807.14	5768.56	2884.28
501	E	2011.73	B	DS Poor	56	36	76	816.80	211.23	49.92	354.18	0.13	1.00	0.30	603.52	1005.87	1207.04	603.52
501	E	698.19	D	DS Fair	86	72	97	9.04	80.02	145.94	465.57	226.86	1.00	0.20	209.46	349.10	418.91	139.64
501	E	2890.32	D	DS Poor	75	57	91	91.04	18.47	139.10	1314.84	368.60	1.00	0.20	867.10	1445.16	1734.19	578.06
		15214.5						0.901	0.979	0.962	0.605	0.903			0.300	0.500	0.600	0.276

Unit Distribution Graph 100-yr 1-hr - Existing Condition

Effective Rainfall

Time (min)	Unit graph	unit num	
15.00	3179.867	1	2.9
30.00	3179.867	2	5.9
45.00	3179.867	3	8.9
60.00	5859.461	4	12.6
75.00	5203.419	5	17.5
90.00	5391.98	6	22.7
105.00	7154.702	7	29.5
120.00	8271.12	8	37.5
135.00	10010.35	9	47.2
150.00	11447.52	10	58.3
165.00	13058.49	11	71.1
180.00	13079.2	12	89.5
195.00	15004.82	13	111.6
210.00	19618.81	14	139.3
225.00	19618.81	15	167.5
240.00	19618.81	16	195.9
255.00	22793.04	17	219.4
270.00	21869.41	18	242.5
285.00	17079.67	19	263.2
300.00	19079.7	20	284.2
315.00	16009.52	21	302.8
330.00	14309.4	22	320.1
345.00	13734.76	23	337.2
360.00	13447.52	24	352.5
375.00	13447.52	25	368.1
390.00	11166.43	26	373.5
405.00	9559.602	27	379.0
420.00	8277.727	28	384.7
435.00	7464.737	29	390.6
450.00	7154.702	30	396.8
465.00	7154.702	31	403.2
480.00	6900.759	32	410.0
495.00	6319.735	33	416.8
510.00	6097.788	34	423.9
525.00	5723.761	35	431.4
540.00	5327.998	36	439.3
555.00	5203.419	37	447.5
570.00	5093.721	38	456.0
585.00	4402.893	39	465.0
600.00	4402.893	40	474.3
615.00	4248.573	41	484.2
630.00	4088.401	42	494.5
645.00	4088.401	43	505.3
660.00	3913.746	44	516.7
675.00	3815.841	45	528.9
690.00	3815.841	46	541.7
705.00	3442.314	47	555.3
720.00	3179.867	48	569.7
735.00	3179.867	49	585.9
750.00	3179.867	50	603.2
765.00	2646.128	51	621.7
780.00	2601.71	52	641.7
795.00	2601.71	53	663.7
810.00	2601.71	54	687.4
825.00	2462.854	55	713.8
840.00	2289.504	56	742.8
855.00	2289.504	57	797.5
870.00	2289.504	58	856.3
885.00	2289.504	59	919.9
900.00	2153.795	60	995.3
915.00	1907.92	61	1088.3
930.00	1907.92	62	1183.4
945.00	1907.92	63	1305.1
960.00	1907.92	64	1485.4
975.00	1907.92	65	2058.8
990.00	1828.831	66	2222.2
1005.00	1589.934	67	2413.0
1020.00	1589.934	68	2745.7
1035.00	1589.934	69	3160.3
1050.00	1589.934	70	3489.5
1065.00	1589.934	71	4025.5
1080.00	1589.934	72	4484.8
1095.00	1589.934	73	4963.6
1110.00	1351.709	74	5398.5
1125.00	1331.107	75	5868.0
1140.00	1331.107	76	6875.3
1155.00	1331.107	77	7528.6
1170.00	1331.107	78	8360.4
1185.00	1331.107	79	8335.0
1200.00	1331.107	80	8138.2
1215.00	1331.107	81	7174.0
1230.00	1258.108	82	6712.2
1245.00	894.3377	83	6000.8
1260.00	894.3377	84	5619.6
1275.00	894.3377	85	4887.9
1290.00	894.3377	86	4344.9
1305.00	894.3377	87	3974.1
1320.00	894.3377	88	3382.8
1335.00	894.3377	89	2967.7
1350.00	894.3377	90	1216.7
1365.00	894.3377	91	1011.3
1380.00	894.3377	92	842.4
1395.00	894.3377	93	696.0
1410.00	894.3377	94	643.7
1425.00	839.8078	95	600.1
1440.00	502.0843	96	563.4
1455.00	502.0843	97	528.6
1470.00	502.0843	98	500.4
1485.00	502.0843	99	475.2
1500.00	502.0843	100	451.8
1515.00	502.0843	101	429.2
1530.00	502.0843	102	408.3
1545.00	502.0843	103	387.3
1560.00	502.0843	104	366.6
1575.00	502.0843	105	345.6
1590.00	502.0843	106	324.3
1605.00	502.0843	107	302.7
1620.00	502.0843	108	276.5
1635.00	502.0843	109	248.1
1650.00	502.0843	110	215.3
1665.00	502.0843	111	183.5
1680.00	502.0843	112	152.6
1695.00	502.0843	113	127.9
1710.00	502.0843	114	104.6
1725.00	502.0843	115	84.6
1740.00	502.0843	116	65.2
1755.00	502.0843	117	49.0
1770.00	502.0843	118	34.9
1785.00	300.7218	119	21.6
1800.00	286.1881	120	10.7
1815.00	286.1881	121	0.0
1830.00	286.1881	122	0.0
1845.00	286.1881	123	0.0
1860.00	286.1881	124	0.0
1875.00	286.1881	125	0.0
1890.00	286.1881	126	0.0
1905.00	286.1881	127	0.0
1920.00	286.1881	128	0.0
1935.00	286.1881	129	0.0
1950.00	286.1881	130	0.0
1965.00	286.1881	131	0.0
1980.00	286.1881	132	0.0
1995.00	286.1881	133	0.0
2010.00	286.1881	134	0.0
2025.00	286.1881	135	0.0
2040.00	286.1881	136	0.0
2055.00	286.1881	137	0.0
2070.00	286.1881	138	0.0
2085.00	286.1881	139	0.0
2100.00	286.1881	140	0.0
2115.00	286.1881	141	0.0
2130.00	286.1881	142	0.0
2145.00	286.1881	143	0.0
2160.00	286.1881	144	0.0
2175.00	286.1881	145	0.0
2190.00	286.1881	146	0.0
2205.00	286.1881	147	0.0
2220.00	286.1881	148	0.0
2235.00	286.1881	149	0.0
2250.00	286.1881	150	0.0
2265.00	286.1881	151	0.0
2280.00	286.1881	152	0.0
2295.00	286.1881	153	0.0
2310.00	286.1881	154	0.0
2325.00	286.1881	155	0.0
2340.00	286.1881	156	0.0
2355.00	286.1881	157	0.0
2370.00	286.1881	158	0.0
2385.00	223.28	159	0.0
2400.00	0	160	0.0
2415.00	0	161	0.0
2430.00	0	162	0.0
2445.00	0	163	0.0
2460.00	0	164	0.0
2475.00	0	165	0.0
2490.00	0	166	0.0
2505.00	0	167	0.0
2520.00	0	168	0.0
2535.00	0	169	0.0

8360.4

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             F L O O D   R O U T I N G   A N A L Y S I S
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                          Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED B - REGIONAL                                                   *
* 2022-09-26                                                               *
 **************************************************************************

  FILE NAME: 87_RG1_B.DAT
  TIME/DATE OF STUDY: 11:32 09/26/2022


****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =   93958.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =   55562.000 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =    1181.900 FEET
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BASIN FACTOR = 0.050

WATERSHED AREA =   15703.500 ACRES

BASEFLOW =   0.000 CFS/SQUARE-MILE

WATERCOURSE "LAG" TIME =    3.949 HOURS

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.289

LOW LOSS FRACTION = 0.908

*HYDROGRAPH MODEL #3 SPECIFIED*


SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.50

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  1.22

SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.65

SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  2.25

SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.57

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  3.53


PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

  5-MINUTE FACTOR = 0.575

 30-MINUTE FACTOR = 0.599

  1-HOUR FACTOR = 0.609

  3-HOUR FACTOR = 0.912

  6-HOUR FACTOR = 0.959

 24-HOUR FACTOR = 0.974


UNIT HYDROGRAPH TIME UNIT =  15.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME =   6.331



***> NOTE: RATIO OF (AREA IN SQUARE FEET) / (WATERCOURSE LENGTH SQUARED)

    IS NOT BETWEEN [.10] AND [1.0]



============================================================================

                      UNIT HYDROGRAPH DETERMINATION
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INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.279	176.341
2	0.836	352.786
3	1.659	521.078
4	2.723	673.719
5	4.065	849.574
6	5.637	994.955
7	7.527	1196.257
8	9.664	1352.964
9	12.940	2073.921
10	17.012	2577.511
11	22.570	3518.468
12	29.040	4096.020
13	34.840	3671.980
14	40.238	3416.791
15	44.750	2856.815
16	48.786	2554.906
17	52.319	2236.236
18	55.588	2069.633
19	58.275	1700.576
20	60.691	1529.544
21	62.792	1330.360
22	64.755	1242.842
23	66.505	1107.794
24	68.170	1053.498
25	69.726	984.997
26	71.231	953.015
27	72.554	837.303
28	73.810	795.405
29	74.956	725.199
30	76.066	702.982
31	77.139	679.404
32	78.184	661.239

33	79.060	554.308
34	79.895	528.971
35	80.731	529.072
36	81.550	518.717
37	82.256	447.039
38	82.940	432.689
39	83.624	432.882
40	84.298	426.633
41	84.914	390.308
42	85.522	384.841
43	86.130	384.739
44	86.722	374.684
45	87.238	326.739
46	87.744	320.586
47	88.251	320.682
48	88.733	305.449
49	89.123	246.666
50	89.503	240.218
51	89.883	240.609
52	90.257	236.900
53	90.613	225.376
54	90.967	224.401
55	91.322	224.401
56	91.663	216.195
57	91.969	193.741
58	92.273	192.370
59	92.577	192.370
60	92.874	187.685
61	93.153	176.745
62	93.431	176.354
63	93.710	176.359
64	93.967	162.879
65	94.184	136.905
66	94.399	136.320
67	94.614	136.320
68	94.829	136.122

69	95.045	136.320
70	95.260	136.320
71	95.475	136.320
72	95.669	122.647
73	95.834	104.294
74	95.998	104.091
75	96.163	104.294
76	96.327	104.091
77	96.492	104.294
78	96.657	104.289
79	96.822	104.289
80	96.959	87.105
81	97.073	72.258
82	97.187	72.263
83	97.301	71.872
84	97.416	72.649
85	97.529	71.872
86	97.643	71.872
87	97.757	72.258
88	97.840	52.340
89	97.903	39.846
90	97.966	40.232
91	98.030	40.227
92	98.093	39.846
93	98.156	40.232
94	98.219	39.841
95	98.283	40.623
96	98.355	45.308
97	98.431	48.433
98	98.507	48.047
99	98.583	48.042
100	98.659	48.042
101	98.735	48.047
102	98.811	48.042
103	98.887	48.438
104	98.963	47.650

105	99.039	48.438
106	99.114	47.650
107	99.190	47.650
108	99.265	47.650
109	99.340	47.650
110	99.415	47.650
111	99.491	47.650
112	99.566	47.650
113	99.641	47.650
114	99.717	47.650
115	99.792	47.650
116	99.867	47.650
117	99.942	47.650
118	100.000	36.474

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0087	0.0079	0.0008
2	0.0088	0.0080	0.0008
3	0.0089	0.0081	0.0008
4	0.0090	0.0082	0.0008
5	0.0091	0.0083	0.0008
6	0.0092	0.0084	0.0008
7	0.0093	0.0085	0.0009
8	0.0095	0.0086	0.0009
9	0.0096	0.0087	0.0009
10	0.0097	0.0088	0.0009
11	0.0099	0.0090	0.0009
12	0.0100	0.0091	0.0009
13	0.0102	0.0092	0.0009
14	0.0103	0.0094	0.0009
15	0.0105	0.0095	0.0010
16	0.0106	0.0096	0.0010
17	0.0108	0.0098	0.0010
18	0.0110	0.0100	0.0010
19	0.0112	0.0101	0.0010
20	0.0113	0.0103	0.0010
21	0.0115	0.0105	0.0011
22	0.0117	0.0107	0.0011
23	0.0120	0.0109	0.0011
24	0.0122	0.0111	0.0011
25	0.0124	0.0113	0.0011
26	0.0127	0.0115	0.0012
27	0.0129	0.0117	0.0012
28	0.0132	0.0120	0.0012
29	0.0135	0.0122	0.0012
30	0.0137	0.0125	0.0013
31	0.0141	0.0128	0.0013

32	0.0144	0.0131	0.0013
33	0.0147	0.0134	0.0014
34	0.0151	0.0137	0.0014
35	0.0155	0.0141	0.0014
36	0.0159	0.0144	0.0015
37	0.0163	0.0148	0.0015
38	0.0168	0.0152	0.0015
39	0.0173	0.0157	0.0016
40	0.0178	0.0162	0.0016
41	0.0184	0.0167	0.0017
42	0.0190	0.0172	0.0017
43	0.0197	0.0179	0.0018
44	0.0204	0.0185	0.0019
45	0.0212	0.0192	0.0019
46	0.0220	0.0200	0.0020
47	0.0230	0.0209	0.0021
48	0.0240	0.0218	0.0022
49	0.0277	0.0251	0.0025
50	0.0290	0.0263	0.0027
51	0.0306	0.0278	0.0028
52	0.0323	0.0293	0.0030
53	0.0344	0.0312	0.0032
54	0.0367	0.0333	0.0034
55	0.0396	0.0359	0.0036
56	0.0428	0.0388	0.0039
57	0.1132	0.0723	0.0409
58	0.1187	0.0723	0.0464
59	0.1260	0.0723	0.0537
60	0.1346	0.0723	0.0624
61	0.1472	0.0723	0.0750
62	0.1328	0.0723	0.0605
63	0.1616	0.0723	0.0893
64	0.2939	0.0723	0.2217
65	0.4246	0.0723	0.3524
66	0.1469	0.0723	0.0747
67	0.1335	0.0723	0.0612

68	0.1179	0.0723	0.0457
69	0.0423	0.0384	0.0039
70	0.0364	0.0330	0.0033
71	0.0321	0.0291	0.0029
72	0.0288	0.0262	0.0026
73	0.0239	0.0217	0.0022
74	0.0219	0.0199	0.0020
75	0.0203	0.0184	0.0019
76	0.0189	0.0172	0.0017
77	0.0177	0.0161	0.0016
78	0.0167	0.0152	0.0015
79	0.0158	0.0144	0.0015
80	0.0150	0.0137	0.0014
81	0.0143	0.0130	0.0013
82	0.0137	0.0124	0.0013
83	0.0131	0.0119	0.0012
84	0.0126	0.0115	0.0012
85	0.0121	0.0110	0.0011
86	0.0117	0.0106	0.0011
87	0.0113	0.0103	0.0010
88	0.0109	0.0099	0.0010
89	0.0106	0.0096	0.0010
90	0.0103	0.0093	0.0009
91	0.0100	0.0091	0.0009
92	0.0097	0.0088	0.0009
93	0.0094	0.0086	0.0009
94	0.0092	0.0084	0.0008
95	0.0090	0.0081	0.0008
96	0.0088	0.0079	0.0008

TOTAL STORM RAINFALL(INCHES) = 3.44

TOTAL SOIL-LOSS(INCHES) = 2.13

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.31

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 2784.4031

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) =   1715.6550

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

==

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	1000.0	2000.0	3000.0	4000.0
0.083	0.0010	0.14	Q	.	.	.	.
0.167	0.0019	0.14	Q	.	.	.	.
0.250	0.0029	0.14	Q	.	.	.	.
0.333	0.0058	0.42	Q	.	.	.	.
0.417	0.0087	0.42	Q	.	.	.	.
0.500	0.0117	0.42	Q	.	.	.	.
0.583	0.0175	0.84	Q	.	.	.	.
0.667	0.0233	0.84	Q	.	.	.	.
0.750	0.0291	0.84	Q	.	.	.	.
0.833	0.0387	1.39	Q	.	.	.	.
0.917	0.0483	1.39	Q	.	.	.	.
1.000	0.0578	1.39	Q	.	.	.	.
1.083	0.0722	2.09	Q	.	.	.	.
1.167	0.0866	2.09	Q	.	.	.	.
1.250	0.1009	2.09	Q	.	.	.	.
1.333	0.1209	2.90	Q	.	.	.	.
1.417	0.1409	2.90	Q	.	.	.	.
1.500	0.1610	2.90	Q	.	.	.	.
1.583	0.1878	3.89	Q	.	.	.	.
1.667	0.2146	3.89	Q	.	.	.	.
1.750	0.2414	3.89	Q	.	.	.	.
1.833	0.2760	5.02	Q	.	.	.	.
1.917	0.3106	5.02	Q	.	.	.	.
2.000	0.3452	5.02	Q	.	.	.	.
2.083	0.3916	6.74	Q	.	.	.	.

2.167	0.4380	6.74	Q	.	.	.	.
2.250	0.4844	6.74	Q	.	.	.	.
2.333	0.5455	8.88	Q	.	.	.	.
2.417	0.6067	8.88	Q	.	.	.	.
2.500	0.6678	8.88	Q	.	.	.	.
2.583	0.7491	11.80	Q	.	.	.	.
2.667	0.8303	11.80	Q	.	.	.	.
2.750	0.9115	11.80	Q	.	.	.	.
2.833	1.0163	15.21	Q	.	.	.	.
2.917	1.1211	15.21	Q	.	.	.	.
3.000	1.2258	15.21	Q	.	.	.	.
3.083	1.3521	18.33	Q	.	.	.	.
3.167	1.4783	18.33	Q	.	.	.	.
3.250	1.6046	18.33	Q	.	.	.	.
3.333	1.7512	21.29	Q	.	.	.	.
3.417	1.8978	21.29	Q	.	.	.	.
3.500	2.0444	21.29	Q	.	.	.	.
3.583	2.2086	23.84	Q	.	.	.	.
3.667	2.3729	23.84	Q	.	.	.	.
3.750	2.5371	23.84	Q	.	.	.	.
3.833	2.7174	26.19	Q	.	.	.	.
3.917	2.8978	26.19	Q	.	.	.	.
4.000	3.0782	26.19	Q	.	.	.	.
4.083	3.2732	28.32	Q	.	.	.	.
4.167	3.4683	28.32	Q	.	.	.	.
4.250	3.6633	28.32	Q	.	.	.	.
4.333	3.8723	30.35	Q	.	.	.	.
4.417	4.0813	30.35	Q	.	.	.	.
4.500	4.2903	30.35	Q	.	.	.	.
4.583	4.5114	32.11	Q	.	.	.	.
4.667	4.7326	32.11	Q	.	.	.	.
4.750	4.9537	32.11	Q	.	.	.	.
4.833	5.1863	33.77	Q	.	.	.	.
4.917	5.4189	33.77	Q	.	.	.	.
5.000	5.6515	33.77	Q	.	.	.	.
5.083	5.8946	35.30	Q	.	.	.	.

5.167	6.1377	35.30	Q	.	.	.	.
5.250	6.3808	35.30	Q	.	.	.	.
5.333	6.6342	36.79	Q	.	.	.	.
5.417	6.8875	36.79	Q	.	.	.	.
5.500	7.1409	36.79	Q	.	.	.	.
5.583	7.4039	38.20	Q	.	.	.	.
5.667	7.6670	38.20	Q	.	.	.	.
5.750	7.9300	38.20	Q	.	.	.	.
5.833	8.2027	39.59	Q	.	.	.	.
5.917	8.4753	39.59	Q	.	.	.	.
6.000	8.7480	39.59	Q	.	.	.	.
6.083	9.0300	40.96	Q	.	.	.	.
6.167	9.3121	40.96	Q	.	.	.	.
6.250	9.5942	40.96	Q	.	.	.	.
6.333	9.8857	42.33	Q	.	.	.	.
6.417	10.1773	42.33	Q	.	.	.	.
6.500	10.4688	42.33	Q	.	.	.	.
6.583	10.7693	43.64	Q	.	.	.	.
6.667	11.0699	43.64	Q	.	.	.	.
6.750	11.3705	43.64	Q	.	.	.	.
6.833	11.6801	44.95	Q	.	.	.	.
6.917	11.9896	44.95	Q	.	.	.	.
7.000	12.2992	44.95	Q	.	.	.	.
7.083	12.6177	46.24	Q	.	.	.	.
7.167	12.9361	46.24	Q	.	.	.	.
7.250	13.2546	46.24	Q	.	.	.	.
7.333	13.5820	47.54	Q	.	.	.	.
7.417	13.9094	47.54	Q	.	.	.	.
7.500	14.2368	47.54	Q	.	.	.	.
7.583	14.5733	48.86	Q	.	.	.	.
7.667	14.9098	48.86	Q	.	.	.	.
7.750	15.2463	48.86	Q	.	.	.	.
7.833	15.5921	50.20	Q	.	.	.	.
7.917	15.9378	50.20	Q	.	.	.	.
8.000	16.2836	50.20	Q	.	.	.	.
8.083	16.6383	51.50	Q	.	.	.	.

8.167	16.9929	51.50	Q	.	.	.	.
8.250	17.3476	51.50	Q	.	.	.	.
8.333	17.7114	52.82	Q	.	.	.	.
8.417	18.0751	52.82	Q	.	.	.	.
8.500	18.4388	52.82	Q	.	.	.	.
8.583	18.8119	54.18	Q	.	.	.	.
8.667	19.1851	54.18	Q	.	.	.	.
8.750	19.5582	54.18	Q	.	.	.	.
8.833	19.9409	55.57	Q	.	.	.	.
8.917	20.3236	55.57	Q	.	.	.	.
9.000	20.7063	55.57	Q	.	.	.	.
9.083	21.0986	56.96	Q	.	.	.	.
9.167	21.4909	56.96	Q	.	.	.	.
9.250	21.8832	56.96	Q	.	.	.	.
9.333	22.2853	58.39	Q	.	.	.	.
9.417	22.6874	58.39	Q	.	.	.	.
9.500	23.0896	58.39	Q	.	.	.	.
9.583	23.5019	59.87	Q	.	.	.	.
9.667	23.9142	59.87	Q	.	.	.	.
9.750	24.3266	59.87	Q	.	.	.	.
9.833	24.7495	61.41	Q	.	.	.	.
9.917	25.1724	61.41	Q	.	.	.	.
10.000	25.5953	61.41	Q	.	.	.	.
10.083	26.0290	62.98	Q	.	.	.	.
10.167	26.4628	62.98	Q	.	.	.	.
10.250	26.8965	62.98	Q	.	.	.	.
10.333	27.3415	64.61	Q	.	.	.	.
10.417	27.7865	64.61	Q	.	.	.	.
10.500	28.2314	64.61	Q	.	.	.	.
10.583	28.6882	66.32	Q	.	.	.	.
10.667	29.1449	66.32	Q	.	.	.	.
10.750	29.6017	66.32	Q	.	.	.	.
10.833	30.0707	68.10	Q	.	.	.	.
10.917	30.5396	68.10	Q	.	.	.	.
11.000	31.0086	68.10	Q	.	.	.	.
11.083	31.4902	69.92	Q	.	.	.	.

11.167	31.9718	69.92	Q	.	.	.	.
11.250	32.4533	69.92	Q	.	.	.	.
11.333	32.9481	71.84	Q	.	.	.	.
11.417	33.4429	71.84	Q	.	.	.	.
11.500	33.9376	71.84	Q	.	.	.	.
11.583	34.4463	73.86	Q	.	.	.	.
11.667	34.9550	73.86	Q	.	.	.	.
11.750	35.4636	73.86	Q	.	.	.	.
11.833	35.9869	75.98	Q	.	.	.	.
11.917	36.5102	75.98	Q	.	.	.	.
12.000	37.0334	75.98	Q	.	.	.	.
12.083	37.5721	78.22	Q	.	.	.	.
12.167	38.1108	78.22	Q	.	.	.	.
12.250	38.6495	78.22	Q	.	.	.	.
12.333	39.2048	80.63	Q	.	.	.	.
12.417	39.7601	80.63	Q	.	.	.	.
12.500	40.3154	80.63	Q	.	.	.	.
12.583	40.8886	83.24	Q	.	.	.	.
12.667	41.4619	83.24	Q	.	.	.	.
12.750	42.0352	83.24	Q	.	.	.	.
12.833	42.6278	86.06	Q	.	.	.	.
12.917	43.2205	86.06	QV	.	.	.	.
13.000	43.8132	86.06	QV	.	.	.	.
13.083	44.4269	89.11	QV	.	.	.	.
13.167	45.0406	89.11	QV	.	.	.	.
13.250	45.6543	89.11	QV	.	.	.	.
13.333	46.2909	92.43	QV	.	.	.	.
13.417	46.9274	92.43	QV	.	.	.	.
13.500	47.5640	92.43	QV	.	.	.	.
13.583	48.2255	96.06	QV	.	.	.	.
13.667	48.8871	96.06	QV	.	.	.	.
13.750	49.5486	96.06	QV	.	.	.	.
13.833	50.2376	100.03	.Q	.	.	.	.
13.917	50.9265	100.03	.Q	.	.	.	.
14.000	51.6154	100.03	.Q	.	.	.	.
14.083	52.3797	110.98	.Q	.	.	.	.

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14.167     53.1440    110.98  .Q        .         .         .         .
14.250     53.9083    110.98  .Q        .         .         .         .
14.333     54.8024    129.83  .Q        .         .         .         .
14.417     55.6966    129.83  .Q        .         .         .         .
14.500     56.5907    129.83  .Q        .         .         .         .
14.583     57.6766    157.67  .Q        .         .         .         .
14.667     58.7625    157.67  .Q        .         .         .         .
14.750     59.8484    157.67  .Q        .         .         .         .
14.833     61.1937    195.33  .Q        .         .         .         .
14.917     62.5390    195.33  .Q        .         .         .         .
15.000     63.8843    195.33  .Q        .         .         .         .
15.083     65.5751    245.51  .VQ       .         .         .         .
15.167     67.2660    245.51  .VQ       .         .         .         .
15.250     68.9569    245.51  .VQ       .         .         .         .
15.333     71.0542    304.53  .V Q      .         .         .         .
15.417     73.1515    304.53  .V Q      .         .         .         .
15.500     75.2488    304.53  .V Q      .         .         .         .
15.583     77.8604    379.21  .V Q      .         .         .         .
15.667     80.4721    379.21  .V Q      .         .         .         .
15.750     83.0838    379.21  .V Q      .         .         .         .
15.833     86.4690    491.53  . V Q     .         .         .         .
15.917     89.8542    491.53  . V Q     .         .         .         .
16.000     93.2394    491.53  . V Q     .         .         .         .
16.083     97.9597    685.39  . V   Q   .         .         .         .
16.167    102.6801    685.39  . V   Q   .         .         .         .
16.250    107.4004    685.39  . V   Q   .         .         .         .
16.333    113.6314    904.74  . V      Q.         .         .         .
16.417    119.8624    904.74  . V      Q.         .         .         .
16.500    126.0934    904.74  . V      Q.         .         .         .
16.583    134.1111   1164.18  .  V      .Q        .         .         .
16.667    142.1289   1164.18  .  V      .Q        .         .         .
16.750    150.1467   1164.18  .  V      .Q        .         .         .
16.833    160.1611   1454.09  .  V      .   Q     .         .         .
16.917    170.1755   1454.09  .  V      .   Q     .         .         .
17.000    180.1898   1454.09  .   V     .   Q     .         .         .
17.083    192.1887   1742.23  .   V     .      Q  .         .         .
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17.167    204.1875   1742.23  .   V     .      Q  .         .         .
17.250    216.1863   1742.23  .    V    .      Q  .         .         .
17.333    230.0672   2015.50  .    V    .         Q         .         .
17.417    243.9481   2015.50  .    V    .         Q         .         .
17.500    257.8289   2015.50  .     V   .         Q         .         .
17.583    273.5880   2288.21  .     V   .         . Q       .         .
17.667    289.3470   2288.21  .     V   .         . Q       .         .
17.750    305.1060   2288.21  .      V  .         . Q       .         .
17.833    322.9959   2597.63  .      V  .         .    Q    .         .
17.917    340.8859   2597.63  .      V  .         .    Q    .         .
18.000    358.7759   2597.63  .       V .         .    Q    .         .
18.083    379.4724   3005.14  .       V .         .         Q         .
18.167    400.1690   3005.14  .        V.         .         Q         .
18.250    420.8655   3005.14  .        V.         .         Q         .
18.333    444.2501   3395.44  .         V         .         .  Q      .
18.417    467.6347   3395.44  .         V         .         .  Q      .
18.500    491.0193   3395.44  .          V        .         .  Q      .
18.583    517.1149   3789.09  .         . V       .         .      Q  .
18.667    543.2106   3789.09  .         . V       .         .      Q  .
18.750    569.3063   3789.09  .         .  V      .         .      Q  .
18.833    596.1678   3900.29  .         .  V      .         .        Q.
18.917    623.0292   3900.29  .         .   V     .         .        Q.
19.000    649.8907   3900.29  .         .    V    .         .        Q.
19.083    675.2523   3682.50  .         .    V    .         .     Q   .
19.167    700.6138   3682.50  .         .     V   .         .     Q   .
19.250    725.9754   3682.50  .         .     V   .         .     Q   .
19.333    749.5000   3415.77  .         .      V  .         .   Q     .
19.417    773.0246   3415.77  .         .       V .         .   Q     .
19.500    796.5492   3415.77  .         .       V .         .   Q     .
19.583    817.5093   3043.40  .         .        V.         Q         .
19.667    838.4694   3043.40  .         .        V.         Q         .
19.750    859.4294   3043.40  .         .         V         Q         .
19.833    878.1818   2722.84  .         .         V      Q  .         .
19.917    896.9341   2722.84  .         .         V      Q  .         .
20.000    915.6864   2722.84  .         .          V     Q  .         .
20.083    932.4559   2434.93  .         .         .V  Q     .         .
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20.167    949.2253   2434.93  .         .         . V Q     .         .
20.250    965.9948   2434.93  .         .         . V Q     .         .
20.333    981.0167   2181.18  .         .         .QV       .         .
20.417    996.0386   2181.18  .         .         .Q V      .         .
20.500   1011.0605   2181.18  .         .         .Q V      .         .
20.583   1024.3037   1922.91  .         .        Q.  V      .         .
20.667   1037.5469   1922.91  .         .        Q.   V     .         .
20.750   1050.7900   1922.91  .         .        Q.   V     .         .
20.833   1062.7303   1733.73  .         .      Q  .   V     .         .
20.917   1074.6707   1733.73  .         .      Q  .    V    .         .
21.000   1086.6110   1733.73  .         .      Q  .    V    .         .
21.083   1097.4062   1567.48  .         .    Q    .    V    .         .
21.167   1108.2015   1567.48  .         .    Q    .    V    .         .
21.250   1118.9968   1567.48  .         .    Q    .     V   .         .
21.333   1128.9067   1438.93  .         .   Q     .     V   .         .
21.417   1138.8167   1438.93  .         .   Q     .     V   .         .
21.500   1148.7266   1438.93  .         .   Q     .     V   .         .
21.583   1157.8589   1326.01  .         .  Q      .     V   .         .
21.667   1166.9912   1326.01  .         .  Q      .      V  .         .
21.750   1176.1235   1326.01  .         .  Q      .      V  .         .
21.833   1184.6967   1244.81  .         . Q       .      V  .         .
21.917   1193.2698   1244.81  .         . Q       .      V  .         .
22.000   1201.8429   1244.81  .         . Q       .       V .         .
22.083   1209.8958   1169.28  .         .Q        .       V .         .
22.167   1217.9486   1169.28  .         .Q        .       V .         .
22.250   1226.0015   1169.28  .         .Q        .       V .         .
22.333   1233.5618   1097.75  .         Q         .       V .         .
22.417   1241.1221   1097.75  .         Q         .       V .         .
22.500   1248.6824   1097.75  .         Q         .        V.         .
22.583   1255.7009   1019.09  .         Q         .        V.         .
22.667   1262.7195   1019.09  .         Q         .        V.         .
22.750   1269.7380   1019.09  .         Q         .        V.         .
22.833   1276.3481    959.80  .        Q.         .        V.         .
22.917   1282.9583    959.80  .        Q.         .        V.         .
23.000   1289.5684    959.80  .        Q.         .         V         .
23.083   1295.7700    900.49  .        Q.         .         V         .
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23.166   1301.9717    900.49  .        Q.         .         V         .
23.250   1308.1733    900.49  .        Q.         .         V         .
23.333   1314.0842    858.26  .       Q .         .         V         .
23.416   1319.9951    858.26  .       Q .         .         V         .
23.500   1325.9060    858.26  .       Q .         .         V         .
23.583   1331.5530    819.93  .       Q .         .         .V        .
23.666   1337.2000    819.93  .       Q .         .         .V        .
23.750   1342.8469    819.93  .       Q .         .         .V        .
23.833   1348.1715    773.13  .      Q  .         .         .V        .
23.916   1353.4961    773.13  .      Q  .         .         .V        .
24.000   1358.8207    773.13  .      Q  .         .         .V        .
24.083   1363.7477    715.41  .      Q  .         .         .V        .
24.166   1368.6747    715.41  .      Q  .         .         .V        .
24.250   1373.6017    715.41  .      Q  .         .         . V       .
24.333   1378.3246    685.76  .     Q   .         .         . V       .
24.416   1383.0475    685.76  .     Q   .         .         . V       .
24.500   1387.7704    685.76  .     Q   .         .         . V       .
24.583   1392.3317    662.30  .     Q   .         .         . V       .
24.666   1396.8929    662.30  .     Q   .         .         . V       .
24.750   1401.4542    662.30  .     Q   .         .         . V       .
24.833   1405.7898    629.52  .     Q   .         .         . V       .
24.916   1410.1254    629.52  .     Q   .         .         . V       .
25.000   1414.4609    629.52  .     Q   .         .         . V       .
25.083   1418.5309    590.95  .    Q    .         .         .  V      .
25.166   1422.6008    590.95  .    Q    .         .         .  V      .
25.250   1426.6708    590.95  .    Q    .         .         .  V      .
25.333   1430.6058    571.38  .    Q    .         .         .  V      .
25.416   1434.5409    571.38  .    Q    .         .         .  V      .
25.500   1438.4760    571.38  .    Q    .         .         .  V      .
25.583   1442.2958    554.64  .    Q    .         .         .  V      .
25.666   1446.1156    554.64  .    Q    .         .         .  V      .
25.750   1449.9354    554.64  .    Q    .         .         .  V      .
25.833   1453.6038    532.64  .    Q    .         .         .  V      .
25.916   1457.2721    532.64  .    Q    .         .         .  V      .
26.000   1460.9404    532.64  .    Q    .         .         .   V     .
26.083   1464.4315    506.90  .    Q    .         .         .   V     .
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26.166	1467.9226	506.90	.	Q	.	.	.	V	.
26.250	1471.4137	506.90	.	Q	.	.	.	V	.
26.333	1474.7926	490.61	.	Q	.	.	.	V	.
26.416	1478.1715	490.61	.	Q	.	.	.	V	.
26.500	1481.5504	490.61	.	Q	.	.	.	V	.
26.583	1484.8052	472.59	.	Q	.	.	.	V	.
26.666	1488.0599	472.59	.	Q	.	.	.	V	.
26.750	1491.3147	472.59	.	Q	.	.	.	V	.
26.833	1494.3894	446.44	.	Q	.	.	.	V	.
26.916	1497.4641	446.44	.	Q	.	.	.	V	.
27.000	1500.5388	446.44	.	Q	.	.	.	V	.
27.083	1503.4111	417.07	.	Q	.	.	.	V	.
27.166	1506.2834	417.07	.	Q	.	.	.	V	.
27.250	1509.1558	417.07	.	Q	.	.	.	V	.
27.333	1511.9182	401.11	.	Q	.	.	.	V	.
27.416	1514.6807	401.11	.	Q	.	.	.	V	.
27.500	1517.4431	401.11	.	Q	.	.	.	V	.
27.583	1520.0911	384.49	.	Q	.	.	.	V	.
27.666	1522.7390	384.49	.	Q	.	.	.	V	.
27.750	1525.3870	384.49	.	Q	.	.	.	V	.
27.833	1527.8594	358.99	.	Q	.	.	.	V	.
27.916	1530.3318	358.99	.	Q	.	.	.	V	.
28.000	1532.8042	358.99	.	Q	.	.	.	V	.
28.083	1535.0813	330.64	.	Q	.	.	.	V	.
28.166	1537.3584	330.64	.	Q	.	.	.	V	.
28.250	1539.6355	330.64	.	Q	.	.	.	V	.
28.333	1541.8278	318.31	.	Q	.	.	.	V	.
28.416	1544.0200	318.31	.	Q	.	.	.	V	.
28.500	1546.2123	318.31	.	Q	.	.	.	V	.
28.583	1548.3346	308.15	.	Q	.	.	.	V	.
28.666	1550.4569	308.15	.	Q	.	.	.	V	.
28.750	1552.5792	308.15	.	Q	.	.	.	V	.
28.833	1554.6260	297.19	.	Q	.	.	.	V	.
28.916	1556.6727	297.19	.	Q	.	.	.	V	.
29.000	1558.7195	297.19	.	Q	.	.	.	V	.
29.083	1560.7015	287.79	.	Q	.	.	.	V	.

29.166	1562.6836	287.79	. Q	.	.	.	V	.
29.250	1564.6656	287.79	. Q	.	.	.	V	.
29.333	1566.6068	281.86	. Q	.	.	.	V	.
29.416	1568.5480	281.86	. Q	.	.	.	V	.
29.500	1570.4891	281.86	. Q	.	.	.	V	.
29.583	1572.3810	274.70	. Q	.	.	.	V	.
29.666	1574.2728	274.70	. Q	.	.	.	V	.
29.750	1576.1647	274.70	. Q	.	.	.	V	.
29.833	1577.9775	263.22	. Q	.	.	.	V	.
29.916	1579.7904	263.22	. Q	.	.	.	V	.
30.000	1581.6033	263.22	. Q	.	.	.	V	.
30.083	1583.3278	250.40	. Q	.	.	.	V	.
30.166	1585.0522	250.40	. Q	.	.	.	V	.
30.250	1586.7767	250.40	. Q	.	.	.	V	.
30.333	1588.4545	243.61	. Q	.	.	.	V	.
30.416	1590.1322	243.61	. Q	.	.	.	V	.
30.500	1591.8099	243.61	. Q	.	.	.	V	.
30.583	1593.4388	236.51	. Q	.	.	.	V	.
30.666	1595.0677	236.51	. Q	.	.	.	V	.
30.750	1596.6967	236.51	. Q	.	.	.	V	.
30.833	1598.2648	227.70	. Q	.	.	.	V	.
30.916	1599.8329	227.70	. Q	.	.	.	V	.
31.000	1601.4010	227.70	. Q	.	.	.	V	.
31.083	1602.9135	219.61	. Q	.	.	.	V	.
31.166	1604.4259	219.61	. Q	.	.	.	V	.
31.250	1605.9384	219.61	. Q	.	.	.	V	.
31.333	1607.4167	214.66	. Q	.	.	.	V	.
31.416	1608.8951	214.66	. Q	.	.	.	V	.
31.500	1610.3735	214.66	. Q	.	.	.	V	.
31.583	1611.8030	207.55	. Q	.	.	.	V	.
31.666	1613.2324	207.55	. Q	.	.	.	V	.
31.750	1614.6619	207.55	. Q	.	.	.	V	.
31.833	1616.0056	195.12	.Q	.	.	.	V	.
31.916	1617.3494	195.12	.Q	.	.	.	V	.
32.000	1618.6931	195.12	.Q	.	.	.	V	.
32.083	1619.9519	182.77	.Q	.	.	.	V	.

32.166	1621.2107	182.77	.Q	.	.	.	V	.
32.250	1622.4695	182.77	.Q	.	.	.	V	.
32.333	1623.6925	177.59	.Q	.	.	.	V	.
32.416	1624.9155	177.59	.Q	.	.	.	V	.
32.500	1626.1385	177.59	.Q	.	.	.	V	.
32.583	1627.3291	172.87	.Q	.	.	.	V	.
32.666	1628.5197	172.87	.Q	.	.	.	V	.
32.750	1629.7102	172.87	.Q	.	.	.	V	.
32.833	1630.8728	168.81	.Q	.	.	.	V	.
32.916	1632.0354	168.81	.Q	.	.	.	V	.
33.000	1633.1980	168.81	.Q	.	.	.	V	.
33.083	1634.3411	165.97	.Q	.	.	.	V	.
33.166	1635.4841	165.97	.Q	.	.	.	V	.
33.250	1636.6272	165.97	.Q	.	.	.	V	.
33.333	1637.7499	163.00	.Q	.	.	.	V	.
33.416	1638.8726	163.00	.Q	.	.	.	V	.
33.500	1639.9952	163.00	.Q	.	.	.	V	.
33.583	1641.0814	157.72	.Q	.	.	.	V	.
33.666	1642.1676	157.72	.Q	.	.	.	V	.
33.750	1643.2538	157.72	.Q	.	.	.	V	.
33.833	1644.2703	147.60	.Q	.	.	.	V	.
33.916	1645.2867	147.60	.Q	.	.	.	V	.
34.000	1646.3032	147.60	.Q	.	.	.	V	.
34.083	1647.2554	138.25	.Q	.	.	.	V	.
34.166	1648.2075	138.25	.Q	.	.	.	V	.
34.250	1649.1597	138.25	.Q	.	.	.	V	.
34.333	1650.0824	133.98	.Q	.	.	.	V	.
34.416	1651.0051	133.98	.Q	.	.	.	V	.
34.500	1651.9279	133.98	.Q	.	.	.	V	.
34.583	1652.8230	129.97	.Q	.	.	.	V	.
34.666	1653.7181	129.97	.Q	.	.	.	V	.
34.750	1654.6133	129.97	.Q	.	.	.	V	.
34.833	1655.4843	126.46	.Q	.	.	.	V	.
34.916	1656.3552	126.46	.Q	.	.	.	V	.
35.000	1657.2262	126.46	.Q	.	.	.	V	.
35.083	1658.0793	123.88	.Q	.	.	.	V	.

```
   35.166   1658.9325    123.88  .Q         .         .         .       V .
   35.250   1659.7856    123.88  .Q         .         .         .       V .
   35.333   1660.6189    120.98  .Q         .         .         .       V .
   35.416   1661.4521    120.98  .Q         .         .         .       V .
   35.500   1662.2854    120.98  .Q         .         .         .       V .
   35.583   1663.0802    115.40  .Q         .         .         .       V .
   35.666   1663.8750    115.40  .Q         .         .         .       V .
   35.750   1664.6698    115.40  .Q         .         .         .       V .
   35.833   1665.3923    104.92  .Q         .         .         .       V .
   35.916   1666.1149    104.92  .Q         .         .         .       V .
   36.000   1666.8374    104.92  .Q         .         .         .       V .
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
              0%                              2175.0
             10%                               705.0
             20%                               450.0
             30%                               315.0
             40%                               255.0
             50%                               195.0
             60%                               150.0
             70%                               105.0
             80%                                75.0
             90%                                45.0
 ============================================================================

   END OF FLOODSCx ROUTING ANALYSIS
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              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
         (c) Copyright 1989-2015 Advanced Engineering Software (aes)
            Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                         Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED C - REGIONAL                                                   *
* 2022-09-26                                                               *
 **************************************************************************

  FILE NAME: 87_RG1_C.DAT
  TIME/DATE OF STUDY: 11:32 09/26/2022


****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =   92833.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =   50115.000 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =    1234.300 FEET
```

```
BASIN FACTOR = 0.050

WATERSHED AREA =   13679.300 ACRES

BASEFLOW =   0.000 CFS/SQUARE-MILE

WATERCOURSE "LAG" TIME =    3.740 HOURS

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.290

LOW LOSS FRACTION = 0.918

*HYDROGRAPH MODEL #3 SPECIFIED*


SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.50

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  1.21

SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.64

SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  2.26

SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.58

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  3.51


PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

  5-MINUTE FACTOR = 0.609

 30-MINUTE FACTOR = 0.627

  1-HOUR FACTOR = 0.634

  3-HOUR FACTOR = 0.922

  6-HOUR FACTOR = 0.963

 24-HOUR FACTOR = 0.977


UNIT HYDROGRAPH TIME UNIT =  15.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME =   6.684



***> NOTE: RATIO OF (AREA IN SQUARE FEET) / (WATERCOURSE LENGTH SQUARED)

    IS NOT BETWEEN [.10] AND [1.0]



============================================================================

                      UNIT HYDROGRAPH DETERMINATION
```

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.294	162.184
2	0.887	326.858
3	1.807	507.635
4	2.948	629.206
5	4.460	833.363
6	6.162	938.774
7	8.298	1178.112
8	10.819	1389.840
9	14.862	2229.816
10	19.682	2657.752
11	26.369	3687.597
12	32.873	3586.297
13	38.621	3170.255
14	43.746	2825.910
15	48.029	2361.958
16	51.875	2120.764
17	55.338	1909.552
18	58.218	1588.336
19	60.763	1403.536
20	62.967	1215.175
21	65.023	1133.741
22	66.840	1001.916
23	68.579	959.297
24	70.199	893.232
25	71.740	849.607
26	73.090	744.347
27	74.373	707.492
28	75.552	650.245
29	76.704	635.423
30	77.826	618.909
31	78.811	542.809
32	79.693	486.538

33	80.575	486.538
34	81.449	481.540
35	82.206	417.414
36	82.927	397.993
37	83.649	398.237
38	84.357	390.100
39	85.005	357.469
40	85.647	353.927
41	86.289	353.843
42	86.891	332.096
43	87.427	295.514
44	87.961	294.870
45	88.495	294.387
46	88.948	249.677
47	89.349	221.392
48	89.750	220.912
49	90.150	220.268
50	90.529	209.308
51	90.903	206.250
52	91.278	206.570
53	91.641	200.288
54	91.966	179.017
55	92.286	176.762
56	92.607	177.085
57	92.917	170.796
58	93.211	162.423
59	93.505	162.099
60	93.799	161.775
61	94.050	138.413
62	94.277	125.198
63	94.504	125.522
64	94.731	125.198
65	94.959	125.362
66	95.186	125.198
67	95.413	125.522
68	95.628	118.433

69	95.805	97.321
70	95.979	96.034
71	96.152	95.714
72	96.326	95.714
73	96.500	96.034
74	96.674	95.710
75	96.847	95.390
76	96.984	75.734
77	97.104	66.385
78	97.225	66.385
79	97.345	66.385
80	97.466	66.390
81	97.585	66.062
82	97.706	66.385
83	97.813	58.977
84	97.882	38.025
85	97.948	36.737
86	98.015	37.061
87	98.082	36.737
88	98.149	36.742
89	98.216	37.057
90	98.283	37.061
91	98.359	41.895
92	98.440	44.470
93	98.519	43.831
94	98.600	44.470
95	98.681	44.474
96	98.760	43.826
97	98.840	44.150
98	98.921	44.470
99	99.001	44.150
100	99.081	44.150
101	99.161	44.150
102	99.241	44.150
103	99.321	44.150
104	99.401	44.150

105	99.481	44.150
106	99.561	44.150
107	99.641	44.150
108	99.721	44.150
109	99.801	44.150
110	99.881	44.150
111	99.962	44.150
112	100.000	21.221

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0083	0.0077	0.0007
2	0.0084	0.0078	0.0007
3	0.0086	0.0079	0.0007
4	0.0087	0.0079	0.0007
5	0.0088	0.0081	0.0007
6	0.0089	0.0082	0.0007
7	0.0090	0.0083	0.0007
8	0.0091	0.0084	0.0007
9	0.0093	0.0085	0.0008
10	0.0094	0.0086	0.0008
11	0.0095	0.0087	0.0008
12	0.0097	0.0089	0.0008
13	0.0098	0.0090	0.0008
14	0.0099	0.0091	0.0008
15	0.0101	0.0093	0.0008
16	0.0103	0.0094	0.0008
17	0.0104	0.0096	0.0009
18	0.0106	0.0097	0.0009
19	0.0108	0.0099	0.0009
20	0.0110	0.0101	0.0009
21	0.0112	0.0102	0.0009
22	0.0113	0.0104	0.0009
23	0.0116	0.0106	0.0009
24	0.0118	0.0108	0.0010
25	0.0120	0.0110	0.0010
26	0.0122	0.0112	0.0010
27	0.0125	0.0115	0.0010
28	0.0127	0.0117	0.0010
29	0.0130	0.0120	0.0011
30	0.0133	0.0122	0.0011
31	0.0136	0.0125	0.0011

32	0.0139	0.0128	0.0011
33	0.0143	0.0131	0.0012
34	0.0146	0.0134	0.0012
35	0.0150	0.0138	0.0012
36	0.0154	0.0141	0.0013
37	0.0158	0.0145	0.0013
38	0.0163	0.0149	0.0013
39	0.0168	0.0154	0.0014
40	0.0173	0.0159	0.0014
41	0.0179	0.0164	0.0015
42	0.0184	0.0169	0.0015
43	0.0191	0.0176	0.0016
44	0.0198	0.0182	0.0016
45	0.0206	0.0189	0.0017
46	0.0214	0.0197	0.0018
47	0.0224	0.0205	0.0018
48	0.0234	0.0215	0.0019
49	0.0267	0.0245	0.0022
50	0.0280	0.0257	0.0023
51	0.0296	0.0272	0.0024
52	0.0312	0.0287	0.0026
53	0.0333	0.0306	0.0027
54	0.0355	0.0326	0.0029
55	0.0384	0.0352	0.0031
56	0.0415	0.0381	0.0034
57	0.1121	0.0725	0.0396
58	0.1179	0.0725	0.0454
59	0.1255	0.0725	0.0530
60	0.1345	0.0725	0.0620
61	0.1477	0.0725	0.0752
62	0.1352	0.0725	0.0627
63	0.1658	0.0725	0.0933
64	0.3029	0.0725	0.2304
65	0.4432	0.0725	0.3707
66	0.1487	0.0725	0.0762
67	0.1333	0.0725	0.0608

68	0.1171	0.0725	0.0446
69	0.0411	0.0377	0.0034
70	0.0352	0.0323	0.0029
71	0.0310	0.0285	0.0025
72	0.0278	0.0255	0.0023
73	0.0232	0.0213	0.0019
74	0.0213	0.0196	0.0017
75	0.0197	0.0181	0.0016
76	0.0184	0.0169	0.0015
77	0.0172	0.0158	0.0014
78	0.0162	0.0149	0.0013
79	0.0153	0.0141	0.0013
80	0.0146	0.0134	0.0012
81	0.0139	0.0127	0.0011
82	0.0133	0.0122	0.0011
83	0.0127	0.0117	0.0010
84	0.0122	0.0112	0.0010
85	0.0117	0.0108	0.0010
86	0.0113	0.0104	0.0009
87	0.0109	0.0100	0.0009
88	0.0106	0.0097	0.0009
89	0.0102	0.0094	0.0008
90	0.0099	0.0091	0.0008
91	0.0096	0.0088	0.0008
92	0.0094	0.0086	0.0008
93	0.0091	0.0084	0.0007
94	0.0089	0.0081	0.0007
95	0.0086	0.0079	0.0007
96	0.0084	0.0077	0.0007

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.10

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.32

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 2398.5869

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) =   1508.6803

```
============================================================================

                          2 4 - H O U R   S T O R M
                       R U N O F F   H Y D R O G R A P H

============================================================================
                 HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      925.0    1850.0    2775.0    3700.0
----------------------------------------------------------------------------
   0.083      0.0008      0.11  Q         .         .         .         .
   0.167      0.0015      0.11  Q         .         .         .         .
   0.250      0.0023      0.11  Q         .         .         .         .
   0.333      0.0046      0.34  Q         .         .         .         .
   0.417      0.0069      0.34  Q         .         .         .         .
   0.500      0.0092      0.34  Q         .         .         .         .
   0.583      0.0140      0.69  Q         .         .         .         .
   0.667      0.0187      0.69  Q         .         .         .         .
   0.750      0.0234      0.69  Q         .         .         .         .
   0.833      0.0312      1.13  Q         .         .         .         .
   0.917      0.0390      1.13  Q         .         .         .         .
   1.000      0.0467      1.13  Q         .         .         .         .
   1.083      0.0585      1.71  Q         .         .         .         .
   1.167      0.0703      1.71  Q         .         .         .         .
   1.250      0.0821      1.71  Q         .         .         .         .
   1.333      0.0984      2.37  Q         .         .         .         .
   1.417      0.1148      2.37  Q         .         .         .         .
   1.500      0.1311      2.37  Q         .         .         .         .
   1.583      0.1533      3.21  Q         .         .         .         .
   1.667      0.1754      3.21  Q         .         .         .         .
   1.750      0.1975      3.21  Q         .         .         .         .
   1.833      0.2264      4.20  Q         .         .         .         .
   1.917      0.2554      4.20  Q         .         .         .         .
   2.000      0.2843      4.20  Q         .         .         .         .
   2.083      0.3241      5.78  Q         .         .         .         .
```

2.167	0.3640	5.78	Q	.	.	.	.
2.250	0.4038	5.78	Q	.	.	.	.
2.333	0.4567	7.67	Q	.	.	.	.
2.417	0.5095	7.67	Q	.	.	.	.
2.500	0.5624	7.67	Q	.	.	.	.
2.583	0.6333	10.30	Q	.	.	.	.
2.667	0.7042	10.30	Q	.	.	.	.
2.750	0.7751	10.30	Q	.	.	.	.
2.833	0.8638	12.88	Q	.	.	.	.
2.917	0.9526	12.88	Q	.	.	.	.
3.000	1.0413	12.88	Q	.	.	.	.
3.083	1.1461	15.22	Q	.	.	.	.
3.167	1.2509	15.22	Q	.	.	.	.
3.250	1.3557	15.22	Q	.	.	.	.
3.333	1.4752	17.35	Q	.	.	.	.
3.417	1.5947	17.35	Q	.	.	.	.
3.500	1.7142	17.35	Q	.	.	.	.
3.583	1.8464	19.19	Q	.	.	.	.
3.667	1.9786	19.19	Q	.	.	.	.
3.750	2.1108	19.19	Q	.	.	.	.
3.833	2.2547	20.90	Q	.	.	.	.
3.917	2.3986	20.90	Q	.	.	.	.
4.000	2.5426	20.90	Q	.	.	.	.
4.083	2.6974	22.49	Q	.	.	.	.
4.167	2.8523	22.49	Q	.	.	.	.
4.250	3.0072	22.49	Q	.	.	.	.
4.333	3.1716	23.88	Q	.	.	.	.
4.417	3.3360	23.88	Q	.	.	.	.
4.500	3.5005	23.88	Q	.	.	.	.
4.583	3.6738	25.17	Q	.	.	.	.
4.667	3.8471	25.17	Q	.	.	.	.
4.750	4.0204	25.17	Q	.	.	.	.
4.833	4.2019	26.35	Q	.	.	.	.
4.917	4.3833	26.35	Q	.	.	.	.
5.000	4.5648	26.35	Q	.	.	.	.
5.083	4.7541	27.49	Q	.	.	.	.

5.167	4.9435	27.49	Q	.	.	.	.
5.250	5.1328	27.49	Q	.	.	.	.
5.333	5.3296	28.57	Q	.	.	.	.
5.417	5.5264	28.57	Q	.	.	.	.
5.500	5.7232	28.57	Q	.	.	.	.
5.583	5.9274	29.64	Q	.	.	.	.
5.667	6.1315	29.64	Q	.	.	.	.
5.750	6.3357	29.64	Q	.	.	.	.
5.833	6.5471	30.69	Q	.	.	.	.
5.917	6.7585	30.69	Q	.	.	.	.
6.000	6.9699	30.69	Q	.	.	.	.
6.083	7.1884	31.74	Q	.	.	.	.
6.167	7.4070	31.74	Q	.	.	.	.
6.250	7.6255	31.74	Q	.	.	.	.
6.333	7.8509	32.73	Q	.	.	.	.
6.417	8.0763	32.73	Q	.	.	.	.
6.500	8.3017	32.73	Q	.	.	.	.
6.583	8.5340	33.72	Q	.	.	.	.
6.667	8.7662	33.72	Q	.	.	.	.
6.750	8.9984	33.72	Q	.	.	.	.
6.833	9.2374	34.70	Q	.	.	.	.
6.917	9.4763	34.70	Q	.	.	.	.
7.000	9.7153	34.70	Q	.	.	.	.
7.083	9.9611	35.69	Q	.	.	.	.
7.167	10.2069	35.69	Q	.	.	.	.
7.250	10.4527	35.69	Q	.	.	.	.
7.333	10.7054	36.70	Q	.	.	.	.
7.417	10.9581	36.70	Q	.	.	.	.
7.500	11.2109	36.70	Q	.	.	.	.
7.583	11.4704	37.68	Q	.	.	.	.
7.667	11.7299	37.68	Q	.	.	.	.
7.750	11.9894	37.68	Q	.	.	.	.
7.833	12.2556	38.65	Q	.	.	.	.
7.917	12.5218	38.65	Q	.	.	.	.
8.000	12.7881	38.65	Q	.	.	.	.
8.083	13.0612	39.66	Q	.	.	.	.

8.167	13.3343	39.66	Q	.	.	.	.
8.250	13.6075	39.66	Q	.	.	.	.
8.333	13.8877	40.69	Q	.	.	.	.
8.417	14.1680	40.69	Q	.	.	.	.
8.500	14.4482	40.69	Q	.	.	.	.
8.583	14.7355	41.72	Q	.	.	.	.
8.667	15.0228	41.72	Q	.	.	.	.
8.750	15.3101	41.72	Q	.	.	.	.
8.833	15.6046	42.76	Q	.	.	.	.
8.917	15.8991	42.76	Q	.	.	.	.
9.000	16.1936	42.76	Q	.	.	.	.
9.083	16.4956	43.85	Q	.	.	.	.
9.167	16.7976	43.85	Q	.	.	.	.
9.250	17.0995	43.85	Q	.	.	.	.
9.333	17.4092	44.97	Q	.	.	.	.
9.417	17.7189	44.97	Q	.	.	.	.
9.500	18.0286	44.97	Q	.	.	.	.
9.583	18.3461	46.11	Q	.	.	.	.
9.667	18.6637	46.11	Q	.	.	.	.
9.750	18.9812	46.11	Q	.	.	.	.
9.833	19.3069	47.29	Q	.	.	.	.
9.917	19.6326	47.29	Q	.	.	.	.
10.000	19.9583	47.29	Q	.	.	.	.
10.083	20.2925	48.53	Q	.	.	.	.
10.167	20.6267	48.53	Q	.	.	.	.
10.250	20.9609	48.53	Q	.	.	.	.
10.333	21.3039	49.80	Q	.	.	.	.
10.417	21.6469	49.80	Q	.	.	.	.
10.500	21.9898	49.80	Q	.	.	.	.
10.583	22.3418	51.11	Q	.	.	.	.
10.667	22.6938	51.11	Q	.	.	.	.
10.750	23.0458	51.11	Q	.	.	.	.
10.833	23.4072	52.48	Q	.	.	.	.
10.917	23.7687	52.48	Q	.	.	.	.
11.000	24.1301	52.48	Q	.	.	.	.
11.083	24.5015	53.92	Q	.	.	.	.

11.167	24.8728	53.92	Q	.	.	.	.
11.250	25.2442	53.92	Q	.	.	.	.
11.333	25.6257	55.40	Q	.	.	.	.
11.417	26.0073	55.40	Q	.	.	.	.
11.500	26.3889	55.40	Q	.	.	.	.
11.583	26.7811	56.95	Q	.	.	.	.
11.667	27.1734	56.95	Q	.	.	.	.
11.750	27.5656	56.95	Q	.	.	.	.
11.833	27.9691	58.59	Q	.	.	.	.
11.917	28.3726	58.59	Q	.	.	.	.
12.000	28.7762	58.59	Q	.	.	.	.
12.083	29.1919	60.36	Q	.	.	.	.
12.167	29.6076	60.36	Q	.	.	.	.
12.250	30.0233	60.36	Q	.	.	.	.
12.333	30.4520	62.26	Q	.	.	.	.
12.417	30.8808	62.26	Q	.	.	.	.
12.500	31.3096	62.26	Q	.	.	.	.
12.583	31.7526	64.32	Q	.	.	.	.
12.667	32.1956	64.32	Q	.	.	.	.
12.750	32.6386	64.32	Q	.	.	.	.
12.833	33.0969	66.54	Q	.	.	.	.
12.917	33.5552	66.54	Q	.	.	.	.
13.000	34.0135	66.54	Q	.	.	.	.
13.083	34.4885	68.97	Q	.	.	.	.
13.167	34.9634	68.97	Q	.	.	.	.
13.250	35.4384	68.97	Q	.	.	.	.
13.333	35.9314	71.58	Q	.	.	.	.
13.417	36.4244	71.58	Q	.	.	.	.
13.500	36.9174	71.58	Q	.	.	.	.
13.583	37.4302	74.46	Q	.	.	.	.
13.667	37.9430	74.46	QV	.	.	.	.
13.750	38.4558	74.46	QV	.	.	.	.
13.833	38.9904	77.62	QV	.	.	.	.
13.917	39.5250	77.62	QV	.	.	.	.
14.000	40.0596	77.62	QV	.	.	.	.
14.083	40.6592	87.07	QV	.	.	.	.

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 14.167     41.2589     87.07  QV         .         .         .         .
 14.250     41.8585     87.07  QV         .         .         .         .
 14.333     42.5728    103.71  .Q         .         .         .         .
 14.417     43.2870    103.71  .Q         .         .         .         .
 14.500     44.0013    103.71  .Q         .         .         .         .
 14.583     44.8933    129.51  .Q         .         .         .         .
 14.667     45.7853    129.51  .Q         .         .         .         .
 14.750     46.6772    129.51  .Q         .         .         .         .
 14.833     47.8047    163.70  .Q         .         .         .         .
 14.917     48.9321    163.70  .Q         .         .         .         .
 15.000     50.0595    163.70  .Q         .         .         .         .
 15.083     51.5137    211.15  .VQ        .         .         .         .
 15.167     52.9679    211.15  .VQ        .         .         .         .
 15.250     54.4221    211.15  .VQ        .         .         .         .
 15.333     56.2572    266.46  .VQ        .         .         .         .
 15.417     58.0924    266.46  .VQ        .         .         .         .
 15.500     59.9275    266.46  .VQ        .         .         .         .
 15.583     62.2632    339.15  .V Q       .         .         .         .
 15.667     64.5990    339.15  .V Q       .         .         .         .
 15.750     66.9348    339.15  .V Q       .         .         .         .
 15.833     70.0361    450.31  .V  Q      .         .         .         .
 15.917     73.1374    450.31  .V  Q      .         .         .         .
 16.000     76.2387    450.31  . V Q      .         .         .         .
 16.083     80.7008    647.90  . V    Q   .         .         .         .
 16.167     85.1629    647.90  . V    Q   .         .         .         .
 16.250     89.6251    647.90  . V    Q   .         .         .         .
 16.333     95.6313    872.10  . V      Q.         .         .         .
 16.417    101.6375    872.10  . V      Q.         .         .         .
 16.500    107.6437    872.10  . V      Q.         .         .         .
 16.583    115.5158   1143.03  .  V       . Q       .         .         .
 16.667    123.3879   1143.03  .  V       . Q       .         .         .
 16.750    131.2601   1143.03  .  V       . Q       .         .         .
 16.833    141.0135   1416.20  .  V       .    Q    .         .         .
 16.917    150.7669   1416.20  .  V       .    Q    .         .         .
 17.000    160.5203   1416.20  .   V      .    Q    .         .         .
 17.083    172.2000   1695.89  .   V      .       Q .         .         .
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17.167    183.8797   1695.89  .   V     .       Q .         .         .
17.250    195.5593   1695.89  .    V    .       Q .         .         .
17.333    208.9635   1946.28  .    V    .         .Q        .         .
17.417    222.3676   1946.28  .    V    .         .Q        .         .
17.500    235.7717   1946.28  .     V   .         .Q        .         .
17.583    251.1044   2226.30  .     V   .         .   Q     .         .
17.667    266.4370   2226.30  .      V  .         .   Q     .         .
17.750    281.7697   2226.30  .      V  .         .   Q     .         .
17.833    299.3409   2551.34  .      V  .         .      Q  .         .
17.917    316.9121   2551.34  .       V .         .      Q  .         .
18.000    334.4833   2551.34  .       V .         .      Q  .         .
18.083    355.0608   2987.85  .        V.         .         . Q       .
18.167    375.6383   2987.85  .        V.         .         . Q       .
18.250    396.2158   2987.85  .         V         .         . Q       .
18.333    419.2522   3344.90  .         .V        .         .     Q   .
18.417    442.2887   3344.90  .         .V        .         .     Q   .
18.500    465.3252   3344.90  .         . V       .         .     Q   .
18.583    490.4837   3653.02  .         .  V      .         .        Q.
18.667    515.6423   3653.02  .         .  V      .         .        Q.
18.750    540.8008   3653.02  .         .   V     .         .        Q.
18.833    565.1608   3537.07  .         .   V     .         .       Q .
18.917    589.5208   3537.07  .         .    V    .         .       Q .
19.000    613.8808   3537.07  .         .     V   .         .       Q .
19.083    636.3682   3265.18  .         .     V   .         .    Q    .
19.167    658.8557   3265.18  .         .      V  .         .    Q    .
19.250    681.3431   3265.18  .         .       V .         .    Q    .
19.333    701.6806   2953.01  .         .       V .         .Q        .
19.417    722.0181   2953.01  .         .        V.         .Q        .
19.500    742.3557   2953.01  .         .        V.         .Q        .
19.583    760.2576   2599.36  .         .         V       Q .         .
19.667    778.1595   2599.36  .         .         V       Q .         .
19.750    796.0614   2599.36  .         .          V      Q .         .
19.833    812.0410   2320.24  .         .         .V   Q     .         .
19.917    828.0206   2320.24  .         .         .V   Q     .         .
20.000    844.0002   2320.24  .         .         . V  Q     .         .
20.083    858.1845   2059.56  .         .         . Q       .         .
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20.167    872.3688   2059.56  .         .         . QV      .         .
20.250    886.5530   2059.56  .         .         . QV      .         .
20.333    898.9784   1804.16  .         .        Q.  V      .         .
20.417    911.4037   1804.16  .         .        Q.   V     .         .
20.500    923.8291   1804.16  .         .        Q.   V     .         .
20.583    934.9393   1613.21  .         .      Q  .   V     .         .
20.667    946.0496   1613.21  .         .      Q  .    V    .         .
20.750    957.1598   1613.21  .         .      Q  .    V    .         .
20.833    967.1430   1449.56  .         .    Q    .    V    .         .
20.917    977.1262   1449.56  .         .    Q    .    V    .         .
21.000    987.1094   1449.56  .         .    Q    .     V   .         .
21.083    996.2393   1325.65  .         .   Q     .     V   .         .
21.167   1005.3691   1325.65  .         .   Q     .     V   .         .
21.250   1014.4989   1325.65  .         .   Q     .     V   .         .
21.333   1022.8760   1216.35  .         .  Q      .      V  .         .
21.417   1031.2531   1216.35  .         .  Q      .      V  .         .
21.500   1039.6301   1216.35  .         .  Q      .      V  .         .
21.583   1047.4749   1139.05  .         . Q       .      V  .         .
21.667   1055.3196   1139.05  .         . Q       .      V  .         .
21.750   1063.1643   1139.05  .         . Q       .       V .         .
21.833   1070.4934   1064.18  .         .Q        .       V .         .
21.917   1077.8225   1064.18  .         .Q        .       V .         .
22.000   1085.1516   1064.18  .         .Q        .       V .         .
22.083   1091.9902    992.98  .         Q         .       V .         .
22.167   1098.8289    992.98  .         Q         .        V.         .
22.250   1105.6675    992.98  .         Q         .        V.         .
22.333   1111.9973    919.09  .        Q.         .        V.         .
22.417   1118.3271    919.09  .        Q.         .        V.         .
22.500   1124.6570    919.09  .        Q.         .        V.         .
22.583   1130.5991    862.80  .        Q.         .        V.         .
22.667   1136.5413    862.80  .        Q.         .         V         .
22.750   1142.4834    862.80  .        Q.         .         V         .
22.833   1148.0698    811.15  .       Q .         .         V         .
22.917   1153.6562    811.15  .       Q .         .         V         .
23.000   1159.2427    811.15  .       Q .         .         V         .
23.083   1164.5731    773.98  .       Q .         .         V         .
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23.166   1169.9036    773.98  .       Q .         .          V        .
23.250   1175.2340    773.98  .       Q .         .          V        .
23.333   1180.2725    731.58  .      Q  .         .         .V        .
23.416   1185.3109    731.58  .      Q  .         .         .V        .
23.500   1190.3494    731.58  .      Q  .         .         .V        .
23.583   1195.0071    676.29  .      Q  .         .         .V        .
23.666   1199.6648    676.29  .      Q  .         .         .V        .
23.750   1204.3225    676.29  .      Q  .         .         .V        .
23.833   1208.7201    638.52  .     Q   .         .         . V       .
23.916   1213.1177    638.52  .     Q   .         .         . V       .
24.000   1217.5153    638.52  .     Q   .         .         . V       .
24.083   1221.7621    616.64  .     Q   .         .         . V       .
24.166   1226.0089    616.64  .     Q   .         .         . V       .
24.250   1230.2557    616.64  .     Q   .         .         . V       .
24.333   1234.2932    586.24  .     Q   .         .         . V       .
24.416   1238.3307    586.24  .     Q   .         .         . V       .
24.500   1242.3682    586.24  .     Q   .         .         . V       .
24.583   1246.1414    547.87  .    Q    .         .         .  V      .
24.666   1249.9146    547.87  .    Q    .         .         .  V      .
24.750   1253.6877    547.87  .    Q    .         .         .  V      .
24.833   1257.3229    527.83  .    Q    .         .         .  V      .
24.916   1260.9580    527.83  .    Q    .         .         .  V      .
25.000   1264.5931    527.83  .    Q    .         .         .  V      .
25.083   1268.1194    512.01  .    Q    .         .         .  V      .
25.166   1271.6456    512.01  .    Q    .         .         .  V      .
25.250   1275.1719    512.01  .    Q    .         .         .  V      .
25.333   1278.5447    489.73  .    Q    .         .         .  V      .
25.416   1281.9175    489.73  .    Q    .         .         .  V      .
25.500   1285.2903    489.73  .    Q    .         .         .   V     .
25.583   1288.5007    466.16  .    Q    .         .         .   V     .
25.666   1291.7112    466.16  .    Q    .         .         .   V     .
25.750   1294.9216    466.16  .    Q    .         .         .   V     .
25.833   1298.0336    451.85  .   Q     .         .         .   V     .
25.916   1301.1455    451.85  .   Q     .         .         .   V     .
26.000   1304.2574    451.85  .   Q     .         .         .   V     .
26.083   1307.2462    433.97  .   Q     .         .         .   V     .
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26.166   1310.2350    433.97  .   Q     .         .         .   V     .
26.250   1313.2238    433.97  .   Q     .         .         .   V     .
26.333   1316.0303    407.51  .   Q     .         .         .   V     .
26.416   1318.8368    407.51  .   Q     .         .         .   V     .
26.500   1321.6433    407.51  .   Q     .         .         .    V    .
26.583   1324.2812    383.03  .   Q     .         .         .    V    .
26.666   1326.9192    383.03  .   Q     .         .         .    V    .
26.750   1329.5571    383.03  .   Q     .         .         .    V    .
26.833   1332.0964    368.71  .  Q      .         .         .    V    .
26.916   1334.6357    368.71  .  Q      .         .         .    V    .
27.000   1337.1750    368.71  .  Q      .         .         .    V    .
27.083   1339.5750    348.46  .  Q      .         .         .    V    .
27.166   1341.9749    348.46  .  Q      .         .         .    V    .
27.250   1344.3748    348.46  .  Q      .         .         .    V    .
27.333   1346.5719    319.03  .  Q      .         .         .    V    .
27.416   1348.7690    319.03  .  Q      .         .         .    V    .
27.500   1350.9662    319.03  .  Q      .         .         .    V    .
27.583   1353.0355    300.47  .  Q      .         .         .    V    .
27.666   1355.1049    300.47  .  Q      .         .         .    V    .
27.750   1357.1742    300.47  .  Q      .         .         .    V    .
27.833   1359.1750    290.52  .  Q      .         .         .     V   .
27.916   1361.1759    290.52  .  Q      .         .         .     V   .
28.000   1363.1768    290.52  .  Q      .         .         .     V   .
28.083   1365.1042    279.87  .  Q      .         .         .     V   .
28.166   1367.0317    279.87  .  Q      .         .         .     V   .
28.250   1368.9592    279.87  .  Q      .         .         .     V   .
28.333   1370.8152    269.48  . Q       .         .         .     V   .
28.416   1372.6711    269.48  . Q       .         .         .     V   .
28.500   1374.5271    269.48  . Q       .         .         .     V   .
28.583   1376.3401    263.24  . Q       .         .         .     V   .
28.666   1378.1531    263.24  . Q       .         .         .     V   .
28.750   1379.9661    263.24  . Q       .         .         .     V   .
28.833   1381.7340    256.71  . Q       .         .         .     V   .
28.916   1383.5020    256.71  . Q       .         .         .     V   .
29.000   1385.2699    256.71  . Q       .         .         .     V   .
29.083   1386.9609    245.55  . Q       .         .         .     V   .
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29.166	1388.6520	245.55	. Q	.	.	.	V	.
29.250	1390.3430	245.55	. Q	.	.	.	V	.
29.333	1391.9473	232.94	. Q	.	.	.	V	.
29.416	1393.5515	232.94	. Q	.	.	.	V	.
29.500	1395.1558	232.94	. Q	.	.	.	V	.
29.583	1396.7141	226.26	. Q	.	.	.	V	.
29.666	1398.2725	226.26	. Q	.	.	.	V	.
29.750	1399.8308	226.26	. Q	.	.	.	V	.
29.833	1401.3416	219.35	. Q	.	.	.	V	.
29.916	1402.8523	219.35	. Q	.	.	.	V	.
30.000	1404.3630	219.35	. Q	.	.	.	V	.
30.083	1405.8134	210.58	. Q	.	.	.	V	.
30.166	1407.2637	210.58	. Q	.	.	.	V	.
30.250	1408.7140	210.58	. Q	.	.	.	V	.
30.333	1410.1157	203.54	. Q	.	.	.	V	.
30.416	1411.5175	203.54	. Q	.	.	.	V	.
30.500	1412.9192	203.54	. Q	.	.	.	V	.
30.583	1414.2867	198.57	. Q	.	.	.	V	.
30.666	1415.6543	198.57	. Q	.	.	.	V	.
30.750	1417.0219	198.57	. Q	.	.	.	V	.
30.833	1418.3308	190.06	. Q	.	.	.	V	.
30.916	1419.6398	190.06	. Q	.	.	.	V	.
31.000	1420.9487	190.06	. Q	.	.	.	V	.
31.083	1422.1621	176.19	.Q	.	.	.	V	.
31.166	1423.3755	176.19	.Q	.	.	.	V	.
31.250	1424.5889	176.19	.Q	.	.	.	V	.
31.333	1425.7428	167.54	.Q	.	.	.	V	.
31.416	1426.8967	167.54	.Q	.	.	.	V	.
31.500	1428.0507	167.54	.Q	.	.	.	V	.
31.583	1429.1732	163.00	.Q	.	.	.	V	.
31.666	1430.2958	163.00	.Q	.	.	.	V	.
31.750	1431.4183	163.00	.Q	.	.	.	V	.
31.833	1432.5112	158.69	.Q	.	.	.	V	.
31.916	1433.6041	158.69	.Q	.	.	.	V	.
32.000	1434.6970	158.69	.Q	.	.	.	V	.
32.083	1435.7677	155.47	.Q	.	.	.	V	.

32.166	1436.8384	155.47	.Q	.	.	.	V	.
32.250	1437.9091	155.47	.Q	.	.	.	V	.
32.333	1438.9614	152.80	.Q	.	.	.	V	.
32.416	1440.0138	152.80	.Q	.	.	.	V	.
32.500	1441.0662	152.80	.Q	.	.	.	V	.
32.583	1442.0900	148.66	.Q	.	.	.	V	.
32.666	1443.1138	148.66	.Q	.	.	.	V	.
32.750	1444.1376	148.66	.Q	.	.	.	V	.
32.833	1445.1006	139.82	.Q	.	.	.	V	.
32.916	1446.0636	139.82	.Q	.	.	.	V	.
33.000	1447.0266	139.82	.Q	.	.	.	V	.
33.083	1447.9183	129.48	.Q	.	.	.	V	.
33.166	1448.8101	129.48	.Q	.	.	.	V	.
33.250	1449.7018	129.48	.Q	.	.	.	V	.
33.333	1450.5630	125.05	.Q	.	.	.	V	.
33.416	1451.4242	125.05	.Q	.	.	.	V	.
33.500	1452.2854	125.05	.Q	.	.	.	V	.
33.583	1453.1199	121.16	.Q	.	.	.	V	.
33.666	1453.9543	121.16	.Q	.	.	.	V	.
33.750	1454.7888	121.16	.Q	.	.	.	V	.
33.833	1455.5996	117.73	.Q	.	.	.	V	.
33.916	1456.4104	117.73	.Q	.	.	.	V	.
34.000	1457.2212	117.73	.Q	.	.	.	V	.
34.083	1458.0153	115.30	.Q	.	.	.	V	.
34.166	1458.8093	115.30	.Q	.	.	.	V	.
34.250	1459.6034	115.30	.Q	.	.	.	V	.
34.333	1460.3767	112.29	.Q	.	.	.	V	.
34.416	1461.1500	112.29	.Q	.	.	.	V	.
34.500	1461.9233	112.29	.Q	.	.	.	V	.
34.583	1462.6543	106.14	.Q	.	.	.	V	.
34.666	1463.3853	106.14	.Q	.	.	.	V	.
34.750	1464.1162	106.14	.Q	.	.	.	V	.
34.833	1464.7722	95.25	.Q	.	.	.	V	.
34.916	1465.4282	95.25	.Q	.	.	.	V	.
35.000	1466.0842	95.25	.Q	.	.	.	V	.
35.083	1466.6946	88.62	Q	.	.	.	V	.

```
 35.166   1467.3049    88.62  Q         .         .         .       V .
 35.250   1467.9153    88.62  Q         .         .         .       V .
 35.333   1468.5000    84.90  Q         .         .         .       V .
 35.416   1469.0847    84.90  Q         .         .         .       V .
 35.500   1469.6694    84.90  Q         .         .         .       V .
 35.583   1470.2297    81.35  Q         .         .         .       V .
 35.666   1470.7900    81.35  Q         .         .         .       V .
 35.750   1471.3503    81.35  Q         .         .         .        V.
 35.833   1471.8914    78.55  Q         .         .         .        V.
 35.916   1472.4324    78.55  Q         .         .         .        V.
 36.000   1472.9734    78.55  Q         .         .         .        V.
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
              0%                             2175.0
             10%                              675.0
             20%                              435.0
             30%                              315.0
             40%                              225.0
             50%                              180.0
             60%                              150.0
             70%                              105.0
             80%                               90.0
             90%                               45.0
 ============================================================================


   END OF FLOODSCx ROUTING ANALYSIS
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             F L O O D   R O U T I N G   A N A L Y S I S
         USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
        (c) Copyright 1989-2015 Advanced Engineering Software (aes)
           Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                         Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED D - REGIONAL                                                   *
* 2022-09-26                                                               *
 **************************************************************************

  FILE NAME: 87_RG1_D.DAT
  TIME/DATE OF STUDY: 11:33 09/26/2022



****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =   91857.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =   51159.000 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =    2361.800 FEET
```

```
BASIN FACTOR = 0.050
WATERSHED AREA =   25486.199 ACRES
BASEFLOW =   0.000 CFS/SQUARE-MILE
WATERCOURSE "LAG" TIME =    3.312 HOURS
DESERT(UNDEVELOPED) S-GRAPH SELECTED
MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.273
LOW LOSS FRACTION = 0.898
*HYDROGRAPH MODEL #3 SPECIFIED*

SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.52
SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  1.25
SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.72
SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  2.35
SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.67
SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  3.63

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
  5-MINUTE FACTOR = 0.476
 30-MINUTE FACTOR = 0.511
  1-HOUR FACTOR = 0.531
  3-HOUR FACTOR = 0.865
  6-HOUR FACTOR = 0.940
 24-HOUR FACTOR = 0.963

UNIT HYDROGRAPH TIME UNIT =  15.000 MINUTES
UNIT INTERVAL PERCENTAGE OF LAG-TIME =   7.548



============================================================================
                      UNIT HYDROGRAPH DETERMINATION

----------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
----------------------------------------------------------------------------
```

1	0.332	341.201
2	1.032	719.078
3	2.170	1169.228
4	3.581	1449.471
5	5.424	1893.222
6	7.648	2285.546
7	10.346	2771.674
8	14.729	4503.140
9	20.309	5733.240
10	27.921	7820.771
11	34.938	7209.626
12	41.264	6499.168
13	46.381	5257.399
14	50.957	4700.621
15	54.905	4056.509
16	58.224	3409.892
17	61.070	2923.958
18	63.510	2507.508
19	65.754	2305.454
20	67.754	2054.605
21	69.635	1932.113
22	71.413	1826.763
23	72.965	1594.468
24	74.414	1489.243
25	75.745	1367.213
26	77.034	1324.807
27	78.268	1267.648
28	79.298	1058.147
29	80.294	1023.713
30	81.287	1020.264
31	82.162	898.625
32	82.977	837.477
33	83.792	837.469
34	84.572	801.459
35	85.298	745.484
36	86.022	744.292

37	86.728	724.751
38	87.343	631.958
39	87.947	620.530
40	88.546	615.349
41	89.041	508.596
42	89.494	465.272
43	89.947	465.264
44	90.386	451.437
45	90.809	434.427
46	91.232	434.419
47	91.642	421.666
48	92.009	376.728
49	92.371	372.213
50	92.732	370.880
51	93.071	348.023
52	93.403	341.635
53	93.735	340.843
54	94.029	302.285
55	94.286	263.743
56	94.542	263.469
57	94.799	263.735
58	95.056	263.743
59	95.312	263.735
60	95.564	258.954
61	95.773	213.757
62	95.969	201.529
63	96.165	201.787
64	96.361	201.262
65	96.558	202.062
66	96.754	201.521
67	96.932	183.445
68	97.070	141.446
69	97.207	140.372
70	97.342	138.781
71	97.478	140.380
72	97.613	138.781

73	97.750	139.847
74	97.847	100.498
75	97.923	77.633
76	97.999	77.633
77	98.074	77.633
78	98.150	77.633
79	98.225	77.100
80	98.302	79.757
81	98.391	91.460
82	98.481	92.518
83	98.572	93.584
84	98.663	92.526
85	98.754	93.584
86	98.844	92.518
87	98.935	93.584
88	99.025	92.526
89	99.115	92.526
90	99.205	92.526
91	99.295	92.526
92	99.385	92.526
93	99.475	92.526
94	99.565	92.526
95	99.655	92.526
96	99.745	92.526
97	99.835	92.526
98	99.925	92.526
99	100.000	76.677

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0087	0.0079	0.0009
2	0.0088	0.0079	0.0009
3	0.0090	0.0080	0.0009
4	0.0091	0.0081	0.0009
5	0.0092	0.0082	0.0009
6	0.0093	0.0084	0.0009
7	0.0094	0.0085	0.0010
8	0.0096	0.0086	0.0010
9	0.0097	0.0087	0.0010
10	0.0098	0.0088	0.0010
11	0.0100	0.0089	0.0010
12	0.0101	0.0091	0.0010
13	0.0103	0.0092	0.0010
14	0.0104	0.0093	0.0011
15	0.0106	0.0095	0.0011
16	0.0107	0.0096	0.0011
17	0.0109	0.0098	0.0011
18	0.0111	0.0099	0.0011
19	0.0113	0.0101	0.0011
20	0.0114	0.0103	0.0012
21	0.0117	0.0105	0.0012
22	0.0119	0.0106	0.0012
23	0.0121	0.0108	0.0012
24	0.0123	0.0110	0.0013
25	0.0125	0.0113	0.0013
26	0.0128	0.0115	0.0013
27	0.0130	0.0117	0.0013
28	0.0133	0.0119	0.0014
29	0.0136	0.0122	0.0014
30	0.0139	0.0125	0.0014
31	0.0142	0.0128	0.0014

32	0.0145	0.0130	0.0015
33	0.0149	0.0134	0.0015
34	0.0152	0.0137	0.0016
35	0.0157	0.0141	0.0016
36	0.0161	0.0144	0.0016
37	0.0165	0.0148	0.0017
38	0.0170	0.0152	0.0017
39	0.0175	0.0157	0.0018
40	0.0180	0.0162	0.0018
41	0.0186	0.0167	0.0019
42	0.0192	0.0172	0.0020
43	0.0199	0.0179	0.0020
44	0.0206	0.0185	0.0021
45	0.0214	0.0192	0.0022
46	0.0223	0.0200	0.0023
47	0.0233	0.0209	0.0024
48	0.0243	0.0218	0.0025
49	0.0323	0.0290	0.0033
50	0.0338	0.0304	0.0034
51	0.0356	0.0320	0.0036
52	0.0375	0.0336	0.0038
53	0.0398	0.0357	0.0041
54	0.0422	0.0379	0.0043
55	0.0454	0.0408	0.0046
56	0.0489	0.0439	0.0050
57	0.1254	0.0683	0.0571
58	0.1301	0.0683	0.0618
59	0.1362	0.0683	0.0680
60	0.1434	0.0683	0.0752
61	0.1537	0.0683	0.0854
62	0.1356	0.0683	0.0674
63	0.1547	0.0683	0.0864
64	0.2604	0.0683	0.1921
65	0.3719	0.0683	0.3037
66	0.1505	0.0683	0.0823
67	0.1424	0.0683	0.0742

68	0.1294	0.0683	0.0612
69	0.0484	0.0434	0.0049
70	0.0419	0.0376	0.0043
71	0.0372	0.0334	0.0038
72	0.0336	0.0302	0.0034
73	0.0241	0.0217	0.0025
74	0.0221	0.0199	0.0023
75	0.0205	0.0184	0.0021
76	0.0191	0.0172	0.0019
77	0.0179	0.0161	0.0018
78	0.0169	0.0152	0.0017
79	0.0160	0.0144	0.0016
80	0.0152	0.0136	0.0015
81	0.0145	0.0130	0.0015
82	0.0138	0.0124	0.0014
83	0.0133	0.0119	0.0014
84	0.0127	0.0114	0.0013
85	0.0123	0.0110	0.0013
86	0.0118	0.0106	0.0012
87	0.0114	0.0103	0.0012
88	0.0110	0.0099	0.0011
89	0.0107	0.0096	0.0011
90	0.0104	0.0093	0.0011
91	0.0101	0.0090	0.0010
92	0.0098	0.0088	0.0010
93	0.0095	0.0086	0.0010
94	0.0093	0.0083	0.0009
95	0.0091	0.0081	0.0009
96	0.0088	0.0079	0.0009

TOTAL STORM RAINFALL(INCHES) = 3.50

TOTAL SOIL-LOSS(INCHES) = 2.13

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.36

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 4528.2725

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 2895.4646

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

==

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	1775.0	3550.0	5325.0	7100.0
0.083	0.0021	0.30	Q	.	.	.	.
0.167	0.0042	0.30	Q	.	.	.	.
0.250	0.0063	0.30	Q	.	.	.	.
0.333	0.0128	0.95	Q	.	.	.	.
0.417	0.0194	0.95	Q	.	.	.	.
0.500	0.0259	0.95	Q	.	.	.	.
0.583	0.0397	2.00	Q	.	.	.	.
0.667	0.0535	2.00	Q	.	.	.	.
0.750	0.0673	2.00	Q	.	.	.	.
0.833	0.0902	3.32	Q	.	.	.	.
0.917	0.1130	3.32	Q	.	.	.	.
1.000	0.1359	3.32	Q	.	.	.	.
1.083	0.1707	5.05	Q	.	.	.	.
1.167	0.2054	5.05	Q	.	.	.	.
1.250	0.2402	5.05	Q	.	.	.	.
1.333	0.2895	7.15	Q	.	.	.	.
1.417	0.3387	7.15	Q	.	.	.	.
1.500	0.3880	7.15	Q	.	.	.	.
1.583	0.4548	9.71	Q	.	.	.	.
1.667	0.5217	9.71	Q	.	.	.	.
1.750	0.5886	9.71	Q	.	.	.	.
1.833	0.6840	13.85	Q	.	.	.	.
1.917	0.7793	13.85	Q	.	.	.	.
2.000	0.8747	13.85	Q	.	.	.	.
2.083	1.0065	19.13	Q	.	.	.	.

2.167	1.1383	19.13	Q	.	.	.	.
2.250	1.2700	19.13	Q	.	.	.	.
2.333	1.4515	26.35	Q	.	.	.	.
2.417	1.6330	26.35	Q	.	.	.	.
2.500	1.8144	26.35	Q	.	.	.	.
2.583	2.0425	33.11	Q	.	.	.	.
2.667	2.2705	33.11	Q	.	.	.	.
2.750	2.4985	33.11	Q	.	.	.	.
2.833	2.7694	39.33	Q	.	.	.	.
2.917	3.0402	39.33	Q	.	.	.	.
3.000	3.3111	39.33	Q	.	.	.	.
3.083	3.6177	44.52	Q	.	.	.	.
3.167	3.9243	44.52	Q	.	.	.	.
3.250	4.2309	44.52	Q	.	.	.	.
3.333	4.5703	49.29	Q	.	.	.	.
3.417	4.9097	49.29	Q	.	.	.	.
3.500	5.2492	49.29	Q	.	.	.	.
3.583	5.6180	53.55	Q	.	.	.	.
3.667	5.9867	53.55	Q	.	.	.	.
3.750	6.3555	53.55	Q	.	.	.	.
3.833	6.7501	57.30	Q	.	.	.	.
3.917	7.1447	57.30	Q	.	.	.	.
4.000	7.5393	57.30	Q	.	.	.	.
4.083	7.9572	60.67	Q	.	.	.	.
4.167	8.3750	60.67	Q	.	.	.	.
4.250	8.7928	60.67	Q	.	.	.	.
4.333	9.2317	63.73	Q	.	.	.	.
4.417	9.6706	63.73	Q	.	.	.	.
4.500	10.1096	63.73	Q	.	.	.	.
4.583	10.5687	66.66	Q	.	.	.	.
4.667	11.0278	66.66	Q	.	.	.	.
4.750	11.4869	66.66	Q	.	.	.	.
4.833	11.9650	69.42	Q	.	.	.	.
4.917	12.4431	69.42	Q	.	.	.	.
5.000	12.9213	69.42	Q	.	.	.	.
5.083	13.4180	72.13	Q	.	.	.	.

5.167	13.9148	72.13	Q	.	.	.	.
5.250	14.4115	72.13	Q	.	.	.	.
5.333	14.9267	74.80	Q	.	.	.	.
5.417	15.4418	74.80	Q	.	.	.	.
5.500	15.9569	74.80	Q	.	.	.	.
5.583	16.4894	77.31	Q	.	.	.	.
5.667	17.0218	77.31	Q	.	.	.	.
5.750	17.5542	77.31	Q	.	.	.	.
5.833	18.1037	79.79	Q	.	.	.	.
5.917	18.6532	79.79	Q	.	.	.	.
6.000	19.2027	79.79	Q	.	.	.	.
6.083	19.7689	82.21	Q	.	.	.	.
6.167	20.3351	82.21	Q	.	.	.	.
6.250	20.9013	82.21	Q	.	.	.	.
6.333	21.4843	84.65	Q	.	.	.	.
6.417	22.0673	84.65	Q	.	.	.	.
6.500	22.6503	84.65	Q	.	.	.	.
6.583	23.2502	87.11	Q	.	.	.	.
6.667	23.8501	87.11	Q	.	.	.	.
6.750	24.4500	87.11	Q	.	.	.	.
6.833	25.0660	89.44	Q	.	.	.	.
6.917	25.6819	89.44	Q	.	.	.	.
7.000	26.2979	89.44	Q	.	.	.	.
7.083	26.9301	91.80	Q	.	.	.	.
7.167	27.5623	91.80	Q	.	.	.	.
7.250	28.1946	91.80	Q	.	.	.	.
7.333	28.8435	94.23	Q	.	.	.	.
7.417	29.4925	94.23	Q	.	.	.	.
7.500	30.1414	94.23	Q	.	.	.	.
7.583	30.8068	96.62	Q	.	.	.	.
7.667	31.4722	96.62	Q	.	.	.	.
7.750	32.1376	96.62	Q	.	.	.	.
7.833	32.8197	99.03	Q	.	.	.	.
7.917	33.5017	99.03	Q	.	.	.	.
8.000	34.1837	99.03	Q	.	.	.	.
8.083	34.8828	101.52	Q	.	.	.	.

8.167	35.5820	101.52	Q	.	.	.	.
8.250	36.2811	101.52	Q	.	.	.	.
8.333	36.9978	104.06	Q	.	.	.	.
8.417	37.7144	104.06	Q	.	.	.	.
8.500	38.4310	104.06	Q	.	.	.	.
8.583	39.1654	106.63	Q	.	.	.	.
8.667	39.8998	106.63	Q	.	.	.	.
8.750	40.6342	106.63	Q	.	.	.	.
8.833	41.3870	109.30	Q	.	.	.	.
8.917	42.1398	109.30	Q	.	.	.	.
9.000	42.8925	109.30	Q	.	.	.	.
9.083	43.6643	112.05	Q	.	.	.	.
9.167	44.4360	112.05	Q	.	.	.	.
9.250	45.2077	112.05	Q	.	.	.	.
9.333	45.9986	114.83	Q	.	.	.	.
9.417	46.7894	114.83	Q	.	.	.	.
9.500	47.5803	114.83	Q	.	.	.	.
9.583	48.3910	117.71	Q	.	.	.	.
9.667	49.2017	117.71	Q	.	.	.	.
9.750	50.0124	117.71	Q	.	.	.	.
9.833	50.8437	120.71	Q	.	.	.	.
9.917	51.6750	120.71	Q	.	.	.	.
10.000	52.5064	120.71	Q	.	.	.	.
10.083	53.3586	123.74	Q	.	.	.	.
10.167	54.2109	123.74	Q	.	.	.	.
10.250	55.0631	123.74	Q	.	.	.	.
10.333	55.9370	126.88	Q	.	.	.	.
10.417	56.8108	126.88	Q	.	.	.	.
10.500	57.6847	126.88	Q	.	.	.	.
10.583	58.5812	130.17	Q	.	.	.	.
10.667	59.4777	130.17	Q	.	.	.	.
10.750	60.3742	130.17	Q	.	.	.	.
10.833	61.2945	133.62	Q	.	.	.	.
10.917	62.2148	133.62	Q	.	.	.	.
11.000	63.1350	133.62	Q	.	.	.	.
11.083	64.0802	137.24	Q	.	.	.	.

11.167	65.0254	137.24	Q	.	.	.	.
11.250	65.9705	137.24	Q	.	.	.	.
11.333	66.9419	141.05	Q	.	.	.	.
11.417	67.9134	141.05	Q	.	.	.	.
11.500	68.8848	141.05	Q	.	.	.	.
11.583	69.8840	145.08	Q	.	.	.	.
11.667	70.8831	145.08	Q	.	.	.	.
11.750	71.8823	145.08	Q	.	.	.	.
11.833	72.9106	149.31	QV	.	.	.	.
11.917	73.9388	149.31	QV	.	.	.	.
12.000	74.9671	149.31	QV	.	.	.	.
12.083	76.0280	154.04	QV	.	.	.	.
12.167	77.0889	154.04	QV	.	.	.	.
12.250	78.1497	154.04	QV	.	.	.	.
12.333	79.2471	159.35	QV	.	.	.	.
12.417	80.3446	159.35	QV	.	.	.	.
12.500	81.4420	159.35	QV	.	.	.	.
12.583	82.5804	165.30	QV	.	.	.	.
12.667	83.7188	165.30	QV	.	.	.	.
12.750	84.8573	165.30	QV	.	.	.	.
12.833	86.0409	171.86	QV	.	.	.	.
12.917	87.2244	171.86	QV	.	.	.	.
13.000	88.4080	171.86	QV	.	.	.	.
13.083	89.6422	179.19	.Q	.	.	.	.
13.167	90.8763	179.19	.Q	.	.	.	.
13.250	92.1104	179.19	.Q	.	.	.	.
13.333	93.4005	187.32	.Q	.	.	.	.
13.417	94.6906	187.32	.Q	.	.	.	.
13.500	95.9807	187.32	.Q	.	.	.	.
13.583	97.3332	196.39	.Q	.	.	.	.
13.667	98.6858	196.39	.Q	.	.	.	.
13.750	100.0384	196.39	.Q	.	.	.	.
13.833	101.4671	207.44	.Q	.	.	.	.
13.917	102.8957	207.44	.Q	.	.	.	.
14.000	104.3244	207.44	.Q	.	.	.	.
14.083	105.9629	237.91	.Q	.	.	.	.

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14.167    107.6014    237.91  .Q        .         .         .         .
14.250    109.2400    237.91  .Q        .         .         .         .
14.333    111.2506    291.94  .Q        .         .         .         .
14.417    113.2612    291.94  .Q        .         .         .         .
14.500    115.2718    291.94  .Q        .         .         .         .
14.583    117.8452    373.65  .VQ       .         .         .         .
14.667    120.4185    373.65  .VQ       .         .         .         .
14.750    122.9919    373.65  .VQ       .         .         .         .
14.833    126.2781    477.16  .VQ       .         .         .         .
14.917    129.5644    477.16  .VQ       .         .         .         .
15.000    132.8506    477.16  .VQ       .         .         .         .
15.083    137.0787    613.91  .V Q      .         .         .         .
15.167    141.3067    613.91  .V Q      .         .         .         .
15.250    145.5348    613.91  . VQ      .         .         .         .
15.333    150.8805    776.21  . V Q     .         .         .         .
15.417    156.2263    776.21  . V Q     .         .         .         .
15.500    161.5721    776.21  . V Q     .         .         .         .
15.583    168.2862    974.89  . V  Q    .         .         .         .
15.667    175.0003    974.89  . V  Q    .         .         .         .
15.750    181.7144    974.89  . V  Q    .         .         .         .
15.833    190.7323   1309.39  . V    Q  .         .         .         .
15.917    199.7501   1309.39  . V    Q  .         .         .         .
16.000    208.7679   1309.39  . V    Q  .         .         .         .
16.083    221.2145   1807.24  .  V      Q         .         .         .
16.167    233.6611   1807.24  .  V      Q         .         .         .
16.250    246.1076   1807.24  .  V      Q         .         .         .
16.333    262.9655   2447.76  .  V      .  Q      .         .         .
16.417    279.8233   2447.76  .  V      .  Q      .         .         .
16.500    296.6812   2447.76  .   V     .  Q      .         .         .
16.583    317.9240   3084.46  .   V     .      Q  .         .         .
16.667    339.1668   3084.46  .   V     .      Q  .         .         .
16.750    360.4097   3084.46  .   V     .      Q  .         .         .
16.833    385.8153   3688.90  .    V    .         Q         .         .
16.917    411.2209   3688.90  .    V    .         Q         .         .
17.000    436.6265   3688.90  .     V   .         Q         .         .
17.083    465.7397   4227.24  .     V   .         .  Q      .         .
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17.167    494.8529   4227.24  .     V   .         .  Q      .         .
17.250    523.9661   4227.24  .      V  .         .  Q      .         .
17.333    556.4764   4720.50  .      V  .         .     Q   .         .
17.417    588.9867   4720.50  .       V .         .     Q   .         .
17.500    621.4970   4720.50  .       V .         .     Q   .         .
17.583    657.7286   5260.83  .        V.         .        Q.         .
17.667    693.9601   5260.83  .        V.         .        Q.         .
17.750    730.1917   5260.83  .         V         .        Q.         .
17.833    771.4113   5985.09  .         V         .         .  Q      .
17.917    812.6309   5985.09  .          V        .         .  Q      .
18.000    853.8505   5985.09  .          V        .         .  Q      .
18.083    899.3091   6600.58  .         . V       .         .      Q  .
18.167    944.7676   6600.58  .         .  V      .         .      Q  .
18.250    990.2262   6600.58  .         .  V      .         .      Q  .
18.333   1038.7018   7038.65  .         .   V     .         .        Q.
18.417   1087.1774   7038.65  .         .    V    .         .        Q.
18.500   1135.6530   7038.65  .         .    V    .         .        Q.
18.583   1182.2755   6769.60  .         .     V   .         .       Q .
18.667   1228.8981   6769.60  .         .     V   .         .       Q .
18.750   1275.5206   6769.60  .         .      V  .         .       Q .
18.833   1318.6870   6267.77  .         .       V .         .    Q    .
18.917   1361.8534   6267.77  .         .       V .         .    Q    .
19.000   1405.0198   6267.77  .         .        V.         .    Q    .
19.083   1443.6879   5614.61  .         .        V.         .Q        .
19.167   1482.3560   5614.61  .         .         V         .Q        .
19.250   1521.0240   5614.61  .         .          V        .Q        .
19.333   1555.3413   4982.86  .         .         .V      Q .         .
19.417   1589.6586   4982.86  .         .         .V      Q .         .
19.500   1623.9758   4982.86  .         .         . V     Q .         .
19.583   1654.0393   4365.21  .         .         . V Q     .         .
19.667   1684.1028   4365.21  .         .         .  VQ     .         .
19.750   1714.1663   4365.21  .         .         .  VQ     .         .
19.833   1740.3992   3809.01  .         .         .Q  V     .         .
19.917   1766.6321   3809.01  .         .         .Q  V     .         .
20.000   1792.8650   3809.01  .         .         .Q  V     .         .
20.083   1816.0634   3368.41  .         .       Q .    V    .         .
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20.167   1839.2617   3368.41  .         .       Q .    V    .         .
20.250   1862.4601   3368.41  .         .       Q .    V    .         .
20.333   1883.1359   3002.12  .         .     Q   .     V   .         .
20.417   1903.8116   3002.12  .         .     Q   .     V   .         .
20.500   1924.4874   3002.12  .         .     Q   .     V   .         .
20.583   1943.2240   2720.55  .         .    Q    .     V   .         .
20.667   1961.9606   2720.55  .         .    Q    .      V  .         .
20.750   1980.6971   2720.55  .         .    Q    .      V  .         .
20.833   1997.7667   2478.51  .         .  Q      .      V  .         .
20.917   2014.8363   2478.51  .         .  Q      .      V  .         .
21.000   2031.9059   2478.51  .         .  Q      .       V .         .
21.083   2047.7174   2295.83  .         . Q       .       V .         .
21.167   2063.5288   2295.83  .         . Q       .       V .         .
21.250   2079.3403   2295.83  .         . Q       .       V .         .
21.333   2094.0146   2130.73  .         . Q       .       V .         .
21.417   2108.6890   2130.73  .         . Q       .        V.         .
21.500   2123.3633   2130.73  .         . Q       .        V.         .
21.583   2136.8513   1958.45  .         .Q        .        V.         .
21.667   2150.3394   1958.45  .         .Q        .        V.         .
21.750   2163.8274   1958.45  .         .Q        .        V.         .
21.833   2176.3936   1824.60  .         Q         .         V         .
21.917   2188.9597   1824.60  .         Q         .         V         .
22.000   2201.5259   1824.60  .         Q         .         V         .
22.083   2213.2903   1708.20  .        Q.         .         V         .
22.167   2225.0547   1708.20  .        Q.         .         V         .
22.250   2236.8191   1708.20  .        Q.         .         V         .
22.333   2247.9211   1612.03  .        Q.         .         .V        .
22.417   2259.0232   1612.03  .        Q.         .         .V        .
22.500   2270.1252   1612.03  .        Q.         .         .V        .
22.583   2280.5061   1507.32  .       Q .         .         .V        .
22.667   2290.8870   1507.32  .       Q .         .         .V        .
22.750   2301.2678   1507.32  .       Q .         .         .V        .
22.833   2310.8936   1397.64  .      Q  .         .         .V        .
22.917   2320.5193   1397.64  .      Q  .         .         . V       .
23.000   2330.1450   1397.64  .      Q  .         .         . V       .
23.083   2339.3435   1335.62  .      Q  .         .         . V       .
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23.166	2348.5420	1335.62	. Q . . . V .
23.250	2357.7405	1335.62	. Q . . . V .
23.333	2366.4619	1266.37	. Q . . . V .
23.416	2375.1833	1266.37	. Q . . . V .
23.500	2383.9048	1266.37	. Q . . . V .
23.583	2392.0552	1183.43	. Q . . . V .
23.666	2400.2056	1183.43	. Q . . . V .
23.750	2408.3560	1183.43	. Q . . . V .
23.833	2416.1550	1132.42	. Q . . . V .
23.916	2423.9541	1132.42	. Q . . . V .
24.000	2431.7532	1132.42	. Q . . . V .
24.083	2439.2371	1086.66	. Q . . . V .
24.166	2446.7209	1086.66	. Q . . . V .
24.250	2454.2048	1086.66	. Q . . . V .
24.333	2461.2966	1029.74	. Q . . . V .
24.416	2468.3884	1029.74	. Q . . . V .
24.500	2475.4802	1029.74	. Q . . . V .
24.583	2482.2446	982.21	. Q . . . V .
24.666	2489.0090	982.21	. Q . . . V .
24.750	2495.7734	982.21	. Q . . . V .
24.833	2502.2839	945.33	. Q . . . V .
24.916	2508.7944	945.33	. Q . . . V .
25.000	2515.3049	945.33	. Q . . . V .
25.083	2521.4692	895.07	. Q . . . V .
25.166	2527.6335	895.07	. Q . . . V .
25.250	2533.7979	895.07	. Q . . . V .
25.333	2539.5925	841.40	. Q . . . V .
25.416	2545.3872	841.40	. Q . . . V .
25.500	2551.1819	841.40	. Q . . . V .
25.583	2556.7432	807.49	. Q . . . V .
25.666	2562.3044	807.49	. Q . . . V .
25.750	2567.8657	807.49	. Q . . . V .
25.833	2573.1038	760.57	. Q . . . V .
25.916	2578.3418	760.57	. Q . . . V .
26.000	2583.5798	760.57	. Q . . . V .
26.083	2588.3967	699.40	. Q . . . V .

26.166	2593.2136	699.40	. Q . . . V .
26.250	2598.0305	699.40	. Q . . . V .
26.333	2602.5789	660.43	. Q . . . V .
26.416	2607.1272	660.43	. Q . . . V .
26.500	2611.6755	660.43	. Q . . . V .
26.583	2616.0146	630.04	. Q . . . V .
26.666	2620.3538	630.04	. Q . . . V .
26.750	2624.6929	630.04	. Q . . . V .
26.833	2628.8147	598.49	. Q . . . V .
26.916	2632.9365	598.49	. Q . . . V .
27.000	2637.0583	598.49	. Q . . . V .
27.083	2641.0271	576.26	. Q . . . V .
27.166	2644.9958	576.26	. Q . . . V .
27.250	2648.9646	576.26	. Q . . . V .
27.333	2652.7991	556.75	. Q . . . V .
27.416	2656.6335	556.75	. Q . . . V .
27.500	2660.4680	556.75	. Q . . . V .
27.583	2664.1157	529.65	. Q . . . V .
27.666	2667.7634	529.65	. Q . . . V .
27.750	2671.4111	529.65	. Q . . . V .
27.833	2674.8650	501.50	. Q . . . V .
27.916	2678.3188	501.50	. Q . . . V .
28.000	2681.7727	501.50	. Q . . . V .
28.083	2685.1028	483.53	. Q . . . V .
28.166	2688.4329	483.53	. Q . . . V .
28.250	2691.7629	483.53	. Q . . . V .
28.333	2694.9602	464.25	. Q . . . V .
28.416	2698.1575	464.25	. Q . . . V .
28.500	2701.3547	464.25	. Q . . . V .
28.583	2704.4119	443.90	. Q . . . V .
28.666	2707.4690	443.90	. Q . . . V .
28.750	2710.5261	443.90	. Q . . . V .
28.833	2713.4902	430.40	. Q . . . V .
28.916	2716.4543	430.40	. Q . . . V .
29.000	2719.4185	430.40	. Q . . . V .
29.083	2722.2539	411.71	. Q . . . V .

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 29.166   2725.0894    411.71  . Q        .         .         .      V  .
 29.250   2727.9248    411.71  . Q        .         .         .      V  .
 29.333   2730.5730    384.53  . Q        .         .         .      V  .
 29.416   2733.2212    384.53  . Q        .         .         .      V  .
 29.500   2735.8694    384.53  . Q        .         .         .      V  .
 29.583   2738.3684    362.85  . Q        .         .         .      V  .
 29.666   2740.8674    362.85  . Q        .         .         .      V  .
 29.750   2743.3665    362.85  . Q        .         .         .      V  .
 29.833   2745.7776    350.10  .Q         .         .         .      V  .
 29.916   2748.1887    350.10  .Q         .         .         .      V  .
 30.000   2750.5999    350.10  .Q         .         .         .      V  .
 30.083   2752.9277    338.02  .Q         .         .         .       V .
 30.166   2755.2556    338.02  .Q         .         .         .       V .
 30.250   2757.5835    338.02  .Q         .         .         .       V .
 30.333   2759.8506    329.18  .Q         .         .         .       V .
 30.416   2762.1177    329.18  .Q         .         .         .       V .
 30.500   2764.3848    329.18  .Q         .         .         .       V .
 30.583   2766.5920    320.51  .Q         .         .         .       V .
 30.666   2768.7993    320.51  .Q         .         .         .       V .
 30.750   2771.0066    320.51  .Q         .         .         .       V .
 30.833   2773.1023    304.30  .Q         .         .         .       V .
 30.916   2775.1980    304.30  .Q         .         .         .       V .
 31.000   2777.2937    304.30  .Q         .         .         .       V .
 31.083   2779.2395    282.53  .Q         .         .         .       V .
 31.166   2781.1853    282.53  .Q         .         .         .       V .
 31.250   2783.1311    282.53  .Q         .         .         .       V .
 31.333   2784.9839    269.04  .Q         .         .         .       V .
 31.416   2786.8367    269.04  .Q         .         .         .       V .
 31.500   2788.6895    269.04  .Q         .         .         .       V .
 31.583   2790.4692    258.42  .Q         .         .         .       V .
 31.666   2792.2490    258.42  .Q         .         .         .       V .
 31.750   2794.0288    258.42  .Q         .         .         .       V .
 31.833   2795.7410    248.60  .Q         .         .         .       V .
 31.916   2797.4531    248.60  .Q         .         .         .       V .
 32.000   2799.1653    248.60  .Q         .         .         .       V .
 32.083   2800.8325    242.09  .Q         .         .         .       V .
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32.166	2802.4998	242.09	.Q	.	.	.	V .
32.250	2804.1670	242.09	.Q	.	.	.	V .
32.333	2805.7605	231.37	.Q	.	.	.	V .
32.416	2807.3540	231.37	.Q	.	.	.	V .
32.500	2808.9475	231.37	.Q	.	.	.	V .
32.583	2810.4148	213.04	.Q	.	.	.	V .
32.666	2811.8821	213.04	.Q	.	.	.	V .
32.750	2813.3494	213.04	.Q	.	.	.	V .
32.833	2814.6826	193.57	.Q	.	.	.	V .
32.916	2816.0159	193.57	.Q	.	.	.	V .
33.000	2817.3491	193.57	.Q	.	.	.	V .
33.083	2818.6091	182.96	.Q	.	.	.	V .
33.166	2819.8691	182.96	.Q	.	.	.	V .
33.250	2821.1292	182.96	.Q	.	.	.	V .
33.333	2822.3184	172.68	Q	.	.	.	V .
33.416	2823.5076	172.68	Q	.	.	.	V.
33.500	2824.6968	172.68	Q	.	.	.	V.
33.583	2825.8320	164.84	Q	.	.	.	V.
33.666	2826.9673	164.84	Q	.	.	.	V.
33.750	2828.1025	164.84	Q	.	.	.	V.
33.833	2829.1963	158.80	Q	.	.	.	V.
33.916	2830.2900	158.80	Q	.	.	.	V.
34.000	2831.3838	158.80	Q	.	.	.	V.
34.083	2832.4133	149.48	Q	.	.	.	V.
34.166	2833.4429	149.48	Q	.	.	.	V.
34.250	2834.4724	149.48	Q	.	.	.	V.
34.333	2835.3911	133.39	Q	.	.	.	V.
34.416	2836.3098	133.39	Q	.	.	.	V.
34.500	2837.2285	133.39	Q	.	.	.	V.
34.583	2838.0796	123.58	Q	.	.	.	V.
34.666	2838.9307	123.58	Q	.	.	.	V.
34.750	2839.7817	123.58	Q	.	.	.	V.
34.833	2840.6038	119.37	Q	.	.	.	V.
34.916	2841.4258	119.37	Q	.	.	.	V.
35.000	2842.2478	119.37	Q	.	.	.	V.
35.083	2843.0464	115.95	Q	.	.	.	V.

```
  35.166   2843.8450    115.95  Q         .         .         .        V.
  35.250   2844.6436    115.95  Q         .         .         .        V.
  35.333   2845.4341    114.80  Q         .         .         .        V.
  35.416   2846.2246    114.80  Q         .         .         .        V.
  35.500   2847.0151    114.80  Q         .         .         .        V.
  35.583   2847.8103    115.46  Q         .         .         .        V.
  35.666   2848.6055    115.46  Q         .         .         .        V.
  35.750   2849.4006    115.46  Q         .         .         .        V.
  35.833   2850.2119    117.80  Q         .         .         .        V.
  35.916   2851.0232    117.80  Q         .         .         .        V.
  36.000   2851.8345    117.80  Q         .         .         .        V.
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
              0%                             2175.0
             10%                              645.0
             20%                              405.0
             30%                              315.0
             40%                              240.0
             50%                              195.0
             60%                              165.0
             70%                              120.0
             80%                               75.0
             90%                               45.0
 ============================================================================

  END OF FLOODSCx ROUTING ANALYSIS
```

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****************************************************************************

            F L O O D   R O U T I N G   A N A L Y S I S
        USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
       (c) Copyright 1989-2015 Advanced Engineering Software (aes)
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                        Analysis prepared by:








 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED E - REGIONAL                                                   *
* 2022-09-26                                                               *
 **************************************************************************

  FILE NAME: 87_RG1_E.DAT
  TIME/DATE OF STUDY: 11:34 09/26/2022



****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =   47432.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =   22615.000 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =     302.600 FEET
```

BASIN FACTOR = 0.050

WATERSHED AREA = 15214.500 ACRES

BASEFLOW = 0.000 CFS/SQUARE-MILE

WATERCOURSE "LAG" TIME = 2.462 HOURS

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.276

LOW LOSS FRACTION = 0.903

HYDROGRAPH MODEL #3 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.18

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.57

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.17

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.50

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.47

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.583

30-MINUTE FACTOR = 0.606

1-HOUR FACTOR = 0.615

3-HOUR FACTOR = 0.914

6-HOUR FACTOR = 0.960

24-HOUR FACTOR = 0.975

UNIT HYDROGRAPH TIME UNIT = 15.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 10.153

==

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)

1	0.447	273.996
2	1.580	695.231
3	3.382	1104.867
4	5.855	1516.844
5	9.060	1965.938
6	14.239	3176.139
7	22.126	4837.458
8	32.155	6151.044
9	40.813	5310.735
10	47.716	4233.892
11	53.435	3507.645
12	58.131	2880.085
13	61.861	2287.758
14	65.013	1933.376
15	67.759	1684.185
16	70.269	1539.284
17	72.505	1371.266
18	74.464	1201.845
19	76.247	1093.087
20	77.945	1041.408
21	79.374	876.727
22	80.714	822.016
23	81.968	769.270
24	83.068	674.531
25	84.156	667.213
26	85.155	612.352
27	86.129	597.897
28	87.036	556.190
29	87.849	498.493
30	88.640	485.396
31	89.280	392.482
32	89.889	373.428
33	90.479	361.626
34	91.047	348.534
35	91.604	341.926
36	92.101	304.407

37	92.588	298.974
38	93.052	284.702
39	93.499	274.085
40	93.927	262.639
41	94.281	216.622
42	94.626	211.788
43	94.971	211.667
44	95.316	211.784
45	95.643	200.460
46	95.911	164.237
47	96.175	161.878
48	96.439	162.117
49	96.703	161.639
50	96.944	147.957
51	97.129	113.503
52	97.312	112.085
53	97.495	112.324
54	97.677	111.851
55	97.832	94.865
56	97.935	63.003
57	98.037	62.530
58	98.138	62.062
59	98.240	62.535
60	98.349	67.013
61	98.471	74.804
62	98.593	74.804
63	98.715	74.566
64	98.837	75.043
65	98.959	74.566
66	99.080	74.566
67	99.202	74.566
68	99.323	74.566
69	99.445	74.566
70	99.566	74.566
71	99.688	74.566
72	99.810	74.566

73	99.931	74.566
74	100.000	42.245

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0088	0.0080	0.0009
2	0.0089	0.0081	0.0009
3	0.0090	0.0082	0.0009
4	0.0091	0.0083	0.0009
5	0.0093	0.0084	0.0009
6	0.0094	0.0085	0.0009
7	0.0095	0.0086	0.0009
8	0.0096	0.0087	0.0009
9	0.0098	0.0088	0.0009
10	0.0099	0.0089	0.0010
11	0.0100	0.0091	0.0010
12	0.0102	0.0092	0.0010
13	0.0103	0.0093	0.0010
14	0.0105	0.0095	0.0010
15	0.0106	0.0096	0.0010
16	0.0108	0.0097	0.0010
17	0.0110	0.0099	0.0011
18	0.0111	0.0101	0.0011
19	0.0113	0.0102	0.0011
20	0.0115	0.0104	0.0011
21	0.0117	0.0106	0.0011
22	0.0119	0.0108	0.0012
23	0.0121	0.0110	0.0012
24	0.0123	0.0112	0.0012
25	0.0126	0.0114	0.0012
26	0.0128	0.0116	0.0012
27	0.0131	0.0118	0.0013
28	0.0133	0.0121	0.0013
29	0.0136	0.0123	0.0013
30	0.0139	0.0126	0.0014
31	0.0142	0.0129	0.0014

32	0.0146	0.0131	0.0014
33	0.0149	0.0135	0.0014
34	0.0153	0.0138	0.0015
35	0.0157	0.0141	0.0015
36	0.0161	0.0145	0.0016
37	0.0165	0.0149	0.0016
38	0.0170	0.0153	0.0016
39	0.0175	0.0158	0.0017
40	0.0180	0.0162	0.0017
41	0.0186	0.0168	0.0018
42	0.0192	0.0173	0.0019
43	0.0199	0.0179	0.0019
44	0.0205	0.0186	0.0020
45	0.0214	0.0193	0.0021
46	0.0222	0.0200	0.0022
47	0.0232	0.0209	0.0022
48	0.0242	0.0218	0.0023
49	0.0277	0.0250	0.0027
50	0.0290	0.0262	0.0028
51	0.0306	0.0277	0.0030
52	0.0323	0.0292	0.0031
53	0.0344	0.0311	0.0033
54	0.0367	0.0331	0.0036
55	0.0395	0.0357	0.0038
56	0.0427	0.0385	0.0041
57	0.1106	0.0690	0.0416
58	0.1159	0.0690	0.0469
59	0.1229	0.0690	0.0539
60	0.1312	0.0690	0.0622
61	0.1432	0.0690	0.0742
62	0.1248	0.0690	0.0558
63	0.1527	0.0690	0.0837
64	0.2863	0.0690	0.2173
65	0.4118	0.0690	0.3428
66	0.1406	0.0690	0.0716
67	0.1301	0.0690	0.0611

68	0.1152	0.0690	0.0462
69	0.0422	0.0381	0.0041
70	0.0363	0.0328	0.0035
71	0.0321	0.0290	0.0031
72	0.0289	0.0261	0.0028
73	0.0240	0.0217	0.0023
74	0.0221	0.0199	0.0021
75	0.0204	0.0185	0.0020
76	0.0191	0.0172	0.0019
77	0.0179	0.0162	0.0017
78	0.0169	0.0153	0.0016
79	0.0160	0.0145	0.0016
80	0.0152	0.0137	0.0015
81	0.0145	0.0131	0.0014
82	0.0139	0.0125	0.0013
83	0.0133	0.0120	0.0013
84	0.0128	0.0116	0.0012
85	0.0123	0.0111	0.0012
86	0.0119	0.0107	0.0012
87	0.0115	0.0104	0.0011
88	0.0111	0.0100	0.0011
89	0.0108	0.0097	0.0010
90	0.0104	0.0094	0.0010
91	0.0101	0.0092	0.0010
92	0.0099	0.0089	0.0010
93	0.0096	0.0087	0.0009
94	0.0094	0.0085	0.0009
95	0.0091	0.0082	0.0009
96	0.0089	0.0080	0.0009

TOTAL STORM RAINFALL(INCHES) = 3.39

TOTAL SOIL-LOSS(INCHES) = 2.09

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.29

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 2653.2124

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) =   1638.8372

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

==

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	1300.0	2600.0	3900.0	5200.0
0.083	0.0016	0.23	Q	.	.	.	.
0.167	0.0032	0.23	Q	.	.	.	.
0.250	0.0048	0.23	Q	.	.	.	.
0.333	0.0106	0.83	Q	.	.	.	.
0.417	0.0163	0.83	Q	.	.	.	.
0.500	0.0220	0.83	Q	.	.	.	.
0.583	0.0343	1.79	Q	.	.	.	.
0.667	0.0466	1.79	Q	.	.	.	.
0.750	0.0590	1.79	Q	.	.	.	.
0.833	0.0804	3.11	Q	.	.	.	.
0.917	0.1017	3.11	Q	.	.	.	.
1.000	0.1231	3.11	Q	.	.	.	.
1.083	0.1564	4.83	Q	.	.	.	.
1.167	0.1896	4.83	Q	.	.	.	.
1.250	0.2228	4.83	Q	.	.	.	.
1.333	0.2752	7.60	Q	.	.	.	.
1.417	0.3276	7.60	Q	.	.	.	.
1.500	0.3799	7.60	Q	.	.	.	.
1.583	0.4614	11.83	Q	.	.	.	.
1.667	0.5429	11.83	Q	.	.	.	.
1.750	0.6244	11.83	Q	.	.	.	.
1.833	0.7431	17.24	Q	.	.	.	.
1.917	0.8619	17.24	Q	.	.	.	.
2.000	0.9806	17.24	Q	.	.	.	.
2.083	1.1321	22.00	Q	.	.	.	.

2.167	1.2836	22.00	Q	.	.	.	.
2.250	1.4351	22.00	Q	.	.	.	.
2.333	1.6134	25.89	Q	.	.	.	.
2.417	1.7917	25.89	Q	.	.	.	.
2.500	1.9700	25.89	Q	.	.	.	.
2.583	2.1712	29.22	Q	.	.	.	.
2.667	2.3725	29.22	Q	.	.	.	.
2.750	2.5737	29.22	Q	.	.	.	.
2.833	2.7944	32.05	Q	.	.	.	.
2.917	3.0151	32.05	Q	.	.	.	.
3.000	3.2359	32.05	Q	.	.	.	.
3.083	3.4729	34.42	Q	.	.	.	.
3.167	3.7100	34.42	Q	.	.	.	.
3.250	3.9470	34.42	Q	.	.	.	.
3.333	4.1985	36.52	Q	.	.	.	.
3.417	4.4500	36.52	Q	.	.	.	.
3.500	4.7015	36.52	Q	.	.	.	.
3.583	4.9663	38.44	Q	.	.	.	.
3.667	5.2310	38.44	Q	.	.	.	.
3.750	5.4958	38.44	Q	.	.	.	.
3.833	5.7731	40.27	Q	.	.	.	.
3.917	6.0504	40.27	Q	.	.	.	.
4.000	6.3278	40.27	Q	.	.	.	.
4.083	6.6170	41.99	Q	.	.	.	.
4.167	6.9061	41.99	Q	.	.	.	.
4.250	7.1953	41.99	Q	.	.	.	.
4.333	7.4955	43.59	Q	.	.	.	.
4.417	7.7958	43.59	Q	.	.	.	.
4.500	8.0960	43.59	Q	.	.	.	.
4.583	8.4068	45.14	Q	.	.	.	.
4.667	8.7177	45.14	Q	.	.	.	.
4.750	9.0285	45.14	Q	.	.	.	.
4.833	9.3499	46.67	Q	.	.	.	.
4.917	9.6713	46.67	Q	.	.	.	.
5.000	9.9927	46.67	Q	.	.	.	.
5.083	10.3239	48.09	Q	.	.	.	.

5.167	10.6550	48.09	Q	.	.	.	.
5.250	10.9862	48.09	Q	.	.	.	.
5.333	11.3271	49.49	Q	.	.	.	.
5.417	11.6679	49.49	Q	.	.	.	.
5.500	12.0088	49.49	Q	.	.	.	.
5.583	12.3593	50.89	Q	.	.	.	.
5.667	12.7097	50.89	Q	.	.	.	.
5.750	13.0602	50.89	Q	.	.	.	.
5.833	13.4200	52.24	Q	.	.	.	.
5.917	13.7797	52.24	Q	.	.	.	.
6.000	14.1395	52.24	Q	.	.	.	.
6.083	14.5087	53.61	Q	.	.	.	.
6.167	14.8779	53.61	Q	.	.	.	.
6.250	15.2472	53.61	Q	.	.	.	.
6.333	15.6258	54.98	Q	.	.	.	.
6.417	16.0044	54.98	Q	.	.	.	.
6.500	16.3831	54.98	Q	.	.	.	.
6.583	16.7713	56.37	Q	.	.	.	.
6.667	17.1595	56.37	Q	.	.	.	.
6.750	17.5478	56.37	Q	.	.	.	.
6.833	17.9456	57.77	Q	.	.	.	.
6.917	18.3435	57.77	Q	.	.	.	.
7.000	18.7413	57.77	Q	.	.	.	.
7.083	19.1487	59.16	Q	.	.	.	.
7.167	19.5561	59.16	Q	.	.	.	.
7.250	19.9635	59.16	Q	.	.	.	.
7.333	20.3807	60.58	Q	.	.	.	.
7.417	20.7979	60.58	Q	.	.	.	.
7.500	21.2151	60.58	Q	.	.	.	.
7.583	21.6419	61.97	Q	.	.	.	.
7.667	22.0687	61.97	Q	.	.	.	.
7.750	22.4954	61.97	Q	.	.	.	.
7.833	22.9320	63.39	Q	.	.	.	.
7.917	23.3685	63.39	Q	.	.	.	.
8.000	23.8051	63.39	Q	.	.	.	.
8.083	24.2517	64.85	Q	.	.	.	.

8.167	24.6983	64.85	Q	.	.	.	.
8.250	25.1449	64.85	Q	.	.	.	.
8.333	25.6019	66.35	Q	.	.	.	.
8.417	26.0589	66.35	Q	.	.	.	.
8.500	26.5159	66.35	Q	.	.	.	.
8.583	26.9836	67.91	Q	.	.	.	.
8.667	27.4513	67.91	Q	.	.	.	.
8.750	27.9190	67.91	Q	.	.	.	.
8.833	28.3977	69.50	Q	.	.	.	.
8.917	28.8764	69.50	Q	.	.	.	.
9.000	29.3550	69.50	Q	.	.	.	.
9.083	29.8451	71.15	Q	.	.	.	.
9.167	30.3351	71.15	Q	.	.	.	.
9.250	30.8251	71.15	Q	.	.	.	.
9.333	31.3269	72.86	Q	.	.	.	.
9.417	31.8287	72.86	Q	.	.	.	.
9.500	32.3306	72.86	Q	.	.	.	.
9.583	32.8446	74.64	Q	.	.	.	.
9.667	33.3587	74.64	Q	.	.	.	.
9.750	33.8727	74.64	Q	.	.	.	.
9.833	34.3996	76.49	Q	.	.	.	.
9.917	34.9264	76.49	Q	.	.	.	.
10.000	35.4532	76.49	Q	.	.	.	.
10.083	35.9931	78.40	Q	.	.	.	.
10.167	36.5331	78.40	Q	.	.	.	.
10.250	37.0730	78.40	Q	.	.	.	.
10.333	37.6267	80.40	Q	.	.	.	.
10.417	38.1804	80.40	Q	.	.	.	.
10.500	38.7341	80.40	Q	.	.	.	.
10.583	39.3023	82.50	Q	.	.	.	.
10.667	39.8705	82.50	Q	.	.	.	.
10.750	40.4387	82.50	Q	.	.	.	.
10.833	41.0222	84.72	QV	.	.	.	.
10.917	41.6057	84.72	QV	.	.	.	.
11.000	42.1892	84.72	QV	.	.	.	.
11.083	42.7888	87.07	QV	.	.	.	.

11.167	43.3884	87.07	QV	.	.	.	.
11.250	43.9880	87.07	QV	.	.	.	.
11.333	44.6046	89.52	QV	.	.	.	.
11.417	45.2211	89.52	QV	.	.	.	.
11.500	45.8376	89.52	QV	.	.	.	.
11.583	46.4721	92.13	QV	.	.	.	.
11.667	47.1066	92.13	QV	.	.	.	.
11.750	47.7411	92.13	QV	.	.	.	.
11.833	48.3947	94.91	QV	.	.	.	.
11.917	49.0484	94.91	QV	.	.	.	.
12.000	49.7020	94.91	QV	.	.	.	.
12.083	50.3766	97.95	QV	.	.	.	.
12.167	51.0513	97.95	QV	.	.	.	.
12.250	51.7259	97.95	QV	.	.	.	.
12.333	52.4235	101.30	QV	.	.	.	.
12.417	53.1212	101.30	QV	.	.	.	.
12.500	53.8189	101.30	QV	.	.	.	.
12.583	54.5419	104.97	QV	.	.	.	.
12.667	55.2648	104.97	QV	.	.	.	.
12.750	55.9878	104.97	QV	.	.	.	.
12.833	56.7386	109.03	QV	.	.	.	.
12.917	57.4895	109.03	QV	.	.	.	.
13.000	58.2404	109.03	QV	.	.	.	.
13.083	59.0223	113.53	QV	.	.	.	.
13.167	59.8041	113.53	QV	.	.	.	.
13.250	60.5860	113.53	QV	.	.	.	.
13.333	61.4035	118.70	QV	.	.	.	.
13.417	62.2210	118.70	QV	.	.	.	.
13.500	63.0385	118.70	QV	.	.	.	.
13.583	63.8974	124.71	QV	.	.	.	.
13.667	64.7563	124.71	QV	.	.	.	.
13.750	65.6152	124.71	QV	.	.	.	.
13.833	66.5213	131.57	.Q	.	.	.	.
13.917	67.4274	131.57	.Q	.	.	.	.
14.000	68.3335	131.57	.Q	.	.	.	.
14.083	69.3602	149.08	.Q	.	.	.	.

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14.167     70.3870    149.08  .Q        .         .         .         .
14.250     71.4137    149.08  .Q        .         .         .         .
14.333     72.6818    184.13  .Q        .         .         .         .
14.417     73.9499    184.13  .Q        .         .         .         .
14.500     75.2180    184.13  .Q        .         .         .         .
14.583     76.8640    238.99  .Q        .         .         .         .
14.667     78.5099    238.99  .Q        .         .         .         .
14.750     80.1558    238.99  .Q        .         .         .         .
14.833     82.3389    316.98  . Q       .         .         .         .
14.917     84.5219    316.98  . Q       .         .         .         .
15.000     86.7050    316.98  . Q       .         .         .         .
15.083     89.6243    423.88  . VQ      .         .         .         .
15.167     92.5435    423.88  . VQ      .         .         .         .
15.250     95.4628    423.88  . VQ      .         .         .         .
15.333     99.4902    584.77  . V Q     .         .         .         .
15.417    103.5175    584.77  . V Q     .         .         .         .
15.500    107.5449    584.77  . V Q     .         .         .         .
15.583    113.2274    825.10  . V   Q   .         .         .         .
15.667    118.9099    825.10  . V   Q   .         .         .         .
15.750    124.5925    825.10  .  V  Q   .         .         .         .
15.833    132.7211   1180.27  .  V     Q.         .         .         .
15.917    140.8496   1180.27  .  V     Q.         .         .         .
16.000    148.9782   1180.27  .  V     Q.         .         .         .
16.083    160.2135   1631.37  .  V      . Q       .         .         .
16.167    171.4488   1631.37  .   V     . Q       .         .         .
16.250    182.6841   1631.37  .   V     . Q       .         .         .
16.333    197.2216   2110.84  .   V     .     Q   .         .         .
16.417    211.7590   2110.84  .    V    .     Q   .         .         .
16.500    226.2965   2110.84  .    V    .     Q   .         .         .
16.583    243.9364   2561.31  .    V    .        Q.         .         .
16.667    261.5762   2561.31  .     V   .        Q.         .         .
16.750    279.2161   2561.31  .     V   .        Q.         .         .
16.833    299.7429   2980.49  .      V  .         . Q       .         .
16.917    320.2697   2980.49  .      V  .         . Q       .         .
17.000    340.7964   2980.49  .       V .         . Q       .         .
17.083    364.5981   3456.00  .       V .         .     Q   .         .
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17.167    388.3998   3456.00  .        V.         .     Q   .         .
17.250    412.2014   3456.00  .         V         .     Q   .         .
17.333    440.9014   4167.23  .         V         .         . Q       .
17.417    469.6013   4167.23  .          V        .         . Q       .
17.500    498.3012   4167.23  .           V       .         . Q       .
17.583    531.8589   4872.58  .         . V       .         .      Q  .
17.667    565.4167   4872.58  .         .  V      .         .      Q  .
17.750    598.9744   4872.58  .         .   V     .         .      Q  .
17.833    634.1271   5104.17  .         .    V    .         .        Q.
17.917    669.2798   5104.17  .         .     V   .         .        Q.
18.000    704.4326   5104.17  .         .      V  .         .        Q.
18.083    736.4391   4647.36  .         .      V  .         .    Q    .
18.167    768.4457   4647.36  .         .       V .         .    Q    .
18.250    800.4523   4647.36  .         .        V.         .    Q    .
18.333    828.5138   4074.53  .         .         V         .Q        .
18.417    856.5753   4074.53  .         .         V         .Q        .
18.500    884.6367   4074.53  .         .          V        .Q        .
18.583    908.8536   3516.29  .         .         . V    Q  .         .
18.667    933.0704   3516.29  .         .         . V    Q  .         .
18.750    957.2873   3516.29  .         .         .  V   Q  .         .
18.833    977.6143   2951.48  .         .         . QV      .         .
18.917    997.9413   2951.48  .         .         . Q V     .         .
19.000   1018.2684   2951.48  .         .         . Q V     .         .
19.083   1035.3273   2476.95  .         .        Q.    V    .         .
19.167   1052.3861   2476.95  .         .        Q.    V    .         .
19.250   1069.4449   2476.95  .         .        Q.     V   .         .
19.333   1084.1787   2139.34  .         .     Q   .     V   .         .
19.417   1098.9125   2139.34  .         .     Q   .     V   .         .
19.500   1113.6462   2139.34  .         .     Q   .      V  .         .
19.583   1126.6339   1885.82  .         .   Q     .      V  .         .
19.667   1139.6216   1885.82  .         .   Q     .      V  .         .
19.750   1152.6093   1885.82  .         .   Q     .       V .         .
19.833   1164.2416   1689.01  .         . Q       .       V .         .
19.917   1175.8739   1689.01  .         . Q       .       V .         .
20.000   1187.5062   1689.01  .         . Q       .       V .         .
20.083   1197.9430   1515.42  .         .Q        .        V.         .
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20.167   1208.3798   1515.42  .         .Q        .        V.         .
20.250   1218.8165   1515.42  .         .Q        .        V.         .
20.333   1228.2531   1370.18  .         Q         .        V.         .
20.417   1237.6896   1370.18  .         Q         .         V         .
20.500   1247.1261   1370.18  .         Q         .         V         .
20.583   1255.8003   1259.49  .        Q.         .         V         .
20.667   1264.4745   1259.49  .        Q.         .         V         .
20.750   1273.1487   1259.49  .        Q.         .          V        .
20.833   1281.1168   1156.98  .       Q .         .         .V        .
20.917   1289.0850   1156.98  .       Q .         .         .V        .
21.000   1297.0531   1156.98  .       Q .         .         .V        .
21.083   1304.2776   1049.00  .       Q .         .         .V        .
21.167   1311.5021   1049.00  .       Q .         .         . V       .
21.250   1318.7266   1049.00  .       Q .         .         . V       .
21.333   1325.4559    977.11  .      Q  .         .         . V       .
21.417   1332.1853    977.11  .      Q  .         .         . V       .
21.500   1338.9147    977.11  .      Q  .         .         . V       .
21.583   1345.1448    904.60  .     Q   .         .         . V       .
21.667   1351.3749    904.60  .     Q   .         .         . V       .
21.750   1357.6050    904.60  .     Q   .         .         .  V      .
21.833   1363.3595    835.55  .     Q   .         .         .  V      .
21.917   1369.1140    835.55  .     Q   .         .         .  V      .
22.000   1374.8685    835.55  .     Q   .         .         .  V      .
22.083   1380.3156    790.91  .     Q   .         .         .  V      .
22.167   1385.7626    790.91  .     Q   .         .         .  V      .
22.250   1391.2096    790.91  .     Q   .         .         .  V      .
22.333   1396.3207    742.13  .    Q    .         .         .   V     .
22.417   1401.4318    742.13  .    Q    .         .         .   V     .
22.500   1406.5428    742.13  .    Q    .         .         .   V     .
22.583   1411.3761    701.78  .    Q    .         .         .   V     .
22.667   1416.2094    701.78  .    Q    .         .         .   V     .
22.750   1421.0426    701.78  .    Q    .         .         .   V     .
22.833   1425.5660    656.81  .    Q    .         .         .   V     .
22.917   1430.0895    656.81  .    Q    .         .         .   V     .
23.000   1434.6129    656.81  .    Q    .         .         .    V    .
23.083   1438.8329    612.75  .   Q     .         .         .    V    .
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23.166	1443.0529	612.75	.	Q	.	.	.	V	.
23.250	1447.2728	612.75	.	Q	.	.	.	V	.
23.333	1451.2126	572.07	.	Q	.	.	.	V	.
23.416	1455.1525	572.07	.	Q	.	.	.	V	.
23.500	1459.0923	572.07	.	Q	.	.	.	V	.
23.583	1462.6857	521.76	.	Q	.	.	.	V	.
23.666	1466.2791	521.76	.	Q	.	.	.	V	.
23.750	1469.8724	521.76	.	Q	.	.	.	V	.
23.833	1473.2765	494.27	.	Q	.	.	.	V	.
23.916	1476.6805	494.27	.	Q	.	.	.	V	.
24.000	1480.0846	494.27	.	Q	.	.	.	V	.
24.083	1483.3263	470.69	.	Q	.	.	.	V	.
24.166	1486.5680	470.69	.	Q	.	.	.	V	.
24.250	1489.8097	470.69	.	Q	.	.	.	V	.
24.333	1492.8953	448.02	.	Q	.	.	.	V	.
24.416	1495.9808	448.02	.	Q	.	.	.	V	.
24.500	1499.0664	448.02	.	Q	.	.	.	V	.
24.583	1502.0051	426.69	.	Q	.	.	.	V	.
24.666	1504.9438	426.69	.	Q	.	.	.	V	.
24.750	1507.8826	426.69	.	Q	.	.	.	V	.
24.833	1510.6506	401.92	.	Q	.	.	.	V	.
24.916	1513.4187	401.92	.	Q	.	.	.	V	.
25.000	1516.1868	401.92	.	Q	.	.	.	V	.
25.083	1518.8326	384.17	.	Q	.	.	.	V	.
25.166	1521.4785	384.17	.	Q	.	.	.	V	.
25.250	1524.1244	384.17	.	Q	.	.	.	V	.
25.333	1526.6307	363.92	.	Q	.	.	.	V	.
25.416	1529.1371	363.92	.	Q	.	.	.	V	.
25.500	1531.6434	363.92	.	Q	.	.	.	V	.
25.583	1534.0042	342.78	.	Q	.	.	.	V	.
25.666	1536.3649	342.78	.	Q	.	.	.	V	.
25.750	1538.7256	342.78	.	Q	.	.	.	V	.
25.833	1540.9110	317.32	.	Q	.	.	.	V	.
25.916	1543.0964	317.32	.	Q	.	.	.	V	.
26.000	1545.2819	317.32	.	Q	.	.	.	V	.
26.083	1547.2759	289.53	.	Q	.	.	.	V	.

26.166	1549.2699	289.53	. Q	.	.	.	V .
26.250	1551.2639	289.53	. Q	.	.	.	V .
26.333	1553.1564	274.78	. Q	.	.	.	V .
26.416	1555.0488	274.78	. Q	.	.	.	V .
26.500	1556.9413	274.78	. Q	.	.	.	V .
26.583	1558.7467	262.15	. Q	.	.	.	V .
26.666	1560.5521	262.15	. Q	.	.	.	V .
26.750	1562.3575	262.15	. Q	.	.	.	V .
26.833	1564.0698	248.63	.Q	.	.	.	V .
26.916	1565.7821	248.63	.Q	.	.	.	V .
27.000	1567.4944	248.63	.Q	.	.	.	V .
27.083	1569.0852	230.99	.Q	.	.	.	V .
27.166	1570.6760	230.99	.Q	.	.	.	V .
27.250	1572.2668	230.99	.Q	.	.	.	V .
27.333	1573.7249	211.70	.Q	.	.	.	V .
27.416	1575.1829	211.70	.Q	.	.	.	V .
27.500	1576.6409	211.70	.Q	.	.	.	V .
27.583	1578.0289	201.55	.Q	.	.	.	V .
27.666	1579.4170	201.55	.Q	.	.	.	V .
27.750	1580.8051	201.55	.Q	.	.	.	V .
27.833	1582.1254	191.70	.Q	.	.	.	V .
27.916	1583.4457	191.70	.Q	.	.	.	V .
28.000	1584.7660	191.70	.Q	.	.	.	V .
28.083	1586.0050	179.91	.Q	.	.	.	V .
28.166	1587.2440	179.91	.Q	.	.	.	V .
28.250	1588.4830	179.91	.Q	.	.	.	V .
28.333	1589.6074	163.26	.Q	.	.	.	V .
28.416	1590.7318	163.26	.Q	.	.	.	V .
28.500	1591.8562	163.26	.Q	.	.	.	V .
28.583	1592.8590	145.61	.Q	.	.	.	V .
28.666	1593.8618	145.61	.Q	.	.	.	V .
28.750	1594.8646	145.61	.Q	.	.	.	V .
28.833	1595.8115	137.49	.Q	.	.	.	V .
28.916	1596.7584	137.49	.Q	.	.	.	V .
29.000	1597.7053	137.49	.Q	.	.	.	V .
29.083	1598.6068	130.90	.Q	.	.	.	V.

29.166	1599.5083	130.90	.Q	.	.	.	V.
29.250	1600.4098	130.90	.Q	.	.	.	V.
29.333	1601.2521	122.31	Q	.	.	.	V.
29.416	1602.0944	122.31	Q	.	.	.	V.
29.500	1602.9366	122.31	Q	.	.	.	V.
29.583	1603.6879	109.08	Q	.	.	.	V.
29.666	1604.4391	109.08	Q	.	.	.	V.
29.750	1605.1903	109.08	Q	.	.	.	V.
29.833	1605.8563	96.70	Q	.	.	.	V.
29.916	1606.5223	96.70	Q	.	.	.	V.
30.000	1607.1884	96.70	Q	.	.	.	V.
30.083	1607.8293	93.06	Q	.	.	.	V.
30.166	1608.4703	93.06	Q	.	.	.	V.
30.250	1609.1113	93.06	Q	.	.	.	V.
30.333	1609.7327	90.22	Q	.	.	.	V.
30.416	1610.3540	90.22	Q	.	.	.	V.
30.500	1610.9753	90.22	Q	.	.	.	V.
30.583	1611.5924	89.60	Q	.	.	.	V.
30.666	1612.2095	89.60	Q	.	.	.	V.
30.750	1612.8265	89.60	Q	.	.	.	V.
30.833	1613.4592	91.87	Q	.	.	.	V.
30.916	1614.0919	91.87	Q	.	.	.	V.
31.000	1614.7246	91.87	Q	.	.	.	V.
31.083	1615.3719	93.99	Q	.	.	.	V.
31.166	1616.0193	93.99	Q	.	.	.	V.
31.250	1616.6666	93.99	Q	.	.	.	V.
31.333	1617.3140	93.98	Q	.	.	.	V.
31.416	1617.9613	93.98	Q	.	.	.	V.
31.500	1618.6086	93.98	Q	.	.	.	V.
31.583	1619.2555	93.93	Q	.	.	.	V.
31.666	1619.9023	93.93	Q	.	.	.	V.
31.750	1620.5492	93.93	Q	.	.	.	V.
31.833	1621.1942	93.66	Q	.	.	.	V.
31.916	1621.8392	93.66	Q	.	.	.	V.
32.000	1622.4843	93.66	Q	.	.	.	V.
32.083	1623.1239	92.88	Q	.	.	.	V.

32.166	1623.7635	92.88	Q	.	.	.	V.
32.250	1624.4032	92.88	Q	.	.	.	V.
32.333	1625.0302	91.03	Q	.	.	.	V.
32.416	1625.6571	91.03	Q	.	.	.	V.
32.500	1626.2841	91.03	Q	.	.	.	V.
32.583	1626.8864	87.44	Q	.	.	.	V.
32.666	1627.4886	87.44	Q	.	.	.	V.
32.750	1628.0909	87.44	Q	.	.	.	V.
32.833	1628.6655	83.44	Q	.	.	.	V.
32.916	1629.2401	83.44	Q	.	.	.	V.
33.000	1629.8147	83.44	Q	.	.	.	V.
33.083	1630.3580	78.90	Q	.	.	.	V.
33.166	1630.9014	78.90	Q	.	.	.	V.
33.250	1631.4447	78.90	Q	.	.	.	V.
33.333	1631.9519	73.65	Q	.	.	.	V.
33.416	1632.4591	73.65	Q	.	.	.	V.
33.500	1632.9663	73.65	Q	.	.	.	V.
33.583	1633.4380	68.49	Q	.	.	.	V.
33.666	1633.9097	68.49	Q	.	.	.	V.
33.750	1634.3813	68.49	Q	.	.	.	V.
33.833	1634.8168	63.23	Q	.	.	.	V.
33.916	1635.2522	63.23	Q	.	.	.	V.
34.000	1635.6876	63.23	Q	.	.	.	V.
34.083	1636.0493	52.52	Q	.	.	.	V.
34.166	1636.4110	52.52	Q	.	.	.	V.
34.250	1636.7727	52.52	Q	.	.	.	V.
34.333	1636.9939	32.12	Q	.	.	.	V.
34.416	1637.2151	32.12	Q	.	.	.	V.
34.500	1637.4363	32.12	Q	.	.	.	V.
34.583	1637.5408	15.18	Q	.	.	.	V.
34.666	1637.6453	15.18	Q	.	.	.	V.
34.750	1637.7498	15.18	Q	.	.	.	V.
34.833	1637.8190	10.05	Q	.	.	.	V.
34.916	1637.8882	10.05	Q	.	.	.	V.
35.000	1637.9574	10.05	Q	.	.	.	V.
35.083	1637.9977	5.85	Q	.	.	.	V.

35.166	1638.0380	5.85	Q	.	.	.	V.
35.250	1638.0782	5.85	Q	.	.	.	V.
35.333	1638.1036	3.68	Q	.	.	.	V.
35.416	1638.1290	3.68	Q	.	.	.	V.
35.500	1638.1544	3.68	Q	.	.	.	V.
35.583	1638.1772	3.31	Q	.	.	.	V.
35.666	1638.2001	3.31	Q	.	.	.	V.
35.750	1638.2229	3.31	Q	.	.	.	V.
35.833	1638.2434	2.98	Q	.	.	.	V.
35.916	1638.2639	2.98	Q	.	.	.	V.
36.000	1638.2844	2.98	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	2175.0
10%	510.0
20%	330.0
30%	240.0
40%	195.0
50%	150.0
60%	105.0
70%	75.0
80%	60.0
90%	45.0

==

END OF FLOODSCx ROUTING ANALYSIS

ONSITE HYDROLOGY RESULTS

NOAA Atlas 14, Volume 6, Version 2
Location name: Earp, California, USA*
Latitude: 34.0887°, Longitude: -114.4629°
Elevation: 467.59 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF tabular | PF graphical | Maps & aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.101 (0.085-0.120)	0.144 (0.121-0.171)	0.205 (0.173-0.245)	0.259 (0.216-0.313)	0.340 (0.274-0.426)	0.408 (0.321-0.523)	0.482 (0.370-0.635)	0.566 (0.421-0.768)	0.689 (0.490-0.979)	0.795 (0.545-1.17)
10-min	0.144 (0.122-0.172)	0.206 (0.174-0.246)	0.294 (0.248-0.352)	0.371 (0.310-0.449)	0.487 (0.392-0.610)	0.584 (0.460-0.749)	0.691 (0.530-0.911)	0.811 (0.603-1.10)	0.988 (0.703-1.40)	1.14 (0.781-1.68)
15-min	0.174 (0.148-0.208)	0.249 (0.210-0.297)	0.355 (0.299-0.426)	0.449 (0.375-0.543)	0.589 (0.474-0.738)	0.707 (0.556-0.906)	0.836 (0.641-1.10)	0.980 (0.729-1.33)	1.20 (0.850-1.70)	1.38 (0.945-2.03)
30-min	0.244 (0.207-0.291)	0.348 (0.294-0.416)	0.497 (0.419-0.596)	0.629 (0.525-0.760)	0.824 (0.664-1.03)	0.989 (0.779-1.27)	1.17 (0.897-1.54)	1.37 (1.02-1.86)	1.67 (1.19-2.38)	1.93 (1.32-2.85)
60-min	0.332 (0.281-0.396)	0.474 (0.400-0.566)	0.676 (0.570-0.810)	0.855 (0.714-1.03)	1.12 (0.903-1.41)	1.35 (1.06-1.73)	1.59 (1.22-2.10)	1.87 (1.39-2.53)	2.28 (1.62-3.23)	2.63 (1.80-3.87)
2-hr	0.433 (0.367-0.517)	0.613 (0.519-0.733)	0.868 (0.732-1.04)	1.09 (0.911-1.32)	1.42 (1.14-1.78)	1.69 (1.33-2.17)	1.99 (1.52-2.62)	2.31 (1.72-3.14)	2.79 (1.99-3.96)	3.19 (2.19-4.71)
3-hr	0.494 (0.418-0.590)	0.697 (0.590-0.833)	0.983 (0.829-1.18)	1.23 (1.03-1.49)	1.60 (1.29-2.00)	1.90 (1.50-2.44)	2.23 (1.71-2.93)	2.58 (1.92-3.51)	3.11 (2.21-4.41)	3.54 (2.43-5.22)
6-hr	0.591 (0.500-0.705)	0.824 (0.696-0.984)	1.15 (0.969-1.38)	1.43 (1.20-1.73)	1.84 (1.49-2.31)	2.18 (1.72-2.80)	2.55 (1.95-3.36)	2.95 (2.19-4.00)	3.53 (2.51-5.01)	4.01 (2.75-5.91)
12-hr	0.697 (0.590-0.832)	0.954 (0.806-1.14)	1.31 (1.11-1.57)	1.62 (1.36-1.96)	2.08 (1.67-2.61)	2.45 (1.93-3.14)	2.85 (2.19-3.76)	3.29 (2.45-4.47)	3.93 (2.80-5.58)	4.46 (3.06-6.58)
24-hr	0.869 (0.767-1.01)	1.17 (1.03-1.36)	1.60 (1.41-1.86)	1.97 (1.72-2.30)	2.51 (2.13-3.02)	2.95 (2.46-3.63)	3.43 (2.79-4.31)	3.96 (3.14-5.10)	4.72 (3.60-6.32)	5.36 (3.96-7.39)
2-day	0.994 (0.876-1.15)	1.34 (1.18-1.56)	1.83 (1.61-2.13)	2.26 (1.97-2.64)	2.88 (2.44-3.47)	3.39 (2.82-4.17)	3.95 (3.21-4.95)	4.55 (3.61-5.86)	5.44 (4.15-7.27)	6.17 (4.56-8.52)
3-day	1.05 (0.925-1.21)	1.42 (1.25-1.65)	1.95 (1.72-2.27)	2.41 (2.11-2.82)	3.08 (2.61-3.72)	3.64 (3.02-4.47)	4.24 (3.44-5.32)	4.89 (3.88-6.30)	5.85 (4.47-7.83)	6.66 (4.92-9.19)
4-day	1.10 (0.974-1.28)	1.51 (1.33-1.75)	2.07 (1.82-2.41)	2.57 (2.24-3.00)	3.28 (2.78-3.96)	3.87 (3.22-4.76)	4.51 (3.67-5.67)	5.22 (4.13-6.72)	6.24 (4.76-8.35)	7.10 (5.25-9.80)
7-day	1.15 (1.01-1.33)	1.59 (1.40-1.84)	2.21 (1.94-2.56)	2.74 (2.39-3.21)	3.52 (2.98-4.24)	4.16 (3.46-5.11)	4.85 (3.94-6.08)	5.60 (4.44-7.21)	6.69 (5.11-8.95)	7.60 (5.62-10.5)
10-day	1.18 (1.04-1.36)	1.64 (1.45-1.90)	2.30 (2.02-2.67)	2.86 (2.50-3.35)	3.68 (3.12-4.43)	4.35 (3.62-5.34)	5.07 (4.12-6.37)	5.85 (4.64-7.54)	6.98 (5.33-9.34)	7.92 (5.86-10.9)
20-day	1.30 (1.14-1.50)	1.86 (1.64-2.15)	2.64 (2.32-3.06)	3.30 (2.88-3.86)	4.26 (3.61-5.13)	5.03 (4.18-6.18)	5.86 (4.76-7.35)	6.74 (5.34-8.68)	7.99 (6.10-10.7)	9.01 (6.66-12.4)
30-day	1.41 (1.24-1.63)	2.05 (1.81-2.38)	2.94 (2.58-3.41)	3.69 (3.22-4.32)	4.77 (4.04-5.75)	5.63 (4.68-6.92)	6.54 (5.31-8.21)	7.50 (5.94-9.66)	8.85 (6.76-11.8)	9.94 (7.35-13.7)
45-day	1.57 (1.38-1.82)	2.32 (2.04-2.69)	3.35 (2.94-3.89)	4.22 (3.68-4.93)	5.45 (4.61-6.57)	6.43 (5.34-7.89)	7.45 (6.05-9.35)	8.52 (6.75-11.0)	10.0 (7.64-13.4)	11.2 (8.27-15.4)
60-day	1.72 (1.52-1.99)	2.57 (2.26-2.97)	3.71 (3.26-4.31)	4.68 (4.08-5.47)	6.03 (5.11-7.27)	7.10 (5.90-8.72)	8.21 (6.67-10.3)	9.36 (7.42-12.1)	11.0 (8.37-14.7)	12.2 (9.04-16.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

LOSS RATES

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           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:




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----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED K - EXISTING
  2022-09-30
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA    NUMBER    Fp(in./hr.)    YIELD
         1        196.40      100.00       82.(AMC II)     0.590      0.222

    TOTAL AREA (Acres) =    196.40
                                    _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                         _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
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****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                          Analysis prepared by:




****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED K - PROPOSED - 1
  2022-09-30
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA    NUMBER    Fp(in./hr.)    YIELD
         1        66.70      100.00       82.(AMC II)     0.590      0.222

    TOTAL AREA (Acres) =     66.70
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                     _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
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****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED K - PROPOSED - 2
  2022-09-30
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA    NUMBER    Fp(in./hr.)    YIELD
         1        62.06      100.00       86.(AMC II)     0.504       0.314

    TOTAL AREA (Acres) =     62.06
                                   _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.504
                                        _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.686
============================================================================
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           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED K - PROPOSED - 3
  2022-09-30
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA    NUMBER    Fp(in./hr.)    YIELD
         1        67.67      100.00       82.(AMC II)     0.590      0.222

    TOTAL AREA (Acres) =     67.67
                              _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                          _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
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****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED L - EXISTING
  2022-09-30
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)  PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
        1        953.60      100.00      82.(AMC II)     0.590      0.222

    TOTAL AREA (Acres) =    953.60
                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                       _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
```

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****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED L - PROPOSED - 1
  2022-09-30
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA    NUMBER    Fp(in./hr.)    YIELD
         1       485.00      100.00       82.(AMC II)     0.590      0.222

    TOTAL AREA (Acres) =    485.00
                                 _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                         _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
```

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****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED L - PROPOSED - 2
  2022-09-30
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1       292.49      100.00       86.(AMC II)     0.504       0.314

    TOTAL AREA (Acres) =    292.49
                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.504
                                       _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.686
============================================================================
```

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****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED L - PROPOSED - 3
  2022-09-30
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1       176.03      100.00       82.(AMC II)     0.590      0.222

    TOTAL AREA (Acres) =    176.03
                               _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                        _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
```

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**************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED M - EXISTING
  2022-09-30
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)  PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1       191.60      100.00       82.(AMC II)     0.590       0.222

    TOTAL AREA (Acres) =    191.60
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                       _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
==========================================================================
```

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**************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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--------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED M - PROPOSED - 1
  2022-09-30
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1       108.10      100.00       86.(AMC II)     0.504       0.314

    TOTAL AREA (Acres) =    108.10
                                 _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.504
                                       _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.686
==========================================================================
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****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
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----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED M - PROPOSED - 2
  2022-09-30
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)  PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1        83.59      100.00       82.(AMC II)     0.590       0.222

    TOTAL AREA (Acres) =     83.59
                              _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                      _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
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************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
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************************************************************************
------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED N - EXISTING
  2022-09-29
========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA    NUMBER    Fp(in./hr.)    YIELD
         1       494.76      100.00       82.(AMC II)     0.590      0.222

    TOTAL AREA (Acres) =    494.76
                              _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                        _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
========================================================================
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****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
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----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED N - PROPOSED - 1
  2022-09-29
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1        209.79      100.00       82.(AMC II)     0.590      0.222

    TOTAL AREA (Acres) =    209.79
                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                          _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
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****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED N - PROPOSED - 2
  2022-09-29
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA    NUMBER    Fp(in./hr.)    YIELD
         1       119.47      100.00       82.(AMC II)     0.590      0.222

    TOTAL AREA (Acres) =    119.47
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                     _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED N - PROPOSED - 3
  2022-09-29
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1        69.85      100.00       86.(AMC II)     0.504       0.314

    TOTAL AREA (Acres) =     69.85
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.504
                                       _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.686
============================================================================
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED N - PROPOSED - 4
  2022-09-29
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)  PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1        92.82      100.00       86.(AMC II)     0.504       0.314

    TOTAL AREA (Acres) =     92.82
                              _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.504
                                      _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.686
============================================================================
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED P - EXISTING
  2022-09-30
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1        100.50      100.00       82.(AMC II)     0.590       0.222

    TOTAL AREA (Acres) =    100.50
                                 _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                        _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED P - PROPOSED - 1
  2022-10-03
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1        30.80      100.00       86.(AMC II)     0.504       0.314

    TOTAL AREA (Acres) =     30.80
                              _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.504
                                      _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.686
============================================================================
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                         Analysis prepared by:




****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED P - PROPOSED - 2
  2022-10-03
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA    NUMBER    Fp(in./hr.)    YIELD
         1        38.00      100.00       86.(AMC II)     0.504      0.314

    TOTAL AREA (Acres) =     38.00
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.504
                                      _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.686
============================================================================
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED P  - PROPOSED - 3
  2022-10-03
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)  PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1        31.72      100.00       82.(AMC II)     0.590      0.222

    TOTAL AREA (Acres) =     31.72
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                     _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED Q - EXISTING
  2022-09-30
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA    NUMBER    Fp(in./hr.)    YIELD
         1        239.50      100.00      82.(AMC II)     0.590      0.222

    TOTAL AREA (Acres) =    239.50
                                   _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                         _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED Q - PROPOSED - 1
  2022-10-03
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1       132.80      100.00       86.(AMC II)     0.504       0.314

    TOTAL AREA (Acres) =    132.80
                                 _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.504
                                        _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.686
============================================================================
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSGED Q - PROPOSED - 2
  2022-10-03
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)  PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1       106.70      100.00      82.(AMC II)     0.590       0.222

    TOTAL AREA (Acres) =    106.70
                            _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                       _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED R - EXISTING
  2022-09-30
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA    NUMBER    Fp(in./hr.)    YIELD
         1       130.60      100.00       82.(AMC II)     0.590       0.222

    TOTAL AREA (Acres) =    130.60
                                    _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                          _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
```

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****************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED R - PROPOSED - 1
  2022-10-03
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1         93.60      100.00       86.(AMC II)     0.504      0.314

    TOTAL AREA (Acres) =     93.60
                              _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.504
                                      _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.686
============================================================================
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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----------------------------------------------------------------------------

 Problem Descriptions:
  40.087
  WATERSHED R - PROPOSED - 2
  2022-10-03
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     3.43 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA    NUMBER    Fp(in./hr.)    YIELD
         1         37.33      100.00      82.(AMC II)     0.590      0.222

    TOTAL AREA (Acres) =     37.33
                              _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.590
                                      _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.778
============================================================================
```

RATIONAL METHOD
EXISTING CONDITION

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED K - EXISTING - RATIONAL METHOD                                 *
* 2022-09-28                                                               *
 **************************************************************************

  FILE NAME: 087_K_EX.DAT
  TIME/DATE OF STUDY: 08:39 09/28/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                  --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
```

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   6000.00 TO NODE   6001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   873.25
  ELEVATION DATA: UPSTREAM(FEET) =    564.30  DOWNSTREAM(FEET) =    554.46

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   25.995
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.855
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B        5.72      0.63     1.000    63   25.99
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =     11.46
  TOTAL AREA(ACRES) =      5.72   PEAK FLOW RATE(CFS) =     11.46

****************************************************************************
  FLOW PROCESS FROM NODE   6001.00 TO NODE   6002.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    554.46  DOWNSTREAM(FEET) =    518.37
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2202.18   CHANNEL SLOPE =  0.0164
  CHANNEL FLOW THRU SUBAREA(CFS) =      11.46
  FLOW VELOCITY(FEET/SEC) =   3.31 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  11.08   Tc(MIN.) =   37.08
  LONGEST FLOWPATH FROM NODE   6000.00 TO NODE   6002.00 =    3075.43 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   6002.00 TO NODE   6002.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   37.08
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.227
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       47.40      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   47.40      SUBAREA RUNOFF(CFS) =   68.13
  EFFECTIVE AREA(ACRES) =     53.12   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       53.1       PEAK FLOW RATE(CFS) =      76.35

****************************************************************************
  FLOW PROCESS FROM NODE   6002.00 TO NODE   6003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    518.37  DOWNSTREAM(FEET) =    490.48
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1951.98   CHANNEL SLOPE =  0.0143
  CHANNEL FLOW THRU SUBAREA(CFS) =      76.35
  FLOW VELOCITY(FEET/SEC) =   5.24 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.21   Tc(MIN.) =   43.29
  LONGEST FLOWPATH FROM NODE   6000.00 TO NODE   6003.00 =    5027.41 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   6003.00 TO NODE   6003.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   43.29
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.998
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       65.66      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   65.66      SUBAREA RUNOFF(CFS) =   80.85
  EFFECTIVE AREA(ACRES) =    118.78   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      118.8       PEAK FLOW RATE(CFS) =     146.26

****************************************************************************
  FLOW PROCESS FROM NODE   6003.00 TO NODE   6004.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    490.48  DOWNSTREAM(FEET) =    462.59
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2176.89   CHANNEL SLOPE =  0.0128
  CHANNEL FLOW THRU SUBAREA(CFS) =     146.26
  FLOW VELOCITY(FEET/SEC) =   6.03 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.02   Tc(MIN.) =   49.31
  LONGEST FLOWPATH FROM NODE   6000.00 TO NODE   6004.00 =    7204.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   6004.00 TO NODE   6004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   49.31
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.824
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       77.63      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   77.63      SUBAREA RUNOFF(CFS) =   83.43
  EFFECTIVE AREA(ACRES) =    196.41   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      196.4       PEAK FLOW RATE(CFS) =     211.09
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      196.4  TC(MIN.) =     49.31
  EFFECTIVE AREA(ACRES) =    196.41  AREA-AVERAGED Fm(INCH/HR)=  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =     211.09
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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             Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                           Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED K - EXISTING - RATIONAL METHOD                                 *
* 2022-09-28                                                               *
 **************************************************************************

  FILE NAME: 087_K_EX.DAT
  TIME/DATE OF STUDY: 08:39 09/28/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
```

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   6000.00 TO NODE   6001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   873.25
  ELEVATION DATA: UPSTREAM(FEET) =    564.30  DOWNSTREAM(FEET) =    554.46

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   25.995
```

```
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.855
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL DESERT COVER
 "DESERT BRUSH"   (50.0%)   B        5.72      0.63     1.000    63   25.99
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =     11.46
 TOTAL AREA(ACRES) =      5.72   PEAK FLOW RATE(CFS) =     11.46

****************************************************************************
 FLOW PROCESS FROM NODE   6001.00 TO NODE   6002.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    554.46  DOWNSTREAM(FEET) =    518.37
 CHANNEL LENGTH THRU SUBAREA(FEET) =  2202.18   CHANNEL SLOPE =  0.0164
 CHANNEL FLOW THRU SUBAREA(CFS) =      11.46
 FLOW VELOCITY(FEET/SEC) =   3.31 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =  11.08   Tc(MIN.) =   37.08
 LONGEST FLOWPATH FROM NODE   6000.00 TO NODE   6002.00 =    3075.43 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   6002.00 TO NODE   6002.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   37.08
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.227
 SUBAREA LOSS RATE DATA(AMC  I ):
```

```
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL DESERT COVER
 "DESERT BRUSH"   (50.0%)   B       47.40      0.63     1.000    63
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   47.40      SUBAREA RUNOFF(CFS) =   68.13
 EFFECTIVE AREA(ACRES) =     53.12   AREA-AVERAGED Fm(INCH/HR) =  0.63
 AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       53.1       PEAK FLOW RATE(CFS) =      76.35

****************************************************************************
 FLOW PROCESS FROM NODE   6002.00 TO NODE   6003.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    518.37  DOWNSTREAM(FEET) =    490.48
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1951.98   CHANNEL SLOPE =  0.0143
 CHANNEL FLOW THRU SUBAREA(CFS) =      76.35
 FLOW VELOCITY(FEET/SEC) =   5.24 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   6.21   Tc(MIN.) =   43.29
 LONGEST FLOWPATH FROM NODE   6000.00 TO NODE   6003.00 =    5027.41 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   6003.00 TO NODE   6003.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   43.29
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.998
 SUBAREA LOSS RATE DATA(AMC  I ):
```

```
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL DESERT COVER
 "DESERT BRUSH"   (50.0%)   B       65.66      0.63     1.000    63
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   65.66      SUBAREA RUNOFF(CFS) =   80.85
 EFFECTIVE AREA(ACRES) =    118.78   AREA-AVERAGED Fm(INCH/HR) =  0.63
 AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =      118.8       PEAK FLOW RATE(CFS) =     146.26

****************************************************************************
 FLOW PROCESS FROM NODE   6003.00 TO NODE   6004.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    490.48  DOWNSTREAM(FEET) =    462.59
 CHANNEL LENGTH THRU SUBAREA(FEET) =  2176.89   CHANNEL SLOPE =  0.0128
 CHANNEL FLOW THRU SUBAREA(CFS) =     146.26
 FLOW VELOCITY(FEET/SEC) =   6.03 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   6.02   Tc(MIN.) =   49.31
 LONGEST FLOWPATH FROM NODE   6000.00 TO NODE   6004.00 =    7204.30 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   6004.00 TO NODE   6004.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   49.31
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.824
 SUBAREA LOSS RATE DATA(AMC  I ):
```

```
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
NATURAL DESERT COVER
"DESERT BRUSH"   (50.0%)   B       77.63      0.63     1.000    63
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA AREA(ACRES) =   77.63      SUBAREA RUNOFF(CFS) =   83.43
EFFECTIVE AREA(ACRES) =    196.41   AREA-AVERAGED Fm(INCH/HR) =  0.63
AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
TOTAL AREA(ACRES) =      196.4       PEAK FLOW RATE(CFS) =     211.09
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =      196.4  TC(MIN.) =     49.31
EFFECTIVE AREA(ACRES) =    196.41  AREA-AVERAGED Fm(INCH/HR)=  0.63
AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap = 1.000
PEAK FLOW RATE(CFS)   =     211.09
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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              Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                           Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED L - EXISTING - RATIONAL METHOD                                 *
* 2022-09-28                                                               *
 **************************************************************************

  FILE NAME: 087_L_EX.DAT
  TIME/DATE OF STUDY: 08:47 09/28/2022
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
```

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   7000.00 TO NODE   7001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   481.55
  ELEVATION DATA: UPSTREAM(FEET) =    672.56  DOWNSTREAM(FEET) =    656.16

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.422
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.938
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B        6.62      0.63     1.000    63   16.42
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =     19.71
  TOTAL AREA(ACRES) =      6.62   PEAK FLOW RATE(CFS) =     19.71

****************************************************************************
  FLOW PROCESS FROM NODE   7001.00 TO NODE   7002.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    656.16  DOWNSTREAM(FEET) =    629.91
  CHANNEL LENGTH THRU SUBAREA(FEET) =   913.56   CHANNEL SLOPE =  0.0287
  CHANNEL FLOW THRU SUBAREA(CFS) =      19.71
  FLOW VELOCITY(FEET/SEC) =   5.06 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.01   Tc(MIN.) =   19.43
  LONGEST FLOWPATH FROM NODE   7000.00 TO NODE   7002.00 =    1395.11 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   7002.00 TO NODE   7002.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   19.43
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.501
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       16.36      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   16.36      SUBAREA RUNOFF(CFS) =   42.27
  EFFECTIVE AREA(ACRES) =     22.98   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       23.0       PEAK FLOW RATE(CFS) =      59.37

****************************************************************************
  FLOW PROCESS FROM NODE   7002.00 TO NODE   7003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    629.91  DOWNSTREAM(FEET) =    620.07
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1423.58   CHANNEL SLOPE =  0.0069
  CHANNEL FLOW THRU SUBAREA(CFS) =      59.37
  FLOW VELOCITY(FEET/SEC) =   3.38 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.02   Tc(MIN.) =   26.45
  LONGEST FLOWPATH FROM NODE   7000.00 TO NODE   7003.00 =    2818.69 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   7003.00 TO NODE   7003.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   26.45
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.821
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       37.13      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   37.13      SUBAREA RUNOFF(CFS) =   73.23
  EFFECTIVE AREA(ACRES) =     60.11   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       60.1       PEAK FLOW RATE(CFS) =     118.55

****************************************************************************
  FLOW PROCESS FROM NODE   7003.00 TO NODE   7004.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    620.07  DOWNSTREAM(FEET) =    582.34
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2030.86   CHANNEL SLOPE =  0.0186
  CHANNEL FLOW THRU SUBAREA(CFS) =     118.55
  FLOW VELOCITY(FEET/SEC) =   6.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.97   Tc(MIN.) =   31.42
  LONGEST FLOWPATH FROM NODE   7000.00 TO NODE   7004.00 =    4849.55 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   7004.00 TO NODE   7004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   31.42
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.501
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       80.22      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   80.22      SUBAREA RUNOFF(CFS) =  135.07
  EFFECTIVE AREA(ACRES) =    140.33   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      140.3       PEAK FLOW RATE(CFS) =     236.29

****************************************************************************
  FLOW PROCESS FROM NODE   7004.00 TO NODE   7005.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    582.34  DOWNSTREAM(FEET) =    534.77
  CHANNEL LENGTH THRU SUBAREA(FEET) =  3384.02   CHANNEL SLOPE =  0.0141
  CHANNEL FLOW THRU SUBAREA(CFS) =     236.29
  FLOW VELOCITY(FEET/SEC) =   7.32 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.70   Tc(MIN.) =   39.12
  LONGEST FLOWPATH FROM NODE   7000.00 TO NODE   7005.00 =    8233.57 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   7005.00 TO NODE   7005.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   39.12
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.145
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B      154.24      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  154.24      SUBAREA RUNOFF(CFS) =  210.32
  EFFECTIVE AREA(ACRES) =    294.57   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      294.6       PEAK FLOW RATE(CFS) =     401.67

****************************************************************************
  FLOW PROCESS FROM NODE   7005.00 TO NODE   7006.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    534.77  DOWNSTREAM(FEET) =    478.99
  CHANNEL LENGTH THRU SUBAREA(FEET) =  5298.73   CHANNEL SLOPE =  0.0105
  CHANNEL FLOW THRU SUBAREA(CFS) =     401.67
  FLOW VELOCITY(FEET/SEC) =   7.49 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  11.79   Tc(MIN.) =   50.91
  LONGEST FLOWPATH FROM NODE   7000.00 TO NODE   7006.00 =   13532.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   7006.00 TO NODE   7006.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   50.91
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.784
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B      341.34      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  341.34      SUBAREA RUNOFF(CFS) =  354.48
  EFFECTIVE AREA(ACRES) =    635.91   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      635.9       PEAK FLOW RATE(CFS) =     660.39

****************************************************************************
  FLOW PROCESS FROM NODE   7006.00 TO NODE   7007.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    478.99  DOWNSTREAM(FEET) =    442.91
  CHANNEL LENGTH THRU SUBAREA(FEET) =  4203.16   CHANNEL SLOPE =  0.0086
  CHANNEL FLOW THRU SUBAREA(CFS) =     660.39
  FLOW VELOCITY(FEET/SEC) =   7.93 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   8.83   Tc(MIN.) =   59.73
  LONGEST FLOWPATH FROM NODE   7000.00 TO NODE   7007.00 =   17735.46 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   7007.00 TO NODE   7007.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   59.73
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.595
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B      169.27      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  169.27      SUBAREA RUNOFF(CFS) =  147.00
  EFFECTIVE AREA(ACRES) =    805.18   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      805.2       PEAK FLOW RATE(CFS) =     699.26

****************************************************************************
  FLOW PROCESS FROM NODE   7007.00 TO NODE   7008.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    442.91  DOWNSTREAM(FEET) =    413.38
  CHANNEL LENGTH THRU SUBAREA(FEET) =  3797.16   CHANNEL SLOPE =  0.0078
  CHANNEL FLOW THRU SUBAREA(CFS) =     699.26
  FLOW VELOCITY(FEET/SEC) =   7.69 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   8.23   Tc(MIN.) =   67.96
  LONGEST FLOWPATH FROM NODE   7000.00 TO NODE   7008.00 =   21532.62 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   7008.00 TO NODE   7008.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   67.96
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.457
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B      148.40      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  148.40      SUBAREA RUNOFF(CFS) =  110.48
  EFFECTIVE AREA(ACRES) =    953.58   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      953.6       PEAK FLOW RATE(CFS) =     709.94
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      953.6  TC(MIN.) =     67.96
  EFFECTIVE AREA(ACRES) =    953.58  AREA-AVERAGED Fm(INCH/HR)=  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =     709.94
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
           RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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            Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                          Analysis prepared by:









 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED M - EXISTING - RATIONAL METHOD                                 *
* 2022-09-28                                                               *
 **************************************************************************

  FILE NAME: 087_M_EX.DAT
  TIME/DATE OF STUDY: 08:51 09/28/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
```

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   8000.00 TO NODE   8001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   707.22
  ELEVATION DATA: UPSTREAM(FEET) =    484.90  DOWNSTREAM(FEET) =    480.64

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   27.080
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.775
```

```
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL DESERT COVER
 "DESERT BRUSH"   (50.0%)   B        5.64      0.63     1.000    63   27.08
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =     10.89
 TOTAL AREA(ACRES) =      5.64   PEAK FLOW RATE(CFS) =     10.89

****************************************************************************
 FLOW PROCESS FROM NODE   8001.00 TO NODE   8002.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    480.64  DOWNSTREAM(FEET) =    465.87
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1884.27   CHANNEL SLOPE =  0.0078
 CHANNEL FLOW THRU SUBAREA(CFS) =      10.89
 FLOW VELOCITY(FEET/SEC) =   2.26 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =  13.89   Tc(MIN.) =   40.97
 LONGEST FLOWPATH FROM NODE   8000.00 TO NODE   8002.00 =    2591.49 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   8002.00 TO NODE   8002.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   40.97
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.077
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       22.52      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   22.52      SUBAREA RUNOFF(CFS) =   29.32
  EFFECTIVE AREA(ACRES) =     28.16   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       28.2       PEAK FLOW RATE(CFS) =      36.67

****************************************************************************
  FLOW PROCESS FROM NODE   8002.00 TO NODE   8003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    465.87  DOWNSTREAM(FEET) =    444.55
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2500.77   CHANNEL SLOPE =  0.0085
  CHANNEL FLOW THRU SUBAREA(CFS) =      36.67
  FLOW VELOCITY(FEET/SEC) =   3.27 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  12.74   Tc(MIN.) =   53.71
  LONGEST FLOWPATH FROM NODE   8000.00 TO NODE   8003.00 =    5092.26 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   8003.00 TO NODE   8003.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   53.71
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.718
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       49.35      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   49.35      SUBAREA RUNOFF(CFS) =   48.33
  EFFECTIVE AREA(ACRES) =     77.51   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       77.5       PEAK FLOW RATE(CFS) =      75.91

****************************************************************************
  FLOW PROCESS FROM NODE   8003.00 TO NODE   8004.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    444.55  DOWNSTREAM(FEET) =    423.22
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2682.71   CHANNEL SLOPE =  0.0080
  CHANNEL FLOW THRU SUBAREA(CFS) =      75.91
  FLOW VELOCITY(FEET/SEC) =   3.90 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  11.47   Tc(MIN.) =   65.18
  LONGEST FLOWPATH FROM NODE   8000.00 TO NODE   8004.00 =    7774.97 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   8004.00 TO NODE   8004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   65.18
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.500
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B      114.13      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  114.13      SUBAREA RUNOFF(CFS) =   89.41
  EFFECTIVE AREA(ACRES) =    191.64   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      191.6       PEAK FLOW RATE(CFS) =     150.13
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      191.6  TC(MIN.) =     65.18
  EFFECTIVE AREA(ACRES) =    191.64  AREA-AVERAGED Fm(INCH/HR)=  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =     150.13
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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              Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                            Analysis prepared by:








 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED N - EXISTING - RATIONAL METHOD                                 *
* 2022-09-26                                                               *
 **************************************************************************

  FILE NAME: 087_N_EX.DAT
  TIME/DATE OF STUDY: 08:14 09/30/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
```

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   9000.00 TO NODE   9001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   804.32
  ELEVATION DATA: UPSTREAM(FEET) =    557.74  DOWNSTREAM(FEET) =    547.89

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   24.739
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.956
```

```
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL DESERT COVER
 "DESERT BRUSH"   (50.0%)   B        2.95      0.63     1.000    63   24.74
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      6.18
 TOTAL AREA(ACRES) =      2.95   PEAK FLOW RATE(CFS) =      6.18

****************************************************************************
 FLOW PROCESS FROM NODE   9001.00 TO NODE   9002.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    547.89  DOWNSTREAM(FEET) =    541.33
 CHANNEL LENGTH THRU SUBAREA(FEET) =   942.65   CHANNEL SLOPE =  0.0070
 CHANNEL FLOW THRU SUBAREA(CFS) =       6.18
 FLOW VELOCITY(FEET/SEC) =   1.85 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   8.49   Tc(MIN.) =   33.23
 LONGEST FLOWPATH FROM NODE   9000.00 TO NODE   9002.00 =    1746.97 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   9002.00 TO NODE   9002.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   33.23
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.405
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       11.35      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   11.35      SUBAREA RUNOFF(CFS) =   18.13
  EFFECTIVE AREA(ACRES) =     14.30   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       14.3       PEAK FLOW RATE(CFS) =      22.84

****************************************************************************
  FLOW PROCESS FROM NODE   9002.00 TO NODE   9003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    541.33  DOWNSTREAM(FEET) =    524.93
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1171.88   CHANNEL SLOPE =  0.0140
  CHANNEL FLOW THRU SUBAREA(CFS) =      22.84
  FLOW VELOCITY(FEET/SEC) =   3.67 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.32   Tc(MIN.) =   38.54
  LONGEST FLOWPATH FROM NODE   9000.00 TO NODE   9003.00 =    2918.85 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9003.00 TO NODE   9003.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   38.54
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.167
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       17.21      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   17.21      SUBAREA RUNOFF(CFS) =   23.81
  EFFECTIVE AREA(ACRES) =     31.51   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       31.5       PEAK FLOW RATE(CFS) =      43.60

****************************************************************************
  FLOW PROCESS FROM NODE   9003.00 TO NODE   9004.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    524.93  DOWNSTREAM(FEET) =    505.24
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1938.53   CHANNEL SLOPE =  0.0102
  CHANNEL FLOW THRU SUBAREA(CFS) =      43.60
  FLOW VELOCITY(FEET/SEC) =   3.75 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   8.61   Tc(MIN.) =   47.16
  LONGEST FLOWPATH FROM NODE   9000.00 TO NODE   9004.00 =    4857.38 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9004.00 TO NODE   9004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   47.16
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.882
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       54.59      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   54.59      SUBAREA RUNOFF(CFS) =   61.51
  EFFECTIVE AREA(ACRES) =     86.10   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       86.1       PEAK FLOW RATE(CFS) =      97.02

****************************************************************************
  FLOW PROCESS FROM NODE   9004.00 TO NODE   9005.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    505.24  DOWNSTREAM(FEET) =    482.28
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1997.43   CHANNEL SLOPE =  0.0115
  CHANNEL FLOW THRU SUBAREA(CFS) =      97.02
  FLOW VELOCITY(FEET/SEC) =   5.04 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.60   Tc(MIN.) =   53.76
  LONGEST FLOWPATH FROM NODE   9000.00 TO NODE   9005.00 =    6854.81 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9005.00 TO NODE   9005.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   53.76
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.717
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B      105.51      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  105.51      SUBAREA RUNOFF(CFS) =  103.23
  EFFECTIVE AREA(ACRES) =    191.61   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      191.6       PEAK FLOW RATE(CFS) =     187.46

****************************************************************************
  FLOW PROCESS FROM NODE   9005.00 TO NODE   9006.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    482.28  DOWNSTREAM(FEET) =    459.31
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2185.27   CHANNEL SLOPE =  0.0105
  CHANNEL FLOW THRU SUBAREA(CFS) =     187.46
  FLOW VELOCITY(FEET/SEC) =   5.89 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.18   Tc(MIN.) =   59.94
  LONGEST FLOWPATH FROM NODE   9000.00 TO NODE   9006.00 =    9040.08 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9006.00 TO NODE   9006.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   59.94
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.591
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B      168.38      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  168.38      SUBAREA RUNOFF(CFS) =  145.65
  EFFECTIVE AREA(ACRES) =    359.99   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      360.0       PEAK FLOW RATE(CFS) =     311.40

****************************************************************************
  FLOW PROCESS FROM NODE   9006.00 TO NODE   9007.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    459.31  DOWNSTREAM(FEET) =    416.66
  CHANNEL LENGTH THRU SUBAREA(FEET) =  3239.67   CHANNEL SLOPE =  0.0132
  CHANNEL FLOW THRU SUBAREA(CFS) =     311.40
  FLOW VELOCITY(FEET/SEC) =   7.73 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.99   Tc(MIN.) =   66.92
  LONGEST FLOWPATH FROM NODE   9000.00 TO NODE   9007.00 =   12279.75 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9007.00 TO NODE   9007.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   66.92
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.473
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   C      135.27      0.53     1.000    70
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.53
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  135.27      SUBAREA RUNOFF(CFS) =  114.80
  EFFECTIVE AREA(ACRES) =    495.26   AREA-AVERAGED Fm(INCH/HR) =  0.60
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      495.3       PEAK FLOW RATE(CFS) =     387.91
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      495.3  TC(MIN.) =     66.92
  EFFECTIVE AREA(ACRES) =    495.26  AREA-AVERAGED Fm(INCH/HR)=  0.60
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =     387.91
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
        (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
       (c) Copyright 1983-2015 Advanced Engineering Software (aes)
          Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                        Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED P - EXISTING - RATIONAL METHOD                                 *
* 2022-10-03                                                               *
 **************************************************************************


  FILE NAME: 087_P_EX.DAT
  TIME/DATE OF STUDY: 08:29 10/03/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                 --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
```

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   3000.00 TO NODE   3001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   869.30
  ELEVATION DATA: UPSTREAM(FEET) =    462.59  DOWNSTREAM(FEET) =    459.31

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   32.295
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.453
```

```
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (50.0%)   B        3.26      0.63     1.000    63   32.29
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA RUNOFF(CFS) =      5.35
TOTAL AREA(ACRES) =      3.26   PEAK FLOW RATE(CFS) =      5.35

****************************************************************************
FLOW PROCESS FROM NODE   3001.00 TO NODE   3002.00 IS CODE =  52
----------------------------------------------------------------------------
>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    459.31  DOWNSTREAM(FEET) =    449.47
CHANNEL LENGTH THRU SUBAREA(FEET) =   987.36   CHANNEL SLOPE =  0.0100
CHANNEL FLOW THRU SUBAREA(CFS) =       5.35
FLOW VELOCITY(FEET/SEC) =   2.14 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =   7.69   Tc(MIN.) =   39.98
LONGEST FLOWPATH FROM NODE   3000.00 TO NODE   3002.00 =    1856.66 FEET.

****************************************************************************
FLOW PROCESS FROM NODE   3002.00 TO NODE   3002.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   39.98
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.112
SUBAREA LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B        8.46      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    8.46      SUBAREA RUNOFF(CFS) =   11.29
  EFFECTIVE AREA(ACRES) =     11.72   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       11.7       PEAK FLOW RATE(CFS) =      15.64

****************************************************************************
  FLOW PROCESS FROM NODE   3002.00 TO NODE   3003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    449.47  DOWNSTREAM(FEET) =    439.63
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1040.85   CHANNEL SLOPE =  0.0095
  CHANNEL FLOW THRU SUBAREA(CFS) =      15.64
  FLOW VELOCITY(FEET/SEC) =   2.73 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.36   Tc(MIN.) =   46.34
  LONGEST FLOWPATH FROM NODE   3000.00 TO NODE   3003.00 =    2897.51 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3003.00 TO NODE   3003.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   46.34
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.905
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       13.00      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   13.00      SUBAREA RUNOFF(CFS) =   14.92
  EFFECTIVE AREA(ACRES) =     24.72   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       24.7       PEAK FLOW RATE(CFS) =      28.37

****************************************************************************
  FLOW PROCESS FROM NODE   3003.00 TO NODE   3004.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    439.63  DOWNSTREAM(FEET) =    433.07
  CHANNEL LENGTH THRU SUBAREA(FEET) =   846.76   CHANNEL SLOPE =  0.0077
  CHANNEL FLOW THRU SUBAREA(CFS) =      28.37
  FLOW VELOCITY(FEET/SEC) =   2.90 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.86   Tc(MIN.) =   51.21
  LONGEST FLOWPATH FROM NODE   3000.00 TO NODE   3004.00 =    3744.27 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3004.00 TO NODE   3004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   51.21
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.777
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       12.01      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   12.01      SUBAREA RUNOFF(CFS) =   12.39
  EFFECTIVE AREA(ACRES) =     36.73   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       36.7       PEAK FLOW RATE(CFS) =      37.90

****************************************************************************
  FLOW PROCESS FROM NODE   3004.00 TO NODE   3004.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   51.21
  RAINFALL INTENSITY(INCH/HR) =   1.78
  AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      36.73
  TOTAL STREAM AREA(ACRES) =      36.73
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      37.90

****************************************************************************
  FLOW PROCESS FROM NODE   3100.00 TO NODE   3101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   683.89
  ELEVATION DATA: UPSTREAM(FEET) =    469.15  DOWNSTREAM(FEET) =    465.87

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   27.965
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.713
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B        2.90      0.63     1.000    63   27.97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      5.44
  TOTAL AREA(ACRES) =      2.90   PEAK FLOW RATE(CFS) =      5.44

****************************************************************************
  FLOW PROCESS FROM NODE   3101.00 TO NODE   3102.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    465.87  DOWNSTREAM(FEET) =    460.95
  CHANNEL LENGTH THRU SUBAREA(FEET) =   635.76   CHANNEL SLOPE =  0.0077
  CHANNEL FLOW THRU SUBAREA(CFS) =       5.44
  FLOW VELOCITY(FEET/SEC) =   1.89 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.60   Tc(MIN.) =   33.56
  LONGEST FLOWPATH FROM NODE   3100.00 TO NODE   3102.00 =    1319.65 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3102.00 TO NODE   3102.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =   33.56
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.388
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B        7.21      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    7.21      SUBAREA RUNOFF(CFS) =   11.41
  EFFECTIVE AREA(ACRES) =     10.11   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       10.1       PEAK FLOW RATE(CFS) =      15.99

****************************************************************************
  FLOW PROCESS FROM NODE   3102.00 TO NODE   3103.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    460.95  DOWNSTREAM(FEET) =    446.19
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1019.27   CHANNEL SLOPE =  0.0145
  CHANNEL FLOW THRU SUBAREA(CFS) =      15.99
  FLOW VELOCITY(FEET/SEC) =   3.40 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.00   Tc(MIN.) =   38.56
  LONGEST FLOWPATH FROM NODE   3100.00 TO NODE   3103.00 =    2338.92 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3103.00 TO NODE   3103.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   38.56
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.167
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B        8.92      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    8.92      SUBAREA RUNOFF(CFS) =   12.34
  EFFECTIVE AREA(ACRES) =     19.03   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       19.0       PEAK FLOW RATE(CFS) =      26.32

****************************************************************************
  FLOW PROCESS FROM NODE   3103.00 TO NODE   3104.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    446.19  DOWNSTREAM(FEET) =    439.63
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1036.62   CHANNEL SLOPE =  0.0063
  CHANNEL FLOW THRU SUBAREA(CFS) =      26.32
  FLOW VELOCITY(FEET/SEC) =   2.57 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.73   Tc(MIN.) =   45.29
  LONGEST FLOWPATH FROM NODE   3100.00 TO NODE   3104.00 =    3375.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3104.00 TO NODE   3104.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   45.29
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.936
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       12.00      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   12.00      SUBAREA RUNOFF(CFS) =   14.10
  EFFECTIVE AREA(ACRES) =     31.03   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       31.0       PEAK FLOW RATE(CFS) =      36.47

****************************************************************************
  FLOW PROCESS FROM NODE   3104.00 TO NODE   3004.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    439.63  DOWNSTREAM(FEET) =    433.07
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1116.65   CHANNEL SLOPE =  0.0059
  CHANNEL FLOW THRU SUBAREA(CFS) =      36.47
  FLOW VELOCITY(FEET/SEC) =   2.71 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.86   Tc(MIN.) =   52.15
  LONGEST FLOWPATH FROM NODE   3100.00 TO NODE   3004.00 =    4492.19 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3004.00 TO NODE   3004.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   52.15
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.754
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       11.21      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   11.21      SUBAREA RUNOFF(CFS) =   11.34
  EFFECTIVE AREA(ACRES) =     42.24   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       42.2       PEAK FLOW RATE(CFS) =      42.73

****************************************************************************
  FLOW PROCESS FROM NODE   3004.00 TO NODE   3004.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   52.15
  RAINFALL INTENSITY(INCH/HR) =   1.75
  AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      42.24
  TOTAL STREAM AREA(ACRES) =      42.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      42.73
```

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	37.90	51.21	1.777	0.63(0.63)	1.00	36.7	3000.00
2	42.73	52.15	1.754	0.63(0.63)	1.00	42.2	3100.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	80.63	51.21	1.777	0.63(0.63)	1.00	78.2	3000.00
2	79.88	52.15	1.754	0.63(0.63)	1.00	79.0	3100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 80.63 Tc(MIN.) = 51.21

EFFECTIVE AREA(ACRES) = 78.20 AREA-AVERAGED Fm(INCH/HR) = 0.63

AREA-AVERAGED Fp(INCH/HR) = 0.63 AREA-AVERAGED Ap = 1.00

TOTAL AREA(ACRES) = 79.0

LONGEST FLOWPATH FROM NODE 3100.00 TO NODE 3004.00 = 4492.19 FEET.

****

FLOW PROCESS FROM NODE 3004.00 TO NODE 3005.00 IS CODE = 52

>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

==

ELEVATION DATA: UPSTREAM(FEET) = 433.07 DOWNSTREAM(FEET) = 406.82

CHANNEL LENGTH THRU SUBAREA(FEET) = 975.21 CHANNEL SLOPE = 0.0269

CHANNEL FLOW THRU SUBAREA(CFS) = 80.63

```
  FLOW VELOCITY(FEET/SEC) =   7.30 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.23   Tc(MIN.) =   53.43
  LONGEST FLOWPATH FROM NODE   3100.00 TO NODE   3005.00 =    5467.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3005.00 TO NODE   3005.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   53.43
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.724
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       21.54      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   21.54      SUBAREA RUNOFF(CFS) =   21.22
  EFFECTIVE AREA(ACRES) =     99.74   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      100.5       PEAK FLOW RATE(CFS) =      98.24
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      100.5  TC(MIN.) =     53.43
  EFFECTIVE AREA(ACRES) =     99.74  AREA-AVERAGED Fm(INCH/HR)=  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =      98.24

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
     1       98.24   53.43    1.724  0.63( 0.63) 1.00      99.7    3000.00
     2       97.08   54.39    1.703  0.63( 0.63) 1.00     100.5    3100.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

****

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE

(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)

Ver. 22.0 Release Date: 07/01/2015 License ID 1673

Analysis prepared by:

************************** DESCRIPTION OF STUDY **************************

* 40.087 *

* WATERSHED Q - EXISTING - RATIONAL METHOD *

* 2022-09-23 *

****

FILE NAME: 087_Q_EX.DAT

TIME/DATE OF STUDY: 08:42 09/30/2022

==

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

==

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00

SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00

SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95

USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   4000.00 TO NODE   4001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   633.27
  ELEVATION DATA: UPSTREAM(FEET) =    469.15  DOWNSTREAM(FEET) =    462.59

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   23.248
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.088
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B        2.71      0.63     1.000    63   23.25
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      5.99
  TOTAL AREA(ACRES) =      2.71   PEAK FLOW RATE(CFS) =      5.99

****************************************************************************
  FLOW PROCESS FROM NODE   4001.00 TO NODE   4002.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    462.59  DOWNSTREAM(FEET) =    454.39
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1185.89   CHANNEL SLOPE =  0.0069
  CHANNEL FLOW THRU SUBAREA(CFS) =       5.99
  FLOW VELOCITY(FEET/SEC) =   1.83 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  10.79   Tc(MIN.) =   34.04
  LONGEST FLOWPATH FROM NODE   4000.00 TO NODE   4002.00 =    1819.16 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4002.00 TO NODE   4002.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   34.04
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.364
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       13.74      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   13.74      SUBAREA RUNOFF(CFS) =   21.45
  EFFECTIVE AREA(ACRES) =     16.45   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       16.5       PEAK FLOW RATE(CFS) =      25.68

****************************************************************************
  FLOW PROCESS FROM NODE   4002.00 TO NODE   4003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    454.39  DOWNSTREAM(FEET) =    423.22
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1763.97   CHANNEL SLOPE =  0.0177
  CHANNEL FLOW THRU SUBAREA(CFS) =      25.68
  FLOW VELOCITY(FEET/SEC) =   4.26 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.90   Tc(MIN.) =   40.93
  LONGEST FLOWPATH FROM NODE   4000.00 TO NODE   4003.00 =    3583.13 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4003.00 TO NODE   4003.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   40.93
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.078
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       40.35      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   40.35      SUBAREA RUNOFF(CFS) =   52.58
  EFFECTIVE AREA(ACRES) =     56.80   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       56.8       PEAK FLOW RATE(CFS) =      74.02

****************************************************************************
  FLOW PROCESS FROM NODE   4003.00 TO NODE   4004.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    439.63  DOWNSTREAM(FEET) =    423.22
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1993.83   CHANNEL SLOPE =  0.0082
  CHANNEL FLOW THRU SUBAREA(CFS) =      74.02
  FLOW VELOCITY(FEET/SEC) =   3.94 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   8.44   Tc(MIN.) =   49.37
  LONGEST FLOWPATH FROM NODE   4000.00 TO NODE   4004.00 =    5576.96 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4004.00 TO NODE   4004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   49.37
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.822
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       64.56      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   64.56      SUBAREA RUNOFF(CFS) =   69.29
  EFFECTIVE AREA(ACRES) =    121.36   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      121.4       PEAK FLOW RATE(CFS) =     130.24

****************************************************************************
  FLOW PROCESS FROM NODE   4004.00 TO NODE   4005.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    423.22  DOWNSTREAM(FEET) =    347.76
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2989.04   CHANNEL SLOPE =  0.0252
  CHANNEL FLOW THRU SUBAREA(CFS) =     130.24
  FLOW VELOCITY(FEET/SEC) =   8.17 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.10   Tc(MIN.) =   55.47
  LONGEST FLOWPATH FROM NODE   4000.00 TO NODE   4005.00 =    8566.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4005.00 TO NODE   4005.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   55.47
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.680
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B      118.15      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  118.15      SUBAREA RUNOFF(CFS) =  111.63
  EFFECTIVE AREA(ACRES) =    239.51   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      239.5       PEAK FLOW RATE(CFS) =     226.29
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      239.5  TC(MIN.) =     55.47
  EFFECTIVE AREA(ACRES) =    239.51  AREA-AVERAGED Fm(INCH/HR)=  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =     226.29
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
       (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
      (c) Copyright 1983-2015 Advanced Engineering Software (aes)
          Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                        Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED R - EXISTING - RATIONAL METHOD                                 *
* 2022-09-23                                                               *
 **************************************************************************

  FILE NAME: 087_R_EX.DAT
  TIME/DATE OF STUDY: 14:35 10/04/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
```

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   5000.00 TO NODE   5001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   853.49
  ELEVATION DATA: UPSTREAM(FEET) =    459.31  DOWNSTREAM(FEET) =    449.47

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   25.640
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.883
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B        2.67      0.63     1.000    63   25.64
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      5.41
  TOTAL AREA(ACRES) =      2.67   PEAK FLOW RATE(CFS) =      5.41

****************************************************************************
  FLOW PROCESS FROM NODE   5001.00 TO NODE   5002.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    449.47  DOWNSTREAM(FEET) =    437.87
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1376.57   CHANNEL SLOPE =  0.0084
  CHANNEL FLOW THRU SUBAREA(CFS) =       5.41
  FLOW VELOCITY(FEET/SEC) =   1.97 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  11.63   Tc(MIN.) =   37.27
  LONGEST FLOWPATH FROM NODE   5000.00 TO NODE   5002.00 =    2230.06 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   5002.00 TO NODE   5002.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   37.27
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.219
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       16.19      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   16.19      SUBAREA RUNOFF(CFS) =   23.16
  EFFECTIVE AREA(ACRES) =     18.86   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       18.9       PEAK FLOW RATE(CFS) =      26.97

****************************************************************************
  FLOW PROCESS FROM NODE   5002.00 TO NODE   5003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    437.87  DOWNSTREAM(FEET) =    423.22
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1856.36   CHANNEL SLOPE =  0.0079
  CHANNEL FLOW THRU SUBAREA(CFS) =      26.97
  FLOW VELOCITY(FEET/SEC) =   2.89 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  10.71   Tc(MIN.) =   47.98
  LONGEST FLOWPATH FROM NODE   5000.00 TO NODE   5003.00 =    4086.42 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   5003.00 TO NODE   5003.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   47.98
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.859
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

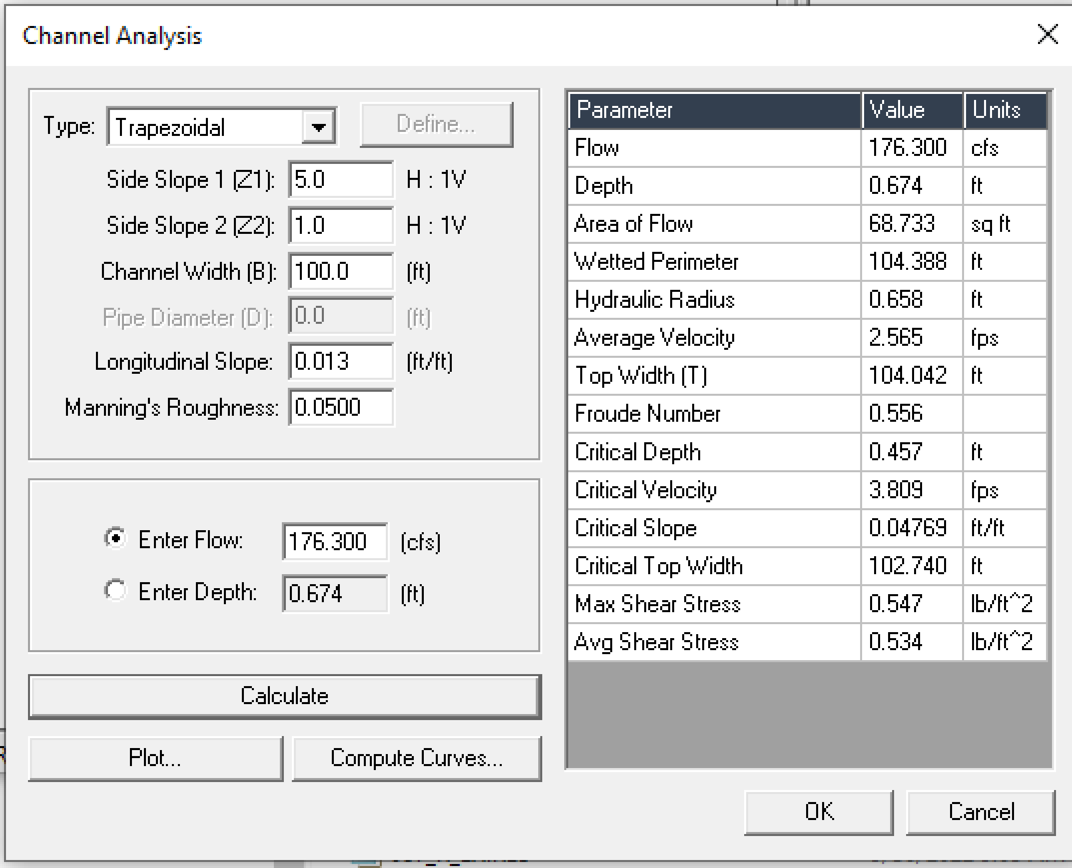
```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   C       48.74      0.53     1.000    70
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.53
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   48.74      SUBAREA RUNOFF(CFS) =   58.32
  EFFECTIVE AREA(ACRES) =     67.60   AREA-AVERAGED Fm(INCH/HR) =  0.56
  AREA-AVERAGED Fp(INCH/HR) =  0.56  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       67.6       PEAK FLOW RATE(CFS) =      79.18

****************************************************************************
  FLOW PROCESS FROM NODE   5003.00 TO NODE   5004.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    423.22  DOWNSTREAM(FEET) =    367.45
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1768.68   CHANNEL SLOPE =  0.0315
  CHANNEL FLOW THRU SUBAREA(CFS) =      79.18
  FLOW VELOCITY(FEET/SEC) =   7.86 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.75   Tc(MIN.) =   51.73
  LONGEST FLOWPATH FROM NODE   5000.00 TO NODE   5004.00 =    5855.10 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   5004.00 TO NODE   5004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   51.73
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.764
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       62.97      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   62.97      SUBAREA RUNOFF(CFS) =   64.27
  EFFECTIVE AREA(ACRES) =    130.57   AREA-AVERAGED Fm(INCH/HR) =  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.59  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      130.6       PEAK FLOW RATE(CFS) =     137.65
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      130.6  TC(MIN.) =     51.73
  EFFECTIVE AREA(ACRES) =    130.57  AREA-AVERAGED Fm(INCH/HR)=  0.59
  AREA-AVERAGED Fp(INCH/HR) =  0.59  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =     137.65
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

HYDRAULIC TOOLBOX


Channel Analysis
Type: Trapezoidal
Define...
Side Slope 1 (Z1): 5.0 H : 1V
Side Slope 2 (Z2): 1.0 H : 1V
Channel Width (B): 100.0 (ft)
Pipe Diameter (D): 0.0 (ft)
Longitudinal Slope: 0.013 (ft/ft)
Manning's Roughness: 0.0500
Enter Flow: 176.300 (cfs)
Enter Depth: 0.674 (ft)
Calculate
Plot...
Compute Curves...
Parameter Value Units
Flow 176.300 cfs
Depth 0.674 ft
Area of Flow 68.733 sq ft
Wetted Perimeter 104.388 ft
Hydraulic Radius 0.658 ft
Average Velocity 2.565 fps
Top Width (T) 104.042 ft
Froude Number 0.556
Critical Depth 0.457 ft
Critical Velocity 3.809 fps
Critical Slope 0.04769 ft/ft
Critical Top Width 102.740 ft
Max Shear Stress 0.547 lb/ft^2
Avg Shear Stress 0.534 lb/ft^2
OK
Cancel

Channel Analysis

Type: Trapezoidal

Define...

Side Slope 1 (Z1): 5.0 H : 1V

Side Slope 2 (Z2): 1.0 H : 1V

Channel Width (B): 100.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.008 (ft/ft)

Manning's Roughness: 0.0500

(•) Enter Flow: 320.700 (cfs)

( ) Enter Depth: 1.114 (ft)

Calculate

Plot... | Compute Curves...

Parameter	Value	Units
Flow	320.700	cfs
Depth	1.114	ft
Area of Flow	115.104	sq ft
Wetted Perimeter	107.255	ft
Hydraulic Radius	1.073	ft
Average Velocity	2.786	fps
Top Width (T)	106.683	ft
Froude Number	0.473	
Critical Depth	0.679	ft
Critical Velocity	4.629	fps
Critical Slope	0.04193	ft/ft
Critical Top Width	104.074	ft
Max Shear Stress	0.556	lb/ft^2
Avg Shear Stress	0.536	lb/ft^2

OK | Cancel

Channel Analysis

Type: Trapezoidal   Define...

Side Slope 1 (Z1): 5.0 H : 1V

Side Slope 2 (Z2): 1.0 H : 1V

Channel Width (B): 100.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.008 (ft/ft)

Manning's Roughness: 0.0500

(•) Enter Flow: 139.670 (cfs)

( ) Enter Depth: 0.678 (ft)

Calculate

Plot...   Compute Curves...

Parameter	Value	Units
Flow	139.670	cfs
Depth	0.678	ft
Area of Flow	69.146	sq ft
Wetted Perimeter	104.414	ft
Hydraulic Radius	0.662	ft
Average Velocity	2.020	fps
Top Width (T)	104.066	ft
Froude Number	0.437	
Critical Depth	0.391	ft
Critical Velocity	3.529	fps
Critical Slope	0.05016	ft/ft
Critical Top Width	102.347	ft
Max Shear Stress	0.338	lb/ft^2
Avg Shear Stress	0.331	lb/ft^2

OK   Cancel

Channel Analysis

Type: Trapezoidal

Define...

Side Slope 1 (Z1):	5.0	H : 1V
Side Slope 2 (Z2):	1.0	H : 1V
Channel Width (B):	100.0	(ft)
Pipe Diameter (D):	0.0	(ft)
Longitudinal Slope:	0.0137	(ft/ft)
Manning's Roughness:	0.0500	

◉ Enter Flow:	254.700	(cfs)
○ Enter Depth:	0.826	(ft)

Calculate

Plot... Compute Curves...

Parameter	Value	Units
Flow	254.700	cfs
Depth	0.826	ft
Area of Flow	84.697	sq ft
Wetted Perimeter	105.383	ft
Hydraulic Radius	0.804	ft
Average Velocity	3.007	fps
Top Width (T)	104.959	ft
Froude Number	0.590	
Critical Depth	0.583	ft
Critical Velocity	4.295	fps
Critical Slope	0.04406	ft/ft
Critical Top Width	103.497	ft
Max Shear Stress	0.707	lb/ft^2
Avg Shear Stress	0.687	lb/ft^2

OK Cancel

Channel Analysis

Type:	Trapezoidal
Side Slope 1 (Z1):	5.0 H : 1V
Side Slope 2 (Z2):	1.0 H : 1V
Channel Width (B):	100.0 (ft)
Pipe Diameter (D):	0.0 (ft)
Longitudinal Slope:	0.0176 (ft/ft)
Manning's Roughness:	0.0500

Define...

- (•) Enter Flow: 82.920 (cfs)
- ( ) Enter Depth: 0.392 (ft)

Calculate

Plot... Compute Curves...

Parameter	Value	Units
Flow	82.920	cfs
Depth	0.392	ft
Area of Flow	39.640	sq ft
Wetted Perimeter	102.552	ft
Hydraulic Radius	0.387	ft
Average Velocity	2.092	fps
Top Width (T)	102.351	ft
Froude Number	0.592	
Critical Depth	0.277	ft
Critical Velocity	2.972	fps
Critical Slope	0.05620	ft/ft
Critical Top Width	101.660	ft
Max Shear Stress	0.430	lb/ft^2
Avg Shear Stress	0.425	lb/ft^2

OK Cancel

Channel Analysis

Type: Trapezoidal

Define...

Side Slope 1 (Z1):	5.0	H : 1V
Side Slope 2 (Z2):	1.0	H : 1V
Channel Width (B):	100.0	(ft)
Pipe Diameter (D):	0.0	(ft)
Longitudinal Slope:	0.024	(ft/ft)
Manning's Roughness:	0.0500	

Enter Flow: 156.240 (cfs)

Enter Depth: 0.522 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	156.240	cfs
Depth	0.522	ft
Area of Flow	52.995	sq ft
Wetted Perimeter	103.398	ft
Hydraulic Radius	0.513	ft
Average Velocity	2.948	fps
Top Width (T)	103.131	ft
Froude Number	0.725	
Critical Depth	0.421	ft
Critical Velocity	3.661	fps
Critical Slope	0.04895	ft/ft
Critical Top Width	102.529	ft
Max Shear Stress	0.781	lb/ft^2
Avg Shear Stress	0.768	lb/ft^2

OK

Cancel

Channel Analysis

Type: Trapezoidal

Define...

Side Slope 1 (Z1): 5.0 H : 1V

Side Slope 2 (Z2): 1.0 H : 1V

Channel Width (B): 100.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.037 (ft/ft)

Manning's Roughness: 0.0500

(•) Enter Flow: 126.040 (cfs)

( ) Enter Depth: 0.403 (ft)

Calculate

Plot... Compute Curves...

Parameter	Value	Units
Flow	126.040	cfs
Depth	0.403	ft
Area of Flow	40.790	sq ft
Wetted Perimeter	102.625	ft
Hydraulic Radius	0.397	ft
Average Velocity	3.090	fps
Top Width (T)	102.418	ft
Froude Number	0.863	
Critical Depth	0.365	ft
Critical Velocity	3.412	fps
Critical Slope	0.05129	ft/ft
Critical Top Width	102.193	ft
Max Shear Stress	0.931	lb/ft^2
Avg Shear Stress	0.918	lb/ft^2

OK Cancel

RATIONAL METHOD
PROPOSED CONDITION

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2015 Advanced Engineering Software (aes)
              Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                           Analysis prepared by:










 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED K - PROPOSED - RATIONAL METHOD                                 *
* 2022-09-28                                                               *
 **************************************************************************


  FILE NAME: 087_K_PR.DAT
  TIME/DATE OF STUDY: 09:02 09/28/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
```

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   6000.00 TO NODE   6001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   873.25
  ELEVATION DATA: UPSTREAM(FEET) =    564.30  DOWNSTREAM(FEET) =    554.46

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   25.995
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.855
```

```
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL DESERT COVER
 "DESERT BRUSH"   (50.0%)   B        5.72      0.63     1.000    63   25.99
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =     11.46
 TOTAL AREA(ACRES) =      5.72   PEAK FLOW RATE(CFS) =     11.46

****************************************************************************
 FLOW PROCESS FROM NODE   6001.00 TO NODE   6002.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    554.46  DOWNSTREAM(FEET) =    518.37
 CHANNEL LENGTH THRU SUBAREA(FEET) =  2202.70   CHANNEL SLOPE =  0.0164
 CHANNEL FLOW THRU SUBAREA(CFS) =      11.46
 FLOW VELOCITY(FEET/SEC) =   3.31 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =  11.08   Tc(MIN.) =   37.08
 LONGEST FLOWPATH FROM NODE   6000.00 TO NODE   6002.00 =    3075.95 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   6002.00 TO NODE   6002.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   37.08
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.227
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   C       60.97      0.53     1.000    70
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.53
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   60.97      SUBAREA RUNOFF(CFS) =   93.12
  EFFECTIVE AREA(ACRES) =     66.69   AREA-AVERAGED Fm(INCH/HR) =  0.54
  AREA-AVERAGED Fp(INCH/HR) =  0.54  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       66.7       PEAK FLOW RATE(CFS) =     101.34

****************************************************************************
  FLOW PROCESS FROM NODE   6002.00 TO NODE   6003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    518.37  DOWNSTREAM(FEET) =    490.48
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1951.98   CHANNEL SLOPE =  0.0143
  CHANNEL FLOW THRU SUBAREA(CFS) =     101.34
  FLOW VELOCITY(FEET/SEC) =   5.70 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.71   Tc(MIN.) =   42.79
  LONGEST FLOWPATH FROM NODE   6000.00 TO NODE   6003.00 =    5027.93 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   6003.00 TO NODE   6003.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   42.79
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.014
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                   B       62.06      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   62.06      SUBAREA RUNOFF(CFS) =   84.37
  EFFECTIVE AREA(ACRES) =    128.75   AREA-AVERAGED Fm(INCH/HR) =  0.52
  AREA-AVERAGED Fp(INCH/HR) =  0.52  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      128.8       PEAK FLOW RATE(CFS) =     172.95

****************************************************************************
  FLOW PROCESS FROM NODE   6003.00 TO NODE   6004.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    490.48  DOWNSTREAM(FEET) =    462.59
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2176.89   CHANNEL SLOPE =  0.0128
  CHANNEL FLOW THRU SUBAREA(CFS) =     172.95
  FLOW VELOCITY(FEET/SEC) =   6.35 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.72   Tc(MIN.) =   48.51
  LONGEST FLOWPATH FROM NODE   6000.00 TO NODE   6004.00 =    7204.82 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   6004.00 TO NODE   6004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   48.51
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.845
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       67.67      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   67.67      SUBAREA RUNOFF(CFS) =   74.01
  EFFECTIVE AREA(ACRES) =    196.42   AREA-AVERAGED Fm(INCH/HR) =  0.56
  AREA-AVERAGED Fp(INCH/HR) =  0.56  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      196.4       PEAK FLOW RATE(CFS) =     227.34
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      196.4  TC(MIN.) =     48.51
  EFFECTIVE AREA(ACRES) =    196.42  AREA-AVERAGED Fm(INCH/HR)=  0.56
  AREA-AVERAGED Fp(INCH/HR) =  0.56  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =     227.34
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

____

****

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE

(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)

Ver. 22.0 Release Date: 07/01/2015 License ID 1673

Analysis prepared by:

************************** DESCRIPTION OF STUDY **************************

* 40.087 *

* WATERSHED L - PROPOSED - RATIONAL METHOD *

* 2022-09-28 *

****

FILE NAME: 087_L_PR.DAT

TIME/DATE OF STUDY: 10:30 09/28/2022

==

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

==

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00

SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00

SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95

USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000

USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

```
   HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
   WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
```

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET

   as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)

2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN

OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****

FLOW PROCESS FROM NODE 7000.00 TO NODE 7001.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

==

INITIAL SUBAREA FLOW-LENGTH(FEET) = 481.55

ELEVATION DATA: UPSTREAM(FEET) = 672.56 DOWNSTREAM(FEET) = 656.16

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.422

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.938

SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc

LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)

NATURAL DESERT COVER

"DESERT BRUSH" (50.0%) B 6.62 0.63 1.000 63 16.42

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.63

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA RUNOFF(CFS) = 19.71

TOTAL AREA(ACRES) = 6.62 PEAK FLOW RATE(CFS) = 19.71

****

FLOW PROCESS FROM NODE 7001.00 TO NODE 7002.00 IS CODE = 52

>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

==

ELEVATION DATA: UPSTREAM(FEET) = 656.16 DOWNSTREAM(FEET) = 629.91

CHANNEL LENGTH THRU SUBAREA(FEET) = 913.56 CHANNEL SLOPE = 0.0287

CHANNEL FLOW THRU SUBAREA(CFS) = 19.71

FLOW VELOCITY(FEET/SEC) = 5.06 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)

TRAVEL TIME(MIN.) = 3.01 Tc(MIN.) = 19.43

LONGEST FLOWPATH FROM NODE 7000.00 TO NODE 7002.00 = 1395.11 FEET.

****

FLOW PROCESS FROM NODE 7002.00 TO NODE 7002.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

==

MAINLINE Tc(MIN.) = 19.43

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.501

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS

LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN

NATURAL DESERT COVER

"DESERT BRUSH" (50.0%) B 16.36 0.63 1.000 63

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.63

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA AREA(ACRES) = 16.36 SUBAREA RUNOFF(CFS) = 42.27

EFFECTIVE AREA(ACRES) = 22.98 AREA-AVERAGED Fm(INCH/HR) = 0.63

AREA-AVERAGED Fp(INCH/HR) = 0.63 AREA-AVERAGED Ap = 1.00

TOTAL AREA(ACRES) = 23.0 PEAK FLOW RATE(CFS) = 59.37

****

FLOW PROCESS FROM NODE 7002.00 TO NODE 7003.00 IS CODE = 52

>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

==

ELEVATION DATA: UPSTREAM(FEET) = 629.91 DOWNSTREAM(FEET) = 620.07

CHANNEL LENGTH THRU SUBAREA(FEET) = 1423.58 CHANNEL SLOPE = 0.0069

CHANNEL FLOW THRU SUBAREA(CFS) = 59.37

FLOW VELOCITY(FEET/SEC) = 3.38 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)

TRAVEL TIME(MIN.) = 7.02 Tc(MIN.) = 26.45

LONGEST FLOWPATH FROM NODE 7000.00 TO NODE 7003.00 = 2818.69 FEET.

****

FLOW PROCESS FROM NODE 7003.00 TO NODE 7003.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

==

MAINLINE Tc(MIN.) = 26.45

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.821

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS

LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN

NATURAL DESERT COVER

"DESERT BRUSH" (50.0%) B 37.13 0.63 1.000 63

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.63

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA AREA(ACRES) = 37.13 SUBAREA RUNOFF(CFS) = 73.23

EFFECTIVE AREA(ACRES) = 60.11 AREA-AVERAGED Fm(INCH/HR) = 0.63

AREA-AVERAGED Fp(INCH/HR) = 0.63 AREA-AVERAGED Ap = 1.00

TOTAL AREA(ACRES) = 60.1 PEAK FLOW RATE(CFS) = 118.55

****

FLOW PROCESS FROM NODE 7003.00 TO NODE 7004.00 IS CODE = 52

>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

==

ELEVATION DATA: UPSTREAM(FEET) = 620.07 DOWNSTREAM(FEET) = 582.34

CHANNEL LENGTH THRU SUBAREA(FEET) = 2030.86 CHANNEL SLOPE = 0.0186

CHANNEL FLOW THRU SUBAREA(CFS) = 118.55

FLOW VELOCITY(FEET/SEC) = 6.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)

TRAVEL TIME(MIN.) = 4.97 Tc(MIN.) = 31.42

LONGEST FLOWPATH FROM NODE 7000.00 TO NODE 7004.00 = 4849.55 FEET.

****

FLOW PROCESS FROM NODE 7004.00 TO NODE 7004.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

==

MAINLINE Tc(MIN.) = 31.42

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.501

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
NATURAL DESERT COVER					
"DESERT BRUSH" (50.0%)	B	80.22	0.63	1.000	63

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.63

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA AREA(ACRES) = 80.22 SUBAREA RUNOFF(CFS) = 135.07

EFFECTIVE AREA(ACRES) = 140.33 AREA-AVERAGED Fm(INCH/HR) = 0.63

AREA-AVERAGED Fp(INCH/HR) = 0.63 AREA-AVERAGED Ap = 1.00

TOTAL AREA(ACRES) = 140.3 PEAK FLOW RATE(CFS) = 236.29

****

FLOW PROCESS FROM NODE 7004.00 TO NODE 7005.00 IS CODE = 52

>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

==

ELEVATION DATA: UPSTREAM(FEET) = 582.34 DOWNSTREAM(FEET) = 534.77

CHANNEL LENGTH THRU SUBAREA(FEET) = 3384.02 CHANNEL SLOPE = 0.0141

CHANNEL FLOW THRU SUBAREA(CFS) = 236.29

FLOW VELOCITY(FEET/SEC) = 7.32 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)

TRAVEL TIME(MIN.) = 7.70 Tc(MIN.) = 39.12

LONGEST FLOWPATH FROM NODE 7000.00 TO NODE 7005.00 = 8233.57 FEET.

****

FLOW PROCESS FROM NODE 7005.00 TO NODE 7005.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

==

MAINLINE Tc(MIN.) = 39.12

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.145

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS

LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN

NATURAL DESERT COVER

"DESERT BRUSH" (50.0%) B 154.24 0.63 1.000 63

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.63

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA AREA(ACRES) = 154.24 SUBAREA RUNOFF(CFS) = 210.32

EFFECTIVE AREA(ACRES) = 294.57 AREA-AVERAGED Fm(INCH/HR) = 0.63

AREA-AVERAGED Fp(INCH/HR) = 0.63 AREA-AVERAGED Ap = 1.00

TOTAL AREA(ACRES) = 294.6 PEAK FLOW RATE(CFS) = 401.67

****

FLOW PROCESS FROM NODE 7005.00 TO NODE 7006.00 IS CODE = 52

>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

==

ELEVATION DATA: UPSTREAM(FEET) = 534.77 DOWNSTREAM(FEET) = 505.24

CHANNEL LENGTH THRU SUBAREA(FEET) = 2271.84 CHANNEL SLOPE = 0.0130

CHANNEL FLOW THRU SUBAREA(CFS) = 401.67

FLOW VELOCITY(FEET/SEC) = 8.32 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)

TRAVEL TIME(MIN.) = 4.55 Tc(MIN.) = 43.67

LONGEST FLOWPATH FROM NODE 7000.00 TO NODE 7006.00 = 10505.41 FEET.

****

FLOW PROCESS FROM NODE 7006.00 TO NODE 7006.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

==

MAINLINE Tc(MIN.) = 43.67

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 1.986

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
NATURAL DESERT COVER					
"DESERT BRUSH" (50.0%)	B	190.46	0.63	1.000	63

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.63

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA AREA(ACRES) = 190.46 SUBAREA RUNOFF(CFS) = 232.46

EFFECTIVE AREA(ACRES) = 485.03 AREA-AVERAGED Fm(INCH/HR) = 0.63

AREA-AVERAGED Fp(INCH/HR) = 0.63 AREA-AVERAGED Ap = 1.00

TOTAL AREA(ACRES) = 485.0 PEAK FLOW RATE(CFS) = 591.98

****

FLOW PROCESS FROM NODE 7006.00 TO NODE 7007.00 IS CODE = 52

>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

==

ELEVATION DATA: UPSTREAM(FEET) = 505.24 DOWNSTREAM(FEET) = 456.03

CHANNEL LENGTH THRU SUBAREA(FEET) = 5702.14 CHANNEL SLOPE = 0.0086

CHANNEL FLOW THRU SUBAREA(CFS) = 591.98

FLOW VELOCITY(FEET/SEC) = 7.68 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)

TRAVEL TIME(MIN.) = 12.37 Tc(MIN.) = 56.04

LONGEST FLOWPATH FROM NODE 7000.00 TO NODE 7007.00 = 16207.55 FEET.

****

FLOW PROCESS FROM NODE 7007.00 TO NODE 7007.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

==

MAINLINE Tc(MIN.) = 56.04

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 1.668

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS

LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN

NATURAL POOR COVER

"BARREN" B 292.49 0.50 1.000 72

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.50

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

```
 SUBAREA AREA(ACRES) =  292.49     SUBAREA RUNOFF(CFS) =  306.37
 EFFECTIVE AREA(ACRES) =    777.52   AREA-AVERAGED Fm(INCH/HR) =  0.58
 AREA-AVERAGED Fp(INCH/HR) =  0.58  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =      777.5       PEAK FLOW RATE(CFS) =     759.41

****************************************************************************
 FLOW PROCESS FROM NODE   7007.00 TO NODE   7008.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    456.03  DOWNSTREAM(FEET) =    413.38
 CHANNEL LENGTH THRU SUBAREA(FEET) =  5325.30   CHANNEL SLOPE =  0.0080
 CHANNEL FLOW THRU SUBAREA(CFS) =     759.41
 FLOW VELOCITY(FEET/SEC) =   8.02 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =  11.07   Tc(MIN.) =   67.11
 LONGEST FLOWPATH FROM NODE   7000.00 TO NODE   7008.00 =   21532.85 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   7008.00 TO NODE   7008.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   67.11
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.470
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/     SCS SOIL   AREA      Fp        Ap     SCS
      LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL DESERT COVER
```

"DESERT BRUSH" (50.0%) B 176.03 0.63 1.000 63

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.63

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA AREA(ACRES) = 176.03 SUBAREA RUNOFF(CFS) = 133.10

EFFECTIVE AREA(ACRES) = 953.55 AREA-AVERAGED Fm(INCH/HR) = 0.59

AREA-AVERAGED Fp(INCH/HR) = 0.59 AREA-AVERAGED Ap = 1.00

TOTAL AREA(ACRES) = 953.6 PEAK FLOW RATE(CFS) = 759.41

NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

==

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 953.6 TC(MIN.) = 67.11

EFFECTIVE AREA(ACRES) = 953.55 AREA-AVERAGED Fm(INCH/HR)= 0.59

AREA-AVERAGED Fp(INCH/HR) = 0.59 AREA-AVERAGED Ap = 1.000

PEAK FLOW RATE(CFS) = 759.41

==

==

END OF RATIONAL METHOD ANALYSIS

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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             Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                           Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED M - PROPOSED - RATIONAL METHOD                                 *
* 2022-09-28                                                               *
 **************************************************************************

  FILE NAME: 087_M_PR.DAT
  TIME/DATE OF STUDY: 10:18 09/28/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
```

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   8000.00 TO NODE   8001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   707.22
  ELEVATION DATA: UPSTREAM(FEET) =    484.90  DOWNSTREAM(FEET) =    480.64

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   20.138
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.414
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "BARREN"                  B        5.64      0.50     1.000    72   20.14
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =     14.77
  TOTAL AREA(ACRES) =      5.64   PEAK FLOW RATE(CFS) =     14.77

****************************************************************************
  FLOW PROCESS FROM NODE   8001.00 TO NODE   8002.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    480.64  DOWNSTREAM(FEET) =    465.87
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1884.27   CHANNEL SLOPE =  0.0078
  CHANNEL FLOW THRU SUBAREA(CFS) =      14.77
  FLOW VELOCITY(FEET/SEC) =   2.45 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  12.83   Tc(MIN.) =   32.97
  LONGEST FLOWPATH FROM NODE   8000.00 TO NODE   8002.00 =    2591.49 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   8002.00 TO NODE   8002.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   32.97
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.418
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                 B       22.52      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   22.52      SUBAREA RUNOFF(CFS) =   38.79
  EFFECTIVE AREA(ACRES) =     28.16   AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       28.2       PEAK FLOW RATE(CFS) =      48.50

****************************************************************************
  FLOW PROCESS FROM NODE   8002.00 TO NODE   8003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    465.87  DOWNSTREAM(FEET) =    444.55
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2500.77   CHANNEL SLOPE =  0.0085
  CHANNEL FLOW THRU SUBAREA(CFS) =      48.50
  FLOW VELOCITY(FEET/SEC) =   3.54 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  11.77   Tc(MIN.) =   44.74
  LONGEST FLOWPATH FROM NODE   8000.00 TO NODE   8003.00 =    5092.26 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   8003.00 TO NODE   8003.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   44.74
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.953
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                 B       79.90      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   79.90      SUBAREA RUNOFF(CFS) =  104.18
  EFFECTIVE AREA(ACRES) =    108.06   AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      108.1       PEAK FLOW RATE(CFS) =     140.90

****************************************************************************
  FLOW PROCESS FROM NODE   8003.00 TO NODE   8004.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    444.55  DOWNSTREAM(FEET) =    423.22
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2682.71   CHANNEL SLOPE =  0.0080
  CHANNEL FLOW THRU SUBAREA(CFS) =     140.90
  FLOW VELOCITY(FEET/SEC) =   4.70 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   9.52   Tc(MIN.) =   54.26
  LONGEST FLOWPATH FROM NODE   8000.00 TO NODE   8004.00 =    7774.97 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   8004.00 TO NODE   8004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   54.26
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.706
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   C       83.59      0.53     1.000    70
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.53
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   83.59      SUBAREA RUNOFF(CFS) =   88.47
  EFFECTIVE AREA(ACRES) =    191.65   AREA-AVERAGED Fm(INCH/HR) =  0.52
  AREA-AVERAGED Fp(INCH/HR) =  0.52  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      191.6       PEAK FLOW RATE(CFS) =     205.37
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      191.6  TC(MIN.) =     54.26
  EFFECTIVE AREA(ACRES) =    191.65  AREA-AVERAGED Fm(INCH/HR)=  0.52
  AREA-AVERAGED Fp(INCH/HR) =  0.52  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =     205.37
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                        Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                 *
* WATERSHED N - PROPOSED - RATIONAL METHOD                               *
* 22-09-29                                                               *
 **************************************************************************

  FILE NAME: 087_N_PR.DAT
  TIME/DATE OF STUDY: 08:23 09/30/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
```

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   9000.00 TO NODE   9001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   804.32
  ELEVATION DATA: UPSTREAM(FEET) =    557.74  DOWNSTREAM(FEET) =    547.89

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   24.739
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.956
```

```
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (50.0%)   B        2.95      0.63     1.000    63   24.74
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA RUNOFF(CFS) =      6.18
TOTAL AREA(ACRES) =      2.95   PEAK FLOW RATE(CFS) =      6.18

****************************************************************************
FLOW PROCESS FROM NODE   9001.00 TO NODE   9002.00 IS CODE =  52
----------------------------------------------------------------------------
>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    547.89  DOWNSTREAM(FEET) =    541.33
CHANNEL LENGTH THRU SUBAREA(FEET) =   942.65   CHANNEL SLOPE =  0.0070
CHANNEL FLOW THRU SUBAREA(CFS) =       6.18
FLOW VELOCITY(FEET/SEC) =   1.85 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =   8.49   Tc(MIN.) =   33.23
LONGEST FLOWPATH FROM NODE   9000.00 TO NODE   9002.00 =    1746.97 FEET.

****************************************************************************
FLOW PROCESS FROM NODE   9002.00 TO NODE   9002.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   33.23
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.405
SUBAREA LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       11.35      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   11.35      SUBAREA RUNOFF(CFS) =   18.13
  EFFECTIVE AREA(ACRES) =     14.30   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       14.3       PEAK FLOW RATE(CFS) =      22.84

****************************************************************************
  FLOW PROCESS FROM NODE   9002.00 TO NODE   9003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    541.33  DOWNSTREAM(FEET) =    524.93
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1171.88   CHANNEL SLOPE =  0.0140
  CHANNEL FLOW THRU SUBAREA(CFS) =      22.84
  FLOW VELOCITY(FEET/SEC) =   3.67 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.32   Tc(MIN.) =   38.54
  LONGEST FLOWPATH FROM NODE   9000.00 TO NODE   9003.00 =    2918.85 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9003.00 TO NODE   9003.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   38.54
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.167
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       17.21      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   17.21      SUBAREA RUNOFF(CFS) =   23.81
  EFFECTIVE AREA(ACRES) =     31.51   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       31.5       PEAK FLOW RATE(CFS) =      43.60

****************************************************************************
  FLOW PROCESS FROM NODE   9003.00 TO NODE   9004.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    524.93  DOWNSTREAM(FEET) =    505.24
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1938.53   CHANNEL SLOPE =  0.0102
  CHANNEL FLOW THRU SUBAREA(CFS) =      43.60
  FLOW VELOCITY(FEET/SEC) =   3.75 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   8.61   Tc(MIN.) =   47.16
  LONGEST FLOWPATH FROM NODE   9000.00 TO NODE   9004.00 =    4857.38 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9004.00 TO NODE   9004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   47.16
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.882
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       54.59      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   54.59      SUBAREA RUNOFF(CFS) =   61.51
  EFFECTIVE AREA(ACRES) =     86.10   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       86.1       PEAK FLOW RATE(CFS) =      97.02

****************************************************************************
  FLOW PROCESS FROM NODE   9004.00 TO NODE   9004.50 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    505.24  DOWNSTREAM(FEET) =    482.28
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1996.40   CHANNEL SLOPE =  0.0115
  CHANNEL FLOW THRU SUBAREA(CFS) =      97.02
  FLOW VELOCITY(FEET/SEC) =   5.04 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.60   Tc(MIN.) =   53.75
  LONGEST FLOWPATH FROM NODE   9000.00 TO NODE   9004.50 =    6853.78 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9004.50 TO NODE   9004.50 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   53.75
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.717
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B      123.80      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  123.80      SUBAREA RUNOFF(CFS) =  121.13
  EFFECTIVE AREA(ACRES) =    209.90   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      209.9       PEAK FLOW RATE(CFS) =     205.38

****************************************************************************
  FLOW PROCESS FROM NODE   9004.50 TO NODE   9005.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    482.28  DOWNSTREAM(FEET) =    452.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2782.02   CHANNEL SLOPE =  0.0106
  CHANNEL FLOW THRU SUBAREA(CFS) =     205.38
  FLOW VELOCITY(FEET/SEC) =   6.09 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.61   Tc(MIN.) =   61.36
  LONGEST FLOWPATH FROM NODE   9000.00 TO NODE   9005.00 =    9635.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9005.00 TO NODE   9005.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   61.36
  RAINFALL INTENSITY(INCH/HR) =   1.57
```

```
 AREA-AVERAGED Fm(INCH/HR) =  0.63
 AREA-AVERAGED Fp(INCH/HR) =  0.63
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =     209.90
 TOTAL STREAM AREA(ACRES) =     209.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     205.38

****************************************************************************
 FLOW PROCESS FROM NODE   9100.00 TO NODE   9101.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   525.08
 ELEVATION DATA: UPSTREAM(FEET) =    475.72  DOWNSTREAM(FEET) =    472.44

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   17.747
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.730
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL POOR COVER
 "BARREN"                   B        5.69      0.50     1.000    72   17.75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =     16.52
 TOTAL AREA(ACRES) =      5.69   PEAK FLOW RATE(CFS) =     16.52

****************************************************************************
 FLOW PROCESS FROM NODE   9101.00 TO NODE   9102.00 IS CODE =  52
----------------------------------------------------------------------------
```

```
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
==============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    472.44  DOWNSTREAM(FEET) =    465.87
 CHANNEL LENGTH THRU SUBAREA(FEET) =   519.76   CHANNEL SLOPE =  0.0126
 CHANNEL FLOW THRU SUBAREA(CFS) =      16.52
 FLOW VELOCITY(FEET/SEC) =   3.20 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   2.71   Tc(MIN.) =   20.45
 LONGEST FLOWPATH FROM NODE   9100.00 TO NODE   9102.00 =    1044.84 FEET.

******************************************************************************
 FLOW PROCESS FROM NODE   9102.00 TO NODE   9102.00 IS CODE =  81
------------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
 MAINLINE Tc(MIN.) =   20.45
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.377
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "BARREN"                   B       10.41      0.50     1.000    72
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   10.41      SUBAREA RUNOFF(CFS) =   26.92
 EFFECTIVE AREA(ACRES) =     16.10   AREA-AVERAGED Fm(INCH/HR) =  0.50
 AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       16.1       PEAK FLOW RATE(CFS) =      41.63

******************************************************************************
 FLOW PROCESS FROM NODE   9102.00 TO NODE   9103.00 IS CODE =  52
------------------------------------------------------------------------------
```

```
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    465.87  DOWNSTREAM(FEET) =    459.31
  CHANNEL LENGTH THRU SUBAREA(FEET) =   833.78   CHANNEL SLOPE =  0.0079
  CHANNEL FLOW THRU SUBAREA(CFS) =      41.63
  FLOW VELOCITY(FEET/SEC) =   3.26 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.27   Tc(MIN.) =   24.72
  LONGEST FLOWPATH FROM NODE   9100.00 TO NODE   9103.00 =    1878.62 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9103.00 TO NODE   9103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   24.72
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.958
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                    B       33.77      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   33.77      SUBAREA RUNOFF(CFS) =   74.58
  EFFECTIVE AREA(ACRES) =     49.87   AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       49.9       PEAK FLOW RATE(CFS) =     110.14

****************************************************************************
  FLOW PROCESS FROM NODE   9103.00 TO NODE   9005.00 IS CODE =  52
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    459.31  DOWNSTREAM(FEET) =    452.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =   735.74   CHANNEL SLOPE =  0.0089
  CHANNEL FLOW THRU SUBAREA(CFS) =     110.14
  FLOW VELOCITY(FEET/SEC) =   4.61 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.66   Tc(MIN.) =   27.38
  LONGEST FLOWPATH FROM NODE   9100.00 TO NODE   9005.00 =    2614.36 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9005.00 TO NODE   9005.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   27.38
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.754
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                    B       19.99      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   19.99      SUBAREA RUNOFF(CFS) =   40.48
  EFFECTIVE AREA(ACRES) =     69.86   AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       69.9       PEAK FLOW RATE(CFS) =     141.46

****************************************************************************
  FLOW PROCESS FROM NODE   9005.00 TO NODE   9005.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   27.38
  RAINFALL INTENSITY(INCH/HR) =   2.75
  AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      69.86
  TOTAL STREAM AREA(ACRES) =      69.86
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     141.46

****************************************************************************
  FLOW PROCESS FROM NODE   9200.00 TO NODE   9201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   638.73
  ELEVATION DATA: UPSTREAM(FEET) =    501.96  DOWNSTREAM(FEET) =    495.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   17.377
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.786
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "BARREN"                    B        9.85      0.50     1.000    72   17.38
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
```

```
  SUBAREA RUNOFF(CFS) =     29.09
  TOTAL AREA(ACRES) =      9.85   PEAK FLOW RATE(CFS) =     29.09

****************************************************************************
  FLOW PROCESS FROM NODE   9201.00 TO NODE   9202.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    495.40  DOWNSTREAM(FEET) =    482.28
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1148.30   CHANNEL SLOPE =  0.0114
  CHANNEL FLOW THRU SUBAREA(CFS) =      29.09
  FLOW VELOCITY(FEET/SEC) =   3.55 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.39   Tc(MIN.) =   22.77
  LONGEST FLOWPATH FROM NODE   9200.00 TO NODE   9202.00 =    1787.03 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9202.00 TO NODE   9202.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   945.79
  ELEVATION DATA: UPSTREAM(FEET) =    482.28  DOWNSTREAM(FEET) =    469.15

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   19.142
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.538
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
```

```
  "BARREN"                  B      23.93     0.50    1.000   72  19.14
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   23.93   INITIAL SUBAREA RUNOFF(CFS) =   65.34

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   22.77
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.133
  SUBAREA AREA(ACRES) =   23.93      SUBAREA RUNOFF(CFS) =   56.62
  EFFECTIVE AREA(ACRES) =     33.78   AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       33.8       PEAK FLOW RATE(CFS) =      79.93

****************************************************************************
  FLOW PROCESS FROM NODE   9202.00 TO NODE   9203.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    482.28  DOWNSTREAM(FEET) =    469.15
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1242.92   CHANNEL SLOPE =  0.0106
  CHANNEL FLOW THRU SUBAREA(CFS) =      79.93
  FLOW VELOCITY(FEET/SEC) =   4.56 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.54   Tc(MIN.) =   27.31
  LONGEST FLOWPATH FROM NODE   9200.00 TO NODE   9203.00 =    3029.95 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9203.00 TO NODE   9203.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   27.31
```

```
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.759
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "BARREN"                    B       38.59      0.50     1.000    72
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   38.59      SUBAREA RUNOFF(CFS) =   78.30
 EFFECTIVE AREA(ACRES) =     72.37   AREA-AVERAGED Fm(INCH/HR) =  0.50
 AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       72.4       PEAK FLOW RATE(CFS) =     146.85

****************************************************************************
 FLOW PROCESS FROM NODE   9203.00 TO NODE   9005.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    469.15  DOWNSTREAM(FEET) =    452.75
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1730.41   CHANNEL SLOPE =  0.0095
 CHANNEL FLOW THRU SUBAREA(CFS) =     146.85
 FLOW VELOCITY(FEET/SEC) =   5.19 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   5.56   Tc(MIN.) =   32.86
 LONGEST FLOWPATH FROM NODE   9200.00 TO NODE   9005.00 =    4760.36 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   9005.00 TO NODE   9005.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   32.86
```

```
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.423
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "BARREN"                    B       20.45      0.50     1.000    72
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   20.45      SUBAREA RUNOFF(CFS) =   35.32
 EFFECTIVE AREA(ACRES) =     92.82   AREA-AVERAGED Fm(INCH/HR) =  0.50
 AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       92.8       PEAK FLOW RATE(CFS) =     160.33

****************************************************************************
 FLOW PROCESS FROM NODE   9005.00 TO NODE   9005.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =   32.86
 RAINFALL INTENSITY(INCH/HR) =   2.42
 AREA-AVERAGED Fm(INCH/HR) =  0.50
 AREA-AVERAGED Fp(INCH/HR) =  0.50
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =      92.82
 TOTAL STREAM AREA(ACRES) =      92.82
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     160.33

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	205.38	61.36	1.565	0.63(0.63)	1.00	209.9	9000.00
2	141.46	27.38	2.754	0.50(0.50)	1.00	69.9	9100.00
3	160.33	32.86	2.423	0.50(0.50)	1.00	92.8	9200.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 3 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	503.40	27.38	2.754	0.55(0.55)	1.00	240.8	9100.00
2	486.38	32.86	2.423	0.56(0.56)	1.00	275.1	9200.00
3	360.75	61.36	1.565	0.57(0.57)	1.00	372.6	9000.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 503.40 Tc(MIN.) = 27.38
EFFECTIVE AREA(ACRES) = 240.82 AREA-AVERAGED Fm(INCH/HR) = 0.55
AREA-AVERAGED Fp(INCH/HR) = 0.55 AREA-AVERAGED Ap = 1.00
TOTAL AREA(ACRES) = 372.6
LONGEST FLOWPATH FROM NODE 9000.00 TO NODE 9005.00 = 9635.80 FEET.

****

FLOW PROCESS FROM NODE 9005.00 TO NODE 9006.00 IS CODE = 52

>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<

==

ELEVATION DATA: UPSTREAM(FEET) = 452.75 DOWNSTREAM(FEET) = 416.66
CHANNEL LENGTH THRU SUBAREA(FEET) = 2622.38 CHANNEL SLOPE = 0.0138
CHANNEL FLOW THRU SUBAREA(CFS) = 503.40
FLOW VELOCITY(FEET/SEC) = 9.21 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)

```
  TRAVEL TIME(MIN.) =   4.75   Tc(MIN.) =   32.12
  LONGEST FLOWPATH FROM NODE   9000.00 TO NODE   9006.00 =   12258.18 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   9006.00 TO NODE   9006.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   32.12
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.462
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   ( 0.0%)   B      119.47      0.55     1.000    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.55
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  119.47      SUBAREA RUNOFF(CFS) =  205.61
  EFFECTIVE AREA(ACRES) =    360.29   AREA-AVERAGED Fm(INCH/HR) =  0.55
  AREA-AVERAGED Fp(INCH/HR) =  0.55  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      492.1       PEAK FLOW RATE(CFS) =     619.41
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      492.1  TC(MIN.) =     32.12
  EFFECTIVE AREA(ACRES) =    360.29  AREA-AVERAGED Fm(INCH/HR)=  0.55
  AREA-AVERAGED Fp(INCH/HR) =  0.55  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =     619.41

  ** PEAK FLOW RATE TABLE **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      619.41   32.12    2.462  0.55( 0.55) 1.00     360.3    9100.00
```

```
    2      585.52   37.66    2.203  0.55( 0.55) 1.00     394.6    9200.00
    3      402.27   66.64    1.477  0.57( 0.57) 1.00     492.1    9000.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

****

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE

(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)

Ver. 22.0 Release Date: 07/01/2015 License ID 1673

Analysis prepared by:

************************* DESCRIPTION OF STUDY ************************

* 40.087 *

* WATERSHED P - PROPOSED - RATIONAL METHOD *

* 2022-10-03 *

****

FILE NAME: 087_P_PR.DAT

TIME/DATE OF STUDY: 09:12 10/03/2022

==

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

==

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00

SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00

SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95

USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   3000.00 TO NODE   3001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   869.30
  ELEVATION DATA: UPSTREAM(FEET) =    467.51  DOWNSTREAM(FEET) =    459.31

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   19.994
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.431
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "BARREN"                   B        3.26      0.50     1.000    72   19.99
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      8.59
  TOTAL AREA(ACRES) =      3.26   PEAK FLOW RATE(CFS) =      8.59

****************************************************************************
  FLOW PROCESS FROM NODE   3001.00 TO NODE   3002.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    459.31  DOWNSTREAM(FEET) =    449.47
  CHANNEL LENGTH THRU SUBAREA(FEET) =   987.36   CHANNEL SLOPE =  0.0100
  CHANNEL FLOW THRU SUBAREA(CFS) =       8.59
  FLOW VELOCITY(FEET/SEC) =   2.40 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.85   Tc(MIN.) =   26.85
  LONGEST FLOWPATH FROM NODE   3000.00 TO NODE   3002.00 =    1856.66 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3002.00 TO NODE   3002.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   26.85
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.792
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                 B        8.46      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    8.46      SUBAREA RUNOFF(CFS) =   17.42
  EFFECTIVE AREA(ACRES) =     11.72   AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       11.7       PEAK FLOW RATE(CFS) =      24.13

****************************************************************************
  FLOW PROCESS FROM NODE   3002.00 TO NODE   3003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    449.47  DOWNSTREAM(FEET) =    437.99
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1276.27   CHANNEL SLOPE =  0.0090
  CHANNEL FLOW THRU SUBAREA(CFS) =      24.13
  FLOW VELOCITY(FEET/SEC) =   2.99 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.11   Tc(MIN.) =   33.96
  LONGEST FLOWPATH FROM NODE   3000.00 TO NODE   3003.00 =    3132.93 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3003.00 TO NODE   3003.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   33.96
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.368
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                 B       19.04      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   19.04      SUBAREA RUNOFF(CFS) =   31.95
  EFFECTIVE AREA(ACRES) =     30.76   AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       30.8       PEAK FLOW RATE(CFS) =      51.61

****************************************************************************
  FLOW PROCESS FROM NODE   3003.00 TO NODE   3003.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   33.96
  RAINFALL INTENSITY(INCH/HR) =   2.37
  AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      30.76
  TOTAL STREAM AREA(ACRES) =      30.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      51.61

****************************************************************************
  FLOW PROCESS FROM NODE   3100.00 TO NODE   3101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   504.51
  ELEVATION DATA: UPSTREAM(FEET) =    469.15  DOWNSTREAM(FEET) =    467.51

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   26.764
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.798
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B        2.67      0.63     1.000    63   26.76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      5.21
  TOTAL AREA(ACRES) =      2.67   PEAK FLOW RATE(CFS) =      5.21

****************************************************************************
  FLOW PROCESS FROM NODE   3101.00 TO NODE   3102.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    467.51  DOWNSTREAM(FEET) =    461.61
  CHANNEL LENGTH THRU SUBAREA(FEET) =   815.14   CHANNEL SLOPE =  0.0072
  CHANNEL FLOW THRU SUBAREA(CFS) =       5.21
  FLOW VELOCITY(FEET/SEC) =   1.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.50   Tc(MIN.) =   34.26
  LONGEST FLOWPATH FROM NODE   3100.00 TO NODE   3102.00 =    1319.65 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3102.00 TO NODE   3102.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   34.26
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.354
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                   B        7.44      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    7.44      SUBAREA RUNOFF(CFS) =   12.39
  EFFECTIVE AREA(ACRES) =     10.11   AREA-AVERAGED Fm(INCH/HR) =  0.54
  AREA-AVERAGED Fp(INCH/HR) =  0.54  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       10.1       PEAK FLOW RATE(CFS) =      16.53

****************************************************************************
  FLOW PROCESS FROM NODE   3102.00 TO NODE   3103.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    461.61  DOWNSTREAM(FEET) =    449.47
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1019.27   CHANNEL SLOPE =  0.0119
  CHANNEL FLOW THRU SUBAREA(CFS) =      16.53
  FLOW VELOCITY(FEET/SEC) =   3.11 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.47   Tc(MIN.) =   39.73
  LONGEST FLOWPATH FROM NODE   3100.00 TO NODE   3103.00 =    2338.92 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3103.00 TO NODE   3103.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   39.73
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.122
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                   B        8.92      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    8.92      SUBAREA RUNOFF(CFS) =   12.99
  EFFECTIVE AREA(ACRES) =     19.03   AREA-AVERAGED Fm(INCH/HR) =  0.52
  AREA-AVERAGED Fp(INCH/HR) =  0.52  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       19.0       PEAK FLOW RATE(CFS) =      27.41

****************************************************************************
  FLOW PROCESS FROM NODE   3103.00 TO NODE   3003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    449.47  DOWNSTREAM(FEET) =    437.99
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1717.07   CHANNEL SLOPE =  0.0067
  CHANNEL FLOW THRU SUBAREA(CFS) =      27.41
  FLOW VELOCITY(FEET/SEC) =   2.67 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  10.72   Tc(MIN.) =   50.44
  LONGEST FLOWPATH FROM NODE   3100.00 TO NODE   3003.00 =    4055.99 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3003.00 TO NODE   3003.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   50.44
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.795
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                   B       19.00      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   19.00      SUBAREA RUNOFF(CFS) =   22.08
  EFFECTIVE AREA(ACRES) =     38.03   AREA-AVERAGED Fm(INCH/HR) =  0.51
  AREA-AVERAGED Fp(INCH/HR) =  0.51  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       38.0       PEAK FLOW RATE(CFS) =      43.89

****************************************************************************
  FLOW PROCESS FROM NODE   3003.00 TO NODE   3003.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   50.44
  RAINFALL INTENSITY(INCH/HR) =   1.80
  AREA-AVERAGED Fm(INCH/HR) =  0.51
  AREA-AVERAGED Fp(INCH/HR) =  0.51
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      38.03
  TOTAL STREAM AREA(ACRES) =      38.03
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      43.89
```

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	51.61	33.96	2.368	0.50(0.50)	1.00	30.8	3000.00
2	43.89	50.44	1.795	0.51(0.51)	1.00	38.0	3100.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	94.36	33.96	2.368	0.51(0.51)	1.00	56.4	3000.00
2	79.64	50.44	1.795	0.51(0.51)	1.00	68.8	3100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 94.36 Tc(MIN.) = 33.96
EFFECTIVE AREA(ACRES) = 56.36 AREA-AVERAGED Fm(INCH/HR) = 0.51
AREA-AVERAGED Fp(INCH/HR) = 0.51 AREA-AVERAGED Ap = 1.00
TOTAL AREA(ACRES) = 68.8
LONGEST FLOWPATH FROM NODE 3100.00 TO NODE 3003.00 = 4055.99 FEET.

****

FLOW PROCESS FROM NODE 3003.00 TO NODE 3004.00 IS CODE = 52

>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<

==

ELEVATION DATA: UPSTREAM(FEET) = 437.99 DOWNSTREAM(FEET) = 431.43
CHANNEL LENGTH THRU SUBAREA(FEET) = 611.34 CHANNEL SLOPE = 0.0107
CHANNEL FLOW THRU SUBAREA(CFS) = 94.36

```
  FLOW VELOCITY(FEET/SEC) =   4.83 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.11   Tc(MIN.) =   36.07
  LONGEST FLOWPATH FROM NODE   3100.00 TO NODE   3004.00 =    4667.33 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3004.00 TO NODE   3004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   36.07
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.270
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       10.18      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   10.18      SUBAREA RUNOFF(CFS) =   15.03
  EFFECTIVE AREA(ACRES) =     66.54   AREA-AVERAGED Fm(INCH/HR) =  0.53
  AREA-AVERAGED Fp(INCH/HR) =  0.53  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       79.0       PEAK FLOW RATE(CFS) =     104.43

****************************************************************************
  FLOW PROCESS FROM NODE   3004.00 TO NODE   3005.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    431.43  DOWNSTREAM(FEET) =    410.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   975.21   CHANNEL SLOPE =  0.0219
  CHANNEL FLOW THRU SUBAREA(CFS) =     104.43
```

```
  FLOW VELOCITY(FEET/SEC) =   7.11 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.29   Tc(MIN.) =   38.35
  LONGEST FLOWPATH FROM NODE   3100.00 TO NODE   3005.00 =    5642.54 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3005.00 TO NODE   3005.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   38.35
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.175
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                  B        0.71      0.50     1.000    72
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       20.83      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   21.54      SUBAREA RUNOFF(CFS) =   30.03
  EFFECTIVE AREA(ACRES) =     88.08   AREA-AVERAGED Fm(INCH/HR) =  0.55
  AREA-AVERAGED Fp(INCH/HR) =  0.55  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      100.5       PEAK FLOW RATE(CFS) =     128.74
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      100.5  TC(MIN.) =     38.35
  EFFECTIVE AREA(ACRES) =     88.08  AREA-AVERAGED Fm(INCH/HR)=  0.55
  AREA-AVERAGED Fp(INCH/HR) =  0.55  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =     128.74

  ** PEAK FLOW RATE TABLE **
```

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	128.74	38.35	2.175	0.55(0.55)	1.00	88.1	3000.00
2	103.30	55.08	1.688	0.55(0.55)	1.00	100.5	3100.00

==

==

END OF RATIONAL METHOD ANALYSIS

```
****************************************************************************
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                           Analysis prepared by:



 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED Q - PROPOSED - RATIONAL METHOD                                 *
* 2022-10-03                                                               *
 **************************************************************************

  FILE NAME: 087_Q_PR.DAT
  TIME/DATE OF STUDY: 09:17 10/03/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
```

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   4000.00 TO NODE   4001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   858.42
  ELEVATION DATA: UPSTREAM(FEET) =    469.15  DOWNSTREAM(FEET) =    462.59

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   27.903
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.717
```

```
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (50.0%)   B        7.12      0.63     1.000    63   27.90
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA RUNOFF(CFS) =     13.38
TOTAL AREA(ACRES) =      7.12   PEAK FLOW RATE(CFS) =     13.38

****************************************************************************
FLOW PROCESS FROM NODE   4001.00 TO NODE   4002.00 IS CODE =  52
----------------------------------------------------------------------------
>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    462.59  DOWNSTREAM(FEET) =    454.39
CHANNEL LENGTH THRU SUBAREA(FEET) =   960.74   CHANNEL SLOPE =  0.0085
CHANNEL FLOW THRU SUBAREA(CFS) =      13.38
FLOW VELOCITY(FEET/SEC) =   2.49 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =   6.44   Tc(MIN.) =   34.34
LONGEST FLOWPATH FROM NODE   4000.00 TO NODE   4002.00 =    1819.16 FEET.

****************************************************************************
FLOW PROCESS FROM NODE   4002.00 TO NODE   4002.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   34.34
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.350
SUBAREA LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                   B        9.32      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    9.32      SUBAREA RUNOFF(CFS) =   15.48
  EFFECTIVE AREA(ACRES) =     16.44   AREA-AVERAGED Fm(INCH/HR) =  0.56
  AREA-AVERAGED Fp(INCH/HR) =  0.56  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       16.4       PEAK FLOW RATE(CFS) =      26.51

****************************************************************************
  FLOW PROCESS FROM NODE   4002.00 TO NODE   4003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    454.39  DOWNSTREAM(FEET) =    439.63
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1763.97   CHANNEL SLOPE =  0.0084
  CHANNEL FLOW THRU SUBAREA(CFS) =      26.51
  FLOW VELOCITY(FEET/SEC) =   2.96 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   9.93   Tc(MIN.) =   44.27
  LONGEST FLOWPATH FROM NODE   4000.00 TO NODE   4003.00 =    3583.13 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4003.00 TO NODE   4003.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   44.27
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.967
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                 B       47.81      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   47.81      SUBAREA RUNOFF(CFS) =   62.95
  EFFECTIVE AREA(ACRES) =     64.25   AREA-AVERAGED Fm(INCH/HR) =  0.52
  AREA-AVERAGED Fp(INCH/HR) =  0.52  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       64.2       PEAK FLOW RATE(CFS) =      83.80

****************************************************************************
  FLOW PROCESS FROM NODE   4003.00 TO NODE   4004.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    439.63  DOWNSTREAM(FEET) =    436.35
  CHANNEL LENGTH THRU SUBAREA(FEET) =   292.20   CHANNEL SLOPE =  0.0112
  CHANNEL FLOW THRU SUBAREA(CFS) =      83.80
  FLOW VELOCITY(FEET/SEC) =   4.77 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.02   Tc(MIN.) =   45.29
  LONGEST FLOWPATH FROM NODE   4000.00 TO NODE   4004.00 =    3875.33 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4004.00 TO NODE   4004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   45.29
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.936
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B        9.51      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    9.51      SUBAREA RUNOFF(CFS) =   11.18
  EFFECTIVE AREA(ACRES) =     73.76   AREA-AVERAGED Fm(INCH/HR) =  0.53
  AREA-AVERAGED Fp(INCH/HR) =  0.53  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       73.8       PEAK FLOW RATE(CFS) =      93.17

****************************************************************************
  FLOW PROCESS FROM NODE   4004.00 TO NODE   4005.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    436.35  DOWNSTREAM(FEET) =    419.94
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1620.36   CHANNEL SLOPE =  0.0101
  CHANNEL FLOW THRU SUBAREA(CFS) =      93.17
  FLOW VELOCITY(FEET/SEC) =   4.68 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.77   Tc(MIN.) =   51.07
  LONGEST FLOWPATH FROM NODE   4000.00 TO NODE   4005.00 =    5495.69 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4005.00 TO NODE   4005.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   51.07
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.780
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                 B       59.04      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   59.04      SUBAREA RUNOFF(CFS) =   67.80
  EFFECTIVE AREA(ACRES) =    132.80   AREA-AVERAGED Fm(INCH/HR) =  0.52
  AREA-AVERAGED Fp(INCH/HR) =  0.52  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      132.8       PEAK FLOW RATE(CFS) =     150.62

****************************************************************************
  FLOW PROCESS FROM NODE   4005.00 TO NODE   4006.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    419.94  DOWNSTREAM(FEET) =    347.76
  CHANNEL LENGTH THRU SUBAREA(FEET) =  3070.30   CHANNEL SLOPE =  0.0235
  CHANNEL FLOW THRU SUBAREA(CFS) =     150.62
  FLOW VELOCITY(FEET/SEC) =   8.24 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.21   Tc(MIN.) =   57.28
  LONGEST FLOWPATH FROM NODE   4000.00 TO NODE   4006.00 =    8565.99 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4006.00 TO NODE   4006.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   57.28
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.643
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                   B      106.70      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  106.70      SUBAREA RUNOFF(CFS) =  109.34
  EFFECTIVE AREA(ACRES) =    239.50   AREA-AVERAGED Fm(INCH/HR) =  0.51
  AREA-AVERAGED Fp(INCH/HR) =  0.51  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      239.5       PEAK FLOW RATE(CFS) =     243.53
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      239.5  TC(MIN.) =     57.28
  EFFECTIVE AREA(ACRES) =    239.50  AREA-AVERAGED Fm(INCH/HR)=  0.51
  AREA-AVERAGED Fp(INCH/HR) =  0.51  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =     243.53
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
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                           Analysis prepared by:

 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED R - PROPOSED - RATIONAL METHOD                                 *
* 2022-10-03                                                               *
 **************************************************************************

  FILE NAME: 087_R_PR.DAT
  TIME/DATE OF STUDY: 09:21 10/03/2022
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
```

```
  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5900

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE   5000.00 TO NODE   5001.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   853.47
  ELEVATION DATA: UPSTREAM(FEET) =    461.61  DOWNSTREAM(FEET) =    449.47

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   18.282
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.653
```

```
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL POOR COVER
 "BARREN"                    B        2.73      0.50     1.000    72   18.28
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      7.74
 TOTAL AREA(ACRES) =      2.73   PEAK FLOW RATE(CFS) =      7.74

****************************************************************************
 FLOW PROCESS FROM NODE   5001.00 TO NODE   5002.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    449.47  DOWNSTREAM(FEET) =    441.27
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1376.57   CHANNEL SLOPE =  0.0060
 CHANNEL FLOW THRU SUBAREA(CFS) =       7.74
 FLOW VELOCITY(FEET/SEC) =   1.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =  12.68   Tc(MIN.) =   30.96
 LONGEST FLOWPATH FROM NODE   5000.00 TO NODE   5002.00 =    2230.04 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   5002.00 TO NODE   5002.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   30.96
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.526
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                 B       21.07      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   21.07      SUBAREA RUNOFF(CFS) =   38.35
  EFFECTIVE AREA(ACRES) =     23.80   AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       23.8       PEAK FLOW RATE(CFS) =      43.32

****************************************************************************
  FLOW PROCESS FROM NODE   5002.00 TO NODE   5003.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    441.27  DOWNSTREAM(FEET) =    436.34
  CHANNEL LENGTH THRU SUBAREA(FEET) =   427.90   CHANNEL SLOPE =  0.0115
  CHANNEL FLOW THRU SUBAREA(CFS) =      43.32
  FLOW VELOCITY(FEET/SEC) =   3.99 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.79   Tc(MIN.) =   32.75
  LONGEST FLOWPATH FROM NODE   5000.00 TO NODE   5003.00 =    2657.94 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   5003.00 TO NODE   5003.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   32.75
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.429
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                 B       23.36      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   23.36      SUBAREA RUNOFF(CFS) =   40.47
  EFFECTIVE AREA(ACRES) =     47.16   AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       47.2       PEAK FLOW RATE(CFS) =      81.70

****************************************************************************
  FLOW PROCESS FROM NODE   5003.00 TO NODE   5004.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    436.34  DOWNSTREAM(FEET) =    419.94
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1777.81   CHANNEL SLOPE =  0.0092
  CHANNEL FLOW THRU SUBAREA(CFS) =      81.70
  FLOW VELOCITY(FEET/SEC) =   4.29 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.90   Tc(MIN.) =   39.66
  LONGEST FLOWPATH FROM NODE   5000.00 TO NODE   5004.00 =    4435.75 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   5004.00 TO NODE   5004.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   39.66
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.125
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                 B       46.41      0.50     1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   46.41      SUBAREA RUNOFF(CFS) =   67.69
  EFFECTIVE AREA(ACRES) =     93.57   AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       93.6       PEAK FLOW RATE(CFS) =     136.48

****************************************************************************
  FLOW PROCESS FROM NODE   5004.00 TO NODE   5005.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    419.94  DOWNSTREAM(FEET) =    367.45
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1419.32   CHANNEL SLOPE =  0.0370
  CHANNEL FLOW THRU SUBAREA(CFS) =     136.48
  FLOW VELOCITY(FEET/SEC) =  10.03 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.36   Tc(MIN.) =   42.02
  LONGEST FLOWPATH FROM NODE   5000.00 TO NODE   5005.00 =    5855.07 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   5005.00 TO NODE   5005.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   42.02
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.040
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL DESERT COVER
  "DESERT BRUSH"   (50.0%)   B       37.33      0.63     1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   37.33      SUBAREA RUNOFF(CFS) =   47.39
  EFFECTIVE AREA(ACRES) =    130.90   AREA-AVERAGED Fm(INCH/HR) =  0.54
  AREA-AVERAGED Fp(INCH/HR) =  0.54  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      130.9       PEAK FLOW RATE(CFS) =     176.77
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      130.9  TC(MIN.) =     42.02
  EFFECTIVE AREA(ACRES) =    130.90  AREA-AVERAGED Fm(INCH/HR)=  0.54
  AREA-AVERAGED Fp(INCH/HR) =  0.54  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =     176.77
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

UNIT HYDROGRAPH

```
****************************************************************************

              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
         (c) Copyright 1989-2015 Advanced Engineering Software (aes)
            Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                         Analysis prepared by:








 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED K - EXISTING - SAUH                                            *
* 2022-09-30                                                               *
 **************************************************************************

  FILE NAME: 87_K_EX.DAT
  TIME/DATE OF STUDY: 09:23 09/30/2022



****************************************************************************
  FLOW PROCESS FROM NODE   6000.00 TO NODE   6004.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =     196.400 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.660 HOURS
```

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.590

LOW LOSS FRACTION = 0.778

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.17

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.991

30-MINUTE FACTOR = 0.991

1-HOUR FACTOR = 0.991

3-HOUR FACTOR = 0.999

6-HOUR FACTOR = 0.999

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 12.626

===

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.556	13.197
2	2.182	38.631
3	4.829	62.866
4	8.552	88.424

5	14.870	150.069
6	25.607	255.041
7	37.346	278.815
8	46.601	219.834
9	53.801	171.013
10	59.356	131.941
11	63.660	102.228
12	67.231	84.823
13	70.375	74.662
14	73.088	64.449
15	75.421	55.417
16	77.573	51.112
17	79.400	43.395
18	81.062	39.471
19	82.527	34.807
20	83.888	32.320
21	85.148	29.939
22	86.356	28.673
23	87.427	25.453
24	88.430	23.818
25	89.261	19.728
26	90.016	17.952
27	90.737	17.122
28	91.440	16.703
29	92.073	15.016
30	92.677	14.344
31	93.244	13.484
32	93.794	13.047
33	94.252	10.890
34	94.681	10.196
35	95.111	10.196
36	95.533	10.034
37	95.882	8.296
38	96.211	7.797
39	96.539	7.800
40	96.859	7.598

41	97.105	5.842
42	97.332	5.394
43	97.559	5.401
44	97.777	5.166
45	97.919	3.380
46	98.045	2.991
47	98.172	3.005
48	98.301	3.064
49	98.449	3.520
50	98.600	3.593
51	98.752	3.601
52	98.903	3.601
53	99.054	3.593
54	99.206	3.593
55	99.357	3.593
56	99.508	3.593
57	99.660	3.593
58	99.811	3.593
59	99.962	3.593
60	100.000	0.899

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0020	0.0006
13	0.0026	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0038	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0040	0.0031	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0069	0.0054	0.0015
146	0.0070	0.0054	0.0016
147	0.0072	0.0056	0.0016
148	0.0072	0.0056	0.0016
149	0.0074	0.0058	0.0016
150	0.0075	0.0058	0.0017
151	0.0077	0.0060	0.0017
152	0.0078	0.0061	0.0017
153	0.0080	0.0062	0.0018
154	0.0081	0.0063	0.0018
155	0.0084	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0087	0.0068	0.0019
158	0.0089	0.0069	0.0020
159	0.0092	0.0071	0.0020
160	0.0093	0.0072	0.0021
161	0.0096	0.0075	0.0021
162	0.0098	0.0076	0.0022
163	0.0101	0.0079	0.0023
164	0.0103	0.0080	0.0023
165	0.0107	0.0083	0.0024
166	0.0109	0.0085	0.0024
167	0.0114	0.0089	0.0025
168	0.0116	0.0091	0.0026
169	0.0196	0.0153	0.0044
170	0.0200	0.0156	0.0044
171	0.0209	0.0162	0.0046
172	0.0213	0.0166	0.0047
173	0.0223	0.0174	0.0050
174	0.0228	0.0178	0.0051

175	0.0240	0.0187	0.0053
176	0.0247	0.0192	0.0055
177	0.0261	0.0203	0.0058
178	0.0269	0.0209	0.0060
179	0.0286	0.0223	0.0064
180	0.0296	0.0231	0.0066
181	0.0319	0.0248	0.0071
182	0.0333	0.0259	0.0074
183	0.0363	0.0283	0.0081
184	0.0382	0.0297	0.0085
185	0.0611	0.0475	0.0136
186	0.0643	0.0492	0.0151
187	0.0721	0.0492	0.0229
188	0.0773	0.0492	0.0282
189	0.1000	0.0492	0.0509
190	0.1108	0.0492	0.0617
191	0.1495	0.0492	0.1004
192	0.1957	0.0492	0.1465
193	0.4778	0.0492	0.4286
194	0.1259	0.0492	0.0767
195	0.0836	0.0492	0.0344
196	0.0678	0.0492	0.0187
197	0.0402	0.0313	0.0089
198	0.0347	0.0270	0.0077
199	0.0307	0.0239	0.0068
200	0.0277	0.0216	0.0062
201	0.0253	0.0197	0.0056
202	0.0234	0.0182	0.0052
203	0.0218	0.0170	0.0048
204	0.0204	0.0159	0.0045
205	0.0119	0.0093	0.0026
206	0.0112	0.0087	0.0025
207	0.0105	0.0082	0.0023
208	0.0100	0.0077	0.0022
209	0.0095	0.0074	0.0021
210	0.0090	0.0070	0.0020

211	0.0086	0.0067	0.0019
212	0.0082	0.0064	0.0018
213	0.0079	0.0062	0.0018
214	0.0076	0.0059	0.0017
215	0.0073	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0040	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0039	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0031	0.0025	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0030	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0006
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0022	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.02

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.41

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 33.0927

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 23.0109

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============================================================================

                        2 4 - H O U R   S T O R M
                      R U N O F F   H Y D R O G R A P H

============================================================================
                   HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
              (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       75.0     150.0     225.0     300.0
----------------------------------------------------------------------------
   0.083      0.0001      0.01  Q         .         .         .         .
   0.167      0.0003      0.03  Q         .         .         .         .
   0.250      0.0007      0.06  Q         .         .         .         .
   0.333      0.0015      0.11  Q         .         .         .         .
   0.417      0.0028      0.20  Q         .         .         .         .
   0.500      0.0052      0.34  Q         .         .         .         .
   0.583      0.0086      0.50  Q         .         .         .         .
   0.667      0.0129      0.62  Q         .         .         .         .
   0.750      0.0179      0.72  Q         .         .         .         .
   0.833      0.0234      0.80  Q         .         .         .         .
   0.917      0.0293      0.86  Q         .         .         .         .
   1.000      0.0356      0.91  Q         .         .         .         .
   1.083      0.0422      0.96  Q         .         .         .         .
   1.167      0.0490      1.00  Q         .         .         .         .
   1.250      0.0561      1.03  Q         .         .         .         .
   1.333      0.0634      1.06  Q         .         .         .         .
   1.417      0.0710      1.09  Q         .         .         .         .
   1.500      0.0787      1.12  Q         .         .         .         .
   1.583      0.0865      1.14  Q         .         .         .         .
   1.667      0.0946      1.17  Q         .         .         .         .
   1.750      0.1028      1.19  Q         .         .         .         .
   1.833      0.1111      1.21  Q         .         .         .         .
   1.917      0.1196      1.23  Q         .         .         .         .
   2.000      0.1282      1.25  Q         .         .         .         .
```

2.083	0.1369	1.26	Q	.	.	.	.
2.167	0.1457	1.28	Q	.	.	.	.
2.250	0.1546	1.30	Q	.	.	.	.
2.333	0.1636	1.31	Q	.	.	.	.
2.417	0.1728	1.33	Q	.	.	.	.
2.500	0.1820	1.34	Q	.	.	.	.
2.583	0.1913	1.35	Q	.	.	.	.
2.667	0.2007	1.37	Q	.	.	.	.
2.750	0.2102	1.38	Q	.	.	.	.
2.833	0.2198	1.39	Q	.	.	.	.
2.917	0.2295	1.40	Q	.	.	.	.
3.000	0.2392	1.42	Q	.	.	.	.
3.083	0.2491	1.43	Q	.	.	.	.
3.167	0.2590	1.44	Q	.	.	.	.
3.250	0.2689	1.45	Q	.	.	.	.
3.333	0.2790	1.46	Q	.	.	.	.
3.417	0.2891	1.47	Q	.	.	.	.
3.500	0.2993	1.48	Q	.	.	.	.
3.583	0.3096	1.49	Q	.	.	.	.
3.667	0.3200	1.50	Q	.	.	.	.
3.750	0.3304	1.51	Q	.	.	.	.
3.833	0.3408	1.52	Q	.	.	.	.
3.917	0.3514	1.53	Q	.	.	.	.
4.000	0.3620	1.54	Q	.	.	.	.
4.083	0.3727	1.55	Q	.	.	.	.
4.167	0.3834	1.56	Q	.	.	.	.
4.250	0.3942	1.57	Q	.	.	.	.
4.333	0.4051	1.58	Q	.	.	.	.
4.417	0.4160	1.59	Q	.	.	.	.
4.500	0.4271	1.60	Q	.	.	.	.
4.583	0.4382	1.61	Q	.	.	.	.
4.667	0.4493	1.62	Q	.	.	.	.
4.750	0.4606	1.63	Q	.	.	.	.
4.833	0.4719	1.64	Q	.	.	.	.
4.917	0.4833	1.65	Q	.	.	.	.
5.000	0.4947	1.66	Q	.	.	.	.

5.083	0.5063	1.67	Q	.	.	.	.
5.167	0.5178	1.68	Q	.	.	.	.
5.250	0.5295	1.69	Q	.	.	.	.
5.333	0.5412	1.70	Q	.	.	.	.
5.417	0.5530	1.71	Q	.	.	.	.
5.500	0.5649	1.72	Q	.	.	.	.
5.583	0.5768	1.73	QV	.	.	.	.
5.667	0.5888	1.74	QV	.	.	.	.
5.750	0.6008	1.75	QV	.	.	.	.
5.833	0.6130	1.76	QV	.	.	.	.
5.917	0.6252	1.77	QV	.	.	.	.
6.000	0.6374	1.78	QV	.	.	.	.
6.083	0.6498	1.79	QV	.	.	.	.
6.167	0.6622	1.80	QV	.	.	.	.
6.250	0.6747	1.82	QV	.	.	.	.
6.333	0.6873	1.83	QV	.	.	.	.
6.417	0.6999	1.84	QV	.	.	.	.
6.500	0.7127	1.85	QV	.	.	.	.
6.583	0.7255	1.86	QV	.	.	.	.
6.667	0.7384	1.87	QV	.	.	.	.
6.750	0.7514	1.89	QV	.	.	.	.
6.833	0.7645	1.90	QV	.	.	.	.
6.917	0.7776	1.91	QV	.	.	.	.
7.000	0.7908	1.92	QV	.	.	.	.
7.083	0.8042	1.94	QV	.	.	.	.
7.167	0.8176	1.95	QV	.	.	.	.
7.250	0.8311	1.96	QV	.	.	.	.
7.333	0.8447	1.97	QV	.	.	.	.
7.417	0.8584	1.99	QV	.	.	.	.
7.500	0.8722	2.00	QV	.	.	.	.
7.583	0.8861	2.02	QV	.	.	.	.
7.667	0.9001	2.03	QV	.	.	.	.
7.750	0.9141	2.05	QV	.	.	.	.
7.833	0.9283	2.06	QV	.	.	.	.
7.917	0.9426	2.07	QV	.	.	.	.
8.000	0.9570	2.09	QV	.	.	.	.

8.083	0.9715	2.11	QV	.	.	.	.
8.167	0.9861	2.12	QV	.	.	.	.
8.250	1.0009	2.14	QV	.	.	.	.
8.333	1.0157	2.15	QV	.	.	.	.
8.417	1.0306	2.17	QV	.	.	.	.
8.500	1.0457	2.19	QV	.	.	.	.
8.583	1.0609	2.20	QV	.	.	.	.
8.667	1.0762	2.22	QV	.	.	.	.
8.750	1.0916	2.24	QV	.	.	.	.
8.833	1.1072	2.26	QV	.	.	.	.
8.917	1.1228	2.28	QV	.	.	.	.
9.000	1.1387	2.30	QV	.	.	.	.
9.083	1.1546	2.31	Q V	.	.	.	.
9.167	1.1707	2.33	Q V	.	.	.	.
9.250	1.1869	2.35	Q V	.	.	.	.
9.333	1.2032	2.37	Q V	.	.	.	.
9.417	1.2197	2.40	Q V	.	.	.	.
9.500	1.2364	2.42	Q V	.	.	.	.
9.583	1.2532	2.44	Q V	.	.	.	.
9.667	1.2701	2.46	Q V	.	.	.	.
9.750	1.2872	2.48	Q V	.	.	.	.
9.833	1.3045	2.51	Q V	.	.	.	.
9.917	1.3219	2.53	Q V	.	.	.	.
10.000	1.3395	2.55	Q V	.	.	.	.
10.083	1.3573	2.58	Q V	.	.	.	.
10.167	1.3752	2.60	Q V	.	.	.	.
10.250	1.3933	2.63	Q V	.	.	.	.
10.333	1.4116	2.66	Q V	.	.	.	.
10.417	1.4301	2.68	Q V	.	.	.	.
10.500	1.4487	2.71	Q V	.	.	.	.
10.583	1.4676	2.74	Q V	.	.	.	.
10.667	1.4866	2.77	Q V	.	.	.	.
10.750	1.5059	2.80	Q V	.	.	.	.
10.833	1.5254	2.83	Q V	.	.	.	.
10.917	1.5450	2.86	Q V	.	.	.	.
11.000	1.5649	2.89	Q V	.	.	.	.

11.083	1.5851	2.92	Q V	.	.	.	.	
11.167	1.6054	2.96	Q V	.	.	.	.	
11.250	1.6260	2.99	Q V	.	.	.	.	
11.333	1.6468	3.03	Q V	.	.	.	.	
11.417	1.6679	3.06	Q V	.	.	.	.	
11.500	1.6893	3.10	Q V	.	.	.	.	
11.583	1.7109	3.14	Q V	.	.	.	.	
11.667	1.7328	3.18	Q V	.	.	.	.	
11.750	1.7549	3.22	Q V	.	.	.	.	
11.833	1.7774	3.26	Q V	.	.	.	.	
11.917	1.8001	3.30	Q V	.	.	.	.	
12.000	1.8232	3.35	Q V	.	.	.	.	
12.083	1.8465	3.39	Q V	.	.	.	.	
12.167	1.8702	3.43	Q V	.	.	.	.	
12.250	1.8941	3.47	Q V	.	.	.	.	
12.333	1.9183	3.51	Q V	.	.	.	.	
12.417	1.9427	3.54	Q V	.	.	.	.	
12.500	1.9672	3.56	Q V	.	.	.	.	
12.583	1.9919	3.58	Q V	.	.	.	.	
12.667	2.0167	3.60	Q V	.	.	.	.	
12.750	2.0417	3.64	Q V	.	.	.	.	
12.833	2.0671	3.68	Q V	.	.	.	.	
12.917	2.0927	3.73	Q V	.	.	.	.	
13.000	2.1187	3.78	Q V	.	.	.	.	
13.083	2.1452	3.84	Q V	.	.	.	.	
13.167	2.1720	3.90	Q V	.	.	.	.	
13.250	2.1993	3.96	Q V	.	.	.	.	
13.333	2.2270	4.03	Q V	.	.	.	.	
13.417	2.2553	4.10	Q V	.	.	.	.	
13.500	2.2841	4.18	Q V	.	.	.	.	
13.583	2.3134	4.26	Q V	.	.	.	.	
13.667	2.3433	4.35	Q V	.	.	.	.	
13.750	2.3739	4.44	Q V	.	.	.	.	
13.833	2.4051	4.53	Q V	.	.	.	.	
13.917	2.4370	4.63	Q V	.	.	.	.	
14.000	2.4697	4.74	Q V	.	.	.	.	

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14.083      2.5033      4.88  Q   V     .         .         .         .
14.167      2.5382      5.06  Q   V     .         .         .         .
14.250      2.5747      5.30  Q   V     .         .         .         .
14.333      2.6132      5.59  Q   V     .         .         .         .
14.417      2.6544      5.99  Q   V     .         .         .         .
14.500      2.6998      6.58  Q   V     .         .         .         .
14.583      2.7496      7.24  Q   V     .         .         .         .
14.667      2.8035      7.82  .Q  V     .         .         .         .
14.750      2.8609      8.34  .Q  V     .         .         .         .
14.833      2.9217      8.83  .Q   V    .         .         .         .
14.917      2.9857      9.29  .Q   V    .         .         .         .
15.000      3.0529      9.76  .Q   V    .         .         .         .
15.083      3.1234     10.24  .Q   V    .         .         .         .
15.167      3.1973     10.74  .Q   V    .         .         .         .
15.250      3.2749     11.27  .Q   V    .         .         .         .
15.333      3.3565     11.85  .Q   V    .         .         .         .
15.417      3.4428     12.53  .Q   V    .         .         .         .
15.500      3.5351     13.39  .Q    V   .         .         .         .
15.583      3.6353     14.55  .Q    V   .         .         .         .
15.667      3.7466     16.17  . Q   V   .         .         .         .
15.750      3.8757     18.74  . Q   V   .         .         .         .
15.833      4.0334     22.90  .  Q   V  .         .         .         .
15.917      4.2344     29.18  .  Q   V  .         .         .         .
16.000      4.5009     38.70  .    Q V  .         .         .         .
16.083      4.8869     56.05  .      QV .         .         .         .
16.167      5.4409     80.44  .        VQ         .         .         .
16.250      6.1740    106.45  .         V   Q     .         .         .
16.333      7.1035    134.97  .         . V    Q  .         .         .
16.417      8.3005    173.80  .         .   V     .  Q      .         .
16.500      9.7871    215.85  .         .      V  .       Q .         .
16.583     11.2914    218.43  .         .        V.        Q.         .
16.667     12.5697    185.61  .         .         .V  Q     .         .
16.750     13.6227    152.89  .         .         Q  V      .         .
16.833     14.4820    124.78  .         .     Q   .    V    .         .
16.917     15.1910    102.94  .         .  Q      .     V   .         .
17.000     15.7990     88.28  .         .Q        .      V  .         .
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17.083     16.3361     78.00  .         Q         .       V .         .
17.167     16.8122     69.13  .        Q.         .        V.         .
17.250     17.2363     61.58  .       Q .         .        V.         .
17.333     17.6228     56.12  .      Q  .         .         V         .
17.417     17.9677     50.08  .     Q   .         .         .V        .
17.500     18.2814     45.55  .     Q   .         .         .V        .
17.583     18.5654     41.23  .    Q    .         .         . V       .
17.667     18.8276     38.07  .    Q    .         .         . V       .
17.750     19.0703     35.25  .   Q     .         .         .  V      .
17.833     19.2970     32.92  .   Q     .         .         .  V      .
17.917     19.5043     30.09  .   Q     .         .         .  V      .
18.000     19.6959     27.82  .  Q      .         .         .   V     .
18.083     19.8682     25.02  .  Q      .         .         .   V     .
18.167     20.0282     23.23  .  Q      .         .         .   V     .
18.250     20.1794     21.96  . Q       .         .         .    V    .
18.333     20.3234     20.91  . Q       .         .         .    V    .
18.417     20.4580     19.54  . Q       .         .         .    V    .
18.500     20.5857     18.55  . Q       .         .         .    V    .
18.583     20.7066     17.55  . Q       .         .         .    V    .
18.667     20.8212     16.64  . Q       .         .         .     V   .
18.750     20.9264     15.27  . Q       .         .         .     V   .
18.833     21.0260     14.47  .Q        .         .         .     V   .
18.917     21.1219     13.93  .Q        .         .         .     V   .
19.000     21.2135     13.29  .Q        .         .         .     V   .
19.083     21.2975     12.20  .Q        .         .         .      V  .
19.167     21.3770     11.55  .Q        .         .         .      V  .
19.250     21.4533     11.07  .Q        .         .         .      V  .
19.333     21.5254     10.47  .Q        .         .         .      V  .
19.417     21.5902      9.42  .Q        .         .         .      V  .
19.500     21.6511      8.84  .Q        .         .         .      V  .
19.583     21.7092      8.43  .Q        .         .         .      V  .
19.667     21.7636      7.91  .Q        .         .         .      V  .
19.750     21.8117      6.99  Q         .         .         .      V  .
19.833     21.8573      6.62  Q         .         .         .      V  .
19.917     21.9021      6.50  Q         .         .         .       V .
20.000     21.9466      6.46  Q         .         .         .       V .
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20.083	21.9918	6.57	Q	.	.	.	V .
20.167	22.0369	6.54	Q	.	.	.	V .
20.250	22.0814	6.46	Q	.	.	.	V .
20.333	22.1253	6.37	Q	.	.	.	V .
20.417	22.1684	6.27	Q	.	.	.	V .
20.500	22.2107	6.14	Q	.	.	.	V .
20.583	22.2521	6.00	Q	.	.	.	V .
20.667	22.2920	5.80	Q	.	.	.	V .
20.750	22.3302	5.55	Q	.	.	.	V .
20.833	22.3660	5.19	Q	.	.	.	V .
20.917	22.3981	4.67	Q	.	.	.	V .
21.000	22.4212	3.35	Q	.	.	.	V .
21.083	22.4400	2.73	Q	.	.	.	V.
21.167	22.4575	2.54	Q	.	.	.	V.
21.250	22.4742	2.43	Q	.	.	.	V.
21.333	22.4904	2.36	Q	.	.	.	V.
21.417	22.5063	2.30	Q	.	.	.	V.
21.500	22.5218	2.25	Q	.	.	.	V.
21.583	22.5370	2.20	Q	.	.	.	V.
21.667	22.5518	2.16	Q	.	.	.	V.
21.750	22.5664	2.12	Q	.	.	.	V.
21.833	22.5807	2.07	Q	.	.	.	V.
21.917	22.5947	2.04	Q	.	.	.	V.
22.000	22.6085	2.00	Q	.	.	.	V.
22.083	22.6221	1.97	Q	.	.	.	V.
22.167	22.6355	1.95	Q	.	.	.	V.
22.250	22.6487	1.92	Q	.	.	.	V.
22.333	22.6617	1.89	Q	.	.	.	V.
22.417	22.6746	1.87	Q	.	.	.	V.
22.500	22.6873	1.84	Q	.	.	.	V.
22.583	22.6998	1.82	Q	.	.	.	V.
22.667	22.7122	1.80	Q	.	.	.	V.
22.750	22.7244	1.77	Q	.	.	.	V.
22.833	22.7365	1.75	Q	.	.	.	V.
22.917	22.7484	1.73	Q	.	.	.	V.
23.000	22.7602	1.71	Q	.	.	.	V.

23.083	22.7718	1.69	Q	.	.	.	V.
23.167	22.7834	1.67	Q	.	.	.	V.
23.250	22.7947	1.65	Q	.	.	.	V.
23.333	22.8060	1.63	Q	.	.	.	V.
23.417	22.8171	1.62	Q	.	.	.	V.
23.500	22.8281	1.60	Q	.	.	.	V.
23.583	22.8390	1.58	Q	.	.	.	V.
23.667	22.8498	1.57	Q	.	.	.	V.
23.750	22.8605	1.55	Q	.	.	.	V.
23.833	22.8711	1.53	Q	.	.	.	V.
23.917	22.8815	1.52	Q	.	.	.	V.
24.000	22.8919	1.50	Q	.	.	.	V.
24.083	22.9021	1.48	Q	.	.	.	V.
24.167	22.9120	1.45	Q	.	.	.	V.
24.250	22.9216	1.40	Q	.	.	.	V.
24.333	22.9308	1.33	Q	.	.	.	V.
24.417	22.9393	1.24	Q	.	.	.	V.
24.500	22.9468	1.08	Q	.	.	.	V.
24.583	22.9531	0.92	Q	.	.	.	V.
24.667	22.9586	0.79	Q	.	.	.	V.
24.750	22.9633	0.68	Q	.	.	.	V.
24.833	22.9674	0.60	Q	.	.	.	V.
24.917	22.9712	0.54	Q	.	.	.	V.
25.000	22.9745	0.49	Q	.	.	.	V.
25.083	22.9776	0.44	Q	.	.	.	V.
25.167	22.9803	0.40	Q	.	.	.	V.
25.250	22.9829	0.37	Q	.	.	.	V.
25.333	22.9852	0.34	Q	.	.	.	V.
25.417	22.9873	0.31	Q	.	.	.	V.
25.500	22.9893	0.28	Q	.	.	.	V.
25.583	22.9910	0.26	Q	.	.	.	V.
25.667	22.9927	0.24	Q	.	.	.	V.
25.750	22.9942	0.22	Q	.	.	.	V.
25.833	22.9956	0.20	Q	.	.	.	V.
25.917	22.9969	0.19	Q	.	.	.	V.
26.000	22.9981	0.17	Q	.	.	.	V.

26.083	22.9992	0.16	Q	.	.	.	V.
26.167	23.0002	0.15	Q	.	.	.	V.
26.250	23.0012	0.14	Q	.	.	.	V.
26.333	23.0020	0.13	Q	.	.	.	V.
26.417	23.0028	0.12	Q	.	.	.	V.
26.500	23.0036	0.11	Q	.	.	.	V.
26.583	23.0043	0.10	Q	.	.	.	V.
26.667	23.0049	0.09	Q	.	.	.	V.
26.750	23.0055	0.08	Q	.	.	.	V.
26.833	23.0060	0.08	Q	.	.	.	V.
26.917	23.0065	0.07	Q	.	.	.	V.
27.000	23.0069	0.06	Q	.	.	.	V.
27.083	23.0073	0.06	Q	.	.	.	V.
27.167	23.0077	0.05	Q	.	.	.	V.
27.250	23.0081	0.05	Q	.	.	.	V.
27.333	23.0084	0.05	Q	.	.	.	V.
27.417	23.0087	0.04	Q	.	.	.	V.
27.500	23.0089	0.04	Q	.	.	.	V.
27.583	23.0092	0.03	Q	.	.	.	V.
27.667	23.0094	0.03	Q	.	.	.	V.
27.750	23.0096	0.03	Q	.	.	.	V.
27.833	23.0098	0.03	Q	.	.	.	V.
27.917	23.0100	0.03	Q	.	.	.	V.
28.000	23.0101	0.02	Q	.	.	.	V.
28.083	23.0103	0.02	Q	.	.	.	V.
28.167	23.0104	0.02	Q	.	.	.	V.
28.250	23.0105	0.02	Q	.	.	.	V.
28.333	23.0106	0.02	Q	.	.	.	V.
28.417	23.0107	0.01	Q	.	.	.	V.
28.500	23.0108	0.01	Q	.	.	.	V.
28.583	23.0108	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1715.0
10%	150.0
20%	90.0
30%	65.0
40%	50.0
50%	35.0
60%	30.0
70%	20.0
80%	15.0
90%	10.0

END OF FLOODSCx ROUTING ANALYSIS

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****************************************************************************

              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
         (c) Copyright 1989-2015 Advanced Engineering Software (aes)
            Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                          Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED K - PROPOSED - UH                                              *
* 2022-10-03                                                               *
 **************************************************************************

  FILE NAME: 87_K_PR.DAT
  TIME/DATE OF STUDY: 11:43 10/03/2022


****************************************************************************
  FLOW PROCESS FROM NODE   6000.00 TO NODE   6002.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      66.700 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.490 HOURS
```

CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.

THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)

MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.590

LOW LOSS FRACTION = 0.778

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.17

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.997

30-MINUTE FACTOR = 0.997

1-HOUR FACTOR = 0.997

3-HOUR FACTOR = 1.000

6-HOUR FACTOR = 1.000

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 17.007

==

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.796	6.422

2	3.477	21.624
3	8.026	36.700
4	16.940	71.902
5	32.370	124.466
6	45.811	108.419
7	55.312	76.640
8	62.021	54.121
9	67.054	40.597
10	71.208	33.512
11	74.611	27.452
12	77.539	23.619
13	79.961	19.536
14	82.085	17.132
15	83.923	14.829
16	85.606	13.573
17	87.145	12.414
18	88.488	10.829
19	89.578	8.793
20	90.571	8.014
21	91.512	7.588
22	92.351	6.771
23	93.137	6.336
24	93.865	5.880
25	94.467	4.850
26	95.045	4.664
27	95.603	4.504
28	96.060	3.683
29	96.502	3.567
30	96.920	3.370
31	97.237	2.555
32	97.543	2.470
33	97.819	2.229
34	97.997	1.436
35	98.167	1.371
36	98.346	1.445
37	98.549	1.634

38	98.753	1.645
39	98.957	1.647
40	99.161	1.647
41	99.365	1.647
42	99.570	1.647
43	99.774	1.647
44	99.978	1.647
45	100.000	0.178

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0020	0.0006
13	0.0026	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0037	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0040	0.0031	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0069	0.0054	0.0015
146	0.0070	0.0054	0.0015
147	0.0071	0.0056	0.0016
148	0.0072	0.0056	0.0016
149	0.0074	0.0058	0.0016
150	0.0075	0.0058	0.0017
151	0.0077	0.0060	0.0017
152	0.0078	0.0061	0.0017
153	0.0080	0.0062	0.0018
154	0.0081	0.0063	0.0018
155	0.0083	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0087	0.0068	0.0019
158	0.0089	0.0069	0.0020
159	0.0091	0.0071	0.0020
160	0.0093	0.0072	0.0021
161	0.0096	0.0075	0.0021
162	0.0098	0.0076	0.0022
163	0.0101	0.0079	0.0022
164	0.0103	0.0080	0.0023
165	0.0107	0.0083	0.0024
166	0.0109	0.0085	0.0024
167	0.0114	0.0088	0.0025
168	0.0116	0.0090	0.0026
169	0.0194	0.0151	0.0043
170	0.0198	0.0154	0.0044
171	0.0206	0.0160	0.0046
172	0.0210	0.0164	0.0047
173	0.0220	0.0171	0.0049
174	0.0226	0.0175	0.0050

175	0.0237	0.0185	0.0053
176	0.0244	0.0190	0.0054
177	0.0258	0.0201	0.0057
178	0.0266	0.0207	0.0059
179	0.0283	0.0220	0.0063
180	0.0293	0.0228	0.0065
181	0.0316	0.0246	0.0070
182	0.0329	0.0256	0.0073
183	0.0360	0.0280	0.0080
184	0.0378	0.0294	0.0084
185	0.0614	0.0478	0.0136
186	0.0647	0.0492	0.0155
187	0.0725	0.0492	0.0234
188	0.0778	0.0492	0.0286
189	0.1011	0.0492	0.0519
190	0.1119	0.0492	0.0628
191	0.1508	0.0492	0.1016
192	0.1971	0.0492	0.1479
193	0.4786	0.0492	0.4294
194	0.1270	0.0492	0.0779
195	0.0841	0.0492	0.0349
196	0.0682	0.0492	0.0191
197	0.0399	0.0310	0.0089
198	0.0344	0.0267	0.0076
199	0.0304	0.0237	0.0068
200	0.0274	0.0213	0.0061
201	0.0250	0.0195	0.0056
202	0.0231	0.0180	0.0051
203	0.0215	0.0167	0.0048
204	0.0202	0.0157	0.0045
205	0.0119	0.0092	0.0026
206	0.0111	0.0087	0.0025
207	0.0105	0.0082	0.0023
208	0.0099	0.0077	0.0022
209	0.0094	0.0073	0.0021
210	0.0090	0.0070	0.0020

211	0.0086	0.0067	0.0019
212	0.0082	0.0064	0.0018
213	0.0079	0.0061	0.0018
214	0.0076	0.0059	0.0017
215	0.0073	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0040	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0039	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0031	0.0024	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0030	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0006
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0021	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.02

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.41

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 11.2040

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 7.8544

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	25.0	50.0	75.0	100.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0001	0.02	Q	.	.	.	.
0.250	0.0004	0.04	Q	.	.	.	.
0.333	0.0009	0.08	Q	.	.	.	.
0.417	0.0019	0.15	Q	.	.	.	.
0.500	0.0033	0.21	Q	.	.	.	.
0.583	0.0051	0.25	Q	.	.	.	.
0.667	0.0070	0.28	Q	.	.	.	.
0.750	0.0091	0.31	Q	.	.	.	.
0.833	0.0114	0.33	Q	.	.	.	.
0.917	0.0137	0.34	Q	.	.	.	.
1.000	0.0162	0.36	Q	.	.	.	.
1.083	0.0188	0.37	Q	.	.	.	.
1.167	0.0214	0.38	Q	.	.	.	.
1.250	0.0241	0.39	Q	.	.	.	.
1.333	0.0268	0.40	Q	.	.	.	.
1.417	0.0296	0.41	Q	.	.	.	.
1.500	0.0325	0.42	Q	.	.	.	.
1.583	0.0354	0.42	Q	.	.	.	.
1.667	0.0384	0.43	Q	.	.	.	.
1.750	0.0414	0.44	Q	.	.	.	.
1.833	0.0444	0.44	Q	.	.	.	.
1.917	0.0475	0.45	Q	.	.	.	.
2.000	0.0506	0.45	Q	.	.	.	.

2.083	0.0538	0.46	Q	.	.	.	.
2.167	0.0570	0.46	Q	.	.	.	.
2.250	0.0602	0.47	Q	.	.	.	.
2.333	0.0634	0.47	Q	.	.	.	.
2.417	0.0667	0.48	Q	.	.	.	.
2.500	0.0700	0.48	Q	.	.	.	.
2.583	0.0733	0.48	Q	.	.	.	.
2.667	0.0767	0.49	Q	.	.	.	.
2.750	0.0801	0.49	Q	.	.	.	.
2.833	0.0835	0.49	Q	.	.	.	.
2.917	0.0869	0.50	Q	.	.	.	.
3.000	0.0903	0.50	Q	.	.	.	.
3.083	0.0938	0.50	Q	.	.	.	.
3.167	0.0973	0.51	Q	.	.	.	.
3.250	0.1008	0.51	Q	.	.	.	.
3.333	0.1043	0.51	Q	.	.	.	.
3.417	0.1079	0.52	Q	.	.	.	.
3.500	0.1114	0.52	Q	.	.	.	.
3.583	0.1150	0.52	Q	.	.	.	.
3.667	0.1187	0.53	Q	.	.	.	.
3.750	0.1223	0.53	Q	.	.	.	.
3.833	0.1260	0.53	Q	.	.	.	.
3.917	0.1297	0.54	Q	.	.	.	.
4.000	0.1334	0.54	Q	.	.	.	.
4.083	0.1371	0.54	Q	.	.	.	.
4.167	0.1408	0.54	Q	.	.	.	.
4.250	0.1446	0.55	Q	.	.	.	.
4.333	0.1484	0.55	Q	.	.	.	.
4.417	0.1522	0.55	Q	.	.	.	.
4.500	0.1560	0.56	Q	.	.	.	.
4.583	0.1598	0.56	Q	.	.	.	.
4.667	0.1637	0.56	Q	.	.	.	.
4.750	0.1676	0.56	Q	.	.	.	.
4.833	0.1715	0.57	Q	.	.	.	.
4.917	0.1754	0.57	Q	.	.	.	.
5.000	0.1794	0.57	Q	.	.	.	.

5.083	0.1834	0.58	Q	.	.	.	.
5.167	0.1874	0.58	Q	.	.	.	.
5.250	0.1914	0.58	Q	.	.	.	.
5.333	0.1954	0.59	Q	.	.	.	.
5.417	0.1995	0.59	QV	.	.	.	.
5.500	0.2036	0.59	QV	.	.	.	.
5.583	0.2077	0.60	QV	.	.	.	.
5.667	0.2118	0.60	QV	.	.	.	.
5.750	0.2160	0.60	QV	.	.	.	.
5.833	0.2202	0.61	QV	.	.	.	.
5.917	0.2244	0.61	QV	.	.	.	.
6.000	0.2286	0.62	QV	.	.	.	.
6.083	0.2329	0.62	QV	.	.	.	.
6.167	0.2372	0.62	QV	.	.	.	.
6.250	0.2415	0.63	QV	.	.	.	.
6.333	0.2458	0.63	QV	.	.	.	.
6.417	0.2502	0.63	QV	.	.	.	.
6.500	0.2546	0.64	QV	.	.	.	.
6.583	0.2590	0.64	QV	.	.	.	.
6.667	0.2635	0.65	QV	.	.	.	.
6.750	0.2680	0.65	QV	.	.	.	.
6.833	0.2725	0.66	QV	.	.	.	.
6.917	0.2770	0.66	QV	.	.	.	.
7.000	0.2816	0.66	QV	.	.	.	.
7.083	0.2862	0.67	QV	.	.	.	.
7.167	0.2909	0.67	QV	.	.	.	.
7.250	0.2955	0.68	QV	.	.	.	.
7.333	0.3003	0.68	QV	.	.	.	.
7.417	0.3050	0.69	QV	.	.	.	.
7.500	0.3098	0.69	QV	.	.	.	.
7.583	0.3146	0.70	QV	.	.	.	.
7.667	0.3194	0.70	QV	.	.	.	.
7.750	0.3243	0.71	QV	.	.	.	.
7.833	0.3292	0.71	QV	.	.	.	.
7.917	0.3342	0.72	QV	.	.	.	.
8.000	0.3391	0.72	QV	.	.	.	.

8.083	0.3442	0.73	QV	.	.	.	.
8.167	0.3492	0.74	QV	.	.	.	.
8.250	0.3543	0.74	QV	.	.	.	.
8.333	0.3595	0.75	QV	.	.	.	.
8.417	0.3647	0.75	QV	.	.	.	.
8.500	0.3699	0.76	QV	.	.	.	.
8.583	0.3751	0.76	QV	.	.	.	.
8.667	0.3805	0.77	QV	.	.	.	.
8.750	0.3858	0.78	QV	.	.	.	.
8.833	0.3912	0.78	QV	.	.	.	.
8.917	0.3966	0.79	Q V	.	.	.	.
9.000	0.4021	0.80	Q V	.	.	.	.
9.083	0.4077	0.80	Q V	.	.	.	.
9.167	0.4133	0.81	Q V	.	.	.	.
9.250	0.4189	0.82	Q V	.	.	.	.
9.333	0.4246	0.83	Q V	.	.	.	.
9.417	0.4303	0.83	Q V	.	.	.	.
9.500	0.4361	0.84	Q V	.	.	.	.
9.583	0.4419	0.85	Q V	.	.	.	.
9.667	0.4478	0.86	Q V	.	.	.	.
9.750	0.4538	0.86	Q V	.	.	.	.
9.833	0.4598	0.87	Q V	.	.	.	.
9.917	0.4659	0.88	Q V	.	.	.	.
10.000	0.4720	0.89	Q V	.	.	.	.
10.083	0.4782	0.90	Q V	.	.	.	.
10.167	0.4844	0.91	Q V	.	.	.	.
10.250	0.4907	0.92	Q V	.	.	.	.
10.333	0.4971	0.93	Q V	.	.	.	.
10.417	0.5036	0.94	Q V	.	.	.	.
10.500	0.5101	0.95	Q V	.	.	.	.
10.583	0.5166	0.96	Q V	.	.	.	.
10.667	0.5233	0.97	Q V	.	.	.	.
10.750	0.5300	0.98	Q V	.	.	.	.
10.833	0.5368	0.99	Q V	.	.	.	.
10.917	0.5437	1.00	Q V	.	.	.	.
11.000	0.5507	1.01	Q V	.	.	.	.

11.083	0.5577	1.02	Q	V	.	.	.	.
11.167	0.5648	1.03	Q	V	.	.	.	.
11.250	0.5720	1.05	Q	V	.	.	.	.
11.333	0.5793	1.06	Q	V	.	.	.	.
11.417	0.5867	1.07	Q	V	.	.	.	.
11.500	0.5942	1.09	Q	V	.	.	.	.
11.583	0.6018	1.10	Q	V	.	.	.	.
11.667	0.6094	1.11	Q	V	.	.	.	.
11.750	0.6172	1.13	Q	V	.	.	.	.
11.833	0.6251	1.14	Q	V	.	.	.	.
11.917	0.6331	1.16	Q	V	.	.	.	.
12.000	0.6412	1.18	Q	V	.	.	.	.
12.083	0.6494	1.19	Q	V	.	.	.	.
12.167	0.6577	1.21	Q	V	.	.	.	.
12.250	0.6661	1.22	Q	V	.	.	.	.
12.333	0.6746	1.23	Q	V	.	.	.	.
12.417	0.6830	1.23	Q	V	.	.	.	.
12.500	0.6915	1.23	Q	V	.	.	.	.
12.583	0.7001	1.24	Q	V	.	.	.	.
12.667	0.7087	1.25	Q	V	.	.	.	.
12.750	0.7175	1.27	Q	V	.	.	.	.
12.833	0.7263	1.29	Q	V	.	.	.	.
12.917	0.7353	1.31	Q	V	.	.	.	.
13.000	0.7444	1.33	Q	V	.	.	.	.
13.083	0.7537	1.35	Q	V	.	.	.	.
13.167	0.7632	1.37	Q	V	.	.	.	.
13.250	0.7728	1.40	Q	V	.	.	.	.
13.333	0.7826	1.42	Q	V	.	.	.	.
13.417	0.7926	1.45	Q	V	.	.	.	.
13.500	0.8027	1.48	Q	V	.	.	.	.
13.583	0.8131	1.51	Q	V	.	.	.	.
13.667	0.8238	1.54	Q	V	.	.	.	.
13.750	0.8346	1.58	Q	V	.	.	.	.
13.833	0.8457	1.61	Q	V	.	.	.	.
13.917	0.8571	1.65	Q	V	.	.	.	.
14.000	0.8688	1.69	Q	V	.	.	.	.

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14.083      0.8808      1.75  Q   V     .         .         .         .
14.167      0.8934      1.83  Q   V     .         .         .         .
14.250      0.9068      1.94  Q   V     .         .         .         .
14.333      0.9213      2.11  Q   V     .         .         .         .
14.417      0.9377      2.37  Q   V     .         .         .         .
14.500      0.9557      2.62  .Q  V     .         .         .         .
14.583      0.9751      2.82  .Q  V     .         .         .         .
14.667      0.9957      2.99  .Q   V    .         .         .         .
14.750      1.0175      3.16  .Q   V    .         .         .         .
14.833      1.0403      3.32  .Q   V    .         .         .         .
14.917      1.0643      3.48  .Q   V    .         .         .         .
15.000      1.0894      3.65  .Q   V    .         .         .         .
15.083      1.1158      3.83  .Q   V    .         .         .         .
15.167      1.1435      4.02  .Q   V    .         .         .         .
15.250      1.1725      4.22  .Q   V    .         .         .         .
15.333      1.2031      4.44  .Q    V   .         .         .         .
15.417      1.2356      4.72  .Q    V   .         .         .         .
15.500      1.2708      5.10  . Q   V   .         .         .         .
15.583      1.3097      5.65  . Q   V   .         .         .         .
15.667      1.3548      6.54  . Q   V   .         .         .         .
15.750      1.4104      8.07  .  Q   V  .         .         .         .
15.833      1.4816     10.35  .   Q  V  .         .         .         .
15.917      1.5765     13.77  .    Q  V .         .         .         .
16.000      1.7074     19.01  .      QV .         .         .         .
16.083      1.9037     28.50  .        V.Q        .         .         .
16.167      2.1920     41.85  .         .V    Q   .         .         .
16.250      2.5798     56.31  .         .  V      . Q       .         .
16.333      3.0990     75.39  .         .    V    .         Q         .
16.417      3.7414     93.28  .         .        V.         .      Q  .
16.500      4.3167     83.52  .         .         .V        .  Q      .
16.583      4.7685     65.60  .         .         .   V Q   .         .
16.667      5.1188     50.86  .         .         Q     V   .         .
16.750      5.3977     40.51  .         .     Q   .      V  .         .
16.833      5.6309     33.86  .         .  Q      .       V .         .
16.917      5.8289     28.75  .         .Q        .        V.         .
17.000      6.0015     25.05  .         Q         .         V         .
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17.083      6.1516     21.80  .       Q .         .V        .
17.167      6.2853     19.41  .      Q  .         . V       .
17.250      6.4046     17.33  .     Q   .         . V       .
17.333      6.5128     15.71  .     Q   .         .  V      .
17.417      6.6102     14.14  .    Q    .         .  V      .
17.500      6.6965     12.54  .    Q    .         .   V     .
17.583      6.7723     11.00  .   Q     .         .   V     .
17.667      6.8414     10.04  .   Q     .         .   V     .
17.750      6.9054      9.29  .  Q      .         .    V    .
17.833      6.9640      8.51  .  Q      .         .    V    .
17.917      7.0184      7.89  .  Q      .         .    V    .
18.000      7.0686      7.28  . Q       .         .    V    .
18.083      7.1137      6.56  . Q       .         .     V   .
18.167      7.1560      6.14  . Q       .         .     V   .
18.250      7.1956      5.74  . Q       .         .     V   .
18.333      7.2312      5.18  . Q       .         .     V   .
18.417      7.2647      4.86  .Q        .         .     V   .
18.500      7.2957      4.50  .Q        .         .      V  .
18.583      7.3232      3.99  .Q        .         .      V  .
18.667      7.3488      3.72  .Q        .         .      V  .
18.750      7.3724      3.42  .Q        .         .      V  .
18.833      7.3931      3.00  .Q        .         .      V  .
18.917      7.4129      2.88  .Q        .         .      V  .
19.000      7.4326      2.86  .Q        .         .      V  .
19.083      7.4524      2.87  .Q        .         .      V  .
19.167      7.4719      2.83  .Q        .         .       V .
19.250      7.4909      2.77  .Q        .         .       V .
19.333      7.5095      2.70  .Q        .         .       V .
19.417      7.5273      2.59  .Q        .         .       V .
19.500      7.5443      2.46  Q         .         .       V .
19.583      7.5600      2.28  Q         .         .       V .
19.667      7.5739      2.02  Q         .         .       V .
19.750      7.5832      1.35  Q         .         .       V .
19.833      7.5910      1.14  Q         .         .       V .
19.917      7.5983      1.06  Q         .         .       V .
20.000      7.6052      1.01  Q         .         .       V .
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20.083	7.6120	0.98	Q	.	.	.	V .
20.167	7.6185	0.95	Q	.	.	.	V .
20.250	7.6249	0.92	Q	.	.	.	V .
20.333	7.6311	0.90	Q	.	.	.	V .
20.417	7.6371	0.88	Q	.	.	.	V .
20.500	7.6430	0.86	Q	.	.	.	V .
20.583	7.6488	0.84	Q	.	.	.	V .
20.667	7.6545	0.82	Q	.	.	.	V .
20.750	7.6600	0.81	Q	.	.	.	V.
20.833	7.6655	0.79	Q	.	.	.	V.
20.917	7.6708	0.78	Q	.	.	.	V.
21.000	7.6761	0.76	Q	.	.	.	V.
21.083	7.6813	0.75	Q	.	.	.	V.
21.167	7.6864	0.74	Q	.	.	.	V.
21.250	7.6914	0.73	Q	.	.	.	V.
21.333	7.6963	0.72	Q	.	.	.	V.
21.417	7.7012	0.71	Q	.	.	.	V.
21.500	7.7060	0.70	Q	.	.	.	V.
21.583	7.7107	0.69	Q	.	.	.	V.
21.667	7.7154	0.68	Q	.	.	.	V.
21.750	7.7200	0.67	Q	.	.	.	V.
21.833	7.7245	0.66	Q	.	.	.	V.
21.917	7.7290	0.65	Q	.	.	.	V.
22.000	7.7334	0.64	Q	.	.	.	V.
22.083	7.7378	0.63	Q	.	.	.	V.
22.167	7.7421	0.62	Q	.	.	.	V.
22.250	7.7463	0.62	Q	.	.	.	V.
22.333	7.7505	0.61	Q	.	.	.	V.
22.417	7.7547	0.60	Q	.	.	.	V.
22.500	7.7588	0.59	Q	.	.	.	V.
22.583	7.7628	0.59	Q	.	.	.	V.
22.667	7.7668	0.58	Q	.	.	.	V.
22.750	7.7708	0.57	Q	.	.	.	V.
22.833	7.7747	0.57	Q	.	.	.	V.
22.917	7.7786	0.56	Q	.	.	.	V.
23.000	7.7824	0.56	Q	.	.	.	V.

23.083	7.7862	0.55	Q	.	.	.	V.
23.167	7.7899	0.54	Q	.	.	.	V.
23.250	7.7936	0.54	Q	.	.	.	V.
23.333	7.7973	0.53	Q	.	.	.	V.
23.417	7.8009	0.53	Q	.	.	.	V.
23.500	7.8045	0.52	Q	.	.	.	V.
23.583	7.8080	0.52	Q	.	.	.	V.
23.667	7.8116	0.51	Q	.	.	.	V.
23.750	7.8151	0.51	Q	.	.	.	V.
23.833	7.8185	0.50	Q	.	.	.	V.
23.917	7.8219	0.50	Q	.	.	.	V.
24.000	7.8253	0.49	Q	.	.	.	V.
24.083	7.8287	0.48	Q	.	.	.	V.
24.167	7.8319	0.47	Q	.	.	.	V.
24.250	7.8349	0.44	Q	.	.	.	V.
24.333	7.8377	0.40	Q	.	.	.	V.
24.417	7.8399	0.33	Q	.	.	.	V.
24.500	7.8417	0.26	Q	.	.	.	V.
24.583	7.8432	0.22	Q	.	.	.	V.
24.667	7.8445	0.19	Q	.	.	.	V.
24.750	7.8456	0.16	Q	.	.	.	V.
24.833	7.8466	0.14	Q	.	.	.	V.
24.917	7.8474	0.12	Q	.	.	.	V.
25.000	7.8482	0.11	Q	.	.	.	V.
25.083	7.8489	0.10	Q	.	.	.	V.
25.167	7.8495	0.09	Q	.	.	.	V.
25.250	7.8500	0.08	Q	.	.	.	V.
25.333	7.8505	0.07	Q	.	.	.	V.
25.417	7.8509	0.06	Q	.	.	.	V.
25.500	7.8513	0.06	Q	.	.	.	V.
25.583	7.8517	0.05	Q	.	.	.	V.
25.667	7.8520	0.05	Q	.	.	.	V.
25.750	7.8523	0.04	Q	.	.	.	V.
25.833	7.8525	0.04	Q	.	.	.	V.
25.917	7.8528	0.03	Q	.	.	.	V.
26.000	7.8530	0.03	Q	.	.	.	V.

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  26.083      7.8532      0.03  Q         .         .         .        V.
  26.167      7.8533      0.02  Q         .         .         .        V.
  26.250      7.8535      0.02  Q         .         .         .        V.
  26.333      7.8536      0.02  Q         .         .         .        V.
  26.417      7.8537      0.02  Q         .         .         .        V.
  26.500      7.8538      0.01  Q         .         .         .        V.
  26.583      7.8539      0.01  Q         .         .         .        V.
  26.667      7.8540      0.01  Q         .         .         .        V.
  26.750      7.8541      0.01  Q         .         .         .        V.
  26.833      7.8541      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                Duration
        Peak Flow Rate                     (minutes)
    =======================                =========
               0%                            1610.0
              10%                             115.0
              20%                              75.0
              30%                              55.0
              40%                              40.0
              50%                              30.0
              60%                              25.0
              70%                              20.0
              80%                              15.0
              90%                               5.0


 ****************************************************************************
  FLOW PROCESS FROM NODE   6002.00 TO NODE   6003.00 IS CODE =   1
 ----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
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(UNIT-HYDROGRAPH ADDED TO STREAM #2)

WATERSHED AREA = 62.060 ACRES

BASEFLOW = 0.000 CFS/SQUARE-MILE

*USER ENTERED "LAG" TIME = 0.570 HOURS

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.504

LOW LOSS FRACTION = 0.686

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.17

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.997

30-MINUTE FACTOR = 0.997

1-HOUR FACTOR = 0.997

3-HOUR FACTOR = 1.000

6-HOUR FACTOR = 1.000

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 14.620

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UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)

1	0.656	4.920
2	2.733	15.595
3	6.186	25.914
4	11.641	40.938
5	22.081	78.357
6	35.909	103.789
7	46.796	81.711
8	54.925	61.010
9	60.913	44.940
10	65.509	34.498
11	69.330	28.679
12	72.622	24.704
13	75.362	20.566
14	77.831	18.531
15	79.882	15.397
16	81.747	13.995
17	83.353	12.050
18	84.860	11.317
19	86.261	10.509
20	87.507	9.353
21	88.643	8.526
22	89.560	6.881
23	90.419	6.453
24	91.239	6.154
25	91.993	5.655
26	92.691	5.240
27	93.347	4.921
28	93.960	4.602
29	94.467	3.803
30	94.964	3.730
31	95.458	3.710
32	95.874	3.119
33	96.254	2.855
34	96.634	2.851
35	96.977	2.573

36	97.242	1.995
37	97.505	1.971
38	97.760	1.913
39	97.929	1.267
40	98.075	1.095
41	98.221	1.099
42	98.381	1.197
43	98.556	1.318
44	98.731	1.316
45	98.907	1.317
46	99.082	1.316
47	99.257	1.316
48	99.433	1.316
49	99.608	1.316
50	99.783	1.316
51	99.959	1.316
52	100.000	0.311

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UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0017	0.0008
2	0.0025	0.0017	0.0008
3	0.0025	0.0017	0.0008
4	0.0025	0.0017	0.0008
5	0.0026	0.0018	0.0008
6	0.0026	0.0018	0.0008
7	0.0026	0.0018	0.0008
8	0.0026	0.0018	0.0008
9	0.0026	0.0018	0.0008
10	0.0026	0.0018	0.0008
11	0.0026	0.0018	0.0008
12	0.0026	0.0018	0.0008
13	0.0026	0.0018	0.0008
14	0.0027	0.0018	0.0008
15	0.0027	0.0018	0.0008
16	0.0027	0.0018	0.0008
17	0.0027	0.0018	0.0008
18	0.0027	0.0019	0.0008
19	0.0027	0.0019	0.0009
20	0.0027	0.0019	0.0009
21	0.0027	0.0019	0.0009
22	0.0028	0.0019	0.0009
23	0.0028	0.0019	0.0009
24	0.0028	0.0019	0.0009
25	0.0028	0.0019	0.0009
26	0.0028	0.0019	0.0009
27	0.0028	0.0019	0.0009
28	0.0028	0.0019	0.0009
29	0.0029	0.0020	0.0009
30	0.0029	0.0020	0.0009

31	0.0029	0.0020	0.0009
32	0.0029	0.0020	0.0009
33	0.0029	0.0020	0.0009
34	0.0029	0.0020	0.0009
35	0.0029	0.0020	0.0009
36	0.0029	0.0020	0.0009
37	0.0030	0.0020	0.0009
38	0.0030	0.0020	0.0009
39	0.0030	0.0021	0.0009
40	0.0030	0.0021	0.0009
41	0.0030	0.0021	0.0010
42	0.0030	0.0021	0.0010
43	0.0031	0.0021	0.0010
44	0.0031	0.0021	0.0010
45	0.0031	0.0021	0.0010
46	0.0031	0.0021	0.0010
47	0.0031	0.0021	0.0010
48	0.0031	0.0022	0.0010
49	0.0032	0.0022	0.0010
50	0.0032	0.0022	0.0010
51	0.0032	0.0022	0.0010
52	0.0032	0.0022	0.0010
53	0.0032	0.0022	0.0010
54	0.0032	0.0022	0.0010
55	0.0033	0.0022	0.0010
56	0.0033	0.0023	0.0010
57	0.0033	0.0023	0.0010
58	0.0033	0.0023	0.0010
59	0.0033	0.0023	0.0011
60	0.0034	0.0023	0.0011
61	0.0034	0.0023	0.0011
62	0.0034	0.0023	0.0011
63	0.0034	0.0024	0.0011
64	0.0034	0.0024	0.0011
65	0.0035	0.0024	0.0011
66	0.0035	0.0024	0.0011

67	0.0035	0.0024	0.0011
68	0.0035	0.0024	0.0011
69	0.0036	0.0024	0.0011
70	0.0036	0.0025	0.0011
71	0.0036	0.0025	0.0011
72	0.0036	0.0025	0.0011
73	0.0036	0.0025	0.0011
74	0.0037	0.0025	0.0012
75	0.0037	0.0025	0.0012
76	0.0037	0.0025	0.0012
77	0.0037	0.0026	0.0012
78	0.0038	0.0026	0.0012
79	0.0038	0.0026	0.0012
80	0.0038	0.0026	0.0012
81	0.0039	0.0026	0.0012
82	0.0039	0.0027	0.0012
83	0.0039	0.0027	0.0012
84	0.0039	0.0027	0.0012
85	0.0040	0.0027	0.0012
86	0.0040	0.0027	0.0013
87	0.0040	0.0028	0.0013
88	0.0040	0.0028	0.0013
89	0.0041	0.0028	0.0013
90	0.0041	0.0028	0.0013
91	0.0042	0.0028	0.0013
92	0.0042	0.0029	0.0013
93	0.0042	0.0029	0.0013
94	0.0042	0.0029	0.0013
95	0.0043	0.0029	0.0013
96	0.0043	0.0030	0.0014
97	0.0044	0.0030	0.0014
98	0.0044	0.0030	0.0014
99	0.0044	0.0030	0.0014
100	0.0045	0.0031	0.0014
101	0.0045	0.0031	0.0014
102	0.0045	0.0031	0.0014

103	0.0046	0.0031	0.0014
104	0.0046	0.0032	0.0014
105	0.0047	0.0032	0.0015
106	0.0047	0.0032	0.0015
107	0.0048	0.0033	0.0015
108	0.0048	0.0033	0.0015
109	0.0048	0.0033	0.0015
110	0.0049	0.0033	0.0015
111	0.0049	0.0034	0.0015
112	0.0050	0.0034	0.0016
113	0.0050	0.0035	0.0016
114	0.0051	0.0035	0.0016
115	0.0051	0.0035	0.0016
116	0.0052	0.0035	0.0016
117	0.0052	0.0036	0.0016
118	0.0053	0.0036	0.0017
119	0.0054	0.0037	0.0017
120	0.0054	0.0037	0.0017
121	0.0055	0.0038	0.0017
122	0.0055	0.0038	0.0017
123	0.0056	0.0038	0.0018
124	0.0056	0.0039	0.0018
125	0.0057	0.0039	0.0018
126	0.0058	0.0040	0.0018
127	0.0059	0.0040	0.0018
128	0.0059	0.0041	0.0019
129	0.0060	0.0041	0.0019
130	0.0061	0.0042	0.0019
131	0.0062	0.0042	0.0019
132	0.0062	0.0043	0.0020
133	0.0063	0.0043	0.0020
134	0.0064	0.0044	0.0020
135	0.0065	0.0045	0.0020
136	0.0066	0.0045	0.0021
137	0.0067	0.0046	0.0021
138	0.0067	0.0046	0.0021

139	0.0069	0.0047	0.0022
140	0.0069	0.0048	0.0022
141	0.0071	0.0049	0.0022
142	0.0072	0.0049	0.0022
143	0.0073	0.0050	0.0023
144	0.0074	0.0051	0.0023
145	0.0069	0.0047	0.0022
146	0.0070	0.0048	0.0022
147	0.0071	0.0049	0.0022
148	0.0072	0.0050	0.0023
149	0.0074	0.0051	0.0023
150	0.0075	0.0051	0.0024
151	0.0077	0.0053	0.0024
152	0.0078	0.0053	0.0024
153	0.0080	0.0055	0.0025
154	0.0081	0.0056	0.0025
155	0.0083	0.0057	0.0026
156	0.0085	0.0058	0.0027
157	0.0087	0.0060	0.0027
158	0.0089	0.0061	0.0028
159	0.0091	0.0063	0.0029
160	0.0093	0.0064	0.0029
161	0.0096	0.0066	0.0030
162	0.0098	0.0067	0.0031
163	0.0101	0.0069	0.0032
164	0.0103	0.0071	0.0032
165	0.0107	0.0073	0.0034
166	0.0109	0.0075	0.0034
167	0.0114	0.0078	0.0036
168	0.0116	0.0080	0.0036
169	0.0194	0.0133	0.0061
170	0.0198	0.0136	0.0062
171	0.0206	0.0141	0.0065
172	0.0210	0.0144	0.0066
173	0.0220	0.0151	0.0069
174	0.0225	0.0155	0.0071

175	0.0237	0.0163	0.0074
176	0.0244	0.0167	0.0076
177	0.0258	0.0177	0.0081
178	0.0266	0.0182	0.0083
179	0.0283	0.0194	0.0089
180	0.0293	0.0201	0.0092
181	0.0316	0.0217	0.0099
182	0.0329	0.0226	0.0103
183	0.0360	0.0247	0.0113
184	0.0378	0.0259	0.0119
185	0.0615	0.0420	0.0195
186	0.0647	0.0420	0.0227
187	0.0725	0.0420	0.0305
188	0.0778	0.0420	0.0358
189	0.1011	0.0420	0.0591
190	0.1119	0.0420	0.0699
191	0.1508	0.0420	0.1088
192	0.1971	0.0420	0.1551
193	0.4787	0.0420	0.4367
194	0.1271	0.0420	0.0851
195	0.0841	0.0420	0.0421
196	0.0682	0.0420	0.0262
197	0.0399	0.0274	0.0125
198	0.0344	0.0236	0.0108
199	0.0304	0.0209	0.0095
200	0.0274	0.0188	0.0086
201	0.0250	0.0172	0.0079
202	0.0231	0.0159	0.0073
203	0.0215	0.0148	0.0068
204	0.0202	0.0138	0.0063
205	0.0119	0.0081	0.0037
206	0.0111	0.0076	0.0035
207	0.0105	0.0072	0.0033
208	0.0099	0.0068	0.0031
209	0.0094	0.0065	0.0030
210	0.0090	0.0062	0.0028

211	0.0086	0.0059	0.0027
212	0.0082	0.0056	0.0026
213	0.0079	0.0054	0.0025
214	0.0076	0.0052	0.0024
215	0.0073	0.0050	0.0023
216	0.0071	0.0048	0.0022
217	0.0075	0.0051	0.0023
218	0.0072	0.0050	0.0023
219	0.0070	0.0048	0.0022
220	0.0068	0.0047	0.0021
221	0.0066	0.0045	0.0021
222	0.0064	0.0044	0.0020
223	0.0063	0.0043	0.0020
224	0.0061	0.0042	0.0019
225	0.0060	0.0041	0.0019
226	0.0058	0.0040	0.0018
227	0.0057	0.0039	0.0018
228	0.0056	0.0038	0.0017
229	0.0054	0.0037	0.0017
230	0.0053	0.0036	0.0017
231	0.0052	0.0036	0.0016
232	0.0051	0.0035	0.0016
233	0.0050	0.0034	0.0016
234	0.0049	0.0034	0.0015
235	0.0048	0.0033	0.0015
236	0.0047	0.0032	0.0015
237	0.0046	0.0032	0.0015
238	0.0046	0.0031	0.0014
239	0.0045	0.0031	0.0014
240	0.0044	0.0030	0.0014
241	0.0043	0.0030	0.0014
242	0.0043	0.0029	0.0013
243	0.0042	0.0029	0.0013
244	0.0041	0.0028	0.0013
245	0.0041	0.0028	0.0013
246	0.0040	0.0027	0.0013

247	0.0039	0.0027	0.0012
248	0.0039	0.0027	0.0012
249	0.0038	0.0026	0.0012
250	0.0038	0.0026	0.0012
251	0.0037	0.0026	0.0012
252	0.0037	0.0025	0.0012
253	0.0036	0.0025	0.0011
254	0.0036	0.0025	0.0011
255	0.0035	0.0024	0.0011
256	0.0035	0.0024	0.0011
257	0.0035	0.0024	0.0011
258	0.0034	0.0023	0.0011
259	0.0034	0.0023	0.0011
260	0.0033	0.0023	0.0010
261	0.0033	0.0023	0.0010
262	0.0033	0.0022	0.0010
263	0.0032	0.0022	0.0010
264	0.0032	0.0022	0.0010
265	0.0031	0.0022	0.0010
266	0.0031	0.0021	0.0010
267	0.0031	0.0021	0.0010
268	0.0030	0.0021	0.0010
269	0.0030	0.0021	0.0009
270	0.0030	0.0020	0.0009
271	0.0030	0.0020	0.0009
272	0.0029	0.0020	0.0009
273	0.0029	0.0020	0.0009
274	0.0029	0.0020	0.0009
275	0.0028	0.0019	0.0009
276	0.0028	0.0019	0.0009
277	0.0028	0.0019	0.0009
278	0.0028	0.0019	0.0009
279	0.0027	0.0019	0.0009
280	0.0027	0.0019	0.0009
281	0.0027	0.0018	0.0008
282	0.0027	0.0018	0.0008

283	0.0026	0.0018	0.0008
284	0.0026	0.0018	0.0008
285	0.0026	0.0018	0.0008
286	0.0026	0.0018	0.0008
287	0.0026	0.0018	0.0008
288	0.0025	0.0017	0.0008

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 1.76

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.67

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 9.1131

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 8.6190

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2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	22.5	45.0	67.5	90.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0001	0.02	Q	.	.	.	.
0.250	0.0004	0.04	Q	.	.	.	.
0.333	0.0009	0.07	Q	.	.	.	.
0.417	0.0018	0.13	Q	.	.	.	.
0.500	0.0032	0.21	Q	.	.	.	.
0.583	0.0052	0.28	Q	.	.	.	.
0.667	0.0074	0.33	Q	.	.	.	.
0.750	0.0100	0.37	Q	.	.	.	.
0.833	0.0127	0.39	Q	.	.	.	.
0.917	0.0156	0.42	Q	.	.	.	.
1.000	0.0186	0.44	Q	.	.	.	.
1.083	0.0217	0.46	Q	.	.	.	.
1.167	0.0250	0.47	Q	.	.	.	.
1.250	0.0284	0.49	Q	.	.	.	.
1.333	0.0318	0.50	Q	.	.	.	.
1.417	0.0354	0.51	Q	.	.	.	.
1.500	0.0390	0.52	Q	.	.	.	.
1.583	0.0427	0.54	Q	.	.	.	.
1.667	0.0464	0.55	Q	.	.	.	.
1.750	0.0502	0.55	Q	.	.	.	.
1.833	0.0541	0.56	Q	.	.	.	.
1.917	0.0580	0.57	Q	.	.	.	.
2.000	0.0620	0.58	Q	.	.	.	.

2.083	0.0660	0.58	Q	.	.	.	.
2.167	0.0701	0.59	Q	.	.	.	.
2.250	0.0742	0.60	Q	.	.	.	.
2.333	0.0784	0.60	Q	.	.	.	.
2.417	0.0826	0.61	Q	.	.	.	.
2.500	0.0868	0.62	Q	.	.	.	.
2.583	0.0911	0.62	Q	.	.	.	.
2.667	0.0954	0.63	Q	.	.	.	.
2.750	0.0998	0.63	Q	.	.	.	.
2.833	0.1042	0.64	Q	.	.	.	.
2.917	0.1086	0.64	Q	.	.	.	.
3.000	0.1130	0.65	Q	.	.	.	.
3.083	0.1175	0.65	Q	.	.	.	.
3.167	0.1220	0.66	Q	.	.	.	.
3.250	0.1266	0.66	Q	.	.	.	.
3.333	0.1312	0.66	Q	.	.	.	.
3.417	0.1358	0.67	Q	.	.	.	.
3.500	0.1404	0.67	Q	.	.	.	.
3.583	0.1451	0.68	Q	.	.	.	.
3.667	0.1498	0.68	Q	.	.	.	.
3.750	0.1545	0.69	Q	.	.	.	.
3.833	0.1592	0.69	Q	.	.	.	.
3.917	0.1640	0.70	Q	.	.	.	.
4.000	0.1688	0.70	Q	.	.	.	.
4.083	0.1737	0.70	Q	.	.	.	.
4.167	0.1786	0.71	Q	.	.	.	.
4.250	0.1835	0.71	Q	.	.	.	.
4.333	0.1884	0.72	Q	.	.	.	.
4.417	0.1934	0.72	Q	.	.	.	.
4.500	0.1984	0.73	Q	.	.	.	.
4.583	0.2034	0.73	Q	.	.	.	.
4.667	0.2085	0.73	Q	.	.	.	.
4.750	0.2136	0.74	Q	.	.	.	.
4.833	0.2187	0.74	QV	.	.	.	.
4.917	0.2238	0.75	QV	.	.	.	.
5.000	0.2290	0.75	QV	.	.	.	.

5.083	0.2341	0.75	QV	.	.	.	.
5.167	0.2394	0.76	QV	.	.	.	.
5.250	0.2446	0.76	QV	.	.	.	.
5.333	0.2499	0.77	QV	.	.	.	.
5.417	0.2552	0.77	QV	.	.	.	.
5.500	0.2605	0.78	QV	.	.	.	.
5.583	0.2659	0.78	QV	.	.	.	.
5.667	0.2713	0.78	QV	.	.	.	.
5.750	0.2767	0.79	QV	.	.	.	.
5.833	0.2822	0.79	QV	.	.	.	.
5.917	0.2877	0.80	QV	.	.	.	.
6.000	0.2932	0.80	QV	.	.	.	.
6.083	0.2988	0.81	QV	.	.	.	.
6.167	0.3044	0.81	QV	.	.	.	.
6.250	0.3101	0.82	QV	.	.	.	.
6.333	0.3157	0.82	QV	.	.	.	.
6.417	0.3214	0.83	QV	.	.	.	.
6.500	0.3272	0.83	QV	.	.	.	.
6.583	0.3330	0.84	QV	.	.	.	.
6.667	0.3388	0.84	QV	.	.	.	.
6.750	0.3446	0.85	QV	.	.	.	.
6.833	0.3505	0.86	QV	.	.	.	.
6.917	0.3565	0.86	QV	.	.	.	.
7.000	0.3624	0.87	QV	.	.	.	.
7.083	0.3684	0.87	QV	.	.	.	.
7.167	0.3745	0.88	QV	.	.	.	.
7.250	0.3806	0.89	QV	.	.	.	.
7.333	0.3867	0.89	QV	.	.	.	.
7.417	0.3929	0.90	QV	.	.	.	.
7.500	0.3991	0.90	QV	.	.	.	.
7.583	0.4054	0.91	QV	.	.	.	.
7.667	0.4117	0.92	QV	.	.	.	.
7.750	0.4181	0.92	QV	.	.	.	.
7.833	0.4245	0.93	QV	.	.	.	.
7.917	0.4309	0.94	QV	.	.	.	.
8.000	0.4374	0.94	Q V	.	.	.	.

8.083	0.4440	0.95	Q	V	.	.	.	.
8.167	0.4506	0.96	Q	V	.	.	.	.
8.250	0.4572	0.97	Q	V	.	.	.	.
8.333	0.4639	0.97	Q	V	.	.	.	.
8.417	0.4707	0.98	Q	V	.	.	.	.
8.500	0.4775	0.99	Q	V	.	.	.	.
8.583	0.4843	1.00	Q	V	.	.	.	.
8.667	0.4913	1.00	Q	V	.	.	.	.
8.750	0.4982	1.01	Q	V	.	.	.	.
8.833	0.5053	1.02	Q	V	.	.	.	.
8.917	0.5124	1.03	Q	V	.	.	.	.
9.000	0.5195	1.04	Q	V	.	.	.	.
9.083	0.5267	1.05	Q	V	.	.	.	.
9.167	0.5340	1.06	Q	V	.	.	.	.
9.250	0.5413	1.06	Q	V	.	.	.	.
9.333	0.5487	1.07	Q	V	.	.	.	.
9.417	0.5562	1.08	Q	V	.	.	.	.
9.500	0.5637	1.09	Q	V	.	.	.	.
9.583	0.5713	1.10	Q	V	.	.	.	.
9.667	0.5790	1.11	Q	V	.	.	.	.
9.750	0.5867	1.12	Q	V	.	.	.	.
9.833	0.5945	1.13	Q	V	.	.	.	.
9.917	0.6024	1.15	Q	V	.	.	.	.
10.000	0.6104	1.16	Q	V	.	.	.	.
10.083	0.6184	1.17	Q	V	.	.	.	.
10.167	0.6265	1.18	Q	V	.	.	.	.
10.250	0.6347	1.19	Q	V	.	.	.	.
10.333	0.6430	1.20	Q	V	.	.	.	.
10.417	0.6514	1.22	Q	V	.	.	.	.
10.500	0.6599	1.23	Q	V	.	.	.	.
10.583	0.6684	1.24	Q	V	.	.	.	.
10.667	0.6770	1.25	Q	V	.	.	.	.
10.750	0.6858	1.27	Q	V	.	.	.	.
10.833	0.6946	1.28	Q	V	.	.	.	.
10.917	0.7035	1.30	Q	V	.	.	.	.
11.000	0.7126	1.31	Q	V	.	.	.	.

11.083	0.7217	1.33	Q	V	.	.	.	.
11.167	0.7309	1.34	Q	V	.	.	.	.
11.250	0.7403	1.36	Q	V	.	.	.	.
11.333	0.7497	1.37	Q	V	.	.	.	.
11.417	0.7593	1.39	Q	V	.	.	.	.
11.500	0.7690	1.41	Q	V	.	.	.	.
11.583	0.7788	1.43	Q	V	.	.	.	.
11.667	0.7888	1.44	Q	V	.	.	.	.
11.750	0.7989	1.46	Q	V	.	.	.	.
11.833	0.8091	1.48	Q	V	.	.	.	.
11.917	0.8194	1.50	Q	V	.	.	.	.
12.000	0.8299	1.52	Q	V	.	.	.	.
12.083	0.8405	1.54	Q	V	.	.	.	.
12.167	0.8513	1.56	Q	V	.	.	.	.
12.250	0.8622	1.58	Q	V	.	.	.	.
12.333	0.8731	1.59	Q	V	.	.	.	.
12.417	0.8842	1.60	Q	V	.	.	.	.
12.500	0.8952	1.61	Q	V	.	.	.	.
12.583	0.9064	1.62	Q	V	.	.	.	.
12.667	0.9176	1.63	Q	V	.	.	.	.
12.750	0.9289	1.65	Q	V	.	.	.	.
12.833	0.9404	1.67	Q	V	.	.	.	.
12.917	0.9521	1.69	Q	V	.	.	.	.
13.000	0.9639	1.72	Q	V	.	.	.	.
13.083	0.9759	1.74	Q	V	.	.	.	.
13.167	0.9881	1.77	Q	V	.	.	.	.
13.250	1.0005	1.80	Q	V	.	.	.	.
13.333	1.0131	1.83	Q	V	.	.	.	.
13.417	1.0260	1.87	Q	V	.	.	.	.
13.500	1.0391	1.91	Q	V	.	.	.	.
13.583	1.0525	1.94	Q	V	.	.	.	.
13.667	1.0662	1.98	Q	V	.	.	.	.
13.750	1.0802	2.03	Q	V	.	.	.	.
13.833	1.0944	2.07	Q	V	.	.	.	.
13.917	1.1091	2.12	Q	V	.	.	.	.
14.000	1.1240	2.17	Q	V	.	.	.	.

```
14.083      1.1394      2.24 Q    V    .         .         .         .
14.167      1.1555      2.33 .Q   V    .         .         .         .
14.250      1.1724      2.45 .Q   V    .         .         .         .
14.333      1.1904      2.61 .Q   V    .         .         .         .
14.417      1.2101      2.87 .Q   V    .         .         .         .
14.500      1.2321      3.19 .Q   V    .         .         .         .
14.583      1.2559      3.46 .Q   V    .         .         .         .
14.667      1.2815      3.71 .Q   V    .         .         .         .
14.750      1.3085      3.93 .Q    V   .         .         .         .
14.833      1.3370      4.14 .Q    V   .         .         .         .
14.917      1.3670      4.35 .Q    V   .         .         .         .
15.000      1.3984      4.56 . Q   V   .         .         .         .
15.083      1.4313      4.78 . Q   V   .         .         .         .
15.167      1.4659      5.02 . Q   V   .         .         .         .
15.250      1.5021      5.27 . Q   V   .         .         .         .
15.333      1.5403      5.54 . Q    V  .         .         .         .
15.417      1.5808      5.87 . Q    V  .         .         .         .
15.500      1.6243      6.32 . Q    V  .         .         .         .
15.583      1.6720      6.93 .  Q   V  .         .         .         .
15.667      1.7258      7.80 .  Q    V .         .         .         .
15.750      1.7892      9.21 .   Q   V .         .         .         .
15.833      1.8674     11.35 .    Q  V .         .         .         .
15.917      1.9658     14.28 .     Q  V.         .         .         .
16.000      2.0929     18.46 .       QV.         .         .         .
16.083      2.2699     25.70 .         VQ        .         .         .
16.167      2.5167     35.84 .         .V   Q    .         .         .
16.250      2.8371     46.52 .         .  V      Q         .         .
16.333      3.2436     59.03 .         .    V    .     Q   .         .
16.417      3.7648     75.68 .         .      V  .         .  Q      .
16.500      4.3366     83.02 .         .         V         .     Q   .
16.583      4.8275     71.28 .         .         . V       .Q        .
16.667      5.2281     58.16 .         .         .   VQ    .         .
16.750      5.5509     46.88 .         .         Q    V    .         .
16.833      5.8163     38.53 .         .      Q  .     V   .         .
16.917      6.0432     32.94 .         .   Q     .       V .         .
17.000      6.2418     28.84 .         . Q       .       V .         .
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17.083      6.4160     25.29  .         .Q        .        V.         .
17.167      6.5727     22.75  .         Q         .         V         .
17.250      6.7116     20.18  .       Q .         .         .V        .
17.333      6.8379     18.33  .       Q .         .         .V        .
17.417      6.9514     16.49  .      Q  .         .         . V       .
17.500      7.0553     15.09  .     Q   .         .         . V       .
17.583      7.1505     13.82  .     Q   .         .         .  V      .
17.667      7.2369     12.54  .    Q    .         .         .  V      .
17.750      7.3157     11.44  .    Q    .         .         .  V      .
17.833      7.3861     10.23  .   Q     .         .         .   V     .
17.917      7.4517      9.52  .   Q     .         .         .   V     .
18.000      7.5132      8.93  .  Q      .         .         .   V     .
18.083      7.5705      8.32  .  Q      .         .         .    V    .
18.167      7.6242      7.79  .  Q      .         .         .    V    .
18.250      7.6745      7.31  .  Q      .         .         .    V    .
18.333      7.7216      6.84  .  Q      .         .         .    V    .
18.417      7.7649      6.28  . Q       .         .         .     V   .
18.500      7.8061      5.98  . Q       .         .         .     V   .
18.583      7.8453      5.70  . Q       .         .         .     V   .
18.667      7.8814      5.24  . Q       .         .         .     V   .
18.750      7.9153      4.92  . Q       .         .         .     V   .
18.833      7.9475      4.68  . Q       .         .         .     V   .
18.917      7.9774      4.34  .Q        .         .         .      V  .
19.000      8.0046      3.94  .Q        .         .         .      V  .
19.083      8.0303      3.73  .Q        .         .         .      V  .
19.167      8.0545      3.51  .Q        .         .         .      V  .
19.250      8.0762      3.15  .Q        .         .         .      V  .
19.333      8.0967      2.98  .Q        .         .         .      V  .
19.417      8.1167      2.91  .Q        .         .         .      V  .
19.500      8.1367      2.90  .Q        .         .         .      V  .
19.583      8.1567      2.90  .Q        .         .         .      V  .
19.667      8.1763      2.85  .Q        .         .         .      V  .
19.750      8.1956      2.80  .Q        .         .         .       V .
19.833      8.2144      2.73  .Q        .         .         .       V .
19.917      8.2327      2.66  .Q        .         .         .       V .
20.000      8.2503      2.56  .Q        .         .         .       V .
```

20.083	8.2672	2.45	.Q	.	.	.	V .
20.167	8.2830	2.30	.Q	.	.	.	V .
20.250	8.2973	2.09	Q	.	.	.	V .
20.333	8.3082	1.58	Q	.	.	.	V .
20.417	8.3175	1.34	Q	.	.	.	V .
20.500	8.3261	1.26	Q	.	.	.	V .
20.583	8.3344	1.20	Q	.	.	.	V .
20.667	8.3424	1.16	Q	.	.	.	V .
20.750	8.3502	1.13	Q	.	.	.	V .
20.833	8.3578	1.11	Q	.	.	.	V .
20.917	8.3653	1.08	Q	.	.	.	V .
21.000	8.3726	1.06	Q	.	.	.	V .
21.083	8.3797	1.03	Q	.	.	.	V .
21.167	8.3867	1.01	Q	.	.	.	V .
21.250	8.3935	0.99	Q	.	.	.	V .
21.333	8.4002	0.98	Q	.	.	.	V .
21.417	8.4068	0.96	Q	.	.	.	V.
21.500	8.4134	0.94	Q	.	.	.	V.
21.583	8.4198	0.93	Q	.	.	.	V.
21.667	8.4261	0.92	Q	.	.	.	V.
21.750	8.4323	0.90	Q	.	.	.	V.
21.833	8.4384	0.89	Q	.	.	.	V.
21.917	8.4445	0.88	Q	.	.	.	V.
22.000	8.4504	0.87	Q	.	.	.	V.
22.083	8.4563	0.85	Q	.	.	.	V.
22.167	8.4621	0.84	Q	.	.	.	V.
22.250	8.4678	0.83	Q	.	.	.	V.
22.333	8.4735	0.82	Q	.	.	.	V.
22.417	8.4791	0.81	Q	.	.	.	V.
22.500	8.4846	0.80	Q	.	.	.	V.
22.583	8.4900	0.79	Q	.	.	.	V.
22.667	8.4954	0.78	Q	.	.	.	V.
22.750	8.5007	0.77	Q	.	.	.	V.
22.833	8.5060	0.76	Q	.	.	.	V.
22.917	8.5112	0.75	Q	.	.	.	V.
23.000	8.5163	0.75	Q	.	.	.	V.

23.083	8.5214	0.74	Q	.	.	.	V.
23.167	8.5264	0.73	Q	.	.	.	V.
23.250	8.5314	0.72	Q	.	.	.	V.
23.333	8.5363	0.71	Q	.	.	.	V.
23.417	8.5411	0.71	Q	.	.	.	V.
23.500	8.5460	0.70	Q	.	.	.	V.
23.583	8.5507	0.69	Q	.	.	.	V.
23.667	8.5554	0.68	Q	.	.	.	V.
23.750	8.5601	0.68	Q	.	.	.	V.
23.833	8.5647	0.67	Q	.	.	.	V.
23.917	8.5693	0.66	Q	.	.	.	V.
24.000	8.5738	0.66	Q	.	.	.	V.
24.083	8.5783	0.65	Q	.	.	.	V.
24.167	8.5826	0.63	Q	.	.	.	V.
24.250	8.5868	0.60	Q	.	.	.	V.
24.333	8.5907	0.57	Q	.	.	.	V.
24.417	8.5941	0.50	Q	.	.	.	V.
24.500	8.5970	0.41	Q	.	.	.	V.
24.583	8.5993	0.34	Q	.	.	.	V.
24.667	8.6014	0.29	Q	.	.	.	V.
24.750	8.6031	0.25	Q	.	.	.	V.
24.833	8.6047	0.23	Q	.	.	.	V.
24.917	8.6061	0.20	Q	.	.	.	V.
25.000	8.6073	0.18	Q	.	.	.	V.
25.083	8.6084	0.16	Q	.	.	.	V.
25.167	8.6094	0.15	Q	.	.	.	V.
25.250	8.6103	0.13	Q	.	.	.	V.
25.333	8.6111	0.12	Q	.	.	.	V.
25.417	8.6119	0.11	Q	.	.	.	V.
25.500	8.6126	0.10	Q	.	.	.	V.
25.583	8.6132	0.09	Q	.	.	.	V.
25.667	8.6137	0.08	Q	.	.	.	V.
25.750	8.6143	0.07	Q	.	.	.	V.
25.833	8.6147	0.07	Q	.	.	.	V.
25.917	8.6152	0.06	Q	.	.	.	V.
26.000	8.6155	0.06	Q	.	.	.	V.

```
  26.083      8.6159      0.05  Q          .          .          .         V.
  26.167      8.6162      0.05  Q          .          .          .         V.
  26.250      8.6165      0.04  Q          .          .          .         V.
  26.333      8.6168      0.04  Q          .          .          .         V.
  26.417      8.6170      0.04  Q          .          .          .         V.
  26.500      8.6173      0.03  Q          .          .          .         V.
  26.583      8.6175      0.03  Q          .          .          .         V.
  26.667      8.6176      0.03  Q          .          .          .         V.
  26.750      8.6178      0.02  Q          .          .          .         V.
  26.833      8.6180      0.02  Q          .          .          .         V.
  26.917      8.6181      0.02  Q          .          .          .         V.
  27.000      8.6182      0.02  Q          .          .          .         V.
  27.083      8.6183      0.02  Q          .          .          .         V.
  27.167      8.6184      0.01  Q          .          .          .         V.
  27.250      8.6185      0.01  Q          .          .          .         V.
  27.333      8.6186      0.01  Q          .          .          .         V.
  27.417      8.6187      0.01  Q          .          .          .         V.
  27.500      8.6187      0.01  Q          .          .          .         V.
  27.583      8.6188      0.01  Q          .          .          .         V.
--------------------------------------------------------------------------------
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1655.0
10%	145.0
20%	85.0
30%	65.0
40%	45.0
50%	35.0
60%	25.0
70%	25.0
80%	15.0

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        90%                                10.0


****************************************************************************
  FLOW PROCESS FROM NODE   6003.00 TO NODE   6003.00 IS CODE = 3.1
----------------------------------------------------------------------------
  >>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #2<<<<<
============================================================================

                     INFLOW
                   (STREAM 2)
                        |
                        |
                        V                __effective depth
                    -----------          |   (and volume)
                   |           |    |    |
                   |           |    |....V........
                   | detention |<-->|           outflow
                   |   basin   |    |.........________
                    -----------     |    ^    |  \
                        |           |  dead   |   basin outlet
                        V           | storage |
                     OUTFLOW         ---------
                   (STREAM 2)



         ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 2
         THROUGH A FLOW-THROUGH DETENTION BASIN
         SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
           DEAD STORAGE(AF) =      0.000
           SPECIFIED DEAD STORAGE(AF) FILLED =      0.000
           SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET =      0.000
           DETENTION BASIN CONSTANT LOSS RATE(CFS) =    0.00
```

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	21.00	2.000
3	2.00	42.00	4.000
4	3.00	63.00	6.000
5	4.00	84.00	10.000

==

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):

(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;

MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
14.083	0.000	2.24	0.00	0.09	1.8	0.172
14.167	0.000	2.33	0.00	0.09	1.8	0.176
14.250	0.000	2.45	0.00	0.09	1.9	0.180
14.333	0.000	2.61	0.00	0.09	1.9	0.184
14.417	0.000	2.87	0.00	0.10	2.0	0.191
14.500	0.000	3.19	0.00	0.10	2.0	0.198
14.583	0.000	3.46	0.00	0.10	2.1	0.208
14.667	0.000	3.71	0.00	0.11	2.2	0.218
14.750	0.000	3.93	0.00	0.11	2.3	0.229
14.833	0.000	4.14	0.00	0.12	2.5	0.240
14.917	0.000	4.35	0.00	0.13	2.6	0.252
15.000	0.000	4.56	0.00	0.13	2.7	0.265
15.083	0.000	4.78	0.00	0.14	2.9	0.278
15.167	0.000	5.02	0.00	0.15	3.0	0.292
15.250	0.000	5.27	0.00	0.15	3.1	0.307
15.333	0.000	5.54	0.00	0.16	3.3	0.322

15.417	0.000	5.87	0.00	0.17	3.5	0.339
15.500	0.000	6.32	0.00	0.18	3.7	0.357
15.583	0.000	6.93	0.00	0.19	3.9	0.378
15.667	0.000	7.80	0.00	0.20	4.1	0.404
15.750	0.000	9.21	0.00	0.22	4.4	0.437
15.833	0.000	11.35	0.00	0.24	4.8	0.482
15.917	0.000	14.28	0.00	0.27	5.4	0.543
16.000	0.000	18.46	0.00	0.31	6.1	0.628
16.083	0.000	25.70	0.00	0.38	7.3	0.755
16.167	0.000	35.84	0.00	0.47	8.9	0.940
16.250	0.000	46.52	0.00	0.59	11.2	1.184
16.333	0.000	59.03	0.00	0.75	14.1	1.494
16.417	0.000	75.68	0.00	0.95	17.8	1.893
16.500	0.000	83.02	0.00	1.16	22.1	2.312
16.583	0.000	71.28	0.00	1.31	25.9	2.625
16.667	0.000	58.16	0.00	1.41	28.6	2.828
16.750	0.000	46.88	0.00	1.47	30.3	2.942
16.833	0.000	38.53	0.00	1.50	31.2	2.993
16.917	0.000	32.94	0.00	1.50	31.5	3.003
17.000	0.000	28.84	0.00	1.49	31.4	2.985
17.083	0.000	25.29	0.00	1.47	31.1	2.945
17.167	0.000	22.75	0.00	1.45	30.6	2.891
17.250	0.000	20.18	0.00	1.41	30.0	2.823
17.333	0.000	18.33	0.00	1.37	29.2	2.748
17.417	0.000	16.49	0.00	1.33	28.4	2.666
17.500	0.000	15.09	0.00	1.29	27.5	2.580
17.583	0.000	13.82	0.00	1.25	26.6	2.492
17.667	0.000	12.54	0.00	1.20	25.7	2.401
17.750	0.000	11.44	0.00	1.15	24.7	2.310
17.833	0.000	10.23	0.00	1.11	23.8	2.216
17.917	0.000	9.52	0.00	1.06	22.8	2.125
18.000	0.000	8.93	0.00	1.02	21.8	2.036
18.083	0.000	8.32	0.00	0.97	20.9	1.949
18.167	0.000	7.79	0.00	0.93	20.0	1.865
18.250	0.000	7.31	0.00	0.89	19.2	1.783
18.333	0.000	6.84	0.00	0.85	18.3	1.704

18.417	0.000	6.28	0.00	0.81	17.5	1.627
18.500	0.000	5.98	0.00	0.78	16.7	1.553
18.583	0.000	5.70	0.00	0.74	15.9	1.483
18.667	0.000	5.24	0.00	0.71	15.2	1.414
18.750	0.000	4.92	0.00	0.67	14.5	1.348
18.833	0.000	4.68	0.00	0.64	13.8	1.285
18.917	0.000	4.34	0.00	0.61	13.2	1.224
19.000	0.000	3.94	0.00	0.58	12.5	1.165
19.083	0.000	3.73	0.00	0.55	11.9	1.109
19.167	0.000	3.51	0.00	0.53	11.4	1.055
19.250	0.000	3.15	0.00	0.50	10.8	1.002
19.333	0.000	2.98	0.00	0.48	10.3	0.952
19.417	0.000	2.91	0.00	0.45	9.7	0.905
19.500	0.000	2.90	0.00	0.43	9.3	0.861
19.583	0.000	2.90	0.00	0.41	8.8	0.820
19.667	0.000	2.85	0.00	0.39	8.4	0.782
19.750	0.000	2.80	0.00	0.37	8.0	0.746
19.833	0.000	2.73	0.00	0.36	7.7	0.712
19.917	0.000	2.66	0.00	0.34	7.3	0.680

PROCESS SUMMARY OF STORAGE:

INFLOW VOLUME =   8.619 AF

BASIN STORAGE =   0.000 AF (WITH   0.000 AF INITIALLY FILLED)

OUTFLOW VOLUME =   8.619 AF

LOSS   VOLUME =   0.000 AF

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FLOW PROCESS FROM NODE   6003.00 TO NODE   6003.00 IS CODE =   7

>>>>>STREAM NUMBER 1 ADDED TO STREAM NUMBER 2<<<<<

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FLOW PROCESS FROM NODE   6003.00 TO NODE   6004.00 IS CODE = 5.1

>>>>>MODEL CHANNEL ROUTING OF STREAM #2 BY THE TRANSLATION METHOD<<<<<

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THE TRANSLATION MODEL NEGLECTS ALL STORAGE ATTENUATION EFFECTS,
AND MOVES THE STREAM 2 RUNOFF HYDROGRAPH FORWARD IN TIME.

ASSUMED REGULAR CHANNEL INFORMATION:

BASEWIDTH(FT) = 100.00 CHANNEL Z = 5.00

UPSTREAM ELEVATION(FT) = 490.48

DOWNSTREAM ELEVATION(FT) = 462.59

CHANNEL LENGTH(FT) = 2176.89 MANNING'S FACTOR = 0.050

CONSTANT LOSS RATE(CFS) = 0.00

MEAN-FLOW RATE NORMAL-DEPTH FLOW VELOCITIES(FPS) ARE AS FOLLOWS:

	(FLOW RATE (CFS))	[FLOW VELOCITY (FPS)]
AVERAGED PEAK 5-MINUTE:	(111.1).......	[2.12]
AVERAGED PEAK 15-MINUTE:	(102.7).......	[2.02]
AVERAGED PEAK 30-MINUTE:	(91.3).......	[1.98]
AVERAGED PEAK 1-HOUR:	(75.1).......	[1.82]
AVERAGED PEAK 3-HOUR:	(45.1).......	[1.49]
AVERAGED PEAK 6-HOUR:	(27.2).......	[1.22]
AVERAGED PEAK 24-HOUR:	(8.3).......	[0.72]

USER-SPECIFIED CHANNEL AVERAGE FLOW VELOCITY(FPS) = 2.570

HYDROGRAPH TRANSLATION TIME

= (CHANNEL LENGTH)/(AVERAGE FLOW VELOCITY)

= (2176.89)/(2.570) = 0.235 HRS

TRANSLATION METHOD CHANNEL ROUTING RESULTS:

MODEL TIME (HRS)	INFLOW (STREAM 2) (CFS)	ROUTED FLOW (CFS)	OUTFLOW LESS LOSS (STREAM 2) (CFS)
14.000	3.45	3.26	3.26
14.083	3.54	3.33	3.33
14.167	3.65	3.40	3.40

14.250	3.80	3.47	3.47
14.333	4.02	3.56	3.56
14.417	4.34	3.68	3.68
14.500	4.66	3.84	3.84
14.583	4.95	4.08	4.08
14.667	5.23	4.40	4.40
14.750	5.50	4.71	4.71
14.833	5.78	5.00	5.00
14.917	6.07	5.28	5.28
15.000	6.37	5.55	5.55
15.083	6.68	5.83	5.83
15.167	7.01	6.12	6.12
15.250	7.37	6.42	6.42
15.333	7.75	6.74	6.74
15.417	8.19	7.07	7.07
15.500	8.76	7.43	7.43
15.583	9.51	7.83	7.83
15.667	10.65	8.29	8.29
15.750	12.49	8.89	8.89
15.833	15.17	9.71	9.71
15.917	19.15	10.97	10.97
16.000	25.16	12.96	12.96
16.083	35.76	15.88	15.88
16.167	50.75	20.21	20.21
16.250	67.46	27.03	27.03
16.333	89.45	38.41	38.41
16.417	111.06	53.70	53.70
16.500	105.60	71.34	71.34
16.583	91.52	93.27	93.27
16.667	79.49	110.10	110.10
16.750	70.80	103.11	103.11
16.833	65.02	89.40	89.40
16.917	60.23	77.96	77.96
17.000	56.49	69.78	69.78
17.083	52.93	64.17	64.17
17.167	50.04	59.57	59.57

17.250	47.32	55.86	55.86
17.333	44.96	52.42	52.42
17.417	42.56	49.56	49.56
17.500	40.08	46.91	46.91
17.583	37.63	44.53	44.53
17.667	35.72	42.12	42.12
17.750	34.03	39.64	39.64
17.833	32.28	37.29	37.29
17.917	30.69	35.42	35.42
18.000	29.13	33.72	33.72
18.083	27.48	31.99	31.99
18.167	26.17	30.41	30.41
18.250	24.90	28.84	28.84
18.333	23.49	27.25	27.25
18.417	22.35	25.94	25.94
18.500	21.20	24.65	24.65
18.583	19.93	23.29	23.29
18.667	18.93	22.15	22.15
18.750	17.92	20.98	20.98
18.833	16.83	19.75	19.75
18.917	16.06	18.75	18.75
19.000	15.40	17.73	17.73
19.083	14.81	16.69	16.69
19.167	14.19	15.94	15.94
19.250	13.57	15.30	15.30
19.333	12.95	14.70	14.70
19.417	12.33	14.08	14.08
19.500	11.73	13.46	13.46
19.583	11.10	12.84	12.84
19.667	10.43	12.23	12.23
19.750	9.37	11.62	11.62
19.833	8.79	10.99	10.99
19.917	8.36	10.24	10.24
20.000	7.99	9.26	9.26

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PROCESS SUMMARY OF STORAGE:

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    INFLOW  VOLUME =     16.473 AF
    OUTFLOW VOLUME =     16.473 AF
    LOSS    VOLUME =      0.000 AF


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  FLOW PROCESS FROM NODE   6004.00 TO NODE   6004.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
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      (UNIT-HYDROGRAPH ADDED TO STREAM #3)

         WATERSHED AREA =      67.670 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.650 HOURS
         DESERT(UNDEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.590
         LOW LOSS FRACTION = 0.778
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.48
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  1.17
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.60
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  2.24
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.56
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  3.43

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.997
          30-MINUTE FACTOR = 0.997
           1-HOUR FACTOR = 0.997
           3-HOUR FACTOR = 1.000
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000
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UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 12.821

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UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.564	4.619
2	2.232	13.648
3	4.952	22.259
4	8.796	31.463
5	15.462	54.546
6	26.681	91.817
7	38.391	95.833
8	47.508	74.610
9	54.623	58.227
10	60.040	44.339
11	64.277	34.670
12	67.809	28.909
13	70.934	25.576
14	73.597	21.786
15	75.911	18.939
16	78.048	17.489
17	79.823	14.529
18	81.484	13.594
19	82.915	11.713
20	84.281	11.175
21	85.531	10.229
22	86.731	9.819
23	87.777	8.564
24	88.756	8.015

25	89.546	6.464
26	90.305	6.206
27	91.026	5.902
28	91.718	5.668
29	92.338	5.074
30	92.940	4.920
31	93.505	4.629
32	94.028	4.280
33	94.467	3.589
34	94.903	3.567
35	95.339	3.567
36	95.733	3.229
37	96.067	2.730
38	96.400	2.728
39	96.733	2.728
40	97.015	2.307
41	97.246	1.890
42	97.477	1.885
43	97.707	1.888
44	97.877	1.389
45	98.005	1.047
46	98.133	1.050
47	98.262	1.055
48	98.407	1.189
49	98.561	1.259
50	98.715	1.262
51	98.869	1.257
52	99.023	1.262
53	99.177	1.257
54	99.330	1.257
55	99.484	1.257
56	99.637	1.257
57	99.791	1.257
58	99.945	1.257
59	100.000	0.454

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UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0020	0.0006
13	0.0026	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0037	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0040	0.0031	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0069	0.0054	0.0015
146	0.0070	0.0054	0.0015
147	0.0071	0.0056	0.0016
148	0.0072	0.0056	0.0016
149	0.0074	0.0058	0.0016
150	0.0075	0.0058	0.0017
151	0.0077	0.0060	0.0017
152	0.0078	0.0061	0.0017
153	0.0080	0.0062	0.0018
154	0.0081	0.0063	0.0018
155	0.0083	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0087	0.0068	0.0019
158	0.0089	0.0069	0.0020
159	0.0091	0.0071	0.0020
160	0.0093	0.0072	0.0021
161	0.0096	0.0075	0.0021
162	0.0098	0.0076	0.0022
163	0.0101	0.0079	0.0022
164	0.0103	0.0080	0.0023
165	0.0107	0.0083	0.0024
166	0.0109	0.0085	0.0024
167	0.0114	0.0088	0.0025
168	0.0116	0.0090	0.0026
169	0.0194	0.0151	0.0043
170	0.0198	0.0154	0.0044
171	0.0206	0.0160	0.0046
172	0.0211	0.0164	0.0047
173	0.0220	0.0171	0.0049
174	0.0226	0.0176	0.0050

175	0.0237	0.0185	0.0053
176	0.0244	0.0190	0.0054
177	0.0258	0.0201	0.0057
178	0.0266	0.0207	0.0059
179	0.0283	0.0220	0.0063
180	0.0293	0.0228	0.0065
181	0.0316	0.0246	0.0070
182	0.0329	0.0256	0.0073
183	0.0360	0.0280	0.0080
184	0.0378	0.0294	0.0084
185	0.0614	0.0478	0.0136
186	0.0647	0.0492	0.0155
187	0.0725	0.0492	0.0234
188	0.0778	0.0492	0.0286
189	0.1011	0.0492	0.0519
190	0.1119	0.0492	0.0628
191	0.1508	0.0492	0.1016
192	0.1971	0.0492	0.1479
193	0.4785	0.0492	0.4294
194	0.1270	0.0492	0.0779
195	0.0841	0.0492	0.0349
196	0.0682	0.0492	0.0191
197	0.0399	0.0310	0.0089
198	0.0344	0.0267	0.0076
199	0.0304	0.0237	0.0068
200	0.0274	0.0213	0.0061
201	0.0250	0.0195	0.0056
202	0.0231	0.0180	0.0051
203	0.0215	0.0167	0.0048
204	0.0202	0.0157	0.0045
205	0.0119	0.0092	0.0026
206	0.0111	0.0087	0.0025
207	0.0105	0.0082	0.0023
208	0.0099	0.0077	0.0022
209	0.0094	0.0073	0.0021
210	0.0090	0.0070	0.0020

211	0.0086	0.0067	0.0019
212	0.0082	0.0064	0.0018
213	0.0079	0.0061	0.0018
214	0.0076	0.0059	0.0017
215	0.0073	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0040	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0039	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0031	0.0024	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0030	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0006
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0021	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.02

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.41

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 11.3672

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 7.9683

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	20.0	40.0	60.0	80.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0001	0.01	Q	.	.	.	.
0.250	0.0002	0.02	Q	.	.	.	.
0.333	0.0005	0.04	Q	.	.	.	.
0.417	0.0010	0.07	Q	.	.	.	.
0.500	0.0019	0.12	Q	.	.	.	.
0.583	0.0031	0.18	Q	.	.	.	.
0.667	0.0046	0.22	Q	.	.	.	.
0.750	0.0063	0.25	Q	.	.	.	.
0.833	0.0082	0.28	Q	.	.	.	.
0.917	0.0103	0.30	Q	.	.	.	.
1.000	0.0125	0.32	Q	.	.	.	.
1.083	0.0148	0.33	Q	.	.	.	.
1.167	0.0171	0.35	Q	.	.	.	.
1.250	0.0196	0.36	Q	.	.	.	.
1.333	0.0221	0.37	Q	.	.	.	.
1.417	0.0247	0.38	Q	.	.	.	.
1.500	0.0274	0.39	Q	.	.	.	.
1.583	0.0301	0.40	Q	.	.	.	.
1.667	0.0329	0.40	Q	.	.	.	.
1.750	0.0358	0.41	Q	.	.	.	.
1.833	0.0386	0.42	Q	.	.	.	.
1.917	0.0416	0.43	Q	.	.	.	.
2.000	0.0445	0.43	Q	.	.	.	.

2.083	0.0475	0.44	Q	.	.	.	.
2.167	0.0506	0.44	Q	.	.	.	.
2.250	0.0537	0.45	Q	.	.	.	.
2.333	0.0568	0.45	Q	.	.	.	.
2.417	0.0600	0.46	Q	.	.	.	.
2.500	0.0631	0.46	Q	.	.	.	.
2.583	0.0664	0.47	Q	.	.	.	.
2.667	0.0696	0.47	Q	.	.	.	.
2.750	0.0729	0.48	Q	.	.	.	.
2.833	0.0762	0.48	Q	.	.	.	.
2.917	0.0795	0.48	Q	.	.	.	.
3.000	0.0829	0.49	Q	.	.	.	.
3.083	0.0863	0.49	Q	.	.	.	.
3.167	0.0897	0.50	Q	.	.	.	.
3.250	0.0932	0.50	Q	.	.	.	.
3.333	0.0966	0.50	Q	.	.	.	.
3.417	0.1001	0.51	Q	.	.	.	.
3.500	0.1037	0.51	Q	.	.	.	.
3.583	0.1072	0.51	Q	.	.	.	.
3.667	0.1108	0.52	Q	.	.	.	.
3.750	0.1144	0.52	Q	.	.	.	.
3.833	0.1180	0.52	Q	.	.	.	.
3.917	0.1216	0.53	Q	.	.	.	.
4.000	0.1253	0.53	Q	.	.	.	.
4.083	0.1290	0.53	Q	.	.	.	.
4.167	0.1327	0.54	Q	.	.	.	.
4.250	0.1364	0.54	Q	.	.	.	.
4.333	0.1402	0.55	Q	.	.	.	.
4.417	0.1439	0.55	Q	.	.	.	.
4.500	0.1477	0.55	Q	.	.	.	.
4.583	0.1516	0.56	Q	.	.	.	.
4.667	0.1554	0.56	Q	.	.	.	.
4.750	0.1593	0.56	Q	.	.	.	.
4.833	0.1632	0.57	Q	.	.	.	.
4.917	0.1671	0.57	Q	.	.	.	.
5.000	0.1711	0.57	Q	.	.	.	.

5.083	0.1751	0.58	Q	.	.	.	.
5.167	0.1791	0.58	Q	.	.	.	.
5.250	0.1831	0.58	Q	.	.	.	.
5.333	0.1871	0.59	Q	.	.	.	.
5.417	0.1912	0.59	Q	.	.	.	.
5.500	0.1953	0.59	Q	.	.	.	.
5.583	0.1994	0.60	QV	.	.	.	.
5.667	0.2035	0.60	QV	.	.	.	.
5.750	0.2077	0.60	QV	.	.	.	.
5.833	0.2118	0.61	QV	.	.	.	.
5.917	0.2160	0.61	QV	.	.	.	.
6.000	0.2203	0.61	QV	.	.	.	.
6.083	0.2245	0.62	QV	.	.	.	.
6.167	0.2288	0.62	QV	.	.	.	.
6.250	0.2331	0.63	QV	.	.	.	.
6.333	0.2375	0.63	QV	.	.	.	.
6.417	0.2418	0.63	QV	.	.	.	.
6.500	0.2462	0.64	QV	.	.	.	.
6.583	0.2506	0.64	QV	.	.	.	.
6.667	0.2551	0.65	QV	.	.	.	.
6.750	0.2596	0.65	QV	.	.	.	.
6.833	0.2641	0.65	QV	.	.	.	.
6.917	0.2686	0.66	QV	.	.	.	.
7.000	0.2732	0.66	QV	.	.	.	.
7.083	0.2778	0.67	QV	.	.	.	.
7.167	0.2824	0.67	QV	.	.	.	.
7.250	0.2871	0.68	QV	.	.	.	.
7.333	0.2918	0.68	QV	.	.	.	.
7.417	0.2965	0.69	QV	.	.	.	.
7.500	0.3012	0.69	QV	.	.	.	.
7.583	0.3060	0.70	QV	.	.	.	.
7.667	0.3108	0.70	QV	.	.	.	.
7.750	0.3157	0.71	QV	.	.	.	.
7.833	0.3206	0.71	QV	.	.	.	.
7.917	0.3255	0.72	QV	.	.	.	.
8.000	0.3305	0.72	QV	.	.	.	.

8.083	0.3355	0.73	QV	.	.	.	.
8.167	0.3405	0.73	QV	.	.	.	.
8.250	0.3456	0.74	QV	.	.	.	.
8.333	0.3507	0.74	QV	.	.	.	.
8.417	0.3559	0.75	QV	.	.	.	.
8.500	0.3611	0.75	QV	.	.	.	.
8.583	0.3663	0.76	QV	.	.	.	.
8.667	0.3716	0.77	QV	.	.	.	.
8.750	0.3769	0.77	QV	.	.	.	.
8.833	0.3823	0.78	QV	.	.	.	.
8.917	0.3877	0.79	QV	.	.	.	.
9.000	0.3931	0.79	QV	.	.	.	.
9.083	0.3986	0.80	Q V	.	.	.	.
9.167	0.4042	0.81	Q V	.	.	.	.
9.250	0.4098	0.81	Q V	.	.	.	.
9.333	0.4154	0.82	Q V	.	.	.	.
9.417	0.4211	0.83	Q V	.	.	.	.
9.500	0.4268	0.83	Q V	.	.	.	.
9.583	0.4326	0.84	Q V	.	.	.	.
9.667	0.4385	0.85	Q V	.	.	.	.
9.750	0.4444	0.86	Q V	.	.	.	.
9.833	0.4503	0.86	Q V	.	.	.	.
9.917	0.4563	0.87	Q V	.	.	.	.
10.000	0.4624	0.88	Q V	.	.	.	.
10.083	0.4685	0.89	Q V	.	.	.	.
10.167	0.4747	0.90	Q V	.	.	.	.
10.250	0.4810	0.91	Q V	.	.	.	.
10.333	0.4873	0.92	Q V	.	.	.	.
10.417	0.4936	0.93	Q V	.	.	.	.
10.500	0.5001	0.93	Q V	.	.	.	.
10.583	0.5066	0.94	Q V	.	.	.	.
10.667	0.5132	0.95	Q V	.	.	.	.
10.750	0.5198	0.96	Q V	.	.	.	.
10.833	0.5265	0.98	Q V	.	.	.	.
10.917	0.5333	0.99	Q V	.	.	.	.
11.000	0.5402	1.00	Q V	.	.	.	.

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11.083      0.5471      1.01  Q V       .         .         .         .
11.167      0.5542      1.02  Q V       .         .         .         .
11.250      0.5613      1.03  Q V       .         .         .         .
11.333      0.5685      1.04  Q V       .         .         .         .
11.417      0.5757      1.06  Q V       .         .         .         .
11.500      0.5831      1.07  Q V       .         .         .         .
11.583      0.5906      1.08  Q V       .         .         .         .
11.667      0.5981      1.10  Q  V      .         .         .         .
11.750      0.6058      1.11  Q  V      .         .         .         .
11.833      0.6135      1.13  Q  V      .         .         .         .
11.917      0.6214      1.14  Q  V      .         .         .         .
12.000      0.6293      1.16  Q  V      .         .         .         .
12.083      0.6374      1.17  Q  V      .         .         .         .
12.167      0.6455      1.19  Q  V      .         .         .         .
12.250      0.6538      1.20  Q  V      .         .         .         .
12.333      0.6621      1.21  Q  V      .         .         .         .
12.417      0.6706      1.22  Q  V      .         .         .         .
12.500      0.6790      1.23  Q  V      .         .         .         .
12.583      0.6875      1.23  Q  V      .         .         .         .
12.667      0.6960      1.24  Q  V      .         .         .         .
12.750      0.7047      1.25  Q  V      .         .         .         .
12.833      0.7134      1.27  Q  V      .         .         .         .
12.917      0.7222      1.28  Q  V      .         .         .         .
13.000      0.7312      1.30  Q  V      .         .         .         .
13.083      0.7403      1.32  Q  V      .         .         .         .
13.167      0.7496      1.34  Q  V      .         .         .         .
13.250      0.7590      1.36  Q  V      .         .         .         .
13.333      0.7685      1.39  Q  V      .         .         .         .
13.417      0.7783      1.41  Q  V      .         .         .         .
13.500      0.7882      1.44  Q  V      .         .         .         .
13.583      0.7983      1.47  Q   V     .         .         .         .
13.667      0.8086      1.50  Q   V     .         .         .         .
13.750      0.8191      1.53  Q   V     .         .         .         .
13.833      0.8299      1.56  Q   V     .         .         .         .
13.917      0.8409      1.60  Q   V     .         .         .         .
14.000      0.8522      1.63  Q   V     .         .         .         .
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14.083      0.8637      1.68  Q   V     .         .         .         .
14.167      0.8758      1.75  Q   V     .         .         .         .
14.250      0.8884      1.83  Q   V     .         .         .         .
14.333      0.9016      1.93  Q   V     .         .         .         .
14.417      0.9159      2.07  .Q  V     .         .         .         .
14.500      0.9315      2.27  .Q  V     .         .         .         .
14.583      0.9487      2.49  .Q  V     .         .         .         .
14.667      0.9672      2.69  .Q  V     .         .         .         .
14.750      0.9870      2.87  .Q  V     .         .         .         .
14.833      1.0078      3.03  .Q   V    .         .         .         .
14.917      1.0298      3.19  .Q   V    .         .         .         .
15.000      1.0528      3.35  .Q   V    .         .         .         .
15.083      1.0770      3.51  .Q   V    .         .         .         .
15.167      1.1024      3.68  .Q   V    .         .         .         .
15.250      1.1290      3.86  .Q   V    .         .         .         .
15.333      1.1570      4.06  . Q  V    .         .         .         .
15.417      1.1866      4.30  . Q  V    .         .         .         .
15.500      1.2183      4.60  . Q   V   .         .         .         .
15.583      1.2528      5.01  . Q   V   .         .         .         .
15.667      1.2913      5.59  . Q   V   .         .         .         .
15.750      1.3363      6.52  .  Q  V   .         .         .         .
15.833      1.3916      8.04  .   Q V   .         .         .         .
15.917      1.4626     10.31  .    Q V  .         .         .         .
16.000      1.5573     13.74  .     QV  .         .         .         .
16.083      1.6946     19.94  .       VQ.         .         .         .
16.167      1.8920     28.67  .        V.   Q     .         .         .
16.250      2.1533     37.94  .         V       Q .         .         .
16.333      2.4848     48.13  .         . V       .   Q     .         .
16.417      2.9125     62.10  .         .   V     .         .Q        .
16.500      3.4397     76.56  .         .      V  .         .       Q .
16.583      3.9612     75.72  .         .        V.         .      Q  .
16.667      4.4007     63.81  .         .         . V       .Q        .
16.750      4.7622     52.50  .         .         .  V  Q   .         .
16.833      5.0558     42.62  .         .         .Q   V    .         .
16.917      5.2987     35.28  .         .      Q  .     V   .         .
17.000      5.5075     30.31  .         .    Q    .      V  .         .
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17.083      5.6921     26.81  .         .  Q      .       V .         .
17.167      5.8552     23.67  .         .Q        .        V.         .
17.250      6.0008     21.14  .         Q         .         V         .
17.333      6.1334     19.26  .        Q.         .         V         .
17.417      6.2511     17.09  .       Q .         .         .V        .
17.500      6.3589     15.65  .      Q  .         .         .V        .
17.583      6.4559     14.10  .      Q  .         .         . V       .
17.667      6.5462     13.11  .     Q   .         .         . V       .
17.750      6.6294     12.09  .     Q   .         .         .  V      .
17.833      6.7071     11.28  .    Q    .         .         .  V      .
17.917      6.7777     10.25  .    Q    .         .         .   V     .
18.000      6.8428      9.46  .   Q     .         .         .   V     .
18.083      6.9012      8.48  .   Q     .         .         .   V     .
18.167      6.9562      7.98  .  Q      .         .         .   V     .
18.250      7.0082      7.55  .  Q      .         .         .    V    .
18.333      7.0574      7.15  .  Q      .         .         .    V    .
18.417      7.1034      6.67  .  Q      .         .         .    V    .
18.500      7.1472      6.36  .  Q      .         .         .    V    .
18.583      7.1885      6.00  .  Q      .         .         .     V   .
18.667      7.2272      5.62  . Q       .         .         .     V   .
18.750      7.2629      5.18  . Q       .         .         .     V   .
18.833      7.2972      4.98  . Q       .         .         .     V   .
18.917      7.3301      4.78  . Q       .         .         .     V   .
19.000      7.3608      4.46  . Q       .         .         .     V   .
19.083      7.3892      4.12  . Q       .         .         .      V  .
19.167      7.4164      3.95  .Q        .         .         .      V  .
19.250      7.4424      3.77  .Q        .         .         .      V  .
19.333      7.4661      3.45  .Q        .         .         .      V  .
19.417      7.4879      3.15  .Q        .         .         .      V  .
19.500      7.5085      3.00  .Q        .         .         .      V  .
19.583      7.5282      2.85  .Q        .         .         .      V  .
19.667      7.5457      2.55  .Q        .         .         .      V  .
19.750      7.5619      2.34  .Q        .         .         .      V  .
19.833      7.5776      2.29  .Q        .         .         .       V .
19.917      7.5932      2.26  .Q        .         .         .       V .
20.000      7.6090      2.29  .Q        .         .         .       V .
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20.083	7.6248	2.30	.Q	.	.	.	V .
20.167	7.6405	2.27	.Q	.	.	.	V .
20.250	7.6559	2.24	.Q	.	.	.	V .
20.333	7.6711	2.21	.Q	.	.	.	V .
20.417	7.6860	2.16	.Q	.	.	.	V .
20.500	7.7005	2.11	.Q	.	.	.	V .
20.583	7.7146	2.04	.Q	.	.	.	V .
20.667	7.7281	1.95	Q	.	.	.	V .
20.750	7.7407	1.83	Q	.	.	.	V .
20.833	7.7521	1.66	Q	.	.	.	V .
20.917	7.7606	1.23	Q	.	.	.	V .
21.000	7.7672	0.96	Q	.	.	.	V .
21.083	7.7733	0.89	Q	.	.	.	V.
21.167	7.7792	0.85	Q	.	.	.	V.
21.250	7.7848	0.82	Q	.	.	.	V.
21.333	7.7904	0.80	Q	.	.	.	V.
21.417	7.7958	0.78	Q	.	.	.	V.
21.500	7.8011	0.77	Q	.	.	.	V.
21.583	7.8062	0.75	Q	.	.	.	V.
21.667	7.8113	0.74	Q	.	.	.	V.
21.750	7.8163	0.72	Q	.	.	.	V.
21.833	7.8212	0.71	Q	.	.	.	V.
21.917	7.8260	0.70	Q	.	.	.	V.
22.000	7.8307	0.69	Q	.	.	.	V.
22.083	7.8354	0.68	Q	.	.	.	V.
22.167	7.8400	0.67	Q	.	.	.	V.
22.250	7.8445	0.66	Q	.	.	.	V.
22.333	7.8490	0.65	Q	.	.	.	V.
22.417	7.8534	0.64	Q	.	.	.	V.
22.500	7.8578	0.63	Q	.	.	.	V.
22.583	7.8621	0.62	Q	.	.	.	V.
22.667	7.8663	0.62	Q	.	.	.	V.
22.750	7.8705	0.61	Q	.	.	.	V.
22.833	7.8746	0.60	Q	.	.	.	V.
22.917	7.8787	0.59	Q	.	.	.	V.
23.000	7.8828	0.59	Q	.	.	.	V.

23.083	7.8868	0.58	Q	.	.	.	V.
23.167	7.8907	0.57	Q	.	.	.	V.
23.250	7.8947	0.57	Q	.	.	.	V.
23.333	7.8985	0.56	Q	.	.	.	V.
23.417	7.9023	0.56	Q	.	.	.	V.
23.500	7.9061	0.55	Q	.	.	.	V.
23.583	7.9099	0.54	Q	.	.	.	V.
23.667	7.9136	0.54	Q	.	.	.	V.
23.750	7.9172	0.53	Q	.	.	.	V.
23.833	7.9209	0.53	Q	.	.	.	V.
23.917	7.9245	0.52	Q	.	.	.	V.
24.000	7.9280	0.52	Q	.	.	.	V.
24.083	7.9315	0.51	Q	.	.	.	V.
24.167	7.9349	0.50	Q	.	.	.	V.
24.250	7.9383	0.48	Q	.	.	.	V.
24.333	7.9414	0.46	Q	.	.	.	V.
24.417	7.9443	0.42	Q	.	.	.	V.
24.500	7.9468	0.37	Q	.	.	.	V.
24.583	7.9490	0.31	Q	.	.	.	V.
24.667	7.9508	0.27	Q	.	.	.	V.
24.750	7.9524	0.23	Q	.	.	.	V.
24.833	7.9538	0.20	Q	.	.	.	V.
24.917	7.9551	0.18	Q	.	.	.	V.
25.000	7.9562	0.17	Q	.	.	.	V.
25.083	7.9572	0.15	Q	.	.	.	V.
25.167	7.9582	0.14	Q	.	.	.	V.
25.250	7.9590	0.12	Q	.	.	.	V.
25.333	7.9598	0.11	Q	.	.	.	V.
25.417	7.9605	0.10	Q	.	.	.	V.
25.500	7.9612	0.10	Q	.	.	.	V.
25.583	7.9618	0.09	Q	.	.	.	V.
25.667	7.9623	0.08	Q	.	.	.	V.
25.750	7.9628	0.07	Q	.	.	.	V.
25.833	7.9633	0.07	Q	.	.	.	V.
25.917	7.9637	0.06	Q	.	.	.	V.
26.000	7.9641	0.06	Q	.	.	.	V.

26.083	7.9645	0.05	Q	.	.	.	V.
26.167	7.9648	0.05	Q	.	.	.	V.
26.250	7.9652	0.05	Q	.	.	.	V.
26.333	7.9654	0.04	Q	.	.	.	V.
26.417	7.9657	0.04	Q	.	.	.	V.
26.500	7.9660	0.04	Q	.	.	.	V.
26.583	7.9662	0.03	Q	.	.	.	V.
26.667	7.9664	0.03	Q	.	.	.	V.
26.750	7.9666	0.03	Q	.	.	.	V.
26.833	7.9668	0.03	Q	.	.	.	V.
26.917	7.9669	0.02	Q	.	.	.	V.
27.000	7.9671	0.02	Q	.	.	.	V.
27.083	7.9672	0.02	Q	.	.	.	V.
27.167	7.9673	0.02	Q	.	.	.	V.
27.250	7.9674	0.02	Q	.	.	.	V.
27.333	7.9675	0.01	Q	.	.	.	V.
27.417	7.9676	0.01	Q	.	.	.	V.
27.500	7.9677	0.01	Q	.	.	.	V.
27.583	7.9678	0.01	Q	.	.	.	V.
27.667	7.9679	0.01	Q	.	.	.	V.
27.750	7.9679	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1665.0
10%	145.0
20%	90.0
30%	65.0
40%	45.0
50%	35.0
60%	30.0

70%	20.0
80%	20.0
90%	10.0

```
****************************************************************************
  FLOW PROCESS FROM NODE   6004.00 TO NODE   6004.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>STREAM NUMBER 2 ADDED TO STREAM NUMBER 3<<<<<
============================================================================


****************************************************************************
  FLOW PROCESS FROM NODE   6004.00 TO NODE   6004.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>VIEW STREAM NUMBER 3 HYDROGRAPH<<<<<
============================================================================

            STREAM HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       50.0     100.0     150.0     200.0
----------------------------------------------------------------------------
  14.000      2.6101      4.90  Q   V     .         .         .         .
  14.083      2.6446      5.01  .Q  V     .         .         .         .
  14.167      2.6800      5.14  .Q  V     .         .         .         .
  14.250      2.7165      5.30  .Q  V     .         .         .         .
  14.333      2.7543      5.49  .Q  V     .         .         .         .
  14.417      2.7939      5.75  .Q  V     .         .         .         .
  14.500      2.8360      6.12  .Q  V     .         .         .         .
  14.583      2.8813      6.57  .Q  V     .         .         .         .
  14.667      2.9301      7.09  .Q  V     .         .         .         .
  14.750      2.9823      7.58  .Q  V     .         .         .         .
  14.833      3.0376      8.03  .Q  V     .         .         .         .
  14.917      3.0958      8.46  .Q   V    .         .         .         .
  15.000      3.1571      8.90  .Q   V    .         .         .         .
```

```
15.083      3.2215      9.34  .Q   V    .         .         .         .
15.167      3.2890      9.80  .Q   V    .         .         .         .
15.250      3.3598     10.29  . Q  V    .         .         .         .
15.333      3.4342     10.80  . Q  V    .         .         .         .
15.417      3.5126     11.37  . Q  V    .         .         .         .
15.500      3.5955     12.04  . Q  V    .         .         .         .
15.583      3.6839     12.84  . Q   V   .         .         .         .
15.667      3.7795     13.89  . Q   V   .         .         .         .
15.750      3.8857     15.42  .  Q  V   .         .         .         .
15.833      4.0079     17.75  .  Q  V   .         .         .         .
15.917      4.1545     21.28  .   Q V   .         .         .         .
16.000      4.3384     26.70  .    Q V  .         .         .         .
16.083      4.5851     35.82  .      Q  .         .         .         .
16.167      4.9217     48.88  .       VQ.         .         .         .
16.250      5.3692     64.97  .       V . Q       .         .         .
16.333      5.9652     86.54  .        V.      Q  .         .         .
16.417      6.7627    115.81  .         .V        .  Q      .         .
16.500      7.7813    147.90  .         . V       .        Q.         .
16.583      8.9451    168.98  .         .   V     .         .  Q      .
16.667     10.1428    173.91  .         .     V   .         .   Q     .
16.750     11.2145    155.61  .         .       V .         .Q        .
16.833     12.1238    132.02  .         .        V.     Q   .         .
16.917     12.9036    113.23  .         .         .VQ       .         .
17.000     13.5930    100.09  .         .         Q V       .         .
17.083     14.2196     90.98  .         .       Q .  V      .         .
17.167     14.7928     83.24  .         .     Q   .   V     .         .
17.250     15.3232     77.01  .         .    Q    .    V    .         .
17.333     15.8169     71.68  .         .   Q     .    V    .         .
17.417     16.2759     66.65  .         .  Q      .     V   .         .
17.500     16.7067     62.56  .         . Q       .      V  .         .
17.583     17.1105     58.63  .         .Q        .       V .         .
17.667     17.4908     55.23  .         .Q        .       V .         .
17.750     17.8471     51.73  .         Q         .        V.         .
17.833     18.1816     48.57  .        Q.         .        V.         .
17.917     18.4961     45.67  .        Q.         .         V         .
18.000     18.7935     43.18  .       Q .         .         V         .
```

```
  18.083     19.0723     40.47  .       Q .         .         .V        .
  18.167     19.3367     38.39  .      Q  .         .         .V        .
  18.250     19.5873     36.38  .      Q  .         .         . V       .
  18.333     19.8242     34.40  .     Q   .         .         . V       .
  18.417     20.0488     32.62  .     Q   .         .         . V       .
  18.500     20.2623     31.00  .     Q   .         .         .  V      .
  18.583     20.4641     29.29  .    Q    .         .         .  V      .
  18.667     20.6553     27.77  .    Q    .         .         .  V      .
  18.750     20.8355     26.16  .    Q    .         .         .   V     .
  18.833     21.0058     24.73  .   Q     .         .         .   V     .
  18.917     21.1678     23.53  .   Q     .         .         .   V     .
  19.000     21.3207     22.19  .   Q     .         .         .   V     .
  19.083     21.4641     20.82  .   Q     .         .         .    V    .
  19.167     21.6011     19.89  .  Q      .         .         .    V    .
  19.250     21.7324     19.07  .  Q      .         .         .    V    .
  19.333     21.8574     18.15  .  Q      .         .         .    V    .
  19.417     21.9761     17.23  .  Q      .         .         .    V    .
  19.500     22.0894     16.46  .  Q      .         .         .     V   .
  19.583     22.1975     15.69  .  Q      .         .         .     V   .
  19.667     22.2993     14.78  . Q       .         .         .     V   .
  19.750     22.3955     13.96  . Q       .         .         .     V   .
  19.833     22.4869     13.27  . Q       .         .         .     V   .
  19.917     22.5730     12.51  . Q       .         .         .     V   .
  20.000     22.6526     11.56  . Q       .         .         .      V  .
--------------------------------------------------------------------------------
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1205.0
10%	215.0
20%	135.0
30%	90.0

40%	65.0
50%	45.0
60%	35.0
70%	25.0
80%	20.0
90%	10.0

==

END OF FLOODSCx ROUTING ANALYSIS

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              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
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                          Analysis prepared by:








 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED L - EXISTING - SAUH                                            *
* 2022-09-30                                                               *
 **************************************************************************

  FILE NAME: 87_L_EX.DAT
  TIME/DATE OF STUDY: 09:25 09/30/2022


****************************************************************************
  FLOW PROCESS FROM NODE   7000.00 TO NODE   7008.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =     953.600 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.910 HOURS
```

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.590

LOW LOSS FRACTION = 0.778

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.17

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.957

30-MINUTE FACTOR = 0.957

1-HOUR FACTOR = 0.957

3-HOUR FACTOR = 0.994

6-HOUR FACTOR = 0.997

24-HOUR FACTOR = 0.998

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 9.158

==

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.403	46.468
2	1.356	109.971
3	2.873	174.876
4	4.949	239.401

5	7.550	299.971
6	11.029	401.240
7	16.649	648.145
8	24.830	943.434
9	33.702	1023.241
10	41.373	884.637
11	47.535	710.630
12	52.762	602.805
13	57.205	512.456
14	60.732	406.722
15	63.729	345.571
16	66.372	304.897
17	68.748	273.945
18	70.950	253.925
19	72.883	222.934
20	74.627	201.184
21	76.230	184.864
22	77.773	177.897
23	79.098	152.808
24	80.306	139.403
25	81.495	137.066
26	82.520	118.176
27	83.509	114.068
28	84.471	110.944
29	85.355	101.954
30	86.234	101.389
31	87.044	93.444
32	87.777	84.478
33	88.504	83.900
34	89.106	69.437
35	89.656	63.387
36	90.201	62.821
37	90.718	59.647
38	91.231	59.131
39	91.721	56.573
40	92.163	50.916

41	92.602	50.669
42	93.022	48.382
43	93.424	46.463
44	93.823	45.923
45	94.155	38.346
46	94.467	35.912
47	94.778	35.911
48	95.089	35.912
49	95.400	35.886
50	95.685	32.838
51	95.924	27.499
52	96.162	27.474
53	96.400	27.426
54	96.638	27.498
55	96.870	26.762
56	97.048	20.513
57	97.214	19.088
58	97.378	18.988
59	97.543	18.988
60	97.708	18.989
61	97.841	15.348
62	97.932	10.528
63	98.024	10.576
64	98.115	10.577
65	98.207	10.577
66	98.300	10.773
67	98.408	12.397
68	98.518	12.643
69	98.628	12.692
70	98.738	12.691
71	98.847	12.643
72	98.957	12.692
73	99.067	12.643
74	99.177	12.643
75	99.286	12.643
76	99.396	12.643

77	99.506	12.643
78	99.615	12.643
79	99.725	12.643
80	99.834	12.643
81	99.944	12.643
82	100.000	6.456

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0026	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0021	0.0006
13	0.0027	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0028	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0023	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0030	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0034	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0038	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0041	0.0032	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0033	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0035	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0054	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0058	0.0016
145	0.0070	0.0055	0.0016
146	0.0071	0.0055	0.0016
147	0.0073	0.0057	0.0016
148	0.0074	0.0057	0.0016
149	0.0075	0.0059	0.0017
150	0.0076	0.0059	0.0017
151	0.0078	0.0061	0.0017
152	0.0079	0.0062	0.0018
153	0.0081	0.0063	0.0018
154	0.0083	0.0064	0.0018
155	0.0085	0.0066	0.0019
156	0.0086	0.0067	0.0019
157	0.0089	0.0069	0.0020
158	0.0090	0.0070	0.0020
159	0.0093	0.0072	0.0021
160	0.0094	0.0073	0.0021
161	0.0098	0.0076	0.0022
162	0.0099	0.0077	0.0022
163	0.0103	0.0080	0.0023
164	0.0105	0.0082	0.0023
165	0.0109	0.0085	0.0024
166	0.0111	0.0086	0.0025
167	0.0116	0.0090	0.0026
168	0.0118	0.0092	0.0026
169	0.0212	0.0165	0.0047
170	0.0216	0.0168	0.0048
171	0.0225	0.0175	0.0050
172	0.0230	0.0179	0.0051
173	0.0240	0.0187	0.0053
174	0.0245	0.0191	0.0054

175	0.0257	0.0200	0.0057
176	0.0264	0.0205	0.0059
177	0.0279	0.0217	0.0062
178	0.0287	0.0223	0.0064
179	0.0305	0.0237	0.0068
180	0.0315	0.0245	0.0070
181	0.0338	0.0263	0.0075
182	0.0352	0.0274	0.0078
183	0.0383	0.0298	0.0085
184	0.0402	0.0313	0.0089
185	0.0590	0.0459	0.0131
186	0.0621	0.0483	0.0138
187	0.0697	0.0492	0.0205
188	0.0747	0.0492	0.0255
189	0.0966	0.0492	0.0475
190	0.1071	0.0492	0.0579
191	0.1444	0.0492	0.0953
192	0.1890	0.0492	0.1398
193	0.4615	0.0492	0.4123
194	0.1216	0.0492	0.0724
195	0.0807	0.0492	0.0316
196	0.0655	0.0492	0.0164
197	0.0423	0.0329	0.0094
198	0.0367	0.0285	0.0081
199	0.0326	0.0254	0.0072
200	0.0295	0.0230	0.0066
201	0.0271	0.0211	0.0060
202	0.0251	0.0195	0.0056
203	0.0235	0.0182	0.0052
204	0.0220	0.0172	0.0049
205	0.0121	0.0094	0.0027
206	0.0113	0.0088	0.0025
207	0.0107	0.0083	0.0024
208	0.0101	0.0079	0.0022
209	0.0096	0.0075	0.0021
210	0.0092	0.0071	0.0020

211	0.0087	0.0068	0.0019
212	0.0084	0.0065	0.0019
213	0.0080	0.0063	0.0018
214	0.0077	0.0060	0.0017
215	0.0075	0.0058	0.0017
216	0.0072	0.0056	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0052	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0041	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0011
237	0.0046	0.0036	0.0010
238	0.0046	0.0036	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0040	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0008
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0032	0.0025	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0031	0.0024	0.0007
269	0.0030	0.0024	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0007
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0022	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.42

TOTAL SOIL-LOSS(INCHES) = 2.06

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.37

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 163.5025

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 108.4899

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	225.0	450.0	675.0	900.0
0.083	0.0002	0.03	Q	.	.	.	.
0.167	0.0008	0.09	Q	.	.	.	.
0.250	0.0021	0.19	Q	.	.	.	.
0.333	0.0043	0.32	Q	.	.	.	.
0.417	0.0076	0.49	Q	.	.	.	.
0.500	0.0126	0.72	Q	.	.	.	.
0.583	0.0200	1.08	Q	.	.	.	.
0.667	0.0312	1.62	Q	.	.	.	.
0.750	0.0463	2.19	Q	.	.	.	.
0.833	0.0649	2.70	Q	.	.	.	.
0.917	0.0863	3.11	Q	.	.	.	.
1.000	0.1101	3.46	Q	.	.	.	.
1.083	0.1360	3.76	Q	.	.	.	.
1.167	0.1635	4.00	Q	.	.	.	.
1.250	0.1926	4.21	Q	.	.	.	.
1.333	0.2229	4.40	Q	.	.	.	.
1.417	0.2544	4.57	Q	.	.	.	.
1.500	0.2870	4.74	Q	.	.	.	.
1.583	0.3206	4.88	Q	.	.	.	.
1.667	0.3551	5.01	Q	.	.	.	.
1.750	0.3905	5.14	Q	.	.	.	.
1.833	0.4268	5.26	Q	.	.	.	.
1.917	0.4638	5.37	Q	.	.	.	.
2.000	0.5015	5.47	Q	.	.	.	.

2.083	0.5398	5.57	Q	.	.	.	.
2.167	0.5789	5.66	Q	.	.	.	.
2.250	0.6185	5.75	Q	.	.	.	.
2.333	0.6587	5.84	Q	.	.	.	.
2.417	0.6995	5.92	Q	.	.	.	.
2.500	0.7409	6.01	Q	.	.	.	.
2.583	0.7828	6.09	Q	.	.	.	.
2.667	0.8253	6.16	Q	.	.	.	.
2.750	0.8682	6.24	Q	.	.	.	.
2.833	0.9117	6.31	Q	.	.	.	.
2.917	0.9555	6.37	Q	.	.	.	.
3.000	0.9999	6.44	Q	.	.	.	.
3.083	1.0446	6.50	Q	.	.	.	.
3.167	1.0898	6.56	Q	.	.	.	.
3.250	1.1355	6.63	Q	.	.	.	.
3.333	1.1815	6.69	Q	.	.	.	.
3.417	1.2280	6.75	Q	.	.	.	.
3.500	1.2748	6.81	Q	.	.	.	.
3.583	1.3221	6.87	Q	.	.	.	.
3.667	1.3698	6.92	Q	.	.	.	.
3.750	1.4179	6.98	Q	.	.	.	.
3.833	1.4663	7.03	Q	.	.	.	.
3.917	1.5152	7.09	Q	.	.	.	.
4.000	1.5644	7.15	Q	.	.	.	.
4.083	1.6140	7.20	Q	.	.	.	.
4.167	1.6639	7.26	Q	.	.	.	.
4.250	1.7143	7.31	Q	.	.	.	.
4.333	1.7650	7.36	Q	.	.	.	.
4.417	1.8160	7.41	Q	.	.	.	.
4.500	1.8675	7.47	Q	.	.	.	.
4.583	1.9193	7.52	Q	.	.	.	.
4.667	1.9714	7.57	Q	.	.	.	.
4.750	2.0239	7.62	Q	.	.	.	.
4.833	2.0768	7.67	Q	.	.	.	.
4.917	2.1300	7.73	Q	.	.	.	.
5.000	2.1836	7.78	Q	.	.	.	.

5.083	2.2375	7.83	Q	.	.	.	.
5.167	2.2917	7.88	Q	.	.	.	.
5.250	2.3463	7.93	Q	.	.	.	.
5.333	2.4013	7.98	Q	.	.	.	.
5.417	2.4565	8.03	Q	.	.	.	.
5.500	2.5122	8.08	Q	.	.	.	.
5.583	2.5682	8.13	Q	.	.	.	.
5.667	2.6245	8.18	Q	.	.	.	.
5.750	2.6813	8.24	Q	.	.	.	.
5.833	2.7384	8.29	QV	.	.	.	.
5.917	2.7959	8.35	QV	.	.	.	.
6.000	2.8537	8.40	QV	.	.	.	.
6.083	2.9120	8.46	QV	.	.	.	.
6.167	2.9707	8.52	QV	.	.	.	.
6.250	3.0297	8.58	QV	.	.	.	.
6.333	3.0892	8.63	QV	.	.	.	.
6.417	3.1491	8.69	QV	.	.	.	.
6.500	3.2094	8.75	QV	.	.	.	.
6.583	3.2701	8.81	QV	.	.	.	.
6.667	3.3312	8.88	QV	.	.	.	.
6.750	3.3928	8.94	QV	.	.	.	.
6.833	3.4547	9.00	QV	.	.	.	.
6.917	3.5171	9.06	QV	.	.	.	.
7.000	3.5799	9.11	QV	.	.	.	.
7.083	3.6431	9.17	QV	.	.	.	.
7.167	3.7067	9.23	QV	.	.	.	.
7.250	3.7707	9.29	QV	.	.	.	.
7.333	3.8351	9.36	QV	.	.	.	.
7.417	3.9000	9.42	QV	.	.	.	.
7.500	3.9653	9.48	QV	.	.	.	.
7.583	4.0310	9.55	QV	.	.	.	.
7.667	4.0972	9.61	QV	.	.	.	.
7.750	4.1639	9.68	QV	.	.	.	.
7.833	4.2310	9.75	QV	.	.	.	.
7.917	4.2986	9.81	QV	.	.	.	.
8.000	4.3667	9.88	QV	.	.	.	.

8.083	4.4352	9.96	QV	.	.	.	.
8.167	4.5043	10.03	QV	.	.	.	.
8.250	4.5739	10.10	QV	.	.	.	.
8.333	4.6439	10.18	QV	.	.	.	.
8.417	4.7145	10.25	QV	.	.	.	.
8.500	4.7857	10.33	QV	.	.	.	.
8.583	4.8574	10.41	QV	.	.	.	.
8.667	4.9296	10.49	QV	.	.	.	.
8.750	5.0024	10.57	QV	.	.	.	.
8.833	5.0757	10.65	QV	.	.	.	.
8.917	5.1497	10.74	QV	.	.	.	.
9.000	5.2242	10.82	QV	.	.	.	.
9.083	5.2993	10.91	QV	.	.	.	.
9.167	5.3751	11.00	QV	.	.	.	.
9.250	5.4514	11.09	Q V	.	.	.	.
9.333	5.5285	11.18	Q V	.	.	.	.
9.417	5.6061	11.28	Q V	.	.	.	.
9.500	5.6844	11.37	Q V	.	.	.	.
9.583	5.7634	11.47	Q V	.	.	.	.
9.667	5.8431	11.57	Q V	.	.	.	.
9.750	5.9235	11.67	Q V	.	.	.	.
9.833	6.0046	11.78	Q V	.	.	.	.
9.917	6.0864	11.88	Q V	.	.	.	.
10.000	6.1690	11.99	Q V	.	.	.	.
10.083	6.2524	12.10	Q V	.	.	.	.
10.167	6.3365	12.22	Q V	.	.	.	.
10.250	6.4214	12.33	Q V	.	.	.	.
10.333	6.5072	12.45	Q V	.	.	.	.
10.417	6.5937	12.57	Q V	.	.	.	.
10.500	6.6812	12.69	Q V	.	.	.	.
10.583	6.7695	12.82	Q V	.	.	.	.
10.667	6.8586	12.95	Q V	.	.	.	.
10.750	6.9487	13.08	Q V	.	.	.	.
10.833	7.0398	13.22	Q V	.	.	.	.
10.917	7.1318	13.36	Q V	.	.	.	.
11.000	7.2247	13.50	Q V	.	.	.	.

11.083	7.3187	13.65	Q V	.	.	.	.
11.167	7.4137	13.79	Q V	.	.	.	.
11.250	7.5098	13.95	Q V	.	.	.	.
11.333	7.6069	14.11	Q V	.	.	.	.
11.417	7.7052	14.27	Q V	.	.	.	.
11.500	7.8046	14.43	Q V	.	.	.	.
11.583	7.9052	14.60	Q V	.	.	.	.
11.667	8.0069	14.78	Q V	.	.	.	.
11.750	8.1100	14.96	Q V	.	.	.	.
11.833	8.2142	15.14	Q V	.	.	.	.
11.917	8.3199	15.33	Q V	.	.	.	.
12.000	8.4268	15.53	Q V	.	.	.	.
12.083	8.5351	15.73	Q V	.	.	.	.
12.167	8.6448	15.92	Q V	.	.	.	.
12.250	8.7558	16.12	Q V	.	.	.	.
12.333	8.8682	16.31	Q V	.	.	.	.
12.417	8.9818	16.51	Q V	.	.	.	.
12.500	9.0968	16.69	Q V	.	.	.	.
12.583	9.2129	16.86	Q V	.	.	.	.
12.667	9.3300	17.00	Q V	.	.	.	.
12.750	9.4481	17.14	Q V	.	.	.	.
12.833	9.5673	17.30	Q V	.	.	.	.
12.917	9.6878	17.50	Q V	.	.	.	.
13.000	9.8097	17.71	Q V	.	.	.	.
13.083	9.9333	17.94	Q V	.	.	.	.
13.167	10.0586	18.20	Q V	.	.	.	.
13.250	10.1859	18.48	Q V	.	.	.	.
13.333	10.3151	18.77	Q V	.	.	.	.
13.417	10.4465	19.08	Q V	.	.	.	.
13.500	10.5802	19.41	Q V	.	.	.	.
13.583	10.7162	19.75	Q V	.	.	.	.
13.667	10.8548	20.12	Q V	.	.	.	.
13.750	10.9959	20.50	Q V	.	.	.	.
13.833	11.1399	20.91	Q V	.	.	.	.
13.917	11.2869	21.34	Q V	.	.	.	.
14.000	11.4369	21.79	Q V	.	.	.	.

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14.083     11.5909     22.36  Q   V     .         .         .         .
14.167     11.7499     23.09  .Q  V     .         .         .         .
14.250     11.9151     23.98  .Q  V     .         .         .         .
14.333     12.0875     25.03  .Q  V     .         .         .         .
14.417     12.2683     26.25  .Q  V     .         .         .         .
14.500     12.4592     27.73  .Q  V     .         .         .         .
14.583     12.6641     29.75  .Q  V     .         .         .         .
14.667     12.8875     32.43  .Q  V     .         .         .         .
14.750     13.1311     35.37  .Q  V     .         .         .         .
14.833     13.3937     38.14  .Q  V     .         .         .         .
14.917     13.6740     40.69  .Q   V    .         .         .         .
15.000     13.9711     43.14  .Q   V    .         .         .         .
15.083     14.2849     45.56  . Q  V    .         .         .         .
15.167     14.6148     47.91  . Q  V    .         .         .         .
15.250     14.9613     50.31  . Q  V    .         .         .         .
15.333     15.3250     52.81  . Q  V    .         .         .         .
15.417     15.7080     55.62  . Q  V    .         .         .         .
15.500     16.1134     58.86  . Q  V    .         .         .         .
15.583     16.5461     62.82  . Q   V   .         .         .         .
15.667     17.0134     67.85  .  Q  V   .         .         .         .
15.750     17.5302     75.04  .  Q  V   .         .         .         .
15.833     18.1183     85.40  .  Q  V   .         .         .         .
15.917     18.8158    101.28  .   Q V   .         .         .         .
16.000     19.6820    125.76  .    Q V  .         .         .         .
16.083     20.8700    172.51  .      Q  .         .         .         .
16.167     22.4629    231.28  .       V Q         .         .         .
16.250     24.5072    296.84  .        V.  Q      .         .         .
16.333     27.0475    368.85  .        V.     Q   .         .         .
16.417     30.1299    447.57  .         .V       Q.         .         .
16.500     33.8957    546.79  .         . V       .   Q     .         .
16.583     38.6073    684.13  .         .   V     .         Q         .
16.667     44.1517    805.05  .         .     V   .         .    Q    .
16.750     49.7861    818.12  .         .       V .         .     Q   .
16.833     54.8393    733.73  .         .         V         . Q       .
16.917     59.1645    628.01  .         .         .V     Q  .         .
17.000     62.9107    543.95  .         .         .  VQ     .         .
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17.083     66.1557    471.17  .         .         Q   V     .         .
17.167     68.9250    402.11  .         .      Q  .    V    .         .
17.250     71.3642    354.16  .         .    Q    .     V   .         .
17.333     73.5610    318.98  .         .   Q     .      V  .         .
17.417     75.5649    290.96  .         . Q       .      V  .         .
17.500     77.4135    268.41  .         .Q        .       V .         .
17.583     79.0933    243.91  .         Q         .        V.         .
17.667     80.6327    223.52  .        Q.         .        V.         .
17.750     82.0536    206.31  .        Q.         .         V         .
17.833     83.3801    192.60  .       Q .         .         V         .
17.917     84.5857    175.06  .      Q  .         .         .V        .
18.000     85.7044    162.43  .      Q  .         .         .V        .
18.083     86.7650    154.00  .     Q   .         .         .V        .
18.167     87.7426    141.95  .     Q   .         .         . V       .
18.250     88.6734    135.15  .     Q   .         .         . V       .
18.333     89.5631    129.18  .    Q    .         .         .  V      .
18.417     90.4026    121.90  .    Q    .         .         .  V      .
18.500     91.2078    116.91  .    Q    .         .         .  V      .
18.583     91.9642    109.82  .   Q     .         .         .  V      .
18.667     92.6709    102.61  .   Q     .         .         .   V     .
18.750     93.3445     97.81  .   Q     .         .         .   V     .
18.833     93.9602     89.40  .  Q      .         .         .   V     .
18.917     94.5407     84.30  .  Q      .         .         .   V     .
19.000     95.1019     81.49  .  Q      .         .         .    V    .
19.083     95.6410     78.26  .  Q      .         .         .    V    .
19.167     96.1633     75.84  .  Q      .         .         .    V    .
19.250     96.6643     72.74  .  Q      .         .         .    V    .
19.333     97.1388     68.90  .  Q      .         .         .    V    .
19.417     97.5985     66.74  . Q       .         .         .    V    .
19.500     98.0399     64.10  . Q       .         .         .     V   .
19.583     98.4635     61.51  . Q       .         .         .     V   .
19.667     98.8708     59.14  . Q       .         .         .     V   .
19.750     99.2488     54.88  . Q       .         .         .     V   .
19.833     99.6107     52.55  . Q       .         .         .     V   .
19.917     99.9636     51.25  . Q       .         .         .     V   .
20.000    100.3079     49.99  . Q       .         .         .     V   .
```

20.083	100.6418	48.49	. Q	.	.	.	V .
20.167	100.9581	45.92	. Q	.	.	.	V .
20.250	101.2535	42.89	.Q	.	.	.	V .
20.333	101.5405	41.68	.Q	.	.	.	V .
20.417	101.8201	40.60	.Q	.	.	.	V .
20.500	102.0913	39.38	.Q	.	.	.	V .
20.583	102.3505	37.63	.Q	.	.	.	V .
20.667	102.5869	34.33	.Q	.	.	.	V .
20.750	102.8122	32.72	.Q	.	.	.	V .
20.833	103.0305	31.69	.Q	.	.	.	V .
20.917	103.2417	30.68	.Q	.	.	.	V .
21.000	103.4442	29.40	.Q	.	.	.	V .
21.083	103.6299	26.96	.Q	.	.	.	V .
21.167	103.7986	24.49	.Q	.	.	.	V .
21.250	103.9630	23.87	.Q	.	.	.	V .
21.333	104.1250	23.53	.Q	.	.	.	V .
21.417	104.2860	23.37	.Q	.	.	.	V .
21.500	104.4470	23.38	.Q	.	.	.	V .
21.583	104.6109	23.80	.Q	.	.	.	V .
21.667	104.7745	23.75	.Q	.	.	.	V .
21.750	104.9368	23.57	.Q	.	.	.	V .
21.833	105.0975	23.33	.Q	.	.	.	V .
21.917	105.2564	23.07	.Q	.	.	.	V .
22.000	105.4137	22.84	.Q	.	.	.	V .
22.083	105.5692	22.58	.Q	.	.	.	V .
22.167	105.7230	22.33	Q	.	.	.	V .
22.250	105.8748	22.05	Q	.	.	.	V.
22.333	106.0244	21.72	Q	.	.	.	V.
22.417	106.1713	21.33	Q	.	.	.	V.
22.500	106.3143	20.77	Q	.	.	.	V.
22.583	106.4521	20.00	Q	.	.	.	V.
22.667	106.5825	18.94	Q	.	.	.	V.
22.750	106.7021	17.36	Q	.	.	.	V.
22.833	106.7973	13.82	Q	.	.	.	V.
22.917	106.8704	10.62	Q	.	.	.	V.
23.000	106.9384	9.87	Q	.	.	.	V.

23.083	107.0037	9.48	Q	.	.	.	V.
23.167	107.0673	9.23	Q	.	.	.	V.
23.250	107.1296	9.04	Q	.	.	.	V.
23.333	107.1907	8.87	Q	.	.	.	V.
23.417	107.2506	8.71	Q	.	.	.	V.
23.500	107.3095	8.55	Q	.	.	.	V.
23.583	107.3675	8.41	Q	.	.	.	V.
23.667	107.4244	8.27	Q	.	.	.	V.
23.750	107.4805	8.14	Q	.	.	.	V.
23.833	107.5358	8.03	Q	.	.	.	V.
23.917	107.5904	7.93	Q	.	.	.	V.
24.000	107.6443	7.84	Q	.	.	.	V.
24.083	107.6975	7.72	Q	.	.	.	V.
24.167	107.7497	7.57	Q	.	.	.	V.
24.250	107.8006	7.39	Q	.	.	.	V.
24.333	107.8500	7.18	Q	.	.	.	V.
24.417	107.8978	6.93	Q	.	.	.	V.
24.500	107.9435	6.64	Q	.	.	.	V.
24.583	107.9862	6.21	Q	.	.	.	V.
24.667	108.0249	5.62	Q	.	.	.	V.
24.750	108.0593	4.99	Q	.	.	.	V.
24.833	108.0898	4.44	Q	.	.	.	V.
24.917	108.1173	3.99	Q	.	.	.	V.
25.000	108.1422	3.61	Q	.	.	.	V.
25.083	108.1649	3.29	Q	.	.	.	V.
25.167	108.1857	3.03	Q	.	.	.	V.
25.250	108.2050	2.80	Q	.	.	.	V.
25.333	108.2229	2.60	Q	.	.	.	V.
25.417	108.2395	2.42	Q	.	.	.	V.
25.500	108.2550	2.25	Q	.	.	.	V.
25.583	108.2695	2.10	Q	.	.	.	V.
25.667	108.2830	1.97	Q	.	.	.	V.
25.750	108.2957	1.84	Q	.	.	.	V.
25.833	108.3076	1.72	Q	.	.	.	V.
25.917	108.3187	1.62	Q	.	.	.	V.
26.000	108.3292	1.52	Q	.	.	.	V.

26.083	108.3390	1.43	Q	.	.	.	V.
26.167	108.3483	1.35	Q	.	.	.	V.
26.250	108.3571	1.27	Q	.	.	.	V.
26.333	108.3653	1.19	Q	.	.	.	V.
26.417	108.3730	1.12	Q	.	.	.	V.
26.500	108.3803	1.06	Q	.	.	.	V.
26.583	108.3871	0.99	Q	.	.	.	V.
26.667	108.3936	0.94	Q	.	.	.	V.
26.750	108.3996	0.88	Q	.	.	.	V.
26.833	108.4053	0.83	Q	.	.	.	V.
26.917	108.4108	0.79	Q	.	.	.	V.
27.000	108.4159	0.74	Q	.	.	.	V.
27.083	108.4207	0.70	Q	.	.	.	V.
27.167	108.4253	0.66	Q	.	.	.	V.
27.250	108.4296	0.62	Q	.	.	.	V.
27.333	108.4336	0.59	Q	.	.	.	V.
27.417	108.4375	0.55	Q	.	.	.	V.
27.500	108.4411	0.52	Q	.	.	.	V.
27.583	108.4444	0.49	Q	.	.	.	V.
27.667	108.4476	0.46	Q	.	.	.	V.
27.750	108.4506	0.43	Q	.	.	.	V.
27.833	108.4534	0.41	Q	.	.	.	V.
27.917	108.4561	0.39	Q	.	.	.	V.
28.000	108.4586	0.36	Q	.	.	.	V.
28.083	108.4609	0.34	Q	.	.	.	V.
28.167	108.4631	0.32	Q	.	.	.	V.
28.250	108.4652	0.30	Q	.	.	.	V.
28.333	108.4671	0.28	Q	.	.	.	V.
28.417	108.4689	0.26	Q	.	.	.	V.
28.500	108.4706	0.24	Q	.	.	.	V.
28.583	108.4721	0.23	Q	.	.	.	V.
28.667	108.4736	0.21	Q	.	.	.	V.
28.750	108.4750	0.20	Q	.	.	.	V.
28.833	108.4763	0.19	Q	.	.	.	V.
28.917	108.4775	0.18	Q	.	.	.	V.
29.000	108.4786	0.16	Q	.	.	.	V.

```
 29.083   108.4797     0.15  Q         .         .         .        V.
 29.167   108.4807     0.15  Q         .         .         .        V.
 29.250   108.4817     0.14  Q         .         .         .        V.
 29.333   108.4826     0.13  Q         .         .         .        V.
 29.417   108.4834     0.12  Q         .         .         .        V.
 29.500   108.4842     0.12  Q         .         .         .        V.
 29.583   108.4850     0.11  Q         .         .         .        V.
 29.667   108.4857     0.10  Q         .         .         .        V.
 29.750   108.4864     0.09  Q         .         .         .        V.
 29.833   108.4869     0.09  Q         .         .         .        V.
 29.917   108.4875     0.08  Q         .         .         .        V.
 30.000   108.4880     0.07  Q         .         .         .        V.
 30.083   108.4884     0.06  Q         .         .         .        V.
 30.167   108.4888     0.05  Q         .         .         .        V.
 30.250   108.4891     0.05  Q         .         .         .        V.
 30.333   108.4894     0.04  Q         .         .         .        V.
 30.417   108.4896     0.03  Q         .         .         .        V.
 30.500   108.4898     0.03  Q         .         .         .        V.
 30.583   108.4899     0.02  Q         .         .         .        V.
 30.667   108.4900     0.01  Q         .         .         .         V
 30.750   108.4900     0.00  Q         .         .         .         V
--------------------------------------------------------------------------------
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1845.0
10%	190.0
20%	115.0
30%	80.0
40%	60.0
50%	45.0
60%	35.0

70%	25.0
80%	20.0
90%	10.0

===

END OF FLOODSCx ROUTING ANALYSIS

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              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
         (c) Copyright 1989-2015 Advanced Engineering Software (aes)
            Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                          Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED L - PROPOSED - UH                                              *
* 2022-10-03                                                               *
 **************************************************************************

  FILE NAME: 87_L_PR.DAT
  TIME/DATE OF STUDY: 11:50 10/03/2022



****************************************************************************
  FLOW PROCESS FROM NODE   7000.00 TO NODE   7006.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =     485.000 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.580 HOURS
```

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.590

LOW LOSS FRACTION = 0.778

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.16

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.978

30-MINUTE FACTOR = 0.978

1-HOUR FACTOR = 0.978

3-HOUR FACTOR = 0.997

6-HOUR FACTOR = 0.998

24-HOUR FACTOR = 0.999

UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 14.368

==

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.642	37.650
2	2.660	118.344
3	6.004	196.180
4	11.187	304.000

5	21.045	578.203
6	34.685	800.075
7	45.756	649.361
8	54.006	483.905
9	60.150	360.359
10	64.822	274.060
11	68.673	225.883
12	72.018	196.193
13	74.804	163.366
14	77.284	145.510
15	79.400	124.092
16	81.277	110.068
17	82.903	95.425
18	84.424	89.198
19	85.817	81.715
20	87.112	75.915
21	88.261	67.431
22	89.235	57.089
23	90.092	50.320
24	90.908	47.848
25	91.689	45.807
26	92.386	40.888
27	93.053	39.094
28	93.683	36.980
29	94.222	31.630
30	94.711	28.657
31	95.199	28.648
32	95.661	27.093
33	96.041	22.262
34	96.414	21.911
35	96.786	21.767
36	97.081	17.334
37	97.340	15.166
38	97.598	15.165
39	97.827	13.411
40	97.975	8.691

41	98.119	8.436
42	98.264	8.484
43	98.427	9.616
44	98.600	10.110
45	98.772	10.110
46	98.945	10.126
47	99.117	10.110
48	99.290	10.110
49	99.462	10.110
50	99.634	10.110
51	99.807	10.110
52	99.979	10.110
53	100.000	1.232

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0021	0.0006
13	0.0027	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0038	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0041	0.0032	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0070	0.0054	0.0015
146	0.0070	0.0055	0.0016
147	0.0072	0.0056	0.0016
148	0.0073	0.0057	0.0016
149	0.0075	0.0058	0.0017
150	0.0076	0.0059	0.0017
151	0.0078	0.0060	0.0017
152	0.0079	0.0061	0.0017
153	0.0081	0.0063	0.0018
154	0.0082	0.0064	0.0018
155	0.0084	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0088	0.0068	0.0020
158	0.0089	0.0069	0.0020
159	0.0092	0.0072	0.0020
160	0.0094	0.0073	0.0021
161	0.0097	0.0075	0.0021
162	0.0098	0.0077	0.0022
163	0.0102	0.0079	0.0023
164	0.0104	0.0081	0.0023
165	0.0108	0.0084	0.0024
166	0.0110	0.0086	0.0024
167	0.0115	0.0089	0.0025
168	0.0117	0.0091	0.0026
169	0.0202	0.0157	0.0045
170	0.0206	0.0161	0.0046
171	0.0215	0.0167	0.0048
172	0.0219	0.0171	0.0049
173	0.0229	0.0178	0.0051
174	0.0235	0.0183	0.0052

175	0.0247	0.0192	0.0055
176	0.0253	0.0197	0.0056
177	0.0268	0.0208	0.0059
178	0.0276	0.0214	0.0061
179	0.0293	0.0228	0.0065
180	0.0304	0.0236	0.0067
181	0.0327	0.0254	0.0073
182	0.0340	0.0264	0.0075
183	0.0371	0.0289	0.0082
184	0.0389	0.0303	0.0086
185	0.0619	0.0482	0.0137
186	0.0651	0.0492	0.0159
187	0.0728	0.0492	0.0236
188	0.0780	0.0492	0.0288
189	0.0974	0.0492	0.0483
190	0.1080	0.0492	0.0588
191	0.1459	0.0492	0.0968
192	0.1912	0.0492	0.1420
193	0.4696	0.0492	0.4204
194	0.1227	0.0492	0.0735
195	0.0841	0.0492	0.0349
196	0.0686	0.0492	0.0194
197	0.0410	0.0319	0.0091
198	0.0355	0.0276	0.0079
199	0.0315	0.0245	0.0070
200	0.0284	0.0221	0.0063
201	0.0260	0.0202	0.0058
202	0.0241	0.0187	0.0053
203	0.0224	0.0174	0.0050
204	0.0210	0.0164	0.0047
205	0.0120	0.0093	0.0027
206	0.0112	0.0087	0.0025
207	0.0106	0.0082	0.0023
208	0.0100	0.0078	0.0022
209	0.0095	0.0074	0.0021
210	0.0091	0.0071	0.0020

211	0.0087	0.0067	0.0019
212	0.0083	0.0065	0.0018
213	0.0080	0.0062	0.0018
214	0.0077	0.0060	0.0017
215	0.0074	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0041	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0040	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0032	0.0025	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0031	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0007
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0022	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.04

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.39

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 82.3324

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 56.1327

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	150.0	300.0	450.0	600.0
0.083	0.0001	0.02	Q	.	.	.	.
0.167	0.0007	0.09	Q	.	.	.	.
0.250	0.0021	0.20	Q	.	.	.	.
0.333	0.0046	0.37	Q	.	.	.	.
0.417	0.0094	0.69	Q	.	.	.	.
0.500	0.0173	1.14	Q	.	.	.	.
0.583	0.0277	1.51	Q	.	.	.	.
0.667	0.0400	1.79	Q	.	.	.	.
0.750	0.0538	2.00	Q	.	.	.	.
0.833	0.0686	2.16	Q	.	.	.	.
0.917	0.0844	2.29	Q	.	.	.	.
1.000	0.1010	2.41	Q	.	.	.	.
1.083	0.1183	2.51	Q	.	.	.	.
1.167	0.1363	2.61	Q	.	.	.	.
1.250	0.1548	2.69	Q	.	.	.	.
1.333	0.1738	2.76	Q	.	.	.	.
1.417	0.1933	2.83	Q	.	.	.	.
1.500	0.2132	2.89	Q	.	.	.	.
1.583	0.2334	2.95	Q	.	.	.	.
1.667	0.2541	3.00	Q	.	.	.	.
1.750	0.2751	3.05	Q	.	.	.	.
1.833	0.2965	3.10	Q	.	.	.	.
1.917	0.3181	3.14	Q	.	.	.	.
2.000	0.3400	3.18	Q	.	.	.	.

2.083	0.3622	3.22	Q	.	.	.	.
2.167	0.3846	3.26	Q	.	.	.	.
2.250	0.4073	3.29	Q	.	.	.	.
2.333	0.4302	3.33	Q	.	.	.	.
2.417	0.4534	3.36	Q	.	.	.	.
2.500	0.4767	3.39	Q	.	.	.	.
2.583	0.5003	3.43	Q	.	.	.	.
2.667	0.5242	3.46	Q	.	.	.	.
2.750	0.5482	3.49	Q	.	.	.	.
2.833	0.5724	3.51	Q	.	.	.	.
2.917	0.5968	3.54	Q	.	.	.	.
3.000	0.6213	3.57	Q	.	.	.	.
3.083	0.6461	3.60	Q	.	.	.	.
3.167	0.6710	3.62	Q	.	.	.	.
3.250	0.6961	3.65	Q	.	.	.	.
3.333	0.7214	3.67	Q	.	.	.	.
3.417	0.7468	3.69	Q	.	.	.	.
3.500	0.7724	3.71	Q	.	.	.	.
3.583	0.7982	3.74	Q	.	.	.	.
3.667	0.8241	3.76	Q	.	.	.	.
3.750	0.8501	3.79	Q	.	.	.	.
3.833	0.8764	3.81	Q	.	.	.	.
3.917	0.9028	3.84	Q	.	.	.	.
4.000	0.9294	3.86	Q	.	.	.	.
4.083	0.9562	3.89	Q	.	.	.	.
4.167	0.9831	3.91	Q	.	.	.	.
4.250	1.0103	3.94	Q	.	.	.	.
4.333	1.0376	3.97	Q	.	.	.	.
4.417	1.0650	3.99	Q	.	.	.	.
4.500	1.0926	4.01	Q	.	.	.	.
4.583	1.1204	4.03	Q	.	.	.	.
4.667	1.1483	4.05	Q	.	.	.	.
4.750	1.1764	4.07	Q	.	.	.	.
4.833	1.2046	4.10	Q	.	.	.	.
4.917	1.2329	4.12	Q	.	.	.	.
5.000	1.2614	4.14	Q	.	.	.	.

5.083	1.2901	4.16	Q	.	.	.	.
5.167	1.3190	4.19	Q	.	.	.	.
5.250	1.3480	4.21	Q	.	.	.	.
5.333	1.3771	4.24	Q	.	.	.	.
5.417	1.4065	4.26	QV	.	.	.	.
5.500	1.4360	4.28	QV	.	.	.	.
5.583	1.4656	4.31	QV	.	.	.	.
5.667	1.4955	4.33	QV	.	.	.	.
5.750	1.5255	4.36	QV	.	.	.	.
5.833	1.5557	4.39	QV	.	.	.	.
5.917	1.5861	4.41	QV	.	.	.	.
6.000	1.6167	4.44	QV	.	.	.	.
6.083	1.6474	4.47	QV	.	.	.	.
6.167	1.6784	4.49	QV	.	.	.	.
6.250	1.7095	4.52	QV	.	.	.	.
6.333	1.7409	4.55	QV	.	.	.	.
6.417	1.7724	4.58	QV	.	.	.	.
6.500	1.8041	4.61	QV	.	.	.	.
6.583	1.8361	4.64	QV	.	.	.	.
6.667	1.8682	4.67	QV	.	.	.	.
6.750	1.9005	4.70	QV	.	.	.	.
6.833	1.9331	4.73	QV	.	.	.	.
6.917	1.9659	4.76	QV	.	.	.	.
7.000	1.9989	4.79	QV	.	.	.	.
7.083	2.0321	4.82	QV	.	.	.	.
7.167	2.0655	4.86	QV	.	.	.	.
7.250	2.0992	4.89	QV	.	.	.	.
7.333	2.1331	4.92	QV	.	.	.	.
7.417	2.1672	4.96	QV	.	.	.	.
7.500	2.2016	4.99	QV	.	.	.	.
7.583	2.2362	5.03	QV	.	.	.	.
7.667	2.2711	5.06	QV	.	.	.	.
7.750	2.3062	5.10	QV	.	.	.	.
7.833	2.3416	5.14	QV	.	.	.	.
7.917	2.3773	5.17	QV	.	.	.	.
8.000	2.4132	5.21	QV	.	.	.	.

8.083	2.4493	5.25	QV	.	.	.	.
8.167	2.4858	5.29	QV	.	.	.	.
8.250	2.5225	5.33	QV	.	.	.	.
8.333	2.5595	5.37	QV	.	.	.	.
8.417	2.5968	5.42	QV	.	.	.	.
8.500	2.6344	5.46	QV	.	.	.	.
8.583	2.6723	5.50	QV	.	.	.	.
8.667	2.7105	5.55	QV	.	.	.	.
8.750	2.7490	5.59	QV	.	.	.	.
8.833	2.7878	5.64	QV	.	.	.	.
8.917	2.8269	5.68	Q V	.	.	.	.
9.000	2.8664	5.73	Q V	.	.	.	.
9.083	2.9062	5.78	Q V	.	.	.	.
9.167	2.9464	5.83	Q V	.	.	.	.
9.250	2.9869	5.88	Q V	.	.	.	.
9.333	3.0277	5.93	Q V	.	.	.	.
9.417	3.0689	5.98	Q V	.	.	.	.
9.500	3.1105	6.04	Q V	.	.	.	.
9.583	3.1525	6.09	Q V	.	.	.	.
9.667	3.1948	6.15	Q V	.	.	.	.
9.750	3.2375	6.21	Q V	.	.	.	.
9.833	3.2807	6.26	Q V	.	.	.	.
9.917	3.3242	6.32	Q V	.	.	.	.
10.000	3.3682	6.38	Q V	.	.	.	.
10.083	3.4126	6.45	Q V	.	.	.	.
10.167	3.4574	6.51	Q V	.	.	.	.
10.250	3.5027	6.57	Q V	.	.	.	.
10.333	3.5485	6.64	Q V	.	.	.	.
10.417	3.5947	6.71	Q V	.	.	.	.
10.500	3.6414	6.78	Q V	.	.	.	.
10.583	3.6885	6.85	Q V	.	.	.	.
10.667	3.7362	6.92	Q V	.	.	.	.
10.750	3.7844	7.00	Q V	.	.	.	.
10.833	3.8332	7.08	Q V	.	.	.	.
10.917	3.8824	7.15	Q V	.	.	.	.
11.000	3.9323	7.24	Q V	.	.	.	.

11.083	3.9827	7.32	Q V . . . .
11.167	4.0337	7.40	Q V . . . .
11.250	4.0853	7.49	Q V . . . .
11.333	4.1375	7.58	Q V . . . .
11.417	4.1903	7.67	Q V . . . .
11.500	4.2439	7.77	Q V . . . .
11.583	4.2980	7.87	Q V . . . .
11.667	4.3529	7.97	Q V . . . .
11.750	4.4085	8.07	Q V . . . .
11.833	4.4648	8.18	Q V . . . .
11.917	4.5219	8.29	Q V . . . .
12.000	4.5798	8.40	Q V . . . .
12.083	4.6384	8.51	Q V . . . .
12.167	4.6978	8.62	Q V . . . .
12.250	4.7579	8.72	Q V . . . .
12.333	4.8185	8.81	Q V . . . .
12.417	4.8796	8.87	Q V . . . .
12.500	4.9409	8.90	Q V . . . .
12.583	5.0025	8.95	Q V . . . .
12.667	5.0648	9.04	Q V . . . .
12.750	5.1277	9.14	Q V . . . .
12.833	5.1915	9.26	Q V . . . .
12.917	5.2561	9.39	Q V . . . .
13.000	5.3217	9.53	Q V . . . .
13.083	5.3884	9.68	Q V . . . .
13.167	5.4561	9.84	Q V . . . .
13.250	5.5251	10.01	Q V . . . .
13.333	5.5952	10.19	Q V . . . .
13.417	5.6667	10.38	Q V . . . .
13.500	5.7396	10.58	Q V . . . .
13.583	5.8140	10.80	Q V . . . .
13.667	5.8899	11.02	Q V . . . .
13.750	5.9674	11.26	Q V . . . .
13.833	6.0467	11.51	Q V . . . .
13.917	6.1278	11.78	Q V . . . .
14.000	6.2109	12.06	Q V . . . .

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14.083      6.2965     12.43  Q   V     .         .         .         .
14.167      6.3857     12.96  Q   V     .         .         .         .
14.250      6.4798     13.65  Q   V     .         .         .         .
14.333      6.5801     14.57  Q   V     .         .         .         .
14.417      6.6903     16.01  .Q  V     .         .         .         .
14.500      6.8135     17.89  .Q  V     .         .         .         .
14.583      6.9483     19.57  .Q  V     .         .         .         .
14.667      7.0931     21.02  .Q   V    .         .         .         .
14.750      7.2467     22.31  .Q   V    .         .         .         .
14.833      7.4087     23.52  .Q   V    .         .         .         .
14.917      7.5790     24.72  .Q   V    .         .         .         .
15.000      7.7577     25.95  .Q   V    .         .         .         .
15.083      7.9451     27.21  .Q   V    .         .         .         .
15.167      8.1416     28.54  .Q   V    .         .         .         .
15.250      8.3480     29.96  .Q   V    .         .         .         .
15.333      8.5649     31.50  . Q   V   .         .         .         .
15.417      8.7945     33.34  . Q   V   .         .         .         .
15.500      9.0409     35.77  . Q   V   .         .         .         .
15.583      9.3104     39.14  . Q   V   .         .         .         .
15.667      9.6138     44.06  . Q   V   .         .         .         .
15.750      9.9729     52.15  .  Q   V  .         .         .         .
15.833     10.4195     64.84  .   Q  V  .         .         .         .
15.917     10.9943     83.46  .    Q V  .         .         .         .
16.000     11.7625    111.54  .      QV .         .         .         .
16.083     12.8785    162.05  .        VQ         .         .         .
16.167     14.4897    233.94  .         V    Q    .         .         .
16.250     16.6276    310.43  .         .V        Q         .         .
16.333     19.3868    400.63  .         .  V      .     Q   .         .
16.417     22.9969    524.19  .         .     V   .         .   Q     .
16.500     27.0698    591.38  .         .        V.         .        Q.
16.583     30.5949    511.84  .         .         .V        .   Q     .
16.667     33.4460    413.98  .         .         .  V   Q  .         .
16.750     35.7277    331.31  .         .         . Q  V    .         .
16.833     37.5806    269.04  .         .      Q  .     V   .         .
16.917     39.1513    228.06  .         .    Q    .      V  .         .
17.000     40.5239    199.30  .         .  Q      .       V .         .
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17.083     41.7209    173.81  .         .Q        .        V.         .
17.167     42.7919    155.51  .         Q         .         V         .
17.250     43.7430    138.10  .        Q.         .         .V        .
17.333     44.5998    124.42  .       Q .         .         .V        .
17.417     45.3692    111.71  .      Q  .         .         . V       .
17.500     46.0733    102.24  .     Q   .         .         . V       .
17.583     46.7165     93.39  .     Q   .         .         .  V      .
17.667     47.3060     85.60  .    Q    .         .         .  V      .
17.750     47.8395     77.46  .    Q    .         .         .   V     .
17.833     48.3180     69.47  .   Q     .         .         .   V     .
17.917     48.7553     63.50  .   Q     .         .         .   V     .
18.000     49.1651     59.50  .  Q      .         .         .    V    .
18.083     49.5506     55.97  .  Q      .         .         .    V    .
18.167     49.9078     51.87  .  Q      .         .         .    V    .
18.250     50.2444     48.88  .  Q      .         .         .    V    .
18.333     50.5601     45.84  .  Q      .         .         .     V   .
18.417     50.8495     42.02  . Q       .         .         .     V   .
18.500     51.1201     39.30  . Q       .         .         .     V   .
18.583     51.3790     37.58  . Q       .         .         .     V   .
18.667     51.6222     35.32  . Q       .         .         .     V   .
18.750     51.8442     32.24  . Q       .         .         .     V   .
18.833     52.0552     30.63  . Q       .         .         .      V  .
18.917     52.2549     29.00  .Q        .         .         .      V  .
19.000     52.4347     26.11  .Q        .         .         .      V  .
19.083     52.6008     24.12  .Q        .         .         .      V  .
19.167     52.7580     22.83  .Q        .         .         .      V  .
19.250     52.9029     21.03  .Q        .         .         .      V  .
19.333     53.0312     18.63  .Q        .         .         .      V  .
19.417     53.1549     17.97  .Q        .         .         .      V  .
19.500     53.2768     17.70  .Q        .         .         .      V  .
19.583     53.3999     17.86  .Q        .         .         .       V .
19.667     53.5227     17.84  .Q        .         .         .       V .
19.750     53.6438     17.58  .Q        .         .         .       V .
19.833     53.7627     17.27  .Q        .         .         .       V .
19.917     53.8790     16.88  .Q        .         .         .       V .
20.000     53.9923     16.45  .Q        .         .         .       V .
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20.083	54.1015	15.85	.Q	.	.	.	V .
20.167	54.2058	15.15	.Q	.	.	.	V .
20.250	54.3029	14.10	Q	.	.	.	V .
20.333	54.3897	12.61	Q	.	.	.	V .
20.417	54.4490	8.61	Q	.	.	.	V .
20.500	54.4996	7.34	Q	.	.	.	V .
20.583	54.5468	6.85	Q	.	.	.	V .
20.667	54.5919	6.55	Q	.	.	.	V .
20.750	54.6357	6.36	Q	.	.	.	V .
20.833	54.6784	6.20	Q	.	.	.	V .
20.917	54.7200	6.05	Q	.	.	.	V .
21.000	54.7607	5.91	Q	.	.	.	V.
21.083	54.8005	5.78	Q	.	.	.	V.
21.167	54.8395	5.65	Q	.	.	.	V.
21.250	54.8776	5.54	Q	.	.	.	V.
21.333	54.9149	5.42	Q	.	.	.	V.
21.417	54.9517	5.33	Q	.	.	.	V.
21.500	54.9878	5.25	Q	.	.	.	V.
21.583	55.0234	5.17	Q	.	.	.	V.
21.667	55.0584	5.09	Q	.	.	.	V.
21.750	55.0929	5.01	Q	.	.	.	V.
21.833	55.1269	4.94	Q	.	.	.	V.
21.917	55.1605	4.87	Q	.	.	.	V.
22.000	55.1936	4.80	Q	.	.	.	V.
22.083	55.2262	4.74	Q	.	.	.	V.
22.167	55.2584	4.67	Q	.	.	.	V.
22.250	55.2902	4.61	Q	.	.	.	V.
22.333	55.3215	4.56	Q	.	.	.	V.
22.417	55.3525	4.50	Q	.	.	.	V.
22.500	55.3831	4.44	Q	.	.	.	V.
22.583	55.4133	4.39	Q	.	.	.	V.
22.667	55.4431	4.33	Q	.	.	.	V.
22.750	55.4726	4.28	Q	.	.	.	V.
22.833	55.5018	4.23	Q	.	.	.	V.
22.917	55.5306	4.18	Q	.	.	.	V.
23.000	55.5590	4.13	Q	.	.	.	V.

23.083	55.5872	4.09	Q	.	.	.	V.
23.167	55.6150	4.04	Q	.	.	.	V.
23.250	55.6426	4.00	Q	.	.	.	V.
23.333	55.6698	3.96	Q	.	.	.	V.
23.417	55.6968	3.91	Q	.	.	.	V.
23.500	55.7235	3.87	Q	.	.	.	V.
23.583	55.7499	3.83	Q	.	.	.	V.
23.667	55.7760	3.80	Q	.	.	.	V.
23.750	55.8019	3.76	Q	.	.	.	V.
23.833	55.8275	3.72	Q	.	.	.	V.
23.917	55.8529	3.68	Q	.	.	.	V.
24.000	55.8780	3.65	Q	.	.	.	V.
24.083	55.9028	3.59	Q	.	.	.	V.
24.167	55.9268	3.49	Q	.	.	.	V.
24.250	55.9499	3.35	Q	.	.	.	V.
24.333	55.9716	3.15	Q	.	.	.	V.
24.417	55.9909	2.80	Q	.	.	.	V.
24.500	56.0069	2.33	Q	.	.	.	V.
24.583	56.0203	1.94	Q	.	.	.	V.
24.667	56.0317	1.66	Q	.	.	.	V.
24.750	56.0417	1.44	Q	.	.	.	V.
24.833	56.0504	1.27	Q	.	.	.	V.
24.917	56.0583	1.14	Q	.	.	.	V.
25.000	56.0653	1.02	Q	.	.	.	V.
25.083	56.0716	0.92	Q	.	.	.	V.
25.167	56.0772	0.83	Q	.	.	.	V.
25.250	56.0824	0.75	Q	.	.	.	V.
25.333	56.0871	0.68	Q	.	.	.	V.
25.417	56.0913	0.62	Q	.	.	.	V.
25.500	56.0952	0.56	Q	.	.	.	V.
25.583	56.0988	0.51	Q	.	.	.	V.
25.667	56.1020	0.47	Q	.	.	.	V.
25.750	56.1049	0.42	Q	.	.	.	V.
25.833	56.1076	0.39	Q	.	.	.	V.
25.917	56.1101	0.36	Q	.	.	.	V.
26.000	56.1123	0.33	Q	.	.	.	V.

26.083	56.1144	0.30	Q	.	.	.	V.
26.167	56.1162	0.27	Q	.	.	.	V.
26.250	56.1180	0.25	Q	.	.	.	V.
26.333	56.1195	0.23	Q	.	.	.	V.
26.417	56.1209	0.21	Q	.	.	.	V.
26.500	56.1222	0.19	Q	.	.	.	V.
26.583	56.1234	0.17	Q	.	.	.	V.
26.667	56.1245	0.15	Q	.	.	.	V.
26.750	56.1254	0.14	Q	.	.	.	V.
26.833	56.1263	0.13	Q	.	.	.	V.
26.917	56.1271	0.11	Q	.	.	.	V.
27.000	56.1278	0.10	Q	.	.	.	V.
27.083	56.1284	0.09	Q	.	.	.	V.
27.167	56.1290	0.08	Q	.	.	.	V.
27.250	56.1295	0.08	Q	.	.	.	V.
27.333	56.1300	0.07	Q	.	.	.	V.
27.417	56.1305	0.06	Q	.	.	.	V.
27.500	56.1309	0.06	Q	.	.	.	V.
27.583	56.1312	0.05	Q	.	.	.	V.
27.667	56.1316	0.05	Q	.	.	.	V.
27.750	56.1319	0.04	Q	.	.	.	V.
27.833	56.1321	0.04	Q	.	.	.	V.
27.917	56.1323	0.03	Q	.	.	.	V.
28.000	56.1325	0.02	Q	.	.	.	V.
28.083	56.1326	0.02	Q	.	.	.	V.
28.167	56.1327	0.01	Q	.	.	.	V.
28.250	56.1327	0.01	Q	.	.	.	V

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1695.0

```
      10%                            135.0
      20%                             80.0
      30%                             55.0
      40%                             40.0
      50%                             35.0
      60%                             25.0
      70%                             20.0
      80%                             15.0
      90%                              5.0


****************************************************************************
  FLOW PROCESS FROM NODE   7006.00 TO NODE   7007.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #2)

         WATERSHED AREA =     292.490 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.750 HOURS
         DESERT(UNDEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.504
         LOW LOSS FRACTION = 0.686
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.48
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  1.16
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.60
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  2.24
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.56
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  3.43

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.987
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30-MINUTE FACTOR = 0.987

1-HOUR FACTOR = 0.987

3-HOUR FACTOR = 0.998

6-HOUR FACTOR = 0.999

24-HOUR FACTOR = 0.999

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 11.111

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UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.489	17.293
2	1.807	46.624
3	3.917	74.627
4	6.835	103.245
5	10.922	144.563
6	17.911	247.218
7	28.397	370.925
8	38.415	354.345
9	46.444	284.041
10	52.889	227.960
11	58.088	183.915
12	62.142	143.384
13	65.529	119.827
14	68.467	103.907
15	71.135	94.403
16	73.436	81.382
17	75.466	71.803
18	77.367	67.231

19	79.033	58.957
20	80.500	51.882
21	81.892	49.224
22	83.100	42.745
23	84.283	41.856
24	85.367	38.324
25	86.428	37.531
26	87.367	33.213
27	88.256	31.444
28	89.033	27.511
29	89.700	23.578
30	90.354	23.143
31	90.978	22.061
32	91.589	21.613
33	92.133	19.257
34	92.665	18.815
35	93.167	17.740
36	93.656	17.298
37	94.089	15.327
38	94.467	13.356
39	94.845	13.369
40	95.222	13.362
41	95.589	12.970
42	95.889	10.608
43	96.178	10.222
44	96.467	10.216
45	96.756	10.222
46	97.000	8.643
47	97.200	7.076
48	97.400	7.076
49	97.600	7.064
50	97.789	6.678
51	97.911	4.328
52	98.022	3.930
53	98.133	3.930
54	98.244	3.942

55	98.366	4.303
56	98.500	4.726
57	98.633	4.726
58	98.766	4.701
59	98.900	4.726
60	99.033	4.713
61	99.166	4.713
62	99.300	4.713
63	99.433	4.713
64	99.566	4.713
65	99.699	4.713
66	99.832	4.713
67	99.966	4.713
68	100.000	1.212

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UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0017	0.0008
2	0.0025	0.0017	0.0008
3	0.0025	0.0017	0.0008
4	0.0025	0.0017	0.0008
5	0.0026	0.0018	0.0008
6	0.0026	0.0018	0.0008
7	0.0026	0.0018	0.0008
8	0.0026	0.0018	0.0008
9	0.0026	0.0018	0.0008
10	0.0026	0.0018	0.0008
11	0.0026	0.0018	0.0008
12	0.0026	0.0018	0.0008
13	0.0027	0.0018	0.0008
14	0.0027	0.0018	0.0008
15	0.0027	0.0018	0.0008
16	0.0027	0.0018	0.0008
17	0.0027	0.0019	0.0008
18	0.0027	0.0019	0.0008
19	0.0027	0.0019	0.0009
20	0.0027	0.0019	0.0009
21	0.0027	0.0019	0.0009
22	0.0028	0.0019	0.0009
23	0.0028	0.0019	0.0009
24	0.0028	0.0019	0.0009
25	0.0028	0.0019	0.0009
26	0.0028	0.0019	0.0009
27	0.0028	0.0019	0.0009
28	0.0028	0.0019	0.0009
29	0.0029	0.0020	0.0009
30	0.0029	0.0020	0.0009

31	0.0029	0.0020	0.0009
32	0.0029	0.0020	0.0009
33	0.0029	0.0020	0.0009
34	0.0029	0.0020	0.0009
35	0.0029	0.0020	0.0009
36	0.0029	0.0020	0.0009
37	0.0030	0.0020	0.0009
38	0.0030	0.0020	0.0009
39	0.0030	0.0021	0.0009
40	0.0030	0.0021	0.0009
41	0.0030	0.0021	0.0010
42	0.0030	0.0021	0.0010
43	0.0031	0.0021	0.0010
44	0.0031	0.0021	0.0010
45	0.0031	0.0021	0.0010
46	0.0031	0.0021	0.0010
47	0.0031	0.0021	0.0010
48	0.0031	0.0022	0.0010
49	0.0032	0.0022	0.0010
50	0.0032	0.0022	0.0010
51	0.0032	0.0022	0.0010
52	0.0032	0.0022	0.0010
53	0.0032	0.0022	0.0010
54	0.0032	0.0022	0.0010
55	0.0033	0.0022	0.0010
56	0.0033	0.0023	0.0010
57	0.0033	0.0023	0.0010
58	0.0033	0.0023	0.0010
59	0.0033	0.0023	0.0011
60	0.0034	0.0023	0.0011
61	0.0034	0.0023	0.0011
62	0.0034	0.0023	0.0011
63	0.0034	0.0024	0.0011
64	0.0034	0.0024	0.0011
65	0.0035	0.0024	0.0011
66	0.0035	0.0024	0.0011

67	0.0035	0.0024	0.0011
68	0.0035	0.0024	0.0011
69	0.0036	0.0024	0.0011
70	0.0036	0.0025	0.0011
71	0.0036	0.0025	0.0011
72	0.0036	0.0025	0.0011
73	0.0037	0.0025	0.0011
74	0.0037	0.0025	0.0012
75	0.0037	0.0025	0.0012
76	0.0037	0.0026	0.0012
77	0.0038	0.0026	0.0012
78	0.0038	0.0026	0.0012
79	0.0038	0.0026	0.0012
80	0.0038	0.0026	0.0012
81	0.0039	0.0026	0.0012
82	0.0039	0.0027	0.0012
83	0.0039	0.0027	0.0012
84	0.0039	0.0027	0.0012
85	0.0040	0.0027	0.0012
86	0.0040	0.0027	0.0013
87	0.0040	0.0028	0.0013
88	0.0040	0.0028	0.0013
89	0.0041	0.0028	0.0013
90	0.0041	0.0028	0.0013
91	0.0042	0.0028	0.0013
92	0.0042	0.0029	0.0013
93	0.0042	0.0029	0.0013
94	0.0042	0.0029	0.0013
95	0.0043	0.0029	0.0013
96	0.0043	0.0030	0.0014
97	0.0044	0.0030	0.0014
98	0.0044	0.0030	0.0014
99	0.0044	0.0030	0.0014
100	0.0045	0.0031	0.0014
101	0.0045	0.0031	0.0014
102	0.0045	0.0031	0.0014

103	0.0046	0.0031	0.0014
104	0.0046	0.0032	0.0014
105	0.0047	0.0032	0.0015
106	0.0047	0.0032	0.0015
107	0.0048	0.0033	0.0015
108	0.0048	0.0033	0.0015
109	0.0048	0.0033	0.0015
110	0.0049	0.0033	0.0015
111	0.0049	0.0034	0.0015
112	0.0050	0.0034	0.0016
113	0.0050	0.0035	0.0016
114	0.0051	0.0035	0.0016
115	0.0051	0.0035	0.0016
116	0.0052	0.0035	0.0016
117	0.0052	0.0036	0.0016
118	0.0053	0.0036	0.0017
119	0.0054	0.0037	0.0017
120	0.0054	0.0037	0.0017
121	0.0055	0.0038	0.0017
122	0.0055	0.0038	0.0017
123	0.0056	0.0038	0.0018
124	0.0056	0.0039	0.0018
125	0.0057	0.0039	0.0018
126	0.0058	0.0040	0.0018
127	0.0059	0.0040	0.0018
128	0.0059	0.0041	0.0019
129	0.0060	0.0041	0.0019
130	0.0061	0.0042	0.0019
131	0.0062	0.0042	0.0019
132	0.0062	0.0043	0.0020
133	0.0063	0.0043	0.0020
134	0.0064	0.0044	0.0020
135	0.0065	0.0045	0.0020
136	0.0066	0.0045	0.0021
137	0.0067	0.0046	0.0021
138	0.0067	0.0046	0.0021

139	0.0069	0.0047	0.0022
140	0.0069	0.0048	0.0022
141	0.0071	0.0049	0.0022
142	0.0072	0.0049	0.0022
143	0.0073	0.0050	0.0023
144	0.0074	0.0051	0.0023
145	0.0069	0.0048	0.0022
146	0.0070	0.0048	0.0022
147	0.0072	0.0049	0.0023
148	0.0073	0.0050	0.0023
149	0.0074	0.0051	0.0023
150	0.0075	0.0052	0.0024
151	0.0077	0.0053	0.0024
152	0.0078	0.0054	0.0025
153	0.0080	0.0055	0.0025
154	0.0081	0.0056	0.0026
155	0.0084	0.0057	0.0026
156	0.0085	0.0058	0.0027
157	0.0088	0.0060	0.0027
158	0.0089	0.0061	0.0028
159	0.0092	0.0063	0.0029
160	0.0093	0.0064	0.0029
161	0.0096	0.0066	0.0030
162	0.0098	0.0067	0.0031
163	0.0102	0.0070	0.0032
164	0.0103	0.0071	0.0032
165	0.0107	0.0074	0.0034
166	0.0110	0.0075	0.0034
167	0.0114	0.0078	0.0036
168	0.0117	0.0080	0.0037
169	0.0198	0.0136	0.0062
170	0.0202	0.0139	0.0064
171	0.0211	0.0145	0.0066
172	0.0215	0.0148	0.0068
173	0.0225	0.0154	0.0071
174	0.0231	0.0158	0.0072

175	0.0242	0.0166	0.0076
176	0.0249	0.0171	0.0078
177	0.0263	0.0180	0.0083
178	0.0271	0.0186	0.0085
179	0.0289	0.0198	0.0091
180	0.0299	0.0205	0.0094
181	0.0322	0.0221	0.0101
182	0.0335	0.0230	0.0105
183	0.0366	0.0251	0.0115
184	0.0384	0.0264	0.0121
185	0.0625	0.0420	0.0205
186	0.0657	0.0420	0.0237
187	0.0735	0.0420	0.0315
188	0.0787	0.0420	0.0367
189	0.0983	0.0420	0.0563
190	0.1089	0.0420	0.0669
191	0.1472	0.0420	0.1052
192	0.1929	0.0420	0.1509
193	0.4737	0.0420	0.4317
194	0.1238	0.0420	0.0818
195	0.0848	0.0420	0.0428
196	0.0692	0.0420	0.0272
197	0.0405	0.0278	0.0127
198	0.0350	0.0240	0.0110
199	0.0310	0.0213	0.0097
200	0.0280	0.0192	0.0088
201	0.0256	0.0175	0.0080
202	0.0236	0.0162	0.0074
203	0.0220	0.0151	0.0069
204	0.0206	0.0142	0.0065
205	0.0119	0.0082	0.0037
206	0.0112	0.0077	0.0035
207	0.0105	0.0072	0.0033
208	0.0100	0.0068	0.0031
209	0.0095	0.0065	0.0030
210	0.0090	0.0062	0.0028

211	0.0086	0.0059	0.0027
212	0.0083	0.0057	0.0026
213	0.0079	0.0054	0.0025
214	0.0076	0.0052	0.0024
215	0.0073	0.0050	0.0023
216	0.0071	0.0049	0.0022
217	0.0075	0.0051	0.0023
218	0.0072	0.0050	0.0023
219	0.0070	0.0048	0.0022
220	0.0068	0.0047	0.0021
221	0.0066	0.0045	0.0021
222	0.0064	0.0044	0.0020
223	0.0063	0.0043	0.0020
224	0.0061	0.0042	0.0019
225	0.0060	0.0041	0.0019
226	0.0058	0.0040	0.0018
227	0.0057	0.0039	0.0018
228	0.0056	0.0038	0.0017
229	0.0054	0.0037	0.0017
230	0.0053	0.0036	0.0017
231	0.0052	0.0036	0.0016
232	0.0051	0.0035	0.0016
233	0.0050	0.0034	0.0016
234	0.0049	0.0034	0.0015
235	0.0048	0.0033	0.0015
236	0.0047	0.0032	0.0015
237	0.0046	0.0032	0.0015
238	0.0046	0.0031	0.0014
239	0.0045	0.0031	0.0014
240	0.0044	0.0030	0.0014
241	0.0043	0.0030	0.0014
242	0.0043	0.0029	0.0013
243	0.0042	0.0029	0.0013
244	0.0041	0.0028	0.0013
245	0.0041	0.0028	0.0013
246	0.0040	0.0027	0.0013

247	0.0039	0.0027	0.0012
248	0.0039	0.0027	0.0012
249	0.0038	0.0026	0.0012
250	0.0038	0.0026	0.0012
251	0.0037	0.0026	0.0012
252	0.0037	0.0025	0.0012
253	0.0036	0.0025	0.0011
254	0.0036	0.0025	0.0011
255	0.0035	0.0024	0.0011
256	0.0035	0.0024	0.0011
257	0.0035	0.0024	0.0011
258	0.0034	0.0023	0.0011
259	0.0034	0.0023	0.0011
260	0.0033	0.0023	0.0010
261	0.0033	0.0023	0.0010
262	0.0033	0.0022	0.0010
263	0.0032	0.0022	0.0010
264	0.0032	0.0022	0.0010
265	0.0032	0.0022	0.0010
266	0.0031	0.0021	0.0010
267	0.0031	0.0021	0.0010
268	0.0031	0.0021	0.0010
269	0.0030	0.0021	0.0009
270	0.0030	0.0020	0.0009
271	0.0030	0.0020	0.0009
272	0.0029	0.0020	0.0009
273	0.0029	0.0020	0.0009
274	0.0029	0.0020	0.0009
275	0.0028	0.0020	0.0009
276	0.0028	0.0019	0.0009
277	0.0028	0.0019	0.0009
278	0.0028	0.0019	0.0009
279	0.0027	0.0019	0.0009
280	0.0027	0.0019	0.0009
281	0.0027	0.0018	0.0008
282	0.0027	0.0018	0.0008

283	0.0026	0.0018	0.0008
284	0.0026	0.0018	0.0008
285	0.0026	0.0018	0.0008
286	0.0026	0.0018	0.0008
287	0.0026	0.0018	0.0008
288	0.0025	0.0017	0.0008

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 1.77

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.66

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 43.1991

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 40.3344

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	100.0	200.0	300.0	400.0
0.083	0.0001	0.01	Q	.	.	.	.
0.167	0.0004	0.05	Q	.	.	.	.
0.250	0.0012	0.11	Q	.	.	.	.
0.333	0.0025	0.19	Q	.	.	.	.
0.417	0.0046	0.31	Q	.	.	.	.
0.500	0.0081	0.50	Q	.	.	.	.
0.583	0.0136	0.80	Q	.	.	.	.
0.667	0.0211	1.08	Q	.	.	.	.
0.750	0.0301	1.31	Q	.	.	.	.
0.833	0.0404	1.50	Q	.	.	.	.
0.917	0.0517	1.65	Q	.	.	.	.
1.000	0.0639	1.77	Q	.	.	.	.
1.083	0.0768	1.87	Q	.	.	.	.
1.167	0.0903	1.96	Q	.	.	.	.
1.250	0.1044	2.04	Q	.	.	.	.
1.333	0.1190	2.12	Q	.	.	.	.
1.417	0.1340	2.18	Q	.	.	.	.
1.500	0.1495	2.25	Q	.	.	.	.
1.583	0.1653	2.30	Q	.	.	.	.
1.667	0.1815	2.35	Q	.	.	.	.
1.750	0.1981	2.40	Q	.	.	.	.
1.833	0.2149	2.45	Q	.	.	.	.
1.917	0.2321	2.49	Q	.	.	.	.
2.000	0.2495	2.53	Q	.	.	.	.

2.083	0.2672	2.57	Q	.	.	.	.
2.167	0.2852	2.61	Q	.	.	.	.
2.250	0.3034	2.65	Q	.	.	.	.
2.333	0.3219	2.68	Q	.	.	.	.
2.417	0.3406	2.71	Q	.	.	.	.
2.500	0.3594	2.74	Q	.	.	.	.
2.583	0.3785	2.77	Q	.	.	.	.
2.667	0.3978	2.80	Q	.	.	.	.
2.750	0.4173	2.83	Q	.	.	.	.
2.833	0.4370	2.86	Q	.	.	.	.
2.917	0.4569	2.89	Q	.	.	.	.
3.000	0.4769	2.91	Q	.	.	.	.
3.083	0.4972	2.94	Q	.	.	.	.
3.167	0.5176	2.96	Q	.	.	.	.
3.250	0.5382	2.99	Q	.	.	.	.
3.333	0.5589	3.01	Q	.	.	.	.
3.417	0.5798	3.04	Q	.	.	.	.
3.500	0.6009	3.06	Q	.	.	.	.
3.583	0.6222	3.08	Q	.	.	.	.
3.667	0.6436	3.11	Q	.	.	.	.
3.750	0.6651	3.13	Q	.	.	.	.
3.833	0.6868	3.15	Q	.	.	.	.
3.917	0.7087	3.17	Q	.	.	.	.
4.000	0.7307	3.20	Q	.	.	.	.
4.083	0.7529	3.22	Q	.	.	.	.
4.167	0.7752	3.24	Q	.	.	.	.
4.250	0.7976	3.26	Q	.	.	.	.
4.333	0.8202	3.28	Q	.	.	.	.
4.417	0.8430	3.30	Q	.	.	.	.
4.500	0.8658	3.32	Q	.	.	.	.
4.583	0.8888	3.34	Q	.	.	.	.
4.667	0.9120	3.36	Q	.	.	.	.
4.750	0.9353	3.38	Q	.	.	.	.
4.833	0.9588	3.41	Q	.	.	.	.
4.917	0.9824	3.43	Q	.	.	.	.
5.000	1.0062	3.45	Q	.	.	.	.

5.083	1.0301	3.47	QV	.	.	.	.
5.167	1.0542	3.50	QV	.	.	.	.
5.250	1.0784	3.52	QV	.	.	.	.
5.333	1.1028	3.54	QV	.	.	.	.
5.417	1.1274	3.57	QV	.	.	.	.
5.500	1.1521	3.59	QV	.	.	.	.
5.583	1.1770	3.62	QV	.	.	.	.
5.667	1.2021	3.64	QV	.	.	.	.
5.750	1.2273	3.66	QV	.	.	.	.
5.833	1.2526	3.68	QV	.	.	.	.
5.917	1.2781	3.70	QV	.	.	.	.
6.000	1.3038	3.72	QV	.	.	.	.
6.083	1.3296	3.75	QV	.	.	.	.
6.167	1.3555	3.77	QV	.	.	.	.
6.250	1.3816	3.79	QV	.	.	.	.
6.333	1.4079	3.81	QV	.	.	.	.
6.417	1.4343	3.84	QV	.	.	.	.
6.500	1.4609	3.86	QV	.	.	.	.
6.583	1.4877	3.89	QV	.	.	.	.
6.667	1.5146	3.91	QV	.	.	.	.
6.750	1.5417	3.94	QV	.	.	.	.
6.833	1.5690	3.96	QV	.	.	.	.
6.917	1.5965	3.99	QV	.	.	.	.
7.000	1.6241	4.01	QV	.	.	.	.
7.083	1.6519	4.04	QV	.	.	.	.
7.167	1.6799	4.07	QV	.	.	.	.
7.250	1.7081	4.09	QV	.	.	.	.
7.333	1.7365	4.12	QV	.	.	.	.
7.417	1.7651	4.15	QV	.	.	.	.
7.500	1.7938	4.18	QV	.	.	.	.
7.583	1.8228	4.21	QV	.	.	.	.
7.667	1.8520	4.24	QV	.	.	.	.
7.750	1.8814	4.27	QV	.	.	.	.
7.833	1.9109	4.30	QV	.	.	.	.
7.917	1.9407	4.33	QV	.	.	.	.
8.000	1.9708	4.36	QV	.	.	.	.

8.083	2.0010	4.39	QV	.	.	.	.
8.167	2.0315	4.42	Q V	.	.	.	.
8.250	2.0622	4.46	Q V	.	.	.	.
8.333	2.0931	4.49	Q V	.	.	.	.
8.417	2.1242	4.52	Q V	.	.	.	.
8.500	2.1556	4.56	Q V	.	.	.	.
8.583	2.1873	4.59	Q V	.	.	.	.
8.667	2.2192	4.63	Q V	.	.	.	.
8.750	2.2513	4.67	Q V	.	.	.	.
8.833	2.2837	4.70	Q V	.	.	.	.
8.917	2.3164	4.74	Q V	.	.	.	.
9.000	2.3493	4.78	Q V	.	.	.	.
9.083	2.3825	4.82	Q V	.	.	.	.
9.167	2.4160	4.86	Q V	.	.	.	.
9.250	2.4498	4.90	Q V	.	.	.	.
9.333	2.4838	4.94	Q V	.	.	.	.
9.417	2.5181	4.99	Q V	.	.	.	.
9.500	2.5528	5.03	Q V	.	.	.	.
9.583	2.5877	5.08	Q V	.	.	.	.
9.667	2.6230	5.12	Q V	.	.	.	.
9.750	2.6586	5.17	Q V	.	.	.	.
9.833	2.6945	5.21	Q V	.	.	.	.
9.917	2.7307	5.26	Q V	.	.	.	.
10.000	2.7673	5.31	Q V	.	.	.	.
10.083	2.8043	5.36	Q V	.	.	.	.
10.167	2.8415	5.41	Q V	.	.	.	.
10.250	2.8792	5.47	Q V	.	.	.	.
10.333	2.9172	5.52	Q V	.	.	.	.
10.417	2.9556	5.57	Q V	.	.	.	.
10.500	2.9944	5.63	Q V	.	.	.	.
10.583	3.0335	5.69	Q V	.	.	.	.
10.667	3.0731	5.75	Q V	.	.	.	.
10.750	3.1131	5.81	Q V	.	.	.	.
10.833	3.1536	5.87	Q V	.	.	.	.
10.917	3.1944	5.93	Q V	.	.	.	.
11.000	3.2357	6.00	Q V	.	.	.	.

11.083	3.2775	6.07	Q	V	.	.	.	.
11.167	3.3197	6.13	Q	V	.	.	.	.
11.250	3.3625	6.20	Q	V	.	.	.	.
11.333	3.4057	6.28	Q	V	.	.	.	.
11.417	3.4494	6.35	Q	V	.	.	.	.
11.500	3.4937	6.43	Q	V	.	.	.	.
11.583	3.5385	6.50	Q	V	.	.	.	.
11.667	3.5838	6.58	Q	V	.	.	.	.
11.750	3.6298	6.67	Q	V	.	.	.	.
11.833	3.6763	6.75	Q	V	.	.	.	.
11.917	3.7234	6.84	Q	V	.	.	.	.
12.000	3.7711	6.93	Q	V	.	.	.	.
12.083	3.8195	7.02	Q	V	.	.	.	.
12.167	3.8684	7.11	Q	V	.	.	.	.
12.250	3.9180	7.19	Q	V	.	.	.	.
12.333	3.9681	7.28	Q	V	.	.	.	.
12.417	4.0187	7.35	Q	V	.	.	.	.
12.500	4.0698	7.41	Q	V	.	.	.	.
12.583	4.1211	7.45	Q	V	.	.	.	.
12.667	4.1728	7.50	Q	V	.	.	.	.
12.750	4.2249	7.56	Q	V	.	.	.	.
12.833	4.2775	7.64	Q	V	.	.	.	.
12.917	4.3308	7.73	Q	V	.	.	.	.
13.000	4.3847	7.84	Q	V	.	.	.	.
13.083	4.4395	7.95	Q	V	.	.	.	.
13.167	4.4950	8.07	Q	V	.	.	.	.
13.250	4.5515	8.20	Q	V	.	.	.	.
13.333	4.6089	8.33	Q	V	.	.	.	.
13.417	4.6673	8.48	Q	V	.	.	.	.
13.500	4.7267	8.63	Q	V	.	.	.	.
13.583	4.7873	8.79	Q	V	.	.	.	.
13.667	4.8490	8.96	Q	V	.	.	.	.
13.750	4.9120	9.15	Q	V	.	.	.	.
13.833	4.9763	9.34	Q	V	.	.	.	.
13.917	5.0420	9.54	Q	V	.	.	.	.
14.000	5.1092	9.75	Q	V	.	.	.	.

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14.083      5.1782     10.02  .Q   V    .         .         .         .
14.167      5.2496     10.37  .Q   V    .         .         .         .
14.250      5.3241     10.81  .Q   V    .         .         .         .
14.333      5.4022     11.34  .Q   V    .         .         .         .
14.417      5.4848     11.99  .Q   V    .         .         .         .
14.500      5.5737     12.91  .Q   V    .         .         .         .
14.583      5.6713     14.17  .Q   V    .         .         .         .
14.667      5.7776     15.43  .Q   V    .         .         .         .
14.750      5.8918     16.58  .Q   V    .         .         .         .
14.833      6.0133     17.64  .Q   V    .         .         .         .
14.917      6.1417     18.65  .Q    V   .         .         .         .
15.000      6.2768     19.62  .Q    V   .         .         .         .
15.083      6.4187     20.60  . Q   V   .         .         .         .
15.167      6.5675     21.61  . Q   V   .         .         .         .
15.250      6.7238     22.69  . Q   V   .         .         .         .
15.333      6.8878     23.82  . Q   V   .         .         .         .
15.417      7.0613     25.18  . Q    V  .         .         .         .
15.500      7.2466     26.91  . Q    V  .         .         .         .
15.583      7.4474     29.15  . Q    V  .         .         .         .
15.667      7.6683     32.09  .  Q   V  .         .         .         .
15.750      7.9177     36.20  .  Q   V  .         .         .         .
15.833      8.2093     42.34  .   Q   V .         .         .         .
15.917      8.5651     51.66  .    Q  V .         .         .         .
16.000      9.0117     64.84  .     Q V .         .         .         .
16.083      9.6116     87.12  .       QV.         .         .         .
16.167     10.4112    116.11  .         VQ        .         .         .
16.250     11.4248    147.16  .         .V  Q     .         .         .
16.333     12.6679    180.50  .         . V     Q .         .         .
16.417     14.1863    220.48  .         .   V     . Q       .         .
16.500     16.0815    275.18  .         .    V    .      Q  .         .
16.583     18.2902    320.70  .         .       V .         . Q       .
16.667     20.3982    306.07  .         .         V         Q         .
16.750     22.2226    264.90  .         .         . V   Q   .         .
16.833     23.7740    225.27  .         .         . QV      .         .
16.917     25.0855    190.43  .         .        Q.   V     .         .
17.000     26.1907    160.48  .         .     Q   .    V    .         .
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17.083     27.1534    139.78  .         .  Q      .     V   .         .
17.167     28.0105    124.45  .         . Q       .      V  .         .
17.250     28.7877    112.86  .         .Q        .       V .         .
17.333     29.4871    101.55  .         Q         .        V.         .
17.417     30.1231     92.35  .        Q.         .        V.         .
17.500     30.7090     85.07  .       Q .         .         V         .
17.583     31.2395     77.03  .      Q  .         .         V         .
17.667     31.7218     70.03  .      Q  .         .         .V        .
17.750     32.1701     65.09  .     Q   .         .         .V        .
17.833     32.5807     59.63  .    Q    .         .         . V       .
17.917     32.9688     56.35  .    Q    .         .         . V       .
18.000     33.3312     52.62  .    Q    .         .         .  V      .
18.083     33.6740     49.78  .   Q     .         .         .  V      .
18.167     33.9911     46.03  .   Q     .         .         .  V      .
18.250     34.2878     43.08  .   Q     .         .         .   V     .
18.333     34.5612     39.71  .  Q      .         .         .   V     .
18.417     34.8138     36.68  .  Q      .         .         .   V     .
18.500     35.0554     35.07  .  Q      .         .         .   V     .
18.583     35.2859     33.47  .  Q      .         .         .   V     .
18.667     35.5071     32.12  .  Q      .         .         .    V    .
18.750     35.7155     30.27  .  Q      .         .         .    V    .
18.833     35.9155     29.04  . Q       .         .         .    V    .
18.917     36.1061     27.67  . Q       .         .         .    V    .
19.000     36.2882     26.44  . Q       .         .         .    V    .
19.083     36.4590     24.80  . Q       .         .         .     V   .
19.167     36.6194     23.29  . Q       .         .         .     V   .
19.250     36.7746     22.53  . Q       .         .         .     V   .
19.333     36.9245     21.77  . Q       .         .         .     V   .
19.417     37.0679     20.83  . Q       .         .         .     V   .
19.500     37.2012     19.35  .Q        .         .         .     V   .
19.583     37.3289     18.54  .Q        .         .         .      V  .
19.667     37.4521     17.89  .Q        .         .         .      V  .
19.750     37.5702     17.15  .Q        .         .         .      V  .
19.833     37.6799     15.93  .Q        .         .         .      V  .
19.917     37.7818     14.79  .Q        .         .         .      V  .
20.000     37.8797     14.22  .Q        .         .         .      V  .
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20.083	37.9737	13.64	.Q . . . V .
20.167	38.0625	12.90	.Q . . . V .
20.250	38.1428	11.66	.Q . . . V .
20.333	38.2197	11.16	.Q . . . V .
20.417	38.2949	10.93	.Q . . . V .
20.500	38.3693	10.80	.Q . . . V .
20.583	38.4438	10.83	.Q . . . V .
20.667	38.5187	10.87	.Q . . . V .
20.750	38.5927	10.75	.Q . . . V .
20.833	38.6658	10.61	.Q . . . V .
20.917	38.7379	10.48	.Q . . . V .
21.000	38.8089	10.30	.Q . . . V .
21.083	38.8786	10.12	.Q . . . V .
21.167	38.9468	9.90	Q . . . V .
21.250	39.0134	9.67	Q . . . V .
21.333	39.0779	9.37	Q . . . V .
21.417	39.1399	9.00	Q . . . V .
21.500	39.1984	8.50	Q . . . V .
21.583	39.2520	7.78	Q . . . V .
21.667	39.2935	6.03	Q . . . V .
21.750	39.3292	5.17	Q . . . V.
21.833	39.3627	4.87	Q . . . V.
21.917	39.3949	4.67	Q . . . V.
22.000	39.4262	4.55	Q . . . V.
22.083	39.4568	4.45	Q . . . V.
22.167	39.4868	4.35	Q . . . V.
22.250	39.5162	4.27	Q . . . V.
22.333	39.5450	4.19	Q . . . V.
22.417	39.5733	4.11	Q . . . V.
22.500	39.6011	4.04	Q . . . V.
22.583	39.6285	3.97	Q . . . V.
22.667	39.6554	3.91	Q . . . V.
22.750	39.6819	3.86	Q . . . V.
22.833	39.7081	3.80	Q . . . V.
22.917	39.7340	3.76	Q . . . V.
23.000	39.7595	3.71	Q . . . V.

23.083	39.7848	3.66	Q	.	.	.	V.
23.167	39.8097	3.62	Q	.	.	.	V.
23.250	39.8343	3.58	Q	.	.	.	V.
23.333	39.8586	3.53	Q	.	.	.	V.
23.417	39.8827	3.49	Q	.	.	.	V.
23.500	39.9065	3.45	Q	.	.	.	V.
23.583	39.9300	3.42	Q	.	.	.	V.
23.667	39.9533	3.38	Q	.	.	.	V.
23.750	39.9763	3.34	Q	.	.	.	V.
23.833	39.9991	3.31	Q	.	.	.	V.
23.917	40.0216	3.27	Q	.	.	.	V.
24.000	40.0439	3.24	Q	.	.	.	V.
24.083	40.0659	3.19	Q	.	.	.	V.
24.167	40.0874	3.12	Q	.	.	.	V.
24.250	40.1083	3.03	Q	.	.	.	V.
24.333	40.1284	2.92	Q	.	.	.	V.
24.417	40.1475	2.78	Q	.	.	.	V.
24.500	40.1651	2.56	Q	.	.	.	V.
24.583	40.1805	2.24	Q	.	.	.	V.
24.667	40.1939	1.94	Q	.	.	.	V.
24.750	40.2056	1.69	Q	.	.	.	V.
24.833	40.2159	1.50	Q	.	.	.	V.
24.917	40.2251	1.34	Q	.	.	.	V.
25.000	40.2334	1.21	Q	.	.	.	V.
25.083	40.2410	1.11	Q	.	.	.	V.
25.167	40.2480	1.01	Q	.	.	.	V.
25.250	40.2544	0.93	Q	.	.	.	V.
25.333	40.2603	0.85	Q	.	.	.	V.
25.417	40.2657	0.79	Q	.	.	.	V.
25.500	40.2707	0.73	Q	.	.	.	V.
25.583	40.2754	0.67	Q	.	.	.	V.
25.667	40.2797	0.63	Q	.	.	.	V.
25.750	40.2837	0.58	Q	.	.	.	V.
25.833	40.2874	0.54	Q	.	.	.	V.
25.917	40.2909	0.50	Q	.	.	.	V.
26.000	40.2941	0.47	Q	.	.	.	V.

26.083	40.2971	0.43	Q	.	.	.	V.
26.167	40.2999	0.40	Q	.	.	.	V.
26.250	40.3025	0.37	Q	.	.	.	V.
26.333	40.3049	0.35	Q	.	.	.	V.
26.417	40.3071	0.33	Q	.	.	.	V.
26.500	40.3092	0.31	Q	.	.	.	V.
26.583	40.3112	0.29	Q	.	.	.	V.
26.667	40.3130	0.27	Q	.	.	.	V.
26.750	40.3148	0.25	Q	.	.	.	V.
26.833	40.3163	0.23	Q	.	.	.	V.
26.917	40.3178	0.21	Q	.	.	.	V.
27.000	40.3192	0.20	Q	.	.	.	V.
27.083	40.3205	0.19	Q	.	.	.	V.
27.167	40.3217	0.17	Q	.	.	.	V.
27.250	40.3228	0.16	Q	.	.	.	V.
27.333	40.3238	0.15	Q	.	.	.	V.
27.417	40.3247	0.14	Q	.	.	.	V.
27.500	40.3256	0.13	Q	.	.	.	V.
27.583	40.3264	0.12	Q	.	.	.	V.
27.667	40.3272	0.11	Q	.	.	.	V.
27.750	40.3279	0.10	Q	.	.	.	V.
27.833	40.3285	0.09	Q	.	.	.	V.
27.917	40.3291	0.09	Q	.	.	.	V.
28.000	40.3296	0.08	Q	.	.	.	V.
28.083	40.3301	0.07	Q	.	.	.	V.
28.167	40.3306	0.07	Q	.	.	.	V.
28.250	40.3310	0.06	Q	.	.	.	V.
28.333	40.3314	0.06	Q	.	.	.	V.
28.417	40.3318	0.06	Q	.	.	.	V.
28.500	40.3322	0.05	Q	.	.	.	V.
28.583	40.3325	0.05	Q	.	.	.	V.
28.667	40.3328	0.04	Q	.	.	.	V.
28.750	40.3331	0.04	Q	.	.	.	V.
28.833	40.3333	0.04	Q	.	.	.	V.
28.917	40.3336	0.03	Q	.	.	.	V.
29.000	40.3338	0.03	Q	.	.	.	V.

```
  29.083     40.3339      0.02  Q          .          .          .        V.
  29.167     40.3341      0.02  Q          .          .          .        V.
  29.250     40.3342      0.02  Q          .          .          .        V.
  29.333     40.3343      0.01  Q          .          .          .        V.
  29.417     40.3343      0.01  Q          .          .          .        V.
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
              0%                             1765.0
             10%                              185.0
             20%                              110.0
             30%                               75.0
             40%                               55.0
             50%                               45.0
             60%                               30.0
             70%                               25.0
             80%                               20.0
             90%                               10.0


 ****************************************************************************
  FLOW PROCESS FROM NODE   7007.00 TO NODE   7007.00 IS CODE = 3.1
 ----------------------------------------------------------------------------
  >>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #2<<<<<
 ============================================================================

                      INFLOW
                    (STREAM 2)
                         |
                         |
                         V                __effective depth
```

```
 -----------          |   (and volume)
|           |    |    |
|           |    |....V........
| detention |<-->|           outflow
|   basin   |    |.........________
 -----------     |    ^    |  \
     |           |  dead   |   basin outlet
     V           | storage |
  OUTFLOW         ---------
(STREAM 2)
```

ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 2

THROUGH A FLOW-THROUGH DETENTION BASIN

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:

DEAD STORAGE(AF) = 0.000

SPECIFIED DEAD STORAGE(AF) FILLED = 0.000

SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000

DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	80.00	10.000
3	2.00	160.00	20.000
4	3.00	240.00	30.000
5	4.00	321.00	42.000

==

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):

(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;

MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
14.083	0.000	10.02	0.00	0.10	7.8	0.979
14.167	0.000	10.37	0.00	0.10	7.9	0.996
14.250	0.000	10.81	0.00	0.10	8.0	1.015
14.333	0.000	11.34	0.00	0.10	8.2	1.037
14.417	0.000	11.99	0.00	0.11	8.4	1.062
14.500	0.000	12.91	0.00	0.11	8.6	1.091
14.583	0.000	14.17	0.00	0.11	8.9	1.128
14.667	0.000	15.43	0.00	0.12	9.2	1.171
14.750	0.000	16.58	0.00	0.12	9.6	1.219
14.833	0.000	17.64	0.00	0.13	10.0	1.272
14.917	0.000	18.65	0.00	0.13	10.4	1.329
15.000	0.000	19.62	0.00	0.14	10.9	1.389
15.083	0.000	20.60	0.00	0.15	11.4	1.453
15.167	0.000	21.61	0.00	0.15	11.9	1.519
15.250	0.000	22.69	0.00	0.16	12.4	1.590
15.333	0.000	23.82	0.00	0.17	13.0	1.664
15.417	0.000	25.18	0.00	0.17	13.6	1.744
15.500	0.000	26.91	0.00	0.18	14.3	1.831
15.583	0.000	29.15	0.00	0.19	15.0	1.928
15.667	0.000	32.09	0.00	0.20	15.9	2.040
15.750	0.000	36.20	0.00	0.22	16.9	2.173
15.833	0.000	42.34	0.00	0.23	18.1	2.340
15.917	0.000	51.66	0.00	0.26	19.6	2.561
16.000	0.000	64.84	0.00	0.29	21.7	2.858
16.083	0.000	87.12	0.00	0.33	24.6	3.289
16.167	0.000	116.11	0.00	0.39	28.7	3.891
16.250	0.000	147.16	0.00	0.47	34.2	4.669
16.333	0.000	180.50	0.00	0.56	41.2	5.628
16.417	0.000	220.48	0.00	0.68	49.7	6.804
16.500	0.000	275.18	0.00	0.83	60.4	8.284

16.583	0.000	320.70	0.00	1.00	73.1	9.989
16.667	0.000	306.07	0.00	1.15	86.0	11.505
16.750	0.000	264.90	0.00	1.27	96.7	12.663
16.833	0.000	225.27	0.00	1.35	104.6	13.494
16.917	0.000	190.43	0.00	1.40	110.2	14.047
17.000	0.000	160.48	0.00	1.44	113.7	14.369
17.083	0.000	139.78	0.00	1.45	115.6	14.536
17.167	0.000	124.45	0.00	1.46	116.5	14.590
17.250	0.000	112.86	0.00	1.46	116.6	14.564
17.333	0.000	101.55	0.00	1.45	116.1	14.464
17.417	0.000	92.35	0.00	1.43	115.1	14.308
17.500	0.000	85.07	0.00	1.41	113.7	14.111
17.583	0.000	77.03	0.00	1.39	111.9	13.870
17.667	0.000	70.03	0.00	1.36	109.9	13.596
17.750	0.000	65.09	0.00	1.33	107.6	13.303
17.833	0.000	59.63	0.00	1.30	105.2	12.990
17.917	0.000	56.35	0.00	1.27	102.6	12.671
18.000	0.000	52.62	0.00	1.23	100.1	12.344
18.083	0.000	49.78	0.00	1.20	97.4	12.016
18.167	0.000	46.03	0.00	1.17	94.8	11.680
18.250	0.000	43.08	0.00	1.13	92.1	11.342
18.333	0.000	39.71	0.00	1.10	89.4	11.000
18.417	0.000	36.68	0.00	1.07	86.6	10.656
18.500	0.000	35.07	0.00	1.03	83.9	10.320
18.583	0.000	33.47	0.00	1.00	81.2	9.991
18.667	0.000	32.12	0.00	0.97	78.6	9.671
18.750	0.000	30.27	0.00	0.94	76.1	9.355
18.833	0.000	29.04	0.00	0.90	73.6	9.048
18.917	0.000	27.67	0.00	0.87	71.2	8.748
19.000	0.000	26.44	0.00	0.85	68.8	8.456
19.083	0.000	24.80	0.00	0.82	66.5	8.169
19.167	0.000	23.29	0.00	0.79	64.2	7.887
19.250	0.000	22.53	0.00	0.76	62.0	7.615
19.333	0.000	21.77	0.00	0.74	59.9	7.353
19.417	0.000	20.83	0.00	0.71	57.8	7.098
19.500	0.000	19.35	0.00	0.68	55.8	6.847

19.583	0.000	18.54	0.00	0.66	53.8	6.605
19.667	0.000	17.89	0.00	0.64	51.9	6.370
19.750	0.000	17.15	0.00	0.61	50.1	6.144
19.833	0.000	15.93	0.00	0.59	48.3	5.921
19.917	0.000	14.79	0.00	0.57	46.5	5.703

PROCESS SUMMARY OF STORAGE:

INFLOW VOLUME = 40.334 AF

BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)

OUTFLOW VOLUME = 40.334 AF

LOSS VOLUME = 0.000 AF

****

FLOW PROCESS FROM NODE 7007.00 TO NODE 7007.00 IS CODE = 7

>>>>>STREAM NUMBER 1 ADDED TO STREAM NUMBER 2<<<<<

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FLOW PROCESS FROM NODE 7007.00 TO NODE 7008.00 IS CODE = 5.1

>>>>>MODEL CHANNEL ROUTING OF STREAM #2 BY THE TRANSLATION METHOD<<<<<

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THE TRANSLATION MODEL NEGLECTS ALL STORAGE ATTENUATION EFFECTS,

AND MOVES THE STREAM 2 RUNOFF HYDROGRAPH FORWARD IN TIME.

ASSUMED REGULAR CHANNEL INFORMATION:

BASEWIDTH(FT) = 100.00 CHANNEL Z = 5.00

UPSTREAM ELEVATION(FT) = 456.03

DOWNSTREAM ELEVATION(FT) = 413.38

CHANNEL LENGTH(FT) = 5325.30 MANNING'S FACTOR = 0.050

CONSTANT LOSS RATE(CFS) = 0.00

MEAN-FLOW RATE NORMAL-DEPTH FLOW VELOCITIES(FPS) ARE AS FOLLOWS:

	(FLOW RATE (CFS))	[FLOW VELOCITY (FPS)]
AVERAGED PEAK 5-MINUTE:	(651.7).......	[3.56]
AVERAGED PEAK 15-MINUTE:	(603.5).......	[3.47]
AVERAGED PEAK 30-MINUTE:	(530.1).......	[3.32]
AVERAGED PEAK 1-HOUR:	(425.9).......	[3.06]
AVERAGED PEAK 3-HOUR:	(252.6).......	[2.53]
AVERAGED PEAK 6-HOUR:	(156.2).......	[2.08]
AVERAGED PEAK 24-HOUR:	(48.2).......	[1.32]

USER-SPECIFIED CHANNEL AVERAGE FLOW VELOCITY(FPS) = 2.790

HYDROGRAPH TRANSLATION TIME

= (CHANNEL LENGTH)/(AVERAGE FLOW VELOCITY)

= (5325.30)/(2.790) = 0.530 HRS

TRANSLATION METHOD CHANNEL ROUTING RESULTS:

MODEL TIME (HRS)	INFLOW (STREAM 2) (CFS)	ROUTED FLOW (CFS)	OUTFLOW LESS LOSS (STREAM 2) (CFS)
14.000	19.71	17.53	17.53
14.083	20.20	17.82	17.82
14.167	20.86	18.14	18.14
14.250	21.70	18.47	18.47
14.333	22.78	18.81	18.81
14.417	24.40	19.18	19.18
14.500	26.50	19.57	19.57
14.583	28.44	20.02	20.02
14.667	30.21	20.62	20.62
14.750	31.87	21.39	21.39
14.833	33.49	22.39	22.39
14.917	35.12	23.81	23.81
15.000	36.82	25.74	25.74
15.083	38.57	27.74	27.74
15.167	40.43	29.57	29.57
15.250	42.40	31.27	31.27
15.333	44.52	32.90	32.90

15.417	46.97	34.53	34.53
15.500	50.07	36.20	36.20
15.583	54.17	37.94	37.94
15.667	59.93	39.76	39.76
15.750	69.00	41.68	41.68
15.833	82.89	43.75	43.75
15.917	103.06	46.08	46.08
16.000	133.22	48.95	48.95
16.083	186.64	52.69	52.69
16.167	262.66	57.84	57.84
16.250	344.66	65.71	65.71
16.333	441.82	77.86	77.86
16.417	573.92	95.75	95.75
16.500	651.73	122.29	122.29
16.583	584.93	167.28	167.28
16.667	499.95	235.11	235.11
16.750	427.98	314.95	314.95
16.833	373.67	406.61	406.61
16.917	338.23	526.05	526.05
17.000	312.96	623.54	623.54
17.083	289.43	609.14	609.14
17.167	272.01	530.75	530.75
17.250	254.72	454.06	454.06
17.333	240.53	393.35	393.35
17.417	226.80	351.07	351.07
17.500	215.91	322.12	322.12
17.583	205.31	297.96	297.96
17.667	195.47	278.32	278.32
17.750	185.06	260.98	260.98
17.833	174.64	245.67	245.67
17.917	166.14	231.77	231.77
18.000	159.56	219.86	219.86
18.083	153.40	209.15	209.15
18.167	146.65	199.03	199.03
18.250	140.97	188.83	188.83
18.333	135.21	178.42	178.42

18.417	128.64	169.22	169.22
18.500	123.20	161.95	161.95
18.583	118.83	155.64	155.64
18.667	113.97	149.10	149.10
18.750	108.34	143.03	143.03
18.833	104.24	137.30	137.30
18.917	100.18	131.02	131.02
19.000	94.92	125.17	125.17
19.083	90.62	120.41	120.41
19.167	87.06	115.73	115.73
19.250	83.04	110.38	110.38
19.333	78.51	105.73	105.73
19.417	75.77	101.65	101.65
19.500	73.48	96.83	96.83
19.583	71.67	92.18	92.18
19.667	69.74	88.35	88.35
19.750	67.63	84.50	84.50
19.833	65.53	80.15	80.15
19.917	63.38	76.76	76.76
20.000	61.23	74.31	74.31

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PROCESS SUMMARY OF STORAGE:

INFLOW VOLUME = 96.467 AF

OUTFLOW VOLUME = 96.467 AF

LOSS VOLUME = 0.000 AF

****

FLOW PROCESS FROM NODE 7008.00 TO NODE 7008.00 IS CODE = 1

>>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<

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(UNIT-HYDROGRAPH ADDED TO STREAM #3)

WATERSHED AREA = 176.030 ACRES

BASEFLOW =   0.000 CFS/SQUARE-MILE

*USER ENTERED "LAG" TIME =   0.890 HOURS

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.590

LOW LOSS FRACTION = 0.778

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.16

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.992

30-MINUTE FACTOR = 0.992

1-HOUR FACTOR = 0.992

3-HOUR FACTOR = 0.999

6-HOUR FACTOR = 0.999

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME =   9.363

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UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.412	8.771
2	1.402	21.067

3	2.973	33.461
4	5.127	45.855
5	7.857	58.117
6	11.623	80.173
7	17.641	128.112
8	26.410	186.678
9	35.227	187.705
10	42.808	161.393
11	48.864	128.910
12	53.993	109.183
13	58.244	90.501
14	61.697	73.514
15	64.637	62.596
16	67.215	54.869
17	69.579	50.325
18	71.748	46.183
19	73.633	40.138
20	75.335	36.221
21	76.947	34.324
22	78.451	32.021
23	79.709	26.777
24	80.945	26.309
25	82.075	24.062
26	83.087	21.530
27	84.093	21.420
28	85.019	19.719
29	85.918	19.137
30	86.787	18.498
31	87.546	16.171
32	88.295	15.942
33	88.958	14.112
34	89.520	11.963
35	90.080	11.928
36	90.614	11.364
37	91.138	11.159
38	91.648	10.857

39	92.103	9.681
40	92.553	9.574
41	92.985	9.206
42	93.397	8.770
43	93.806	8.695
44	94.148	7.291
45	94.466	6.777
46	94.785	6.776
47	95.103	6.781
48	95.421	6.772
49	95.707	6.075
50	95.950	5.187
51	96.194	5.182
52	96.437	5.178
53	96.681	5.196
54	96.911	4.885
55	97.085	3.721
56	97.254	3.588
57	97.422	3.579
58	97.591	3.588
59	97.757	3.544
60	97.871	2.425
61	97.964	1.989
62	98.058	1.998
63	98.152	1.998
64	98.246	1.989
65	98.347	2.158
66	98.460	2.398
67	98.572	2.389
68	98.684	2.389
69	98.796	2.389
70	98.909	2.398
71	99.021	2.389
72	99.133	2.389
73	99.246	2.389
74	99.358	2.389

75	99.470	2.389
76	99.582	2.389
77	99.694	2.389
78	99.807	2.389
79	99.919	2.389
80	100.000	1.727

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0020	0.0006
13	0.0026	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0038	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0040	0.0031	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0069	0.0054	0.0015
146	0.0070	0.0054	0.0016
147	0.0072	0.0056	0.0016
148	0.0072	0.0056	0.0016
149	0.0074	0.0058	0.0016
150	0.0075	0.0058	0.0017
151	0.0077	0.0060	0.0017
152	0.0078	0.0061	0.0017
153	0.0080	0.0062	0.0018
154	0.0081	0.0063	0.0018
155	0.0084	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0087	0.0068	0.0019
158	0.0089	0.0069	0.0020
159	0.0092	0.0071	0.0020
160	0.0093	0.0072	0.0021
161	0.0096	0.0075	0.0021
162	0.0098	0.0076	0.0022
163	0.0101	0.0079	0.0023
164	0.0103	0.0080	0.0023
165	0.0107	0.0083	0.0024
166	0.0109	0.0085	0.0024
167	0.0114	0.0089	0.0025
168	0.0116	0.0091	0.0026
169	0.0196	0.0153	0.0044
170	0.0200	0.0156	0.0044
171	0.0208	0.0162	0.0046
172	0.0213	0.0166	0.0047
173	0.0223	0.0173	0.0049
174	0.0228	0.0177	0.0051

175	0.0240	0.0186	0.0053
176	0.0246	0.0191	0.0055
177	0.0260	0.0203	0.0058
178	0.0268	0.0209	0.0060
179	0.0286	0.0222	0.0063
180	0.0296	0.0230	0.0066
181	0.0319	0.0248	0.0071
182	0.0332	0.0258	0.0074
183	0.0363	0.0282	0.0081
184	0.0381	0.0297	0.0085
185	0.0628	0.0488	0.0139
186	0.0660	0.0492	0.0168
187	0.0738	0.0492	0.0247
188	0.0791	0.0492	0.0299
189	0.0988	0.0492	0.0496
190	0.1095	0.0492	0.0603
191	0.1480	0.0492	0.0988
192	0.1939	0.0492	0.1447
193	0.4762	0.0492	0.4271
194	0.1244	0.0492	0.0753
195	0.0853	0.0492	0.0361
196	0.0696	0.0492	0.0204
197	0.0402	0.0313	0.0089
198	0.0347	0.0270	0.0077
199	0.0307	0.0239	0.0068
200	0.0277	0.0215	0.0061
201	0.0253	0.0197	0.0056
202	0.0234	0.0182	0.0052
203	0.0218	0.0169	0.0048
204	0.0204	0.0159	0.0045
205	0.0119	0.0093	0.0026
206	0.0112	0.0087	0.0025
207	0.0105	0.0082	0.0023
208	0.0100	0.0077	0.0022
209	0.0095	0.0074	0.0021
210	0.0090	0.0070	0.0020

211	0.0086	0.0067	0.0019
212	0.0082	0.0064	0.0018
213	0.0079	0.0062	0.0018
214	0.0076	0.0059	0.0017
215	0.0073	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0040	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0039	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0031	0.0025	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0030	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0006
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0022	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.02

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.41

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 29.6648

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 20.6220

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0001	0.02	Q	.	.	.	.
0.250	0.0004	0.04	Q	.	.	.	.
0.333	0.0008	0.06	Q	.	.	.	.
0.417	0.0015	0.09	Q	.	.	.	.
0.500	0.0024	0.14	Q	.	.	.	.
0.583	0.0039	0.21	Q	.	.	.	.
0.667	0.0061	0.32	Q	.	.	.	.
0.750	0.0090	0.42	Q	.	.	.	.
0.833	0.0125	0.51	Q	.	.	.	.
0.917	0.0166	0.59	Q	.	.	.	.
1.000	0.0211	0.65	Q	.	.	.	.
1.083	0.0259	0.71	Q	.	.	.	.
1.167	0.0311	0.75	Q	.	.	.	.
1.250	0.0365	0.79	Q	.	.	.	.
1.333	0.0422	0.82	Q	.	.	.	.
1.417	0.0480	0.85	Q	.	.	.	.
1.500	0.0541	0.88	Q	.	.	.	.
1.583	0.0604	0.91	Q	.	.	.	.
1.667	0.0668	0.93	Q	.	.	.	.
1.750	0.0734	0.96	Q	.	.	.	.
1.833	0.0801	0.98	Q	.	.	.	.
1.917	0.0870	1.00	Q	.	.	.	.
2.000	0.0940	1.02	Q	.	.	.	.

2.083	0.1011	1.03	Q	.	.	.	.
2.167	0.1084	1.05	Q	.	.	.	.
2.250	0.1157	1.07	Q	.	.	.	.
2.333	0.1232	1.08	Q	.	.	.	.
2.417	0.1308	1.10	Q	.	.	.	.
2.500	0.1384	1.11	Q	.	.	.	.
2.583	0.1462	1.13	Q	.	.	.	.
2.667	0.1541	1.14	Q	.	.	.	.
2.750	0.1620	1.16	Q	.	.	.	.
2.833	0.1701	1.17	Q	.	.	.	.
2.917	0.1782	1.18	Q	.	.	.	.
3.000	0.1864	1.19	Q	.	.	.	.
3.083	0.1947	1.20	Q	.	.	.	.
3.167	0.2031	1.22	Q	.	.	.	.
3.250	0.2115	1.23	Q	.	.	.	.
3.333	0.2201	1.24	Q	.	.	.	.
3.417	0.2287	1.25	Q	.	.	.	.
3.500	0.2373	1.26	Q	.	.	.	.
3.583	0.2461	1.27	Q	.	.	.	.
3.667	0.2549	1.28	Q	.	.	.	.
3.750	0.2638	1.29	Q	.	.	.	.
3.833	0.2728	1.30	Q	.	.	.	.
3.917	0.2818	1.31	Q	.	.	.	.
4.000	0.2909	1.32	Q	.	.	.	.
4.083	0.3001	1.33	Q	.	.	.	.
4.167	0.3094	1.34	Q	.	.	.	.
4.250	0.3187	1.35	Q	.	.	.	.
4.333	0.3280	1.36	Q	.	.	.	.
4.417	0.3375	1.37	Q	.	.	.	.
4.500	0.3470	1.38	Q	.	.	.	.
4.583	0.3566	1.39	Q	.	.	.	.
4.667	0.3662	1.40	Q	.	.	.	.
4.750	0.3759	1.41	Q	.	.	.	.
4.833	0.3857	1.42	Q	.	.	.	.
4.917	0.3955	1.43	Q	.	.	.	.
5.000	0.4054	1.44	Q	.	.	.	.

5.083	0.4154	1.45	Q	.	.	.	.
5.167	0.4254	1.46	Q	.	.	.	.
5.250	0.4355	1.46	Q	.	.	.	.
5.333	0.4457	1.47	Q	.	.	.	.
5.417	0.4559	1.48	Q	.	.	.	.
5.500	0.4662	1.49	Q	.	.	.	.
5.583	0.4765	1.50	Q	.	.	.	.
5.667	0.4869	1.51	Q	.	.	.	.
5.750	0.4974	1.52	Q	.	.	.	.
5.833	0.5080	1.53	Q	.	.	.	.
5.917	0.5186	1.54	QV	.	.	.	.
6.000	0.5293	1.55	QV	.	.	.	.
6.083	0.5401	1.56	QV	.	.	.	.
6.167	0.5509	1.57	QV	.	.	.	.
6.250	0.5618	1.59	QV	.	.	.	.
6.333	0.5728	1.60	QV	.	.	.	.
6.417	0.5839	1.61	QV	.	.	.	.
6.500	0.5950	1.62	QV	.	.	.	.
6.583	0.6063	1.63	QV	.	.	.	.
6.667	0.6176	1.64	QV	.	.	.	.
6.750	0.6289	1.65	QV	.	.	.	.
6.833	0.6404	1.66	QV	.	.	.	.
6.917	0.6519	1.67	QV	.	.	.	.
7.000	0.6635	1.68	QV	.	.	.	.
7.083	0.6752	1.69	QV	.	.	.	.
7.167	0.6869	1.71	QV	.	.	.	.
7.250	0.6987	1.72	QV	.	.	.	.
7.333	0.7106	1.73	QV	.	.	.	.
7.417	0.7226	1.74	QV	.	.	.	.
7.500	0.7347	1.75	QV	.	.	.	.
7.583	0.7468	1.76	QV	.	.	.	.
7.667	0.7590	1.78	QV	.	.	.	.
7.750	0.7713	1.79	QV	.	.	.	.
7.833	0.7837	1.80	QV	.	.	.	.
7.917	0.7962	1.81	QV	.	.	.	.
8.000	0.8088	1.83	QV	.	.	.	.

8.083	0.8215	1.84	QV	.	.	.	.
8.167	0.8342	1.85	QV	.	.	.	.
8.250	0.8471	1.87	QV	.	.	.	.
8.333	0.8600	1.88	QV	.	.	.	.
8.417	0.8730	1.89	QV	.	.	.	.
8.500	0.8862	1.91	QV	.	.	.	.
8.583	0.8994	1.92	QV	.	.	.	.
8.667	0.9128	1.94	QV	.	.	.	.
8.750	0.9262	1.95	QV	.	.	.	.
8.833	0.9398	1.97	QV	.	.	.	.
8.917	0.9534	1.98	QV	.	.	.	.
9.000	0.9672	2.00	QV	.	.	.	.
9.083	0.9811	2.02	QV	.	.	.	.
9.167	0.9951	2.03	QV	.	.	.	.
9.250	1.0092	2.05	QV	.	.	.	.
9.333	1.0234	2.07	QV	.	.	.	.
9.417	1.0378	2.08	Q V	.	.	.	.
9.500	1.0522	2.10	Q V	.	.	.	.
9.583	1.0668	2.12	Q V	.	.	.	.
9.667	1.0816	2.14	Q V	.	.	.	.
9.750	1.0964	2.16	Q V	.	.	.	.
9.833	1.1114	2.18	Q V	.	.	.	.
9.917	1.1265	2.20	Q V	.	.	.	.
10.000	1.1418	2.22	Q V	.	.	.	.
10.083	1.1572	2.24	Q V	.	.	.	.
10.167	1.1728	2.26	Q V	.	.	.	.
10.250	1.1885	2.28	Q V	.	.	.	.
10.333	1.2043	2.30	Q V	.	.	.	.
10.417	1.2203	2.32	Q V	.	.	.	.
10.500	1.2365	2.35	Q V	.	.	.	.
10.583	1.2528	2.37	Q V	.	.	.	.
10.667	1.2693	2.39	Q V	.	.	.	.
10.750	1.2860	2.42	Q V	.	.	.	.
10.833	1.3028	2.44	Q V	.	.	.	.
10.917	1.3198	2.47	Q V	.	.	.	.
11.000	1.3370	2.50	Q V	.	.	.	.

11.083	1.3544	2.52	Q V	.	.	.	.
11.167	1.3719	2.55	Q V	.	.	.	.
11.250	1.3897	2.58	Q V	.	.	.	.
11.333	1.4077	2.61	Q V	.	.	.	.
11.417	1.4258	2.64	Q V	.	.	.	.
11.500	1.4442	2.67	Q V	.	.	.	.
11.583	1.4628	2.70	Q V	.	.	.	.
11.667	1.4817	2.73	Q V	.	.	.	.
11.750	1.5007	2.77	Q V	.	.	.	.
11.833	1.5200	2.80	Q V	.	.	.	.
11.917	1.5396	2.84	Q V	.	.	.	.
12.000	1.5594	2.87	Q V	.	.	.	.
12.083	1.5794	2.91	Q V	.	.	.	.
12.167	1.5997	2.95	Q V	.	.	.	.
12.250	1.6202	2.98	Q V	.	.	.	.
12.333	1.6410	3.02	Q V	.	.	.	.
12.417	1.6620	3.05	Q V	.	.	.	.
12.500	1.6832	3.08	Q V	.	.	.	.
12.583	1.7047	3.11	Q V	.	.	.	.
12.667	1.7262	3.13	Q V	.	.	.	.
12.750	1.7479	3.15	Q V	.	.	.	.
12.833	1.7698	3.18	Q V	.	.	.	.
12.917	1.7919	3.21	Q V	.	.	.	.
13.000	1.8143	3.25	Q V	.	.	.	.
13.083	1.8369	3.29	Q V	.	.	.	.
13.167	1.8599	3.34	Q V	.	.	.	.
13.250	1.8832	3.38	Q V	.	.	.	.
13.333	1.9069	3.44	Q V	.	.	.	.
13.417	1.9310	3.49	Q V	.	.	.	.
13.500	1.9554	3.55	Q V	.	.	.	.
13.583	1.9803	3.62	Q V	.	.	.	.
13.667	2.0057	3.68	Q V	.	.	.	.
13.750	2.0315	3.75	Q V	.	.	.	.
13.833	2.0579	3.83	Q V	.	.	.	.
13.917	2.0848	3.91	Q V	.	.	.	.
14.000	2.1123	3.99	Q V	.	.	.	.

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14.083      2.1404      4.09  Q   V     .         .         .         .
14.167      2.1695      4.22  Q   V     .         .         .         .
14.250      2.1996      4.38  Q   V     .         .         .         .
14.333      2.2310      4.56  Q   V     .         .         .         .
14.417      2.2639      4.77  Q   V     .         .         .         .
14.500      2.2985      5.03  .Q  V     .         .         .         .
14.583      2.3356      5.38  .Q  V     .         .         .         .
14.667      2.3758      5.84  .Q  V     .         .         .         .
14.750      2.4192      6.32  .Q  V     .         .         .         .
14.833      2.4659      6.77  .Q  V     .         .         .         .
14.917      2.5154      7.19  .Q  V     .         .         .         .
15.000      2.5678      7.61  .Q  V     .         .         .         .
15.083      2.6230      8.01  .Q   V    .         .         .         .
15.167      2.6809      8.42  .Q   V    .         .         .         .
15.250      2.7418      8.83  .Q   V    .         .         .         .
15.333      2.8056      9.27  .Q   V    .         .         .         .
15.417      2.8730      9.78  .Q   V    .         .         .         .
15.500      2.9447     10.42  . Q  V    .         .         .         .
15.583      3.0221     11.23  . Q  V    .         .         .         .
15.667      3.1070     12.32  . Q   V   .         .         .         .
15.750      3.2024     13.86  . Q   V   .         .         .         .
15.833      3.3131     16.07  .  Q  V   .         .         .         .
15.917      3.4470     19.45  .  Q  V   .         .         .         .
16.000      3.6172     24.71  .   Q  V  .         .         .         .
16.083      3.8546     34.47  .     QV  .         .         .         .
16.167      4.1765     46.74  .       VQ.         .         .         .
16.250      4.5902     60.07  .       V . Q       .         .         .
16.333      5.1038     74.57  .        V.   Q     .         .         .
16.417      5.7258     90.32  .         .V      Q .         .         .
16.500      6.4875    110.60  .         . V       . Q       .         .
16.583      7.4327    137.24  .         .   V     .      Q  .         .
16.667      8.5368    160.31  .         .     V   .         . Q       .
16.750      9.6206    157.38  .         .       V .         .Q        .
16.833     10.5873    140.36  .         .         V       Q .         .
16.917     11.4117    119.70  .         .         . VQ      .         .
17.000     12.1227    103.25  .         .         Q  V      .         .
```

```
17.083     12.7323     88.50  .         .      Q  .   V     .         .
17.167     13.2555     75.97  .         .    Q    .    V    .         .
17.250     13.7161     66.89  .         .  Q      .     V   .         .
17.333     14.1298     60.06  .         . Q       .      V  .         .
17.417     14.5086     55.00  .         .Q        .       V .         .
17.500     14.8562     50.48  .         Q         .       V .         .
17.583     15.1708     45.67  .        Q.         .        V.         .
17.667     15.4591     41.87  .       Q .         .        V.         .
17.750     15.7272     38.93  .      Q  .         .         V         .
17.833     15.9753     36.02  .      Q  .         .         V         .
17.917     16.1995     32.56  .     Q   .         .         .V        .
18.000     16.4116     30.79  .     Q   .         .         .V        .
18.083     16.6092     28.69  .    Q    .         .         . V       .
18.167     16.7931     26.72  .    Q    .         .         . V       .
18.250     16.9696     25.62  .    Q    .         .         . V       .
18.333     17.1359     24.15  .   Q     .         .         .  V      .
18.417     17.2946     23.03  .   Q     .         .         .  V      .
18.500     17.4452     21.88  .   Q     .         .         .  V      .
18.583     17.5847     20.25  .   Q     .         .         .   V     .
18.667     17.7175     19.27  .  Q      .         .         .   V     .
18.750     17.8404     17.86  .  Q      .         .         .   V     .
18.833     17.9541     16.50  .  Q      .         .         .   V     .
18.917     18.0638     15.93  .  Q      .         .         .    V    .
19.000     18.1691     15.29  .  Q      .         .         .    V    .
19.083     18.2708     14.77  . Q       .         .         .    V    .
19.167     18.3687     14.22  . Q       .         .         .    V    .
19.250     18.4612     13.42  . Q       .         .         .    V    .
19.333     18.5506     12.98  . Q       .         .         .    V    .
19.417     18.6365     12.48  . Q       .         .         .     V   .
19.500     18.7187     11.94  . Q       .         .         .     V   .
19.583     18.7978     11.49  . Q       .         .         .     V   .
19.667     18.8712     10.65  . Q       .         .         .     V   .
19.750     18.9412     10.17  . Q       .         .         .     V   .
19.833     19.0095      9.91  .Q        .         .         .     V   .
19.917     19.0760      9.66  .Q        .         .         .      V  .
20.000     19.1404      9.35  .Q        .         .         .      V  .
```

20.083	19.2011	8.81	.Q	.	.	.	V .
20.167	19.2580	8.26	.Q	.	.	.	V .
20.250	19.3132	8.02	.Q	.	.	.	V .
20.333	19.3669	7.80	.Q	.	.	.	V .
20.417	19.4189	7.54	.Q	.	.	.	V .
20.500	19.4681	7.14	.Q	.	.	.	V .
20.583	19.5129	6.51	.Q	.	.	.	V .
20.667	19.5558	6.23	.Q	.	.	.	V .
20.750	19.5974	6.03	.Q	.	.	.	V .
20.833	19.6375	5.82	.Q	.	.	.	V .
20.917	19.6757	5.55	.Q	.	.	.	V .
21.000	19.7098	4.96	Q	.	.	.	V .
21.083	19.7419	4.65	Q	.	.	.	V .
21.167	19.7732	4.55	Q	.	.	.	V .
21.250	19.8042	4.50	Q	.	.	.	V .
21.333	19.8350	4.48	Q	.	.	.	V .
21.417	19.8662	4.52	Q	.	.	.	V .
21.500	19.8977	4.58	Q	.	.	.	V .
21.583	19.9291	4.55	Q	.	.	.	V .
21.667	19.9602	4.51	Q	.	.	.	V .
21.750	19.9910	4.47	Q	.	.	.	V .
21.833	20.0215	4.43	Q	.	.	.	V .
21.917	20.0516	4.38	Q	.	.	.	V .
22.000	20.0815	4.33	Q	.	.	.	V .
22.083	20.1109	4.28	Q	.	.	.	V.
22.167	20.1399	4.21	Q	.	.	.	V.
22.250	20.1683	4.13	Q	.	.	.	V.
22.333	20.1960	4.02	Q	.	.	.	V.
22.417	20.2227	3.88	Q	.	.	.	V.
22.500	20.2481	3.69	Q	.	.	.	V.
22.583	20.2716	3.40	Q	.	.	.	V.
22.667	20.2912	2.85	Q	.	.	.	V.
22.750	20.3053	2.05	Q	.	.	.	V.
22.833	20.3183	1.88	Q	.	.	.	V.
22.917	20.3306	1.79	Q	.	.	.	V.
23.000	20.3425	1.73	Q	.	.	.	V.

23.083	20.3541	1.69	Q	.	.	.	V.
23.167	20.3656	1.66	Q	.	.	.	V.
23.250	20.3768	1.63	Q	.	.	.	V.
23.333	20.3878	1.60	Q	.	.	.	V.
23.417	20.3987	1.58	Q	.	.	.	V.
23.500	20.4094	1.55	Q	.	.	.	V.
23.583	20.4199	1.53	Q	.	.	.	V.
23.667	20.4302	1.50	Q	.	.	.	V.
23.750	20.4404	1.48	Q	.	.	.	V.
23.833	20.4506	1.47	Q	.	.	.	V.
23.917	20.4605	1.45	Q	.	.	.	V.
24.000	20.4704	1.43	Q	.	.	.	V.
24.083	20.4801	1.41	Q	.	.	.	V.
24.167	20.4897	1.39	Q	.	.	.	V.
24.250	20.4990	1.35	Q	.	.	.	V.
24.333	20.5080	1.31	Q	.	.	.	V.
24.417	20.5168	1.27	Q	.	.	.	V.
24.500	20.5251	1.21	Q	.	.	.	V.
24.583	20.5328	1.12	Q	.	.	.	V.
24.667	20.5398	1.01	Q	.	.	.	V.
24.750	20.5459	0.89	Q	.	.	.	V.
24.833	20.5514	0.79	Q	.	.	.	V.
24.917	20.5563	0.71	Q	.	.	.	V.
25.000	20.5608	0.65	Q	.	.	.	V.
25.083	20.5648	0.59	Q	.	.	.	V.
25.167	20.5685	0.54	Q	.	.	.	V.
25.250	20.5720	0.50	Q	.	.	.	V.
25.333	20.5752	0.46	Q	.	.	.	V.
25.417	20.5782	0.43	Q	.	.	.	V.
25.500	20.5809	0.40	Q	.	.	.	V.
25.583	20.5835	0.37	Q	.	.	.	V.
25.667	20.5859	0.35	Q	.	.	.	V.
25.750	20.5882	0.33	Q	.	.	.	V.
25.833	20.5903	0.31	Q	.	.	.	V.
25.917	20.5922	0.29	Q	.	.	.	V.
26.000	20.5941	0.27	Q	.	.	.	V.

26.083	20.5958	0.25	Q	.	.	.	V.
26.167	20.5975	0.24	Q	.	.	.	V.
26.250	20.5990	0.22	Q	.	.	.	V.
26.333	20.6005	0.21	Q	.	.	.	V.
26.417	20.6018	0.20	Q	.	.	.	V.
26.500	20.6031	0.19	Q	.	.	.	V.
26.583	20.6043	0.17	Q	.	.	.	V.
26.667	20.6055	0.16	Q	.	.	.	V.
26.750	20.6065	0.15	Q	.	.	.	V.
26.833	20.6075	0.15	Q	.	.	.	V.
26.917	20.6085	0.14	Q	.	.	.	V.
27.000	20.6094	0.13	Q	.	.	.	V.
27.083	20.6102	0.12	Q	.	.	.	V.
27.167	20.6110	0.12	Q	.	.	.	V.
27.250	20.6118	0.11	Q	.	.	.	V.
27.333	20.6125	0.10	Q	.	.	.	V.
27.417	20.6131	0.10	Q	.	.	.	V.
27.500	20.6138	0.09	Q	.	.	.	V.
27.583	20.6144	0.08	Q	.	.	.	V.
27.667	20.6149	0.08	Q	.	.	.	V.
27.750	20.6154	0.08	Q	.	.	.	V.
27.833	20.6159	0.07	Q	.	.	.	V.
27.917	20.6164	0.07	Q	.	.	.	V.
28.000	20.6168	0.06	Q	.	.	.	V.
28.083	20.6172	0.06	Q	.	.	.	V.
28.167	20.6176	0.05	Q	.	.	.	V.
28.250	20.6179	0.05	Q	.	.	.	V.
28.333	20.6182	0.05	Q	.	.	.	V.
28.417	20.6186	0.04	Q	.	.	.	V.
28.500	20.6188	0.04	Q	.	.	.	V.
28.583	20.6191	0.04	Q	.	.	.	V.
28.667	20.6194	0.04	Q	.	.	.	V.
28.750	20.6196	0.03	Q	.	.	.	V.
28.833	20.6198	0.03	Q	.	.	.	V.
28.917	20.6200	0.03	Q	.	.	.	V.
29.000	20.6202	0.03	Q	.	.	.	V.

```
  29.083     20.6204      0.03  Q         .         .         .        V.
  29.167     20.6206      0.03  Q         .         .         .        V.
  29.250     20.6207      0.02  Q         .         .         .        V.
  29.333     20.6209      0.02  Q         .         .         .        V.
  29.417     20.6210      0.02  Q         .         .         .        V.
  29.500     20.6211      0.02  Q         .         .         .        V.
  29.583     20.6213      0.02  Q         .         .         .        V.
  29.667     20.6214      0.02  Q         .         .         .        V.
  29.750     20.6215      0.02  Q         .         .         .        V.
  29.833     20.6216      0.01  Q         .         .         .        V.
  29.917     20.6217      0.01  Q         .         .         .        V.
  30.000     20.6217      0.01  Q         .         .         .        V.
  30.083     20.6218      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1805.0
10%	185.0
20%	115.0
30%	80.0
40%	60.0
50%	45.0
60%	35.0
70%	25.0
80%	20.0
90%	10.0

```
****************************************************************************
  FLOW PROCESS FROM NODE   7008.00 TO NODE   7008.00 IS CODE =   7
----------------------------------------------------------------------------
```

>>>>>STREAM NUMBER 2 ADDED TO STREAM NUMBER 3<<<<<

==

****

FLOW PROCESS FROM NODE 7008.00 TO NODE 7008.00 IS CODE = 11

>>>>>VIEW STREAM NUMBER 3 HYDROGRAPH<<<<<

==

STREAM HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

```
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      200.0     400.0     600.0     800.0
----------------------------------------------------------------------------
  14.000     11.6481     21.52  .Q V      .         .         .         .
  14.083     11.7991     21.92  .Q  V     .         .         .         .
  14.167     11.9531     22.36  .Q  V     .         .         .         .
  14.250     12.1104     22.84  .Q  V     .         .         .         .
  14.333     12.2713     23.37  .Q  V     .         .         .         .
  14.417     12.4363     23.95  .Q  V     .         .         .         .
  14.500     12.6057     24.60  .Q  V     .         .         .         .
  14.583     12.7806     25.40  .Q  V     .         .         .         .
  14.667     12.9629     26.46  .Q  V     .         .         .         .
  14.750     13.1537     27.71  .Q  V     .         .         .         .
  14.833     13.3545     29.16  .Q  V     .         .         .         .
  14.917     13.5680     31.01  .Q  V     .         .         .         .
  15.000     13.7977     33.35  .Q  V     .         .         .         .
  15.083     14.0439     35.75  .Q  V     .         .         .         .
  15.167     14.3055     37.99  .Q  V     .         .         .         .
  15.250     14.5817     40.10  . Q V     .         .         .         .
  15.333     14.8722     42.17  . Q  V    .         .         .         .
  15.417     15.1774     44.32  . Q  V    .         .         .         .
  15.500     15.4984     46.62  . Q  V    .         .         .         .
  15.583     15.8371     49.17  . Q  V    .         .         .         .
  15.667     16.1958     52.08  . Q  V    .         .         .         .
```

```
15.750     16.5783      55.55 . Q  V    .         .         .         .
15.833     16.9903      59.82 . Q  V    .         .         .         .
15.917     17.4416      65.53 .  Q V    .         .         .         .
16.000     17.9489      73.66 .  Q  V   .         .         .         .
16.083     18.5491      87.15 .   Q V   .         .         .         .
16.167     19.2693     104.58 .    QV   .         .         .         .
16.250     20.1356     125.78 .     Q   .         .         .         .
16.333     21.1854     152.43 .      Q  .         .         .         .
16.417     22.4669     186.07 .      V Q.         .         .         .
16.500     24.0709     232.89 .       V .Q        .         .         .
16.583     26.1682     304.53 .       V .    Q    .         .         .
16.667     28.8914     395.42 .        V.        Q.         .         .
16.750     32.1443     472.32 .         V         .  Q      .         .
16.833     35.9113     546.97 .         . V       .      Q  .         .
16.917     40.3586     645.75 .         .  V      .         . Q       .
17.000     45.3641     726.79 .         .    V    .         .     Q   .
17.083     50.1688     697.64 .         .      V  .         .   Q     .
17.167     54.3472     606.71 .         .       V .         Q         .
17.250     57.9350     520.95 .         .        V.     Q   .         .
17.333     61.0577     453.42 .         .         V Q       .         .
17.417     63.8543     406.07 .         .         QV        .         .
17.500     66.4204     372.59 .         .       Q . V       .         .
17.583     68.7870     343.63 .         .      Q  .  V      .         .
17.667     70.9922     320.20 .         .     Q   .   V     .         .
17.750     73.0577     299.91 .         .   Q     .   V     .         .
17.833     74.9977     281.69 .         .   Q     .    V    .         .
17.917     76.8182     264.34 .         .  Q      .     V   .         .
18.000     78.5444     250.65 .         . Q       .     V   .         .
18.083     80.1825     237.84 .         .Q        .      V  .         .
18.167     81.7372     225.75 .         .Q        .      V  .         .
18.250     83.2142     214.45 .         Q         .       V .         .
18.333     84.6093     202.57 .         Q         .       V .         .
18.417     85.9333     192.26 .        Q.         .        V.         .
18.500     87.1994     183.83 .        Q.         .        V.         .
18.583     88.4107     175.89 .       Q .         .         V         .
18.667     89.5703     168.37 .       Q .         .         V         .
```

```
   18.750     90.6783    160.89  .       Q .         .         V         .
   18.833     91.7375    153.79  .      Q  .         .         .V        .
   18.917     92.7496    146.95  .      Q  .         .         .V        .
   19.000     93.7170    140.46  .      Q  .         .         . V       .
   19.083     94.6480    135.19  .     Q   .         .         . V       .
   19.167     95.5429    129.95  .     Q   .         .         . V       .
   19.250     96.3956    123.81  .     Q   .         .         . V       .
   19.333     97.2131    118.71  .    Q    .         .         .  V      .
   19.417     97.9991    114.13  .    Q    .         .         .  V      .
   19.500     98.7483    108.77  .    Q    .         .         .  V      .
   19.583     99.4622    103.66  .    Q    .         .         .  V      .
   19.667    100.1440     99.00  .   Q     .         .         .   V     .
   19.750    100.7960     94.67  .   Q     .         .         .   V     .
   19.833    101.4163     90.06  .   Q     .         .         .   V     .
   19.917    102.0115     86.42  .   Q     .         .         .   V     .
   20.000    102.5877     83.66  .   Q     .         .         .    V    .
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
               0%                            1205.0
              10%                             265.0
              20%                             160.0
              30%                             105.0
              40%                              75.0
              50%                              55.0
              60%                              40.0
              70%                              30.0
              80%                              20.0
              90%                              10.0
 ============================================================================
```

END OF FLOODSCx ROUTING ANALYSIS

```
****************************************************************************

              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
         (c) Copyright 1989-2015 Advanced Engineering Software (aes)
            Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                         Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED M - EXISTING - SAUH                                            *
* 2022-09-30                                                               *
 **************************************************************************

  FILE NAME: 87_M_EX.DAT
  TIME/DATE OF STUDY: 09:26 09/30/2022


****************************************************************************
  FLOW PROCESS FROM NODE   8000.00 TO NODE   8004.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =     191.600 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.870 HOURS
```

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.590

LOW LOSS FRACTION = 0.778

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.17

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.991

30-MINUTE FACTOR = 0.991

1-HOUR FACTOR = 0.991

3-HOUR FACTOR = 0.999

6-HOUR FACTOR = 0.999

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 9.579

==

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.421	9.766
2	1.449	23.820
3	3.081	37.812
4	5.317	51.811

5	8.183	66.399
6	12.287	95.101
7	18.762	150.030
8	28.040	214.993
9	36.793	202.833
10	44.219	172.054
11	50.188	138.309
12	55.237	117.011
13	59.277	93.606
14	62.644	78.017
15	65.538	67.052
16	68.082	58.958
17	70.431	54.423
18	72.525	48.524
19	74.379	42.970
20	76.067	39.097
21	77.686	37.525
22	79.084	32.390
23	80.348	29.299
24	81.583	28.602
25	82.645	24.612
26	83.679	23.971
27	84.667	22.894
28	85.587	21.321
29	86.501	21.162
30	87.305	18.644
31	88.072	17.761
32	88.794	16.726
33	89.378	13.546
34	89.953	13.315
35	90.506	12.814
36	91.042	12.431
37	91.570	12.237
38	92.042	10.919
39	92.501	10.650
40	92.947	10.333

41	93.369	9.776
42	93.788	9.700
43	94.141	8.188
44	94.467	7.550
45	94.792	7.541
46	95.118	7.546
47	95.444	7.546
48	95.729	6.624
49	95.979	5.774
50	96.228	5.769
51	96.477	5.769
52	96.726	5.774
53	96.950	5.207
54	97.124	4.026
55	97.297	3.997
56	97.469	3.988
57	97.642	4.007
58	97.801	3.685
59	97.904	2.381
60	97.999	2.221
61	98.095	2.221
62	98.191	2.211
63	98.288	2.258
64	98.399	2.570
65	98.514	2.655
66	98.629	2.665
67	98.744	2.665
68	98.859	2.665
69	98.974	2.665
70	99.089	2.665
71	99.204	2.665
72	99.319	2.665
73	99.434	2.665
74	99.549	2.665
75	99.664	2.665
76	99.779	2.665

77	99.894	2.665
78	100.000	2.465

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UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0020	0.0006
13	0.0026	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0038	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0040	0.0031	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0069	0.0054	0.0015
146	0.0070	0.0054	0.0016
147	0.0072	0.0056	0.0016
148	0.0072	0.0056	0.0016
149	0.0074	0.0058	0.0016
150	0.0075	0.0058	0.0017
151	0.0077	0.0060	0.0017
152	0.0078	0.0061	0.0017
153	0.0080	0.0062	0.0018
154	0.0081	0.0063	0.0018
155	0.0084	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0087	0.0068	0.0019
158	0.0089	0.0069	0.0020
159	0.0092	0.0071	0.0020
160	0.0093	0.0072	0.0021
161	0.0096	0.0075	0.0021
162	0.0098	0.0076	0.0022
163	0.0101	0.0079	0.0023
164	0.0103	0.0080	0.0023
165	0.0107	0.0083	0.0024
166	0.0109	0.0085	0.0024
167	0.0114	0.0089	0.0025
168	0.0116	0.0091	0.0026
169	0.0196	0.0153	0.0044
170	0.0200	0.0156	0.0044
171	0.0209	0.0162	0.0046
172	0.0213	0.0166	0.0047
173	0.0223	0.0173	0.0050
174	0.0228	0.0178	0.0051

175	0.0240	0.0187	0.0053
176	0.0246	0.0192	0.0055
177	0.0261	0.0203	0.0058
178	0.0269	0.0209	0.0060
179	0.0286	0.0223	0.0064
180	0.0296	0.0231	0.0066
181	0.0319	0.0248	0.0071
182	0.0332	0.0259	0.0074
183	0.0363	0.0283	0.0081
184	0.0382	0.0297	0.0085
185	0.0611	0.0475	0.0136
186	0.0643	0.0492	0.0151
187	0.0721	0.0492	0.0230
188	0.0774	0.0492	0.0282
189	0.1001	0.0492	0.0509
190	0.1109	0.0492	0.0617
191	0.1496	0.0492	0.1004
192	0.1957	0.0492	0.1466
193	0.4779	0.0492	0.4287
194	0.1259	0.0492	0.0767
195	0.0836	0.0492	0.0344
196	0.0679	0.0492	0.0187
197	0.0402	0.0313	0.0089
198	0.0347	0.0270	0.0077
199	0.0307	0.0239	0.0068
200	0.0277	0.0216	0.0062
201	0.0253	0.0197	0.0056
202	0.0234	0.0182	0.0052
203	0.0218	0.0170	0.0048
204	0.0204	0.0159	0.0045
205	0.0119	0.0093	0.0026
206	0.0112	0.0087	0.0025
207	0.0105	0.0082	0.0023
208	0.0100	0.0077	0.0022
209	0.0095	0.0074	0.0021
210	0.0090	0.0070	0.0020

211	0.0086	0.0067	0.0019
212	0.0082	0.0064	0.0018
213	0.0079	0.0062	0.0018
214	0.0076	0.0059	0.0017
215	0.0073	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0040	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0039	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0031	0.0025	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0030	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0006
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0022	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.02

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.41

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 32.2802

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 22.4528

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2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
0.083	0.0000	0.01	Q	.	.	.	.
0.167	0.0002	0.02	Q	.	.	.	.
0.250	0.0004	0.04	Q	.	.	.	.
0.333	0.0009	0.07	Q	.	.	.	.
0.417	0.0017	0.11	Q	.	.	.	.
0.500	0.0028	0.16	Q	.	.	.	.
0.583	0.0044	0.24	Q	.	.	.	.
0.667	0.0070	0.37	Q	.	.	.	.
0.750	0.0103	0.48	Q	.	.	.	.
0.833	0.0143	0.58	Q	.	.	.	.
0.917	0.0188	0.66	Q	.	.	.	.
1.000	0.0238	0.73	Q	.	.	.	.
1.083	0.0292	0.78	Q	.	.	.	.
1.167	0.0349	0.83	Q	.	.	.	.
1.250	0.0409	0.87	Q	.	.	.	.
1.333	0.0471	0.91	Q	.	.	.	.
1.417	0.0536	0.94	Q	.	.	.	.
1.500	0.0603	0.97	Q	.	.	.	.
1.583	0.0672	1.00	Q	.	.	.	.
1.667	0.0742	1.03	Q	.	.	.	.
1.750	0.0815	1.05	Q	.	.	.	.
1.833	0.0889	1.07	Q	.	.	.	.
1.917	0.0964	1.10	Q	.	.	.	.
2.000	0.1041	1.12	Q	.	.	.	.

2.083	0.1119	1.13	Q	.	.	.	.
2.167	0.1199	1.15	Q	.	.	.	.
2.250	0.1279	1.17	Q	.	.	.	.
2.333	0.1361	1.19	Q	.	.	.	.
2.417	0.1444	1.21	Q	.	.	.	.
2.500	0.1528	1.22	Q	.	.	.	.
2.583	0.1613	1.24	Q	.	.	.	.
2.667	0.1700	1.25	Q	.	.	.	.
2.750	0.1787	1.27	Q	.	.	.	.
2.833	0.1875	1.28	Q	.	.	.	.
2.917	0.1964	1.29	Q	.	.	.	.
3.000	0.2054	1.30	Q	.	.	.	.
3.083	0.2144	1.32	Q	.	.	.	.
3.167	0.2236	1.33	Q	.	.	.	.
3.250	0.2329	1.34	Q	.	.	.	.
3.333	0.2422	1.35	Q	.	.	.	.
3.417	0.2516	1.37	Q	.	.	.	.
3.500	0.2611	1.38	Q	.	.	.	.
3.583	0.2707	1.39	Q	.	.	.	.
3.667	0.2803	1.40	Q	.	.	.	.
3.750	0.2900	1.41	Q	.	.	.	.
3.833	0.2998	1.42	Q	.	.	.	.
3.917	0.3097	1.43	Q	.	.	.	.
4.000	0.3197	1.45	Q	.	.	.	.
4.083	0.3297	1.46	Q	.	.	.	.
4.167	0.3398	1.47	Q	.	.	.	.
4.250	0.3500	1.48	Q	.	.	.	.
4.333	0.3602	1.49	Q	.	.	.	.
4.417	0.3705	1.50	Q	.	.	.	.
4.500	0.3809	1.51	Q	.	.	.	.
4.583	0.3914	1.52	Q	.	.	.	.
4.667	0.4019	1.53	Q	.	.	.	.
4.750	0.4125	1.54	Q	.	.	.	.
4.833	0.4232	1.55	Q	.	.	.	.
4.917	0.4339	1.56	Q	.	.	.	.
5.000	0.4447	1.57	Q	.	.	.	.

5.083	0.4556	1.58	Q	.	.	.	.
5.167	0.4666	1.59	Q	.	.	.	.
5.250	0.4776	1.60	Q	.	.	.	.
5.333	0.4886	1.61	Q	.	.	.	.
5.417	0.4998	1.62	Q	.	.	.	.
5.500	0.5110	1.63	Q	.	.	.	.
5.583	0.5223	1.64	Q	.	.	.	.
5.667	0.5337	1.65	Q	.	.	.	.
5.750	0.5451	1.66	Q	.	.	.	.
5.833	0.5567	1.67	Q	.	.	.	.
5.917	0.5683	1.68	QV	.	.	.	.
6.000	0.5800	1.70	QV	.	.	.	.
6.083	0.5917	1.71	QV	.	.	.	.
6.167	0.6036	1.72	QV	.	.	.	.
6.250	0.6155	1.73	QV	.	.	.	.
6.333	0.6275	1.74	QV	.	.	.	.
6.417	0.6396	1.76	QV	.	.	.	.
6.500	0.6518	1.77	QV	.	.	.	.
6.583	0.6640	1.78	QV	.	.	.	.
6.667	0.6763	1.79	QV	.	.	.	.
6.750	0.6887	1.80	QV	.	.	.	.
6.833	0.7012	1.81	QV	.	.	.	.
6.917	0.7138	1.82	QV	.	.	.	.
7.000	0.7264	1.84	QV	.	.	.	.
7.083	0.7391	1.85	QV	.	.	.	.
7.167	0.7520	1.86	QV	.	.	.	.
7.250	0.7648	1.87	QV	.	.	.	.
7.333	0.7778	1.88	QV	.	.	.	.
7.417	0.7909	1.90	QV	.	.	.	.
7.500	0.8040	1.91	QV	.	.	.	.
7.583	0.8173	1.92	QV	.	.	.	.
7.667	0.8306	1.94	QV	.	.	.	.
7.750	0.8441	1.95	QV	.	.	.	.
7.833	0.8576	1.96	QV	.	.	.	.
7.917	0.8712	1.98	QV	.	.	.	.
8.000	0.8849	1.99	QV	.	.	.	.

8.083	0.8987	2.01	QV	.	.	.	.
8.167	0.9126	2.02	QV	.	.	.	.
8.250	0.9267	2.04	QV	.	.	.	.
8.333	0.9408	2.05	QV	.	.	.	.
8.417	0.9550	2.07	QV	.	.	.	.
8.500	0.9693	2.08	QV	.	.	.	.
8.583	0.9838	2.10	QV	.	.	.	.
8.667	0.9984	2.11	QV	.	.	.	.
8.750	1.0130	2.13	QV	.	.	.	.
8.833	1.0278	2.15	QV	.	.	.	.
8.917	1.0427	2.16	QV	.	.	.	.
9.000	1.0577	2.18	QV	.	.	.	.
9.083	1.0729	2.20	QV	.	.	.	.
9.167	1.0882	2.22	QV	.	.	.	.
9.250	1.1036	2.24	QV	.	.	.	.
9.333	1.1191	2.25	QV	.	.	.	.
9.417	1.1347	2.27	Q V	.	.	.	.
9.500	1.1505	2.29	Q V	.	.	.	.
9.583	1.1665	2.31	Q V	.	.	.	.
9.667	1.1825	2.33	Q V	.	.	.	.
9.750	1.1988	2.35	Q V	.	.	.	.
9.833	1.2151	2.38	Q V	.	.	.	.
9.917	1.2316	2.40	Q V	.	.	.	.
10.000	1.2483	2.42	Q V	.	.	.	.
10.083	1.2651	2.44	Q V	.	.	.	.
10.167	1.2821	2.46	Q V	.	.	.	.
10.250	1.2992	2.49	Q V	.	.	.	.
10.333	1.3165	2.51	Q V	.	.	.	.
10.417	1.3340	2.54	Q V	.	.	.	.
10.500	1.3516	2.56	Q V	.	.	.	.
10.583	1.3694	2.59	Q V	.	.	.	.
10.667	1.3874	2.61	Q V	.	.	.	.
10.750	1.4056	2.64	Q V	.	.	.	.
10.833	1.4240	2.67	Q V	.	.	.	.
10.917	1.4426	2.70	Q V	.	.	.	.
11.000	1.4614	2.73	Q V	.	.	.	.

```
11.083      1.4803      2.76  Q V       .         .         .         .
11.167      1.4995      2.79  Q V       .         .         .         .
11.250      1.5189      2.82  Q V       .         .         .         .
11.333      1.5385      2.85  Q V       .         .         .         .
11.417      1.5584      2.88  Q V       .         .         .         .
11.500      1.5785      2.92  Q V       .         .         .         .
11.583      1.5988      2.95  Q V       .         .         .         .
11.667      1.6193      2.99  Q V       .         .         .         .
11.750      1.6402      3.02  Q V       .         .         .         .
11.833      1.6612      3.06  Q V       .         .         .         .
11.917      1.6826      3.10  Q V       .         .         .         .
12.000      1.7042      3.14  Q  V      .         .         .         .
12.083      1.7261      3.18  Q  V      .         .         .         .
12.167      1.7483      3.22  Q  V      .         .         .         .
12.250      1.7707      3.26  Q  V      .         .         .         .
12.333      1.7934      3.29  Q  V      .         .         .         .
12.417      1.8163      3.33  Q  V      .         .         .         .
12.500      1.8395      3.37  Q  V      .         .         .         .
12.583      1.8629      3.40  Q  V      .         .         .         .
12.667      1.8864      3.42  Q  V      .         .         .         .
12.750      1.9101      3.44  Q  V      .         .         .         .
12.833      1.9340      3.47  Q  V      .         .         .         .
12.917      1.9582      3.51  Q  V      .         .         .         .
13.000      1.9826      3.55  Q  V      .         .         .         .
13.083      2.0074      3.59  Q  V      .         .         .         .
13.167      2.0325      3.64  Q  V      .         .         .         .
13.250      2.0579      3.70  Q  V      .         .         .         .
13.333      2.0838      3.76  Q  V      .         .         .         .
13.417      2.1101      3.82  Q  V      .         .         .         .
13.500      2.1369      3.88  Q  V      .         .         .         .
13.583      2.1641      3.95  Q  V      .         .         .         .
13.667      2.1919      4.03  Q  V      .         .         .         .
13.750      2.2201      4.10  Q  V      .         .         .         .
13.833      2.2490      4.19  Q   V     .         .         .         .
13.917      2.2784      4.27  Q   V     .         .         .         .
14.000      2.3085      4.37  Q   V     .         .         .         .
```

```
14.083      2.3393      4.48  Q   V     .         .         .         .
14.167      2.3711      4.62  Q   V     .         .         .         .
14.250      2.4042      4.79  Q   V     .         .         .         .
14.333      2.4386      5.00  Q   V     .         .         .         .
14.417      2.4747      5.24  .Q  V     .         .         .         .
14.500      2.5128      5.53  .Q  V     .         .         .         .
14.583      2.5536      5.93  .Q  V     .         .         .         .
14.667      2.5981      6.46  .Q  V     .         .         .         .
14.750      2.6462      6.98  .Q  V     .         .         .         .
14.833      2.6977      7.48  .Q  V     .         .         .         .
14.917      2.7524      7.94  .Q  V     .         .         .         .
15.000      2.8102      8.39  .Q   V    .         .         .         .
15.083      2.8710      8.83  .Q   V    .         .         .         .
15.167      2.9348      9.27  .Q   V    .         .         .         .
15.250      3.0019      9.73  .Q   V    .         .         .         .
15.333      3.0723     10.22  . Q  V    .         .         .         .
15.417      3.1465     10.78  . Q  V    .         .         .         .
15.500      3.2254     11.46  . Q  V    .         .         .         .
15.583      3.3103     12.32  . Q  V    .         .         .         .
15.667      3.4030     13.47  . Q   V   .         .         .         .
15.750      3.5072     15.13  .  Q  V   .         .         .         .
15.833      3.6283     17.58  .  Q  V   .         .         .         .
15.917      3.7753     21.34  .   Q V   .         .         .         .
16.000      3.9627     27.22  .    Q V  .         .         .         .
16.083      4.2249     38.07  .      Q  .         .         .         .
16.167      4.5831     52.00  .       V Q         .         .         .
16.250      5.0464     67.27  .       V .  Q      .         .         .
16.333      5.6260     84.16  .         V     Q   .         .         .
16.417      6.3326    102.61  .         .V        Q         .         .
16.500      7.2058    126.79  .         . V       .    Q    .         .
16.583      8.2830    156.40  .         .   V     .         .Q        .
16.667      9.5259    180.47  .         .     V   .         .     Q   .
16.750     10.7075    171.57  .         .        V.         .  Q      .
16.833     11.7486    151.17  .         .         V         Q         .
16.917     12.6337    128.52  .         .         . V  Q    .         .
17.000     13.3940    110.39  .         .         . QV      .         .
```

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17.083     14.0383     93.56  .         .       Q .    V    .         .
17.167     14.5966     81.06  .         .     Q   .     V   .         .
17.250     15.0907     71.74  .         .   Q     .     V   .         .
17.333     15.5352     64.54  .         . Q       .      V  .         .
17.417     15.9429     59.21  .         .Q        .       V .         .
17.500     16.3140     53.88  .         Q         .        V.         .
17.583     16.6517     49.03  .        Q.         .        V.         .
17.667     16.9618     45.02  .        Q.         .         V         .
17.750     17.2504     41.90  .       Q .         .         V         .
17.833     17.5122     38.02  .      Q  .         .         .V        .
17.917     17.7540     35.10  .      Q  .         .         .V        .
18.000     17.9822     33.14  .     Q   .         .         . V       .
18.083     18.1920     30.47  .     Q   .         .         . V       .
18.167     18.3918     29.00  .    Q    .         .         . V       .
18.250     18.5815     27.55  .    Q    .         .         .  V      .
18.333     18.7606     26.00  .    Q    .         .         .  V      .
18.417     18.9317     24.85  .   Q     .         .         .  V      .
18.500     19.0902     23.02  .   Q     .         .         .   V     .
18.583     19.2398     21.71  .   Q     .         .         .   V     .
18.667     19.3802     20.39  .   Q     .         .         .   V     .
18.750     19.5081     18.57  .  Q      .         .         .   V     .
18.833     19.6309     17.83  .  Q      .         .         .   V     .
18.917     19.7489     17.13  .  Q      .         .         .    V    .
19.000     19.8625     16.50  .  Q      .         .         .    V    .
19.083     19.9722     15.92  .  Q      .         .         .    V    .
19.167     20.0757     15.02  .  Q      .         .         .    V    .
19.250     20.1753     14.47  . Q       .         .         .    V    .
19.333     20.2712     13.92  . Q       .         .         .     V   .
19.417     20.3628     13.30  . Q       .         .         .     V   .
19.500     20.4508     12.79  . Q       .         .         .     V   .
19.583     20.5326     11.87  . Q       .         .         .     V   .
19.667     20.6104     11.30  . Q       .         .         .     V   .
19.750     20.6861     11.00  . Q       .         .         .     V   .
19.833     20.7599     10.71  . Q       .         .         .     V   .
19.917     20.8313     10.36  . Q       .         .         .      V  .
20.000     20.8982      9.72  .Q        .         .         .      V  .
```

20.083	20.9612	9.14	.Q	.	.	.	V	.
20.167	21.0223	8.87	.Q	.	.	.	V	.
20.250	21.0817	8.62	.Q	.	.	.	V	.
20.333	21.1389	8.32	.Q	.	.	.	V	.
20.417	21.1926	7.80	.Q	.	.	.	V	.
20.500	21.2417	7.13	.Q	.	.	.	V	.
20.583	21.2890	6.86	.Q	.	.	.	V	.
20.667	21.3347	6.64	.Q	.	.	.	V	.
20.750	21.3787	6.38	.Q	.	.	.	V	.
20.833	21.4199	5.98	.Q	.	.	.	V	.
20.917	21.4566	5.33	.Q	.	.	.	V	.
21.000	21.4918	5.11	.Q	.	.	.	V	.
21.083	21.5264	5.02	.Q	.	.	.	V	.
21.167	21.5606	4.97	Q	.	.	.	V	.
21.250	21.5949	4.98	Q	.	.	.	V	.
21.333	21.6298	5.07	.Q	.	.	.	V	.
21.417	21.6647	5.07	.Q	.	.	.	V	.
21.500	21.6994	5.03	.Q	.	.	.	V	.
21.583	21.7337	4.99	Q	.	.	.	V	.
21.667	21.7678	4.94	Q	.	.	.	V	.
21.750	21.8014	4.89	Q	.	.	.	V	.
21.833	21.8347	4.83	Q	.	.	.	V	.
21.917	21.8676	4.77	Q	.	.	.	V	.
22.000	21.9000	4.71	Q	.	.	.	V.	
22.083	21.9318	4.62	Q	.	.	.	V.	
22.167	21.9630	4.52	Q	.	.	.	V.	
22.250	21.9930	4.36	Q	.	.	.	V.	
22.333	22.0217	4.17	Q	.	.	.	V.	
22.417	22.0483	3.87	Q	.	.	.	V.	
22.500	22.0718	3.40	Q	.	.	.	V.	
22.583	22.0877	2.31	Q	.	.	.	V.	
22.667	22.1021	2.10	Q	.	.	.	V.	
22.750	22.1158	1.99	Q	.	.	.	V.	
22.833	22.1290	1.92	Q	.	.	.	V.	
22.917	22.1420	1.88	Q	.	.	.	V.	
23.000	22.1547	1.84	Q	.	.	.	V.	

23.083	22.1672	1.81	Q	.	.	.	V.
23.167	22.1794	1.78	Q	.	.	.	V.
23.250	22.1914	1.75	Q	.	.	.	V.
23.333	22.2033	1.72	Q	.	.	.	V.
23.417	22.2149	1.69	Q	.	.	.	V.
23.500	22.2264	1.66	Q	.	.	.	V.
23.583	22.2377	1.64	Q	.	.	.	V.
23.667	22.2489	1.62	Q	.	.	.	V.
23.750	22.2599	1.60	Q	.	.	.	V.
23.833	22.2708	1.59	Q	.	.	.	V.
23.917	22.2816	1.57	Q	.	.	.	V.
24.000	22.2923	1.55	Q	.	.	.	V.
24.083	22.3028	1.53	Q	.	.	.	V.
24.167	22.3132	1.50	Q	.	.	.	V.
24.250	22.3232	1.46	Q	.	.	.	V.
24.333	22.3330	1.42	Q	.	.	.	V.
24.417	22.3424	1.37	Q	.	.	.	V.
24.500	22.3513	1.30	Q	.	.	.	V.
24.583	22.3596	1.20	Q	.	.	.	V.
24.667	22.3670	1.07	Q	.	.	.	V.
24.750	22.3735	0.95	Q	.	.	.	V.
24.833	22.3793	0.84	Q	.	.	.	V.
24.917	22.3845	0.75	Q	.	.	.	V.
25.000	22.3892	0.68	Q	.	.	.	V.
25.083	22.3934	0.62	Q	.	.	.	V.
25.167	22.3974	0.57	Q	.	.	.	V.
25.250	22.4010	0.53	Q	.	.	.	V.
25.333	22.4044	0.49	Q	.	.	.	V.
25.417	22.4075	0.45	Q	.	.	.	V.
25.500	22.4104	0.42	Q	.	.	.	V.
25.583	22.4131	0.39	Q	.	.	.	V.
25.667	22.4157	0.37	Q	.	.	.	V.
25.750	22.4180	0.34	Q	.	.	.	V.
25.833	22.4202	0.32	Q	.	.	.	V.
25.917	22.4223	0.30	Q	.	.	.	V.
26.000	22.4243	0.28	Q	.	.	.	V.

26.083	22.4261	0.27	Q	.	.	.	V.
26.167	22.4278	0.25	Q	.	.	.	V.
26.250	22.4294	0.23	Q	.	.	.	V.
26.333	22.4309	0.22	Q	.	.	.	V.
26.417	22.4323	0.21	Q	.	.	.	V.
26.500	22.4337	0.19	Q	.	.	.	V.
26.583	22.4349	0.18	Q	.	.	.	V.
26.667	22.4361	0.17	Q	.	.	.	V.
26.750	22.4372	0.16	Q	.	.	.	V.
26.833	22.4382	0.15	Q	.	.	.	V.
26.917	22.4392	0.14	Q	.	.	.	V.
27.000	22.4401	0.13	Q	.	.	.	V.
27.083	22.4410	0.13	Q	.	.	.	V.
27.167	22.4418	0.12	Q	.	.	.	V.
27.250	22.4426	0.11	Q	.	.	.	V.
27.333	22.4433	0.11	Q	.	.	.	V.
27.417	22.4440	0.10	Q	.	.	.	V.
27.500	22.4446	0.09	Q	.	.	.	V.
27.583	22.4452	0.09	Q	.	.	.	V.
27.667	22.4458	0.08	Q	.	.	.	V.
27.750	22.4463	0.08	Q	.	.	.	V.
27.833	22.4468	0.07	Q	.	.	.	V.
27.917	22.4473	0.07	Q	.	.	.	V.
28.000	22.4477	0.06	Q	.	.	.	V.
28.083	22.4481	0.06	Q	.	.	.	V.
28.167	22.4485	0.05	Q	.	.	.	V.
28.250	22.4489	0.05	Q	.	.	.	V.
28.333	22.4492	0.05	Q	.	.	.	V.
28.417	22.4495	0.04	Q	.	.	.	V.
28.500	22.4498	0.04	Q	.	.	.	V.
28.583	22.4500	0.04	Q	.	.	.	V.
28.667	22.4503	0.04	Q	.	.	.	V.
28.750	22.4505	0.03	Q	.	.	.	V.
28.833	22.4507	0.03	Q	.	.	.	V.
28.917	22.4509	0.03	Q	.	.	.	V.
29.000	22.4511	0.03	Q	.	.	.	V.

```
 29.083     22.4513      0.03  Q         .         .         .        V.
 29.167     22.4515      0.03  Q         .         .         .        V.
 29.250     22.4517      0.02  Q         .         .         .        V.
 29.333     22.4518      0.02  Q         .         .         .        V.
 29.417     22.4519      0.02  Q         .         .         .        V.
 29.500     22.4521      0.02  Q         .         .         .        V.
 29.583     22.4522      0.02  Q         .         .         .        V.
 29.667     22.4523      0.02  Q         .         .         .        V.
 29.750     22.4524      0.01  Q         .         .         .        V.
 29.833     22.4525      0.01  Q         .         .         .        V.
 29.917     22.4526      0.01  Q         .         .         .        V.
 30.000     22.4526      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1800.0
10%	175.0
20%	110.0
30%	75.0
40%	55.0
50%	45.0
60%	35.0
70%	30.0
80%	20.0
90%	10.0

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END OF FLOODSCx ROUTING ANALYSIS

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              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
         (c) Copyright 1989-2015 Advanced Engineering Software (aes)
            Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                           Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED M - PROPOSED - UH                                              *
* 2022-10-03                                                               *
 **************************************************************************

  FILE NAME: 87_M_PR.DAT
  TIME/DATE OF STUDY: 11:53 10/03/2022



****************************************************************************
  FLOW PROCESS FROM NODE   8000.00 TO NODE   8003.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =     108.100 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.600 HOURS
```

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.504

LOW LOSS FRACTION = 0.686

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.16

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.995

30-MINUTE FACTOR = 0.995

1-HOUR FACTOR = 0.995

3-HOUR FACTOR = 0.999

6-HOUR FACTOR = 1.000

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 13.889

==

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.617	8.062
2	2.522	24.912
3	5.666	41.101
4	10.371	61.510

5	19.167	114.987
6	32.302	171.726
7	43.643	148.259
8	52.133	111.000
9	58.624	84.853
10	63.463	63.268
11	67.393	51.378
12	70.808	44.646
13	73.696	37.746
14	76.186	32.559
15	78.443	29.510
16	80.317	24.492
17	82.043	22.572
18	83.550	19.697
19	84.967	18.522
20	86.296	17.371
21	87.478	15.456
22	88.567	14.235
23	89.450	11.549
24	90.273	10.762
25	91.055	10.225
26	91.798	9.707
27	92.467	8.742
28	93.106	8.354
29	93.714	7.953
30	94.230	6.753
31	94.703	6.175
32	95.175	6.174
33	95.627	5.914
34	95.997	4.833
35	96.358	4.721
36	96.720	4.725
37	97.025	3.989
38	97.275	3.276
39	97.525	3.265
40	97.766	3.151

41	97.925	2.077
42	98.064	1.816
43	98.203	1.816
44	98.351	1.934
45	98.517	2.169
46	98.684	2.180
47	98.850	2.177
48	99.017	2.180
49	99.183	2.177
50	99.350	2.177
51	99.516	2.177
52	99.683	2.177
53	99.849	2.177
54	100.000	1.969

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UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0017	0.0008
2	0.0025	0.0017	0.0008
3	0.0025	0.0017	0.0008
4	0.0025	0.0017	0.0008
5	0.0026	0.0018	0.0008
6	0.0026	0.0018	0.0008
7	0.0026	0.0018	0.0008
8	0.0026	0.0018	0.0008
9	0.0026	0.0018	0.0008
10	0.0026	0.0018	0.0008
11	0.0026	0.0018	0.0008
12	0.0026	0.0018	0.0008
13	0.0026	0.0018	0.0008
14	0.0027	0.0018	0.0008
15	0.0027	0.0018	0.0008
16	0.0027	0.0018	0.0008
17	0.0027	0.0018	0.0008
18	0.0027	0.0019	0.0008
19	0.0027	0.0019	0.0009
20	0.0027	0.0019	0.0009
21	0.0027	0.0019	0.0009
22	0.0028	0.0019	0.0009
23	0.0028	0.0019	0.0009
24	0.0028	0.0019	0.0009
25	0.0028	0.0019	0.0009
26	0.0028	0.0019	0.0009
27	0.0028	0.0019	0.0009
28	0.0028	0.0019	0.0009
29	0.0029	0.0020	0.0009
30	0.0029	0.0020	0.0009

31	0.0029	0.0020	0.0009
32	0.0029	0.0020	0.0009
33	0.0029	0.0020	0.0009
34	0.0029	0.0020	0.0009
35	0.0029	0.0020	0.0009
36	0.0029	0.0020	0.0009
37	0.0030	0.0020	0.0009
38	0.0030	0.0020	0.0009
39	0.0030	0.0021	0.0009
40	0.0030	0.0021	0.0009
41	0.0030	0.0021	0.0010
42	0.0030	0.0021	0.0010
43	0.0031	0.0021	0.0010
44	0.0031	0.0021	0.0010
45	0.0031	0.0021	0.0010
46	0.0031	0.0021	0.0010
47	0.0031	0.0021	0.0010
48	0.0031	0.0022	0.0010
49	0.0032	0.0022	0.0010
50	0.0032	0.0022	0.0010
51	0.0032	0.0022	0.0010
52	0.0032	0.0022	0.0010
53	0.0032	0.0022	0.0010
54	0.0032	0.0022	0.0010
55	0.0033	0.0022	0.0010
56	0.0033	0.0023	0.0010
57	0.0033	0.0023	0.0010
58	0.0033	0.0023	0.0010
59	0.0033	0.0023	0.0011
60	0.0034	0.0023	0.0011
61	0.0034	0.0023	0.0011
62	0.0034	0.0023	0.0011
63	0.0034	0.0024	0.0011
64	0.0034	0.0024	0.0011
65	0.0035	0.0024	0.0011
66	0.0035	0.0024	0.0011

67	0.0035	0.0024	0.0011
68	0.0035	0.0024	0.0011
69	0.0036	0.0024	0.0011
70	0.0036	0.0025	0.0011
71	0.0036	0.0025	0.0011
72	0.0036	0.0025	0.0011
73	0.0037	0.0025	0.0011
74	0.0037	0.0025	0.0012
75	0.0037	0.0025	0.0012
76	0.0037	0.0025	0.0012
77	0.0037	0.0026	0.0012
78	0.0038	0.0026	0.0012
79	0.0038	0.0026	0.0012
80	0.0038	0.0026	0.0012
81	0.0039	0.0026	0.0012
82	0.0039	0.0027	0.0012
83	0.0039	0.0027	0.0012
84	0.0039	0.0027	0.0012
85	0.0040	0.0027	0.0012
86	0.0040	0.0027	0.0013
87	0.0040	0.0028	0.0013
88	0.0040	0.0028	0.0013
89	0.0041	0.0028	0.0013
90	0.0041	0.0028	0.0013
91	0.0042	0.0028	0.0013
92	0.0042	0.0029	0.0013
93	0.0042	0.0029	0.0013
94	0.0042	0.0029	0.0013
95	0.0043	0.0029	0.0013
96	0.0043	0.0030	0.0014
97	0.0044	0.0030	0.0014
98	0.0044	0.0030	0.0014
99	0.0044	0.0030	0.0014
100	0.0045	0.0031	0.0014
101	0.0045	0.0031	0.0014
102	0.0045	0.0031	0.0014

103	0.0046	0.0031	0.0014
104	0.0046	0.0032	0.0014
105	0.0047	0.0032	0.0015
106	0.0047	0.0032	0.0015
107	0.0048	0.0033	0.0015
108	0.0048	0.0033	0.0015
109	0.0048	0.0033	0.0015
110	0.0049	0.0033	0.0015
111	0.0049	0.0034	0.0015
112	0.0050	0.0034	0.0016
113	0.0050	0.0035	0.0016
114	0.0051	0.0035	0.0016
115	0.0051	0.0035	0.0016
116	0.0052	0.0035	0.0016
117	0.0052	0.0036	0.0016
118	0.0053	0.0036	0.0017
119	0.0054	0.0037	0.0017
120	0.0054	0.0037	0.0017
121	0.0055	0.0038	0.0017
122	0.0055	0.0038	0.0017
123	0.0056	0.0038	0.0018
124	0.0056	0.0039	0.0018
125	0.0057	0.0039	0.0018
126	0.0058	0.0040	0.0018
127	0.0059	0.0040	0.0018
128	0.0059	0.0041	0.0019
129	0.0060	0.0041	0.0019
130	0.0061	0.0042	0.0019
131	0.0062	0.0042	0.0019
132	0.0062	0.0043	0.0020
133	0.0063	0.0043	0.0020
134	0.0064	0.0044	0.0020
135	0.0065	0.0045	0.0020
136	0.0066	0.0045	0.0021
137	0.0067	0.0046	0.0021
138	0.0067	0.0046	0.0021

139	0.0069	0.0047	0.0022
140	0.0069	0.0048	0.0022
141	0.0071	0.0049	0.0022
142	0.0072	0.0049	0.0022
143	0.0073	0.0050	0.0023
144	0.0074	0.0051	0.0023
145	0.0069	0.0047	0.0022
146	0.0070	0.0048	0.0022
147	0.0071	0.0049	0.0022
148	0.0072	0.0050	0.0023
149	0.0074	0.0051	0.0023
150	0.0075	0.0051	0.0024
151	0.0077	0.0053	0.0024
152	0.0078	0.0053	0.0024
153	0.0080	0.0055	0.0025
154	0.0081	0.0056	0.0025
155	0.0083	0.0057	0.0026
156	0.0085	0.0058	0.0027
157	0.0087	0.0060	0.0027
158	0.0089	0.0061	0.0028
159	0.0091	0.0063	0.0029
160	0.0093	0.0064	0.0029
161	0.0096	0.0066	0.0030
162	0.0098	0.0067	0.0031
163	0.0101	0.0069	0.0032
164	0.0103	0.0071	0.0032
165	0.0107	0.0073	0.0034
166	0.0109	0.0075	0.0034
167	0.0114	0.0078	0.0036
168	0.0116	0.0080	0.0036
169	0.0195	0.0134	0.0061
170	0.0199	0.0136	0.0062
171	0.0207	0.0142	0.0065
172	0.0211	0.0145	0.0066
173	0.0221	0.0152	0.0069
174	0.0226	0.0155	0.0071

175	0.0238	0.0163	0.0075
176	0.0245	0.0168	0.0077
177	0.0259	0.0177	0.0081
178	0.0267	0.0183	0.0084
179	0.0284	0.0195	0.0089
180	0.0294	0.0202	0.0092
181	0.0317	0.0218	0.0100
182	0.0330	0.0227	0.0104
183	0.0361	0.0248	0.0113
184	0.0379	0.0260	0.0119
185	0.0630	0.0420	0.0210
186	0.0662	0.0420	0.0242
187	0.0741	0.0420	0.0321
188	0.0793	0.0420	0.0373
189	0.0991	0.0420	0.0571
190	0.1099	0.0420	0.0679
191	0.1484	0.0420	0.1064
192	0.1945	0.0420	0.1525
193	0.4777	0.0420	0.4357
194	0.1248	0.0420	0.0828
195	0.0856	0.0420	0.0436
196	0.0698	0.0420	0.0278
197	0.0400	0.0274	0.0126
198	0.0345	0.0237	0.0108
199	0.0305	0.0209	0.0096
200	0.0275	0.0189	0.0086
201	0.0251	0.0172	0.0079
202	0.0232	0.0159	0.0073
203	0.0216	0.0148	0.0068
204	0.0203	0.0139	0.0064
205	0.0119	0.0081	0.0037
206	0.0111	0.0076	0.0035
207	0.0105	0.0072	0.0033
208	0.0099	0.0068	0.0031
209	0.0094	0.0065	0.0030
210	0.0090	0.0062	0.0028

211	0.0086	0.0059	0.0027
212	0.0082	0.0056	0.0026
213	0.0079	0.0054	0.0025
214	0.0076	0.0052	0.0024
215	0.0073	0.0050	0.0023
216	0.0071	0.0048	0.0022
217	0.0075	0.0051	0.0023
218	0.0072	0.0050	0.0023
219	0.0070	0.0048	0.0022
220	0.0068	0.0047	0.0021
221	0.0066	0.0045	0.0021
222	0.0064	0.0044	0.0020
223	0.0063	0.0043	0.0020
224	0.0061	0.0042	0.0019
225	0.0060	0.0041	0.0019
226	0.0058	0.0040	0.0018
227	0.0057	0.0039	0.0018
228	0.0056	0.0038	0.0017
229	0.0054	0.0037	0.0017
230	0.0053	0.0036	0.0017
231	0.0052	0.0036	0.0016
232	0.0051	0.0035	0.0016
233	0.0050	0.0034	0.0016
234	0.0049	0.0034	0.0015
235	0.0048	0.0033	0.0015
236	0.0047	0.0032	0.0015
237	0.0046	0.0032	0.0015
238	0.0046	0.0031	0.0014
239	0.0045	0.0031	0.0014
240	0.0044	0.0030	0.0014
241	0.0043	0.0030	0.0014
242	0.0043	0.0029	0.0013
243	0.0042	0.0029	0.0013
244	0.0041	0.0028	0.0013
245	0.0041	0.0028	0.0013
246	0.0040	0.0027	0.0013

247	0.0039	0.0027	0.0012
248	0.0039	0.0027	0.0012
249	0.0038	0.0026	0.0012
250	0.0038	0.0026	0.0012
251	0.0037	0.0026	0.0012
252	0.0037	0.0025	0.0012
253	0.0036	0.0025	0.0011
254	0.0036	0.0025	0.0011
255	0.0035	0.0024	0.0011
256	0.0035	0.0024	0.0011
257	0.0035	0.0024	0.0011
258	0.0034	0.0023	0.0011
259	0.0034	0.0023	0.0011
260	0.0033	0.0023	0.0010
261	0.0033	0.0023	0.0010
262	0.0033	0.0022	0.0010
263	0.0032	0.0022	0.0010
264	0.0032	0.0022	0.0010
265	0.0031	0.0022	0.0010
266	0.0031	0.0021	0.0010
267	0.0031	0.0021	0.0010
268	0.0030	0.0021	0.0010
269	0.0030	0.0021	0.0009
270	0.0030	0.0020	0.0009
271	0.0030	0.0020	0.0009
272	0.0029	0.0020	0.0009
273	0.0029	0.0020	0.0009
274	0.0029	0.0020	0.0009
275	0.0028	0.0019	0.0009
276	0.0028	0.0019	0.0009
277	0.0028	0.0019	0.0009
278	0.0028	0.0019	0.0009
279	0.0027	0.0019	0.0009
280	0.0027	0.0019	0.0009
281	0.0027	0.0018	0.0008
282	0.0027	0.0018	0.0008

283	0.0026	0.0018	0.0008
284	0.0026	0.0018	0.0008
285	0.0026	0.0018	0.0008
286	0.0026	0.0018	0.0008
287	0.0026	0.0018	0.0008
288	0.0025	0.0017	0.0008

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 1.76

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.67

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 15.8922

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 14.9919

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================================================================================

                         2 4 - H O U R   S T O R M
                     R U N O F F   H Y D R O G R A P H

================================================================================
              HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
--------------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       50.0     100.0     150.0     200.0
--------------------------------------------------------------------------------
   0.083      0.0000      0.01  Q         .         .         .         .
   0.167      0.0002      0.03  Q         .         .         .         .
   0.250      0.0006      0.06  Q         .         .         .         .
   0.333      0.0014      0.11  Q         .         .         .         .
   0.417      0.0027      0.20  Q         .         .         .         .
   0.500      0.0050      0.34  Q         .         .         .         .
   0.583      0.0082      0.45  Q         .         .         .         .
   0.667      0.0119      0.54  Q         .         .         .         .
   0.750      0.0161      0.61  Q         .         .         .         .
   0.833      0.0207      0.67  Q         .         .         .         .
   0.917      0.0256      0.71  Q         .         .         .         .
   1.000      0.0307      0.75  Q         .         .         .         .
   1.083      0.0361      0.78  Q         .         .         .         .
   1.167      0.0417      0.81  Q         .         .         .         .
   1.250      0.0474      0.84  Q         .         .         .         .
   1.333      0.0533      0.86  Q         .         .         .         .
   1.417      0.0594      0.88  Q         .         .         .         .
   1.500      0.0656      0.90  Q         .         .         .         .
   1.583      0.0719      0.92  Q         .         .         .         .
   1.667      0.0784      0.94  Q         .         .         .         .
   1.750      0.0849      0.95  Q         .         .         .         .
   1.833      0.0916      0.97  Q         .         .         .         .
   1.917      0.0983      0.98  Q         .         .         .         .
   2.000      0.1052      0.99  Q         .         .         .         .
```

2.083	0.1121	1.01	Q	.	.	.	.
2.167	0.1191	1.02	Q	.	.	.	.
2.250	0.1262	1.03	Q	.	.	.	.
2.333	0.1334	1.04	Q	.	.	.	.
2.417	0.1407	1.05	Q	.	.	.	.
2.500	0.1480	1.06	Q	.	.	.	.
2.583	0.1554	1.07	Q	.	.	.	.
2.667	0.1628	1.08	Q	.	.	.	.
2.750	0.1703	1.09	Q	.	.	.	.
2.833	0.1779	1.10	Q	.	.	.	.
2.917	0.1856	1.11	Q	.	.	.	.
3.000	0.1933	1.12	Q	.	.	.	.
3.083	0.2010	1.13	Q	.	.	.	.
3.167	0.2089	1.14	Q	.	.	.	.
3.250	0.2167	1.14	Q	.	.	.	.
3.333	0.2247	1.15	Q	.	.	.	.
3.417	0.2326	1.16	Q	.	.	.	.
3.500	0.2407	1.17	Q	.	.	.	.
3.583	0.2487	1.17	Q	.	.	.	.
3.667	0.2569	1.18	Q	.	.	.	.
3.750	0.2651	1.19	Q	.	.	.	.
3.833	0.2733	1.20	Q	.	.	.	.
3.917	0.2816	1.20	Q	.	.	.	.
4.000	0.2899	1.21	Q	.	.	.	.
4.083	0.2983	1.22	Q	.	.	.	.
4.167	0.3068	1.23	Q	.	.	.	.
4.250	0.3153	1.24	Q	.	.	.	.
4.333	0.3239	1.24	Q	.	.	.	.
4.417	0.3325	1.25	Q	.	.	.	.
4.500	0.3412	1.26	Q	.	.	.	.
4.583	0.3499	1.27	Q	.	.	.	.
4.667	0.3587	1.27	Q	.	.	.	.
4.750	0.3675	1.28	Q	.	.	.	.
4.833	0.3764	1.29	QV	.	.	.	.
4.917	0.3853	1.29	QV	.	.	.	.
5.000	0.3942	1.30	QV	.	.	.	.

5.083	0.4033	1.31	QV	.	.	.	.
5.167	0.4123	1.32	QV	.	.	.	.
5.250	0.4214	1.32	QV	.	.	.	.
5.333	0.4306	1.33	QV	.	.	.	.
5.417	0.4398	1.34	QV	.	.	.	.
5.500	0.4491	1.35	QV	.	.	.	.
5.583	0.4584	1.35	QV	.	.	.	.
5.667	0.4678	1.36	QV	.	.	.	.
5.750	0.4773	1.37	QV	.	.	.	.
5.833	0.4868	1.38	QV	.	.	.	.
5.917	0.4963	1.39	QV	.	.	.	.
6.000	0.5059	1.40	QV	.	.	.	.
6.083	0.5156	1.40	QV	.	.	.	.
6.167	0.5253	1.41	QV	.	.	.	.
6.250	0.5351	1.42	QV	.	.	.	.
6.333	0.5450	1.43	QV	.	.	.	.
6.417	0.5549	1.44	QV	.	.	.	.
6.500	0.5649	1.45	QV	.	.	.	.
6.583	0.5749	1.46	QV	.	.	.	.
6.667	0.5850	1.47	QV	.	.	.	.
6.750	0.5952	1.48	QV	.	.	.	.
6.833	0.6054	1.49	QV	.	.	.	.
6.917	0.6157	1.50	QV	.	.	.	.
7.000	0.6261	1.51	QV	.	.	.	.
7.083	0.6365	1.52	QV	.	.	.	.
7.167	0.6470	1.53	QV	.	.	.	.
7.250	0.6576	1.54	QV	.	.	.	.
7.333	0.6683	1.55	QV	.	.	.	.
7.417	0.6790	1.56	QV	.	.	.	.
7.500	0.6898	1.57	QV	.	.	.	.
7.583	0.7007	1.58	QV	.	.	.	.
7.667	0.7116	1.59	QV	.	.	.	.
7.750	0.7227	1.60	QV	.	.	.	.
7.833	0.7338	1.61	QV	.	.	.	.
7.917	0.7450	1.63	QV	.	.	.	.
8.000	0.7563	1.64	Q V	.	.	.	.

8.083	0.7676	1.65	Q	V	.	.	.	.
8.167	0.7791	1.66	Q	V	.	.	.	.
8.250	0.7906	1.68	Q	V	.	.	.	.
8.333	0.8023	1.69	Q	V	.	.	.	.
8.417	0.8140	1.70	Q	V	.	.	.	.
8.500	0.8258	1.72	Q	V	.	.	.	.
8.583	0.8377	1.73	Q	V	.	.	.	.
8.667	0.8497	1.74	Q	V	.	.	.	.
8.750	0.8618	1.76	Q	V	.	.	.	.
8.833	0.8740	1.77	Q	V	.	.	.	.
8.917	0.8863	1.79	Q	V	.	.	.	.
9.000	0.8987	1.80	Q	V	.	.	.	.
9.083	0.9112	1.82	Q	V	.	.	.	.
9.167	0.9238	1.83	Q	V	.	.	.	.
9.250	0.9366	1.85	Q	V	.	.	.	.
9.333	0.9494	1.86	Q	V	.	.	.	.
9.417	0.9623	1.88	Q	V	.	.	.	.
9.500	0.9754	1.90	Q	V	.	.	.	.
9.583	0.9886	1.91	Q	V	.	.	.	.
9.667	1.0019	1.93	Q	V	.	.	.	.
9.750	1.0153	1.95	Q	V	.	.	.	.
9.833	1.0289	1.97	Q	V	.	.	.	.
9.917	1.0425	1.99	Q	V	.	.	.	.
10.000	1.0563	2.01	Q	V	.	.	.	.
10.083	1.0703	2.02	Q	V	.	.	.	.
10.167	1.0844	2.04	Q	V	.	.	.	.
10.250	1.0986	2.07	Q	V	.	.	.	.
10.333	1.1130	2.09	Q	V	.	.	.	.
10.417	1.1275	2.11	Q	V	.	.	.	.
10.500	1.1421	2.13	Q	V	.	.	.	.
10.583	1.1570	2.15	Q	V	.	.	.	.
10.667	1.1719	2.17	Q	V	.	.	.	.
10.750	1.1871	2.20	Q	V	.	.	.	.
10.833	1.2024	2.22	Q	V	.	.	.	.
10.917	1.2178	2.25	Q	V	.	.	.	.
11.000	1.2335	2.27	Q	V	.	.	.	.

11.083	1.2493	2.30	Q	V	.	.	.	.
11.167	1.2653	2.32	Q	V	.	.	.	.
11.250	1.2815	2.35	Q	V	.	.	.	.
11.333	1.2979	2.38	Q	V	.	.	.	.
11.417	1.3145	2.41	Q	V	.	.	.	.
11.500	1.3313	2.44	Q	V	.	.	.	.
11.583	1.3483	2.47	Q	V	.	.	.	.
11.667	1.3655	2.50	Q	V	.	.	.	.
11.750	1.3830	2.53	Q	V	.	.	.	.
11.833	1.4007	2.57	Q	V	.	.	.	.
11.917	1.4186	2.60	Q	V	.	.	.	.
12.000	1.4368	2.64	Q	V	.	.	.	.
12.083	1.4552	2.67	Q	V	.	.	.	.
12.167	1.4738	2.70	Q	V	.	.	.	.
12.250	1.4926	2.74	Q	V	.	.	.	.
12.333	1.5117	2.76	Q	V	.	.	.	.
12.417	1.5308	2.78	Q	V	.	.	.	.
12.500	1.5500	2.79	Q	V	.	.	.	.
12.583	1.5693	2.80	Q	V	.	.	.	.
12.667	1.5888	2.83	Q	V	.	.	.	.
12.750	1.6085	2.86	Q	V	.	.	.	.
12.833	1.6284	2.89	Q	V	.	.	.	.
12.917	1.6486	2.93	Q	V	.	.	.	.
13.000	1.6690	2.97	Q	V	.	.	.	.
13.083	1.6898	3.02	Q	V	.	.	.	.
13.167	1.7110	3.07	Q	V	.	.	.	.
13.250	1.7325	3.12	Q	V	.	.	.	.
13.333	1.7543	3.18	Q	V	.	.	.	.
13.417	1.7766	3.23	Q	V	.	.	.	.
13.500	1.7993	3.30	Q	V	.	.	.	.
13.583	1.8225	3.36	Q	V	.	.	.	.
13.667	1.8461	3.43	Q	V	.	.	.	.
13.750	1.8703	3.51	Q	V	.	.	.	.
13.833	1.8949	3.58	Q	V	.	.	.	.
13.917	1.9202	3.67	Q	V	.	.	.	.
14.000	1.9460	3.75	Q	V	.	.	.	.

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14.083      1.9726      3.86  Q    V    .         .         .         .
14.167      2.0003      4.02  Q    V    .         .         .         .
14.250      2.0294      4.22  Q    V    .         .         .         .
14.333      2.0602      4.48  Q    V    .         .         .         .
14.417      2.0938      4.87  Q    V    .         .         .         .
14.500      2.1310      5.40  .Q   V    .         .         .         .
14.583      2.1716      5.90  .Q   V    .         .         .         .
14.667      2.2152      6.34  .Q   V    .         .         .         .
14.750      2.2616      6.73  .Q    V   .         .         .         .
14.833      2.3105      7.10  .Q    V   .         .         .         .
14.917      2.3618      7.46  .Q    V   .         .         .         .
15.000      2.4157      7.83  .Q    V   .         .         .         .
15.083      2.4722      8.21  .Q    V   .         .         .         .
15.167      2.5315      8.61  .Q    V   .         .         .         .
15.250      2.5938      9.04  .Q    V   .         .         .         .
15.333      2.6592      9.50  .Q     V  .         .         .         .
15.417      2.7286     10.08  . Q    V  .         .         .         .
15.500      2.8034     10.86  . Q    V  .         .         .         .
15.583      2.8856     11.93  . Q    V  .         .         .         .
15.667      2.9780     13.42  . Q    V  .         .         .         .
15.750      3.0868     15.79  .  Q    V .         .         .         .
15.833      3.2205     19.41  .  Q    V .         .         .         .
15.917      3.3876     24.26  .   Q    V.         .         .         .
16.000      3.6008     30.97  .     Q  V.         .         .         .
16.083      3.8925     42.35  .       Q V         .         .         .
16.167      4.2930     58.16  .         .Q        .         .         .
16.250      4.8084     74.84  .         . V Q     .         .         .
16.333      5.4560     94.03  .         .   V   Q .         .         .
16.417      6.2868    120.63  .         .     V   .   Q     .         .
16.500      7.2487    139.67  .         .        V.      Q  .         .
16.583      8.1164    125.99  .         .         .V   Q    .         .
16.667      8.8339    104.17  .         .         Q  V      .         .
16.750      9.4225     85.47  .         .      Q  .    V    .         .
16.833      9.9020     69.62  .         .  Q      .     V   .         .
16.917     10.3086     59.03  .         .Q        .      V  .         .
17.000     10.6648     51.72  .         Q         .       V .         .
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17.083     10.9781     45.50  .        Q.         .        V.         .
17.167     11.2573     40.54  .       Q .         .         V         .
17.250     11.5101     36.70  .      Q  .         .         V         .
17.333     11.7351     32.66  .     Q   .         .         .V        .
17.417     11.9404     29.81  .    Q    .         .         .V        .
17.500     12.1256     26.89  .    Q    .         .         . V       .
17.583     12.2960     24.74  .   Q     .         .         . V       .
17.667     12.4533     22.83  .   Q     .         .         .  V      .
17.750     12.5966     20.81  .   Q     .         .         .  V      .
17.833     12.7282     19.11  .  Q      .         .         .  V      .
17.917     12.8464     17.15  .  Q      .         .         .   V     .
18.000     12.9564     15.97  .  Q      .         .         .   V     .
18.083     13.0598     15.02  .  Q      .         .         .   V     .
18.167     13.1571     14.13  . Q       .         .         .    V    .
18.250     13.2480     13.19  . Q       .         .         .    V    .
18.333     13.3338     12.47  . Q       .         .         .    V    .
18.417     13.4148     11.76  . Q       .         .         .    V    .
18.500     13.4896     10.85  . Q       .         .         .    V    .
18.583     13.5599     10.22  . Q       .         .         .     V   .
18.667     13.6273      9.79  .Q        .         .         .     V   .
18.750     13.6910      9.25  .Q        .         .         .     V   .
18.833     13.7496      8.50  .Q        .         .         .     V   .
18.917     13.8053      8.09  .Q        .         .         .     V   .
19.000     13.8584      7.70  .Q        .         .         .     V   .
19.083     13.9072      7.08  .Q        .         .         .      V  .
19.167     13.9521      6.52  .Q        .         .         .      V  .
19.250     13.9948      6.20  .Q        .         .         .      V  .
19.333     14.0350      5.84  .Q        .         .         .      V  .
19.417     14.0712      5.24  .Q        .         .         .      V  .
19.500     14.1054      4.98  Q         .         .         .      V  .
19.583     14.1389      4.86  Q         .         .         .      V  .
19.667     14.1722      4.83  Q         .         .         .      V  .
19.750     14.2056      4.85  Q         .         .         .      V  .
19.833     14.2385      4.78  Q         .         .         .      V  .
19.917     14.2708      4.69  Q         .         .         .       V .
20.000     14.3025      4.59  Q         .         .         .       V .
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20.083	14.3333	4.48	Q	.	.	.	V .
20.167	14.3633	4.35	Q	.	.	.	V .
20.250	14.3921	4.19	Q	.	.	.	V .
20.333	14.4196	3.99	Q	.	.	.	V .
20.417	14.4452	3.72	Q	.	.	.	V .
20.500	14.4679	3.30	Q	.	.	.	V .
20.583	14.4844	2.40	Q	.	.	.	V .
20.667	14.4996	2.20	Q	.	.	.	V .
20.750	14.5139	2.08	Q	.	.	.	V .
20.833	14.5276	1.99	Q	.	.	.	V .
20.917	14.5410	1.94	Q	.	.	.	V .
21.000	14.5540	1.89	Q	.	.	.	V .
21.083	14.5668	1.85	Q	.	.	.	V .
21.167	14.5792	1.81	Q	.	.	.	V .
21.250	14.5914	1.77	Q	.	.	.	V .
21.333	14.6034	1.73	Q	.	.	.	V .
21.417	14.6151	1.70	Q	.	.	.	V .
21.500	14.6266	1.67	Q	.	.	.	V.
21.583	14.6379	1.64	Q	.	.	.	V.
21.667	14.6490	1.62	Q	.	.	.	V.
21.750	14.6599	1.59	Q	.	.	.	V.
21.833	14.6707	1.57	Q	.	.	.	V.
21.917	14.6814	1.54	Q	.	.	.	V.
22.000	14.6919	1.52	Q	.	.	.	V.
22.083	14.7022	1.50	Q	.	.	.	V.
22.167	14.7124	1.48	Q	.	.	.	V.
22.250	14.7225	1.46	Q	.	.	.	V.
22.333	14.7324	1.44	Q	.	.	.	V.
22.417	14.7423	1.43	Q	.	.	.	V.
22.500	14.7519	1.41	Q	.	.	.	V.
22.583	14.7615	1.39	Q	.	.	.	V.
22.667	14.7710	1.37	Q	.	.	.	V.
22.750	14.7803	1.36	Q	.	.	.	V.
22.833	14.7895	1.34	Q	.	.	.	V.
22.917	14.7987	1.32	Q	.	.	.	V.
23.000	14.8077	1.31	Q	.	.	.	V.

23.083	14.8166	1.29	Q	.	.	.	V.
23.167	14.8254	1.28	Q	.	.	.	V.
23.250	14.8341	1.27	Q	.	.	.	V.
23.333	14.8428	1.25	Q	.	.	.	V.
23.417	14.8513	1.24	Q	.	.	.	V.
23.500	14.8597	1.23	Q	.	.	.	V.
23.583	14.8681	1.21	Q	.	.	.	V.
23.667	14.8764	1.20	Q	.	.	.	V.
23.750	14.8846	1.19	Q	.	.	.	V.
23.833	14.8927	1.18	Q	.	.	.	V.
23.917	14.9007	1.17	Q	.	.	.	V.
24.000	14.9086	1.15	Q	.	.	.	V.
24.083	14.9165	1.14	Q	.	.	.	V.
24.167	14.9241	1.11	Q	.	.	.	V.
24.250	14.9314	1.06	Q	.	.	.	V.
24.333	14.9383	1.01	Q	.	.	.	V.
24.417	14.9446	0.91	Q	.	.	.	V.
24.500	14.9498	0.76	Q	.	.	.	V.
24.583	14.9542	0.64	Q	.	.	.	V.
24.667	14.9580	0.54	Q	.	.	.	V.
24.750	14.9612	0.47	Q	.	.	.	V.
24.833	14.9641	0.42	Q	.	.	.	V.
24.917	14.9667	0.37	Q	.	.	.	V.
25.000	14.9690	0.34	Q	.	.	.	V.
25.083	14.9711	0.30	Q	.	.	.	V.
25.167	14.9729	0.27	Q	.	.	.	V.
25.250	14.9747	0.25	Q	.	.	.	V.
25.333	14.9762	0.23	Q	.	.	.	V.
25.417	14.9776	0.21	Q	.	.	.	V.
25.500	14.9789	0.19	Q	.	.	.	V.
25.583	14.9801	0.17	Q	.	.	.	V.
25.667	14.9812	0.16	Q	.	.	.	V.
25.750	14.9822	0.14	Q	.	.	.	V.
25.833	14.9831	0.13	Q	.	.	.	V.
25.917	14.9839	0.12	Q	.	.	.	V.
26.000	14.9847	0.11	Q	.	.	.	V.

```
   26.083     14.9854      0.10  Q         .         .         .        V.
   26.167     14.9860      0.09  Q         .         .         .        V.
   26.250     14.9866      0.09  Q         .         .         .        V.
   26.333     14.9871      0.08  Q         .         .         .        V.
   26.417     14.9876      0.07  Q         .         .         .        V.
   26.500     14.9881      0.07  Q         .         .         .        V.
   26.583     14.9885      0.06  Q         .         .         .        V.
   26.667     14.9889      0.05  Q         .         .         .        V.
   26.750     14.9892      0.05  Q         .         .         .        V.
   26.833     14.9895      0.04  Q         .         .         .        V.
   26.917     14.9898      0.04  Q         .         .         .        V.
   27.000     14.9900      0.04  Q         .         .         .        V.
   27.083     14.9903      0.03  Q         .         .         .        V.
   27.167     14.9905      0.03  Q         .         .         .        V.
   27.250     14.9907      0.03  Q         .         .         .        V.
   27.333     14.9908      0.02  Q         .         .         .        V.
   27.417     14.9910      0.02  Q         .         .         .        V.
   27.500     14.9911      0.02  Q         .         .         .        V.
   27.583     14.9913      0.02  Q         .         .         .        V.
   27.667     14.9914      0.02  Q         .         .         .        V.
   27.750     14.9915      0.02  Q         .         .         .        V.
   27.833     14.9916      0.01  Q         .         .         .        V.
   27.917     14.9917      0.01  Q         .         .         .        V.
   28.000     14.9918      0.01  Q         .         .         .        V.
   28.083     14.9918      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                Duration
        Peak Flow Rate                     (minutes)
    =======================                =========
               0%                           1685.0
              10%                            150.0
              20%                             90.0
```

30%	65.0
40%	50.0
50%	35.0
60%	30.0
70%	20.0
80%	15.0
90%	10.0

```
****************************************************************************
  FLOW PROCESS FROM NODE   8003.00 TO NODE   8003.00 IS CODE = 3.1
----------------------------------------------------------------------------
  >>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<
============================================================================

                     INFLOW
                   (STREAM 1)
                        |
                        |
                        V                __effective depth
                    -----------          |   (and volume)
                   |           |    |    |
                   |           |    |....V........
                   | detention |<-->|           outflow
                   |   basin   |    |.........________
                    -----------     |    ^    |  \
                        |           |  dead   |   basin outlet
                        V           | storage |
                     OUTFLOW         ---------
                   (STREAM 1)


         ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
         THROUGH A FLOW-THROUGH DETENTION BASIN
         SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
```

DEAD STORAGE(AF) = 0.000

SPECIFIED DEAD STORAGE(AF) FILLED = 0.000

SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000

DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	35.00	4.000
3	2.00	70.00	8.000
4	3.00	105.00	12.000
5	4.00	140.00	16.000

==

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):

(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time; MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
14.083	0.000	3.86	0.00	0.09	3.0	0.347
14.167	0.000	4.02	0.00	0.09	3.1	0.353
14.250	0.000	4.22	0.00	0.09	3.1	0.361
14.333	0.000	4.48	0.00	0.09	3.2	0.370
14.417	0.000	4.87	0.00	0.10	3.3	0.381
14.500	0.000	5.40	0.00	0.10	3.4	0.394
14.583	0.000	5.90	0.00	0.10	3.5	0.411
14.667	0.000	6.34	0.00	0.11	3.7	0.429
14.750	0.000	6.73	0.00	0.11	3.8	0.449
14.833	0.000	7.10	0.00	0.12	4.0	0.470

14.917	0.000	7.46	0.00	0.12	4.2	0.493
15.000	0.000	7.83	0.00	0.13	4.4	0.516
15.083	0.000	8.21	0.00	0.14	4.6	0.541
15.167	0.000	8.61	0.00	0.14	4.8	0.567
15.250	0.000	9.04	0.00	0.15	5.1	0.594
15.333	0.000	9.50	0.00	0.16	5.3	0.623
15.417	0.000	10.08	0.00	0.16	5.6	0.654
15.500	0.000	10.86	0.00	0.17	5.9	0.688
15.583	0.000	11.93	0.00	0.18	6.2	0.728
15.667	0.000	13.42	0.00	0.19	6.6	0.775
15.750	0.000	15.79	0.00	0.21	7.0	0.835
15.833	0.000	19.41	0.00	0.23	7.7	0.916
15.917	0.000	24.26	0.00	0.26	8.5	1.025
16.000	0.000	30.97	0.00	0.29	9.6	1.172
16.083	0.000	42.35	0.00	0.35	11.2	1.386
16.167	0.000	58.16	0.00	0.42	13.5	1.694
16.250	0.000	74.84	0.00	0.52	16.6	2.095
16.333	0.000	94.03	0.00	0.65	20.5	2.601
16.417	0.000	120.63	0.00	0.81	25.6	3.256
16.500	0.000	139.67	0.00	1.00	31.7	3.999
16.583	0.000	125.99	0.00	1.15	37.7	4.607
16.667	0.000	104.17	0.00	1.26	42.2	5.034
16.750	0.000	85.47	0.00	1.33	45.3	5.311
16.833	0.000	69.62	0.00	1.37	47.2	5.466
16.917	0.000	59.03	0.00	1.39	48.2	5.541
17.000	0.000	51.72	0.00	1.39	48.6	5.563
17.083	0.000	45.50	0.00	1.39	48.6	5.541
17.167	0.000	40.54	0.00	1.37	48.3	5.488
17.250	0.000	36.70	0.00	1.35	47.7	5.413
17.333	0.000	32.66	0.00	1.33	46.9	5.314
17.417	0.000	29.81	0.00	1.30	46.0	5.203
17.500	0.000	26.89	0.00	1.27	45.0	5.078
17.583	0.000	24.74	0.00	1.24	43.9	4.946
17.667	0.000	22.83	0.00	1.20	42.7	4.810
17.750	0.000	20.81	0.00	1.17	41.5	4.668
17.833	0.000	19.11	0.00	1.13	40.2	4.522

17.917	0.000	17.15	0.00	1.09	38.9	4.372
18.000	0.000	15.97	0.00	1.06	37.6	4.223
18.083	0.000	15.02	0.00	1.02	36.3	4.077
18.167	0.000	14.13	0.00	0.98	35.0	3.933
18.250	0.000	13.19	0.00	0.95	33.8	3.791
18.333	0.000	12.47	0.00	0.91	32.6	3.652
18.417	0.000	11.76	0.00	0.88	31.4	3.517
18.500	0.000	10.85	0.00	0.85	30.2	3.384
18.583	0.000	10.22	0.00	0.81	29.0	3.255
18.667	0.000	9.79	0.00	0.78	27.9	3.130
18.750	0.000	9.25	0.00	0.75	26.9	3.008
18.833	0.000	8.50	0.00	0.72	25.8	2.889
18.917	0.000	8.09	0.00	0.69	24.8	2.774
19.000	0.000	7.70	0.00	0.67	23.8	2.664
19.083	0.000	7.08	0.00	0.64	22.8	2.555
19.167	0.000	6.52	0.00	0.61	21.9	2.449
19.250	0.000	6.20	0.00	0.59	21.0	2.347
19.333	0.000	5.84	0.00	0.56	20.1	2.249
19.417	0.000	5.24	0.00	0.54	19.3	2.153
19.500	0.000	4.98	0.00	0.51	18.4	2.060
19.583	0.000	4.86	0.00	0.49	17.6	1.972
19.667	0.000	4.83	0.00	0.47	16.9	1.889
19.750	0.000	4.85	0.00	0.45	16.2	1.811
19.833	0.000	4.78	0.00	0.43	15.5	1.737
19.917	0.000	4.69	0.00	0.42	14.9	1.667

PROCESS SUMMARY OF STORAGE:

INFLOW VOLUME = 14.992 AF

BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)

OUTFLOW VOLUME = 14.992 AF

LOSS VOLUME = 0.000 AF

****

FLOW PROCESS FROM NODE 8003.00 TO NODE 8004.00 IS CODE = 5.1

>>>>>MODEL CHANNEL ROUTING OF STREAM #1 BY THE TRANSLATION METHOD<<<<<

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THE TRANSLATION MODEL NEGLECTS ALL STORAGE ATTENUATION EFFECTS,
AND MOVES THE STREAM 1 RUNOFF HYDROGRAPH FORWARD IN TIME.

ASSUMED REGULAR CHANNEL INFORMATION:

BASEWIDTH(FT) = 100.00 CHANNEL Z = 5.00

UPSTREAM ELEVATION(FT) = 444.55

DOWNSTREAM ELEVATION(FT) = 423.22

CHANNEL LENGTH(FT) = 2682.71 MANNING'S FACTOR = 0.050

CONSTANT LOSS RATE(CFS) = 0.00

MEAN-FLOW RATE NORMAL-DEPTH FLOW VELOCITIES(FPS) ARE AS FOLLOWS:

	(FLOW RATE (CFS))	[FLOW VELOCITY (FPS)]
AVERAGED PEAK 5-MINUTE:	(48.6).......	[1.33]
AVERAGED PEAK 15-MINUTE:	(48.5).......	[1.33]
AVERAGED PEAK 30-MINUTE:	(48.1).......	[1.32]
AVERAGED PEAK 1-HOUR:	(46.5).......	[1.33]
AVERAGED PEAK 3-HOUR:	(36.0).......	[1.19]
AVERAGED PEAK 6-HOUR:	(23.8).......	[0.99]
AVERAGED PEAK 24-HOUR:	(7.5).......	[0.65]

USER-SPECIFIED CHANNEL AVERAGE FLOW VELOCITY(FPS) = 2.020

HYDROGRAPH TRANSLATION TIME

= (CHANNEL LENGTH)/(AVERAGE FLOW VELOCITY)

= (2682.71)/(2.020) = 0.369 HRS

TRANSLATION METHOD CHANNEL ROUTING RESULTS:

MODEL TIME (HRS)	INFLOW (STREAM 1) (CFS)	ROUTED FLOW (CFS)	OUTFLOW LESS LOSS (STREAM 1) (CFS)
14.000	2.96	2.77	2.77
14.083	3.01	2.81	2.81
14.167	3.06	2.85	2.85
14.250	3.12	2.89	2.89

14.333	3.20	2.94	2.94
14.417	3.28	2.99	2.99
14.500	3.39	3.04	3.04
14.583	3.52	3.10	3.10
14.667	3.68	3.17	3.17
14.750	3.84	3.25	3.25
14.833	4.02	3.34	3.34
14.917	4.21	3.47	3.47
15.000	4.41	3.61	3.61
15.083	4.62	3.77	3.77
15.167	4.84	3.95	3.95
15.250	5.08	4.13	4.13
15.333	5.32	4.33	4.33
15.417	5.58	4.53	4.53
15.500	5.87	4.75	4.75
15.583	6.19	4.98	4.98
15.667	6.57	5.22	5.22
15.750	7.04	5.47	5.47
15.833	7.66	5.75	5.75
15.917	8.49	6.06	6.06
16.000	9.61	6.41	6.41
16.083	11.19	6.84	6.84
16.167	13.48	7.40	7.40
16.250	16.58	8.14	8.14
16.333	20.55	9.13	9.13
16.417	25.62	10.52	10.52
16.500	31.74	12.50	12.50
16.583	37.65	15.25	15.25
16.667	42.18	18.85	18.85
16.750	45.26	23.46	23.46
16.833	47.15	29.13	29.13
16.917	48.15	35.13	35.13
17.000	48.58	40.25	40.25
17.083	48.58	43.95	43.95
17.167	48.25	46.34	46.34
17.250	47.69	47.73	47.73

17.333	46.93	48.40	48.40
17.417	46.01	48.58	48.58
17.500	44.98	48.39	48.39
17.583	43.86	47.93	47.93
17.667	42.68	47.25	47.25
17.750	41.46	46.40	46.40
17.833	40.21	45.42	45.42
17.917	38.91	44.34	44.34
18.000	37.61	43.18	43.18
18.083	36.31	41.98	41.98
18.167	35.04	40.74	40.74
18.250	33.79	39.47	39.47
18.333	32.56	38.16	38.16
18.417	31.37	36.87	36.87
18.500	30.19	35.58	35.58
18.583	29.04	34.32	34.32
18.667	27.93	33.09	33.09
18.750	26.85	31.88	31.88
18.833	25.80	30.70	30.70
18.917	24.78	29.54	29.54
19.000	23.79	28.41	28.41
19.083	22.83	27.31	27.31
19.167	21.89	26.25	26.25
19.250	20.98	25.22	25.22
19.333	20.11	24.21	24.21
19.417	19.26	23.24	23.24
19.500	18.43	22.29	22.29
19.583	17.64	21.37	21.37
19.667	16.89	20.48	20.48
19.750	16.19	19.62	19.62
19.833	15.52	18.78	18.78
19.917	14.89	17.98	17.98
20.000	14.29	17.21	17.21

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PROCESS SUMMARY OF STORAGE:

INFLOW VOLUME =   14.992 AF

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    OUTFLOW VOLUME =     14.992 AF
    LOSS    VOLUME =      0.000 AF


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  FLOW PROCESS FROM NODE   8004.00 TO NODE   8004.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #2)

         WATERSHED AREA =      83.590 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.720 HOURS
         DESERT(UNDEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.590
         LOW LOSS FRACTION = 0.778
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.48
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  1.16
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.60
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  2.24
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.56
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  3.43

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.996
          30-MINUTE FACTOR = 0.996
           1-HOUR FACTOR = 0.996
           3-HOUR FACTOR = 0.999
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000

         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
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UNIT INTERVAL PERCENTAGE OF LAG-TIME = 11.574

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UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.509	5.148
2	1.920	14.258
3	4.188	22.929
4	7.340	31.871
5	12.013	47.240
6	20.041	81.149
7	31.274	113.560
8	41.164	99.974
9	48.873	77.936
10	55.114	63.094
11	59.950	48.886
12	63.824	39.161
13	67.094	33.061
14	70.000	29.375
15	72.564	25.924
16	74.772	22.317
17	76.781	20.313
18	78.620	18.583
19	80.164	15.610
20	81.648	15.004
21	82.925	12.908
22	84.164	12.524
23	85.300	11.485
24	86.406	11.179
25	87.385	9.900

26	88.310	9.353
27	89.103	8.011
28	89.797	7.022
29	90.472	6.820
30	91.120	6.554
31	91.742	6.283
32	92.300	5.642
33	92.847	5.534
34	93.360	5.184
35	93.858	5.034
36	94.270	4.162
37	94.663	3.978
38	95.057	3.978
39	95.450	3.971
40	95.787	3.405
41	96.088	3.043
42	96.388	3.040
43	96.689	3.040
44	96.961	2.747
45	97.171	2.122
46	97.380	2.112
47	97.588	2.105
48	97.785	1.996
49	97.913	1.297
50	98.030	1.174
51	98.145	1.167
52	98.261	1.174
53	98.392	1.324
54	98.530	1.399
55	98.670	1.409
56	98.809	1.402
57	98.947	1.402
58	99.087	1.409
59	99.225	1.402
60	99.364	1.402
61	99.503	1.402

62	99.641	1.402
63	99.780	1.402
64	99.919	1.402
65	100.000	0.820

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UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0020	0.0006
13	0.0026	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0037	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0040	0.0031	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0069	0.0054	0.0015
146	0.0070	0.0054	0.0015
147	0.0071	0.0056	0.0016
148	0.0072	0.0056	0.0016
149	0.0074	0.0058	0.0016
150	0.0075	0.0058	0.0017
151	0.0077	0.0060	0.0017
152	0.0078	0.0061	0.0017
153	0.0080	0.0062	0.0018
154	0.0081	0.0063	0.0018
155	0.0083	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0087	0.0068	0.0019
158	0.0089	0.0069	0.0020
159	0.0091	0.0071	0.0020
160	0.0093	0.0072	0.0021
161	0.0096	0.0075	0.0021
162	0.0098	0.0076	0.0022
163	0.0101	0.0079	0.0022
164	0.0103	0.0080	0.0023
165	0.0107	0.0083	0.0024
166	0.0109	0.0085	0.0024
167	0.0114	0.0088	0.0025
168	0.0116	0.0090	0.0026
169	0.0194	0.0151	0.0043
170	0.0198	0.0154	0.0044
171	0.0206	0.0161	0.0046
172	0.0211	0.0164	0.0047
173	0.0221	0.0172	0.0049
174	0.0226	0.0176	0.0050

175	0.0238	0.0185	0.0053
176	0.0244	0.0190	0.0054
177	0.0258	0.0201	0.0057
178	0.0266	0.0207	0.0059
179	0.0284	0.0221	0.0063
180	0.0294	0.0228	0.0065
181	0.0317	0.0246	0.0070
182	0.0330	0.0256	0.0073
183	0.0360	0.0280	0.0080
184	0.0379	0.0295	0.0084
185	0.0630	0.0490	0.0140
186	0.0663	0.0492	0.0171
187	0.0741	0.0492	0.0250
188	0.0794	0.0492	0.0302
189	0.0992	0.0492	0.0501
190	0.1100	0.0492	0.0608
191	0.1486	0.0492	0.0994
192	0.1947	0.0492	0.1455
193	0.4782	0.0492	0.4290
194	0.1250	0.0492	0.0758
195	0.0856	0.0492	0.0365
196	0.0699	0.0492	0.0207
197	0.0399	0.0311	0.0089
198	0.0344	0.0268	0.0076
199	0.0305	0.0237	0.0068
200	0.0275	0.0214	0.0061
201	0.0251	0.0195	0.0056
202	0.0232	0.0180	0.0051
203	0.0216	0.0168	0.0048
204	0.0202	0.0157	0.0045
205	0.0119	0.0092	0.0026
206	0.0111	0.0087	0.0025
207	0.0105	0.0082	0.0023
208	0.0099	0.0077	0.0022
209	0.0094	0.0073	0.0021
210	0.0090	0.0070	0.0020

211	0.0086	0.0067	0.0019
212	0.0082	0.0064	0.0018
213	0.0079	0.0061	0.0018
214	0.0076	0.0059	0.0017
215	0.0073	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0040	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0039	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0031	0.0024	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0030	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0006
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0021	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.02

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.41

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 14.0558

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 9.8279

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==============================================================================

                    2 4 - H O U R   S T O R M
                 R U N O F F   H Y D R O G R A P H

==============================================================================
              HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
       (Note: Time indicated is at END of Each Unit Intervals)
------------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       25.0      50.0      75.0     100.0
------------------------------------------------------------------------------
   0.083      0.0000      0.00  Q         .         .         .         .
   0.167      0.0001      0.01  Q         .         .         .         .
   0.250      0.0003      0.02  Q         .         .         .         .
   0.333      0.0005      0.04  Q         .         .         .         .
   0.417      0.0010      0.07  Q         .         .         .         .
   0.500      0.0018      0.11  Q         .         .         .         .
   0.583      0.0030      0.18  Q         .         .         .         .
   0.667      0.0046      0.23  Q         .         .         .         .
   0.750      0.0066      0.28  Q         .         .         .         .
   0.833      0.0087      0.32  Q         .         .         .         .
   0.917      0.0111      0.34  Q         .         .         .         .
   1.000      0.0136      0.37  Q         .         .         .         .
   1.083      0.0163      0.39  Q         .         .         .         .
   1.167      0.0191      0.41  Q         .         .         .         .
   1.250      0.0220      0.42  Q         .         .         .         .
   1.333      0.0250      0.44  Q         .         .         .         .
   1.417      0.0281      0.45  Q         .         .         .         .
   1.500      0.0312      0.46  Q         .         .         .         .
   1.583      0.0345      0.47  Q         .         .         .         .
   1.667      0.0378      0.48  Q         .         .         .         .
   1.750      0.0412      0.49  Q         .         .         .         .
   1.833      0.0447      0.50  Q         .         .         .         .
   1.917      0.0482      0.51  Q         .         .         .         .
   2.000      0.0517      0.52  Q         .         .         .         .
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2.083	0.0553	0.53	Q	.	.	.	.
2.167	0.0590	0.53	Q	.	.	.	.
2.250	0.0627	0.54	Q	.	.	.	.
2.333	0.0665	0.55	Q	.	.	.	.
2.417	0.0703	0.55	Q	.	.	.	.
2.500	0.0742	0.56	Q	.	.	.	.
2.583	0.0781	0.57	Q	.	.	.	.
2.667	0.0820	0.57	Q	.	.	.	.
2.750	0.0860	0.58	Q	.	.	.	.
2.833	0.0900	0.58	Q	.	.	.	.
2.917	0.0940	0.59	Q	.	.	.	.
3.000	0.0981	0.59	Q	.	.	.	.
3.083	0.1022	0.60	Q	.	.	.	.
3.167	0.1064	0.60	Q	.	.	.	.
3.250	0.1106	0.61	Q	.	.	.	.
3.333	0.1148	0.61	Q	.	.	.	.
3.417	0.1190	0.62	Q	.	.	.	.
3.500	0.1233	0.62	Q	.	.	.	.
3.583	0.1276	0.63	Q	.	.	.	.
3.667	0.1320	0.63	Q	.	.	.	.
3.750	0.1364	0.64	Q	.	.	.	.
3.833	0.1408	0.64	Q	.	.	.	.
3.917	0.1452	0.64	Q	.	.	.	.
4.000	0.1497	0.65	Q	.	.	.	.
4.083	0.1542	0.65	Q	.	.	.	.
4.167	0.1587	0.66	Q	.	.	.	.
4.250	0.1633	0.66	Q	.	.	.	.
4.333	0.1679	0.67	Q	.	.	.	.
4.417	0.1725	0.67	Q	.	.	.	.
4.500	0.1771	0.67	Q	.	.	.	.
4.583	0.1818	0.68	Q	.	.	.	.
4.667	0.1865	0.68	Q	.	.	.	.
4.750	0.1912	0.69	Q	.	.	.	.
4.833	0.1960	0.69	Q	.	.	.	.
4.917	0.2008	0.70	Q	.	.	.	.
5.000	0.2056	0.70	Q	.	.	.	.

5.083	0.2104	0.71	Q	.	.	.	.
5.167	0.2153	0.71	Q	.	.	.	.
5.250	0.2203	0.71	Q	.	.	.	.
5.333	0.2252	0.72	Q	.	.	.	.
5.417	0.2302	0.72	Q	.	.	.	.
5.500	0.2352	0.73	Q	.	.	.	.
5.583	0.2403	0.73	Q	.	.	.	.
5.667	0.2453	0.74	Q	.	.	.	.
5.750	0.2504	0.74	QV	.	.	.	.
5.833	0.2556	0.75	QV	.	.	.	.
5.917	0.2607	0.75	QV	.	.	.	.
6.000	0.2659	0.75	QV	.	.	.	.
6.083	0.2712	0.76	QV	.	.	.	.
6.167	0.2764	0.76	QV	.	.	.	.
6.250	0.2817	0.77	QV	.	.	.	.
6.333	0.2870	0.77	QV	.	.	.	.
6.417	0.2924	0.78	QV	.	.	.	.
6.500	0.2978	0.78	QV	.	.	.	.
6.583	0.3032	0.79	QV	.	.	.	.
6.667	0.3086	0.79	QV	.	.	.	.
6.750	0.3141	0.80	QV	.	.	.	.
6.833	0.3197	0.80	QV	.	.	.	.
6.917	0.3252	0.81	QV	.	.	.	.
7.000	0.3308	0.81	QV	.	.	.	.
7.083	0.3365	0.82	QV	.	.	.	.
7.167	0.3421	0.82	QV	.	.	.	.
7.250	0.3478	0.83	QV	.	.	.	.
7.333	0.3536	0.83	QV	.	.	.	.
7.417	0.3594	0.84	QV	.	.	.	.
7.500	0.3652	0.85	QV	.	.	.	.
7.583	0.3711	0.85	QV	.	.	.	.
7.667	0.3770	0.86	QV	.	.	.	.
7.750	0.3829	0.86	QV	.	.	.	.
7.833	0.3889	0.87	QV	.	.	.	.
7.917	0.3950	0.88	QV	.	.	.	.
8.000	0.4011	0.88	QV	.	.	.	.

8.083	0.4072	0.89	QV	.	.	.	.
8.167	0.4134	0.90	QV	.	.	.	.
8.250	0.4196	0.90	QV	.	.	.	.
8.333	0.4259	0.91	QV	.	.	.	.
8.417	0.4322	0.92	QV	.	.	.	.
8.500	0.4385	0.92	QV	.	.	.	.
8.583	0.4449	0.93	QV	.	.	.	.
8.667	0.4514	0.94	QV	.	.	.	.
8.750	0.4579	0.95	QV	.	.	.	.
8.833	0.4645	0.95	QV	.	.	.	.
8.917	0.4711	0.96	QV	.	.	.	.
9.000	0.4778	0.97	QV	.	.	.	.
9.083	0.4845	0.98	QV	.	.	.	.
9.167	0.4913	0.99	QV	.	.	.	.
9.250	0.4982	0.99	Q V	.	.	.	.
9.333	0.5051	1.00	Q V	.	.	.	.
9.417	0.5120	1.01	Q V	.	.	.	.
9.500	0.5191	1.02	Q V	.	.	.	.
9.583	0.5261	1.03	Q V	.	.	.	.
9.667	0.5333	1.04	Q V	.	.	.	.
9.750	0.5405	1.05	Q V	.	.	.	.
9.833	0.5478	1.06	Q V	.	.	.	.
9.917	0.5551	1.07	Q V	.	.	.	.
10.000	0.5626	1.08	Q V	.	.	.	.
10.083	0.5701	1.09	Q V	.	.	.	.
10.167	0.5776	1.10	Q V	.	.	.	.
10.250	0.5852	1.11	Q V	.	.	.	.
10.333	0.5930	1.12	Q V	.	.	.	.
10.417	0.6008	1.13	Q V	.	.	.	.
10.500	0.6086	1.14	Q V	.	.	.	.
10.583	0.6166	1.15	Q V	.	.	.	.
10.667	0.6246	1.17	Q V	.	.	.	.
10.750	0.6327	1.18	Q V	.	.	.	.
10.833	0.6409	1.19	Q V	.	.	.	.
10.917	0.6492	1.20	Q V	.	.	.	.
11.000	0.6576	1.22	Q V	.	.	.	.

11.083	0.6661	1.23	Q V	.	.	.	.
11.167	0.6747	1.25	Q V	.	.	.	.
11.250	0.6833	1.26	Q V	.	.	.	.
11.333	0.6921	1.27	Q V	.	.	.	.
11.417	0.7010	1.29	Q V	.	.	.	.
11.500	0.7100	1.30	Q V	.	.	.	.
11.583	0.7191	1.32	Q V	.	.	.	.
11.667	0.7283	1.34	Q V	.	.	.	.
11.750	0.7376	1.35	Q V	.	.	.	.
11.833	0.7471	1.37	Q V	.	.	.	.
11.917	0.7566	1.39	Q V	.	.	.	.
12.000	0.7663	1.41	Q V	.	.	.	.
12.083	0.7761	1.43	Q V	.	.	.	.
12.167	0.7861	1.44	Q V	.	.	.	.
12.250	0.7962	1.46	Q V	.	.	.	.
12.333	0.8063	1.48	Q V	.	.	.	.
12.417	0.8166	1.49	Q V	.	.	.	.
12.500	0.8270	1.50	Q V	.	.	.	.
12.583	0.8373	1.51	Q V	.	.	.	.
12.667	0.8478	1.52	Q V	.	.	.	.
12.750	0.8584	1.53	Q V	.	.	.	.
12.833	0.8690	1.55	Q V	.	.	.	.
12.917	0.8798	1.57	Q V	.	.	.	.
13.000	0.8907	1.59	Q V	.	.	.	.
13.083	0.9018	1.61	Q V	.	.	.	.
13.167	0.9131	1.63	Q V	.	.	.	.
13.250	0.9245	1.66	Q V	.	.	.	.
13.333	0.9362	1.69	Q V	.	.	.	.
13.417	0.9480	1.72	Q V	.	.	.	.
13.500	0.9600	1.75	Q V	.	.	.	.
13.583	0.9723	1.78	Q V	.	.	.	.
13.667	0.9848	1.82	Q V	.	.	.	.
13.750	0.9976	1.86	Q V	.	.	.	.
13.833	1.0107	1.89	Q V	.	.	.	.
13.917	1.0240	1.94	Q V	.	.	.	.
14.000	1.0376	1.98	Q V	.	.	.	.

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14.083      1.0517      2.03  Q   V     .         .         .         .
14.167      1.0662      2.11  Q   V     .         .         .         .
14.250      1.0813      2.20  Q   V     .         .         .         .
14.333      1.0972      2.31  Q   V     .         .         .         .
14.417      1.1140      2.44  Q   V     .         .         .         .
14.500      1.1322      2.64  .Q  V     .         .         .         .
14.583      1.1522      2.90  .Q  V     .         .         .         .
14.667      1.1739      3.15  .Q  V     .         .         .         .
14.750      1.1971      3.37  .Q  V     .         .         .         .
14.833      1.2218      3.58  .Q  V     .         .         .         .
14.917      1.2478      3.77  .Q   V    .         .         .         .
15.000      1.2751      3.97  .Q   V    .         .         .         .
15.083      1.3038      4.16  .Q   V    .         .         .         .
15.167      1.3339      4.37  .Q   V    .         .         .         .
15.250      1.3654      4.59  .Q   V    .         .         .         .
15.333      1.3986      4.82  .Q   V    .         .         .         .
15.417      1.4337      5.09  . Q  V    .         .         .         .
15.500      1.4712      5.45  . Q  V    .         .         .         .
15.583      1.5121      5.94  . Q   V   .         .         .         .
15.667      1.5576      6.61  . Q   V   .         .         .         .
15.750      1.6100      7.61  .  Q  V   .         .         .         .
15.833      1.6733      9.18  .  Q  V   .         .         .         .
15.917      1.7534     11.63  .   Q  V  .         .         .         .
16.000      1.8586     15.28  .     QV  .         .         .         .
16.083      2.0086     21.78  .       Q .         .         .         .
16.167      2.2188     30.52  .        V. Q       .         .         .
16.250      2.4937     39.92  .         V    Q    .         .         .
16.333      2.8388     50.11  .         .V        Q         .         .
16.417      3.2721     62.91  .         .  V      .    Q    .         .
16.500      3.8199     79.54  .         .    V    .         .Q        .
16.583      4.4429     90.46  .         .       V .         .     Q   .
16.667      5.0101     82.34  .         .         V         . Q       .
16.750      5.4868     69.23  .         .         . V    Q  .         .
16.833      5.8865     58.03  .         .         .  Q      .         .
16.917      6.2158     47.82  .         .        Q.    V    .         .
17.000      6.4934     40.30  .         .     Q   .     V   .         .
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17.083      6.7347     35.05  .         .   Q     .      V  .         .
17.167      6.9501     31.27  .         . Q       .       V .         .
17.250      7.1430     28.01  .         .Q        .        V.         .
17.333      7.3157     25.08  .         Q         .        V.         .
17.417      7.4732     22.86  .        Q.         .         V         .
17.500      7.6169     20.86  .       Q .         .         .V        .
17.583      7.7451     18.62  .      Q  .         .         .V        .
17.667      7.8641     17.29  .     Q   .         .         . V       .
17.750      7.9722     15.69  .     Q   .         .         . V       .
17.833      8.0739     14.76  .    Q    .         .         . V       .
17.917      8.1685     13.73  .    Q    .         .         .  V      .
18.000      8.2576     12.94  .    Q    .         .         .  V      .
18.083      8.3395     11.90  .   Q     .         .         .  V      .
18.167      8.4158     11.08  .   Q     .         .         .   V     .
18.250      8.4853     10.08  .   Q     .         .         .   V     .
18.333      8.5493      9.30  .  Q      .         .         .   V     .
18.417      8.6104      8.86  .  Q      .         .         .    V    .
18.500      8.6686      8.45  .  Q      .         .         .    V    .
18.583      8.7240      8.05  .  Q      .         .         .    V    .
18.667      8.7761      7.56  .  Q      .         .         .    V    .
18.750      8.8260      7.25  . Q       .         .         .    V    .
18.833      8.8734      6.87  . Q       .         .         .     V   .
18.917      8.9184      6.53  . Q       .         .         .     V   .
19.000      8.9597      6.01  . Q       .         .         .     V   .
19.083      8.9992      5.74  . Q       .         .         .     V   .
19.167      9.0374      5.54  . Q       .         .         .     V   .
19.250      9.0741      5.33  . Q       .         .         .     V   .
19.333      9.1082      4.95  .Q        .         .         .      V  .
19.417      9.1402      4.65  .Q        .         .         .      V  .
19.500      9.1710      4.48  .Q        .         .         .      V  .
19.583      9.2006      4.29  .Q        .         .         .      V  .
19.667      9.2281      4.00  .Q        .         .         .      V  .
19.750      9.2531      3.63  .Q        .         .         .      V  .
19.833      9.2770      3.47  .Q        .         .         .      V  .
19.917      9.2998      3.32  .Q        .         .         .      V  .
20.000      9.3213      3.12  .Q        .         .         .      V  .
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20.083	9.3403	2.76	.Q	.	.	.	V .
20.167	9.3584	2.63	.Q	.	.	.	V .
20.250	9.3761	2.58	.Q	.	.	.	V .
20.333	9.3937	2.56	.Q	.	.	.	V .
20.417	9.4116	2.59	.Q	.	.	.	V .
20.500	9.4295	2.60	.Q	.	.	.	V .
20.583	9.4473	2.58	.Q	.	.	.	V .
20.667	9.4648	2.55	.Q	.	.	.	V .
20.750	9.4822	2.52	.Q	.	.	.	V .
20.833	9.4992	2.48	Q	.	.	.	V .
20.917	9.5160	2.43	Q	.	.	.	V .
21.000	9.5324	2.38	Q	.	.	.	V .
21.083	9.5483	2.31	Q	.	.	.	V .
21.167	9.5636	2.22	Q	.	.	.	V .
21.250	9.5780	2.10	Q	.	.	.	V .
21.333	9.5912	1.92	Q	.	.	.	V.
21.417	9.6018	1.54	Q	.	.	.	V.
21.500	9.6096	1.13	Q	.	.	.	V.
21.583	9.6168	1.04	Q	.	.	.	V.
21.667	9.6235	0.98	Q	.	.	.	V.
21.750	9.6301	0.95	Q	.	.	.	V.
21.833	9.6365	0.93	Q	.	.	.	V.
21.917	9.6428	0.91	Q	.	.	.	V.
22.000	9.6489	0.89	Q	.	.	.	V.
22.083	9.6549	0.87	Q	.	.	.	V.
22.167	9.6608	0.86	Q	.	.	.	V.
22.250	9.6666	0.84	Q	.	.	.	V.
22.333	9.6723	0.83	Q	.	.	.	V.
22.417	9.6779	0.81	Q	.	.	.	V.
22.500	9.6834	0.80	Q	.	.	.	V.
22.583	9.6889	0.79	Q	.	.	.	V.
22.667	9.6942	0.78	Q	.	.	.	V.
22.750	9.6995	0.77	Q	.	.	.	V.
22.833	9.7048	0.76	Q	.	.	.	V.
22.917	9.7099	0.75	Q	.	.	.	V.
23.000	9.7150	0.74	Q	.	.	.	V.

23.083	9.7201	0.73	Q	.	.	.	V.
23.167	9.7251	0.72	Q	.	.	.	V.
23.250	9.7300	0.72	Q	.	.	.	V.
23.333	9.7349	0.71	Q	.	.	.	V.
23.417	9.7397	0.70	Q	.	.	.	V.
23.500	9.7445	0.69	Q	.	.	.	V.
23.583	9.7492	0.68	Q	.	.	.	V.
23.667	9.7538	0.68	Q	.	.	.	V.
23.750	9.7584	0.67	Q	.	.	.	V.
23.833	9.7630	0.66	Q	.	.	.	V.
23.917	9.7675	0.66	Q	.	.	.	V.
24.000	9.7720	0.65	Q	.	.	.	V.
24.083	9.7764	0.64	Q	.	.	.	V.
24.167	9.7807	0.63	Q	.	.	.	V.
24.250	9.7849	0.61	Q	.	.	.	V.
24.333	9.7889	0.58	Q	.	.	.	V.
24.417	9.7927	0.55	Q	.	.	.	V.
24.500	9.7961	0.50	Q	.	.	.	V.
24.583	9.7991	0.43	Q	.	.	.	V.
24.667	9.8017	0.37	Q	.	.	.	V.
24.750	9.8039	0.33	Q	.	.	.	V.
24.833	9.8059	0.29	Q	.	.	.	V.
24.917	9.8076	0.26	Q	.	.	.	V.
25.000	9.8092	0.23	Q	.	.	.	V.
25.083	9.8107	0.21	Q	.	.	.	V.
25.167	9.8120	0.19	Q	.	.	.	V.
25.250	9.8133	0.18	Q	.	.	.	V.
25.333	9.8144	0.16	Q	.	.	.	V.
25.417	9.8154	0.15	Q	.	.	.	V.
25.500	9.8164	0.14	Q	.	.	.	V.
25.583	9.8172	0.13	Q	.	.	.	V.
25.667	9.8180	0.12	Q	.	.	.	V.
25.750	9.8188	0.11	Q	.	.	.	V.
25.833	9.8195	0.10	Q	.	.	.	V.
25.917	9.8202	0.09	Q	.	.	.	V.
26.000	9.8208	0.09	Q	.	.	.	V.

26.083	9.8213	0.08	Q	.	.	.	V.
26.167	9.8218	0.07	Q	.	.	.	V.
26.250	9.8223	0.07	Q	.	.	.	V.
26.333	9.8228	0.07	Q	.	.	.	V.
26.417	9.8232	0.06	Q	.	.	.	V.
26.500	9.8236	0.06	Q	.	.	.	V.
26.583	9.8239	0.05	Q	.	.	.	V.
26.667	9.8243	0.05	Q	.	.	.	V.
26.750	9.8246	0.05	Q	.	.	.	V.
26.833	9.8249	0.04	Q	.	.	.	V.
26.917	9.8251	0.04	Q	.	.	.	V.
27.000	9.8254	0.04	Q	.	.	.	V.
27.083	9.8256	0.03	Q	.	.	.	V.
27.167	9.8258	0.03	Q	.	.	.	V.
27.250	9.8260	0.03	Q	.	.	.	V.
27.333	9.8262	0.03	Q	.	.	.	V.
27.417	9.8264	0.02	Q	.	.	.	V.
27.500	9.8265	0.02	Q	.	.	.	V.
27.583	9.8267	0.02	Q	.	.	.	V.
27.667	9.8268	0.02	Q	.	.	.	V.
27.750	9.8269	0.02	Q	.	.	.	V.
27.833	9.8270	0.02	Q	.	.	.	V.
27.917	9.8271	0.01	Q	.	.	.	V.
28.000	9.8272	0.01	Q	.	.	.	V.
28.083	9.8273	0.01	Q	.	.	.	V.
28.167	9.8274	0.01	Q	.	.	.	V.
28.250	9.8275	0.01	Q	.	.	.	V.
28.333	9.8275	0.01	Q	.	.	.	V.
28.417	9.8276	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)

```
   ======================                ========= 
              0%                             1705.0 
             10%                              155.0 
             20%                               95.0 
             30%                               70.0 
             40%                               50.0 
             50%                               40.0 
             60%                               30.0 
             70%                               20.0 
             80%                               15.0 
             90%                               10.0 


****************************************************************************
  FLOW PROCESS FROM NODE   8004.00 TO NODE   8004.00 IS CODE =   7 
----------------------------------------------------------------------------
  >>>>>STREAM NUMBER 1 ADDED TO STREAM NUMBER 2<<<<< 
============================================================================


****************************************************************************
  FLOW PROCESS FROM NODE   8004.00 TO NODE   8004.00 IS CODE =  11 
----------------------------------------------------------------------------
  >>>>>VIEW STREAM NUMBER 2 HYDROGRAPH<<<<< 
============================================================================

            STREAM HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS) 
        (Note: Time indicated is at END of Each Unit Intervals) 
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       50.0     100.0     150.0     200.0 
----------------------------------------------------------------------------
  14.000      2.5550      4.75  Q   V     .         .         .         . 
  14.083      2.5884      4.84  Q   V     .         .         .         . 
  14.167      2.6225      4.96  Q   V     .         .         .         . 
  14.250      2.6576      5.09  .Q  V     .         .         .         . 
  14.333      2.6937      5.24  .Q  V     .         .         .         . 
```

```
14.417      2.7311      5.43  .Q  V     .         .         .         .
14.500      2.7702      5.68  .Q  V     .         .         .         .
14.583      2.8116      6.00  .Q  V     .         .         .         .
14.667      2.8551      6.32  .Q  V     .         .         .         .
14.750      2.9006      6.62  .Q  V     .         .         .         .
14.833      2.9483      6.92  .Q  V     .         .         .         .
14.917      2.9982      7.24  .Q  V     .         .         .         .
15.000      3.0504      7.58  .Q  V     .         .         .         .
15.083      3.1050      7.93  .Q   V    .         .         .         .
15.167      3.1623      8.31  .Q   V    .         .         .         .
15.250      3.2223      8.72  .Q   V    .         .         .         .
15.333      3.2853      9.14  .Q   V    .         .         .         .
15.417      3.3516      9.63  .Q   V    .         .         .         .
15.500      3.4218     10.20  . Q  V    .         .         .         .
15.583      3.4970     10.91  . Q  V    .         .         .         .
15.667      3.5784     11.83  . Q  V    .         .         .         .
15.750      3.6685     13.08  . Q  V    .         .         .         .
15.833      3.7714     14.93  . Q   V   .         .         .         .
15.917      3.8932     17.69  .  Q  V   .         .         .         .
16.000      4.0426     21.69  .   Q V   .         .         .         .
16.083      4.2397     28.62  .    QV   .         .         .         .
16.167      4.5008     37.92  .      Q  .         .         .         .
16.250      4.8318     48.05  .      V Q.         .         .         .
16.333      5.2397     59.24  .       V .Q        .         .         .
16.417      5.7454     73.43  .        V.   Q     .         .         .
16.500      6.3794     92.04  .         V       Q .         .         .
16.583      7.1074    105.72  .         .V        .Q        .         .
16.667      7.8044    101.20  .         . V       Q         .         .
16.750      8.4427     92.68  .         .  V    Q .         .         .
16.833      9.0429     87.16  .         .   V  Q  .         .         .
16.917      9.6142     82.95  .         .    VQ   .         .         .
17.000     10.1690     80.55  .         .     Q   .         .         .
17.083     10.7130     78.99  .         .    Q V  .         .         .
17.167     11.2475     77.61  .         .    Q  V .         .         .
17.250     11.7691     75.74  .         .    Q  V .         .         .
17.333     12.2752     73.48  .         .   Q    V.         .         .
```

```
17.417     12.7672     71.44  .         .   Q     V         .         .
17.500     13.2441     69.25  .         .  Q      .V        .         .
17.583     13.7025     66.55  .         .  Q      . V       .         .
17.667     14.1469     64.54  .         . Q       . V       .         .
17.750     14.5746     62.10  .         . Q       .  V      .         .
17.833     14.9891     60.18  .         . Q       .   V     .         .
17.917     15.3890     58.07  .         .Q        .   V     .         .
18.000     15.7756     56.13  .         .Q        .    V    .         .
18.083     16.1467     53.88  .         Q         .     V   .         .
18.167     16.5036     51.82  .         Q         .     V   .         .
18.250     16.8448     49.55  .        Q.         .      V  .         .
18.333     17.1717     47.47  .        Q.         .      V  .         .
18.417     17.4867     45.73  .        Q.         .       V .         .
18.500     17.7899     44.03  .       Q .         .       V .         .
18.583     18.0818     42.38  .       Q .         .        V.         .
18.667     18.3617     40.65  .       Q .         .        V.         .
18.750     18.6312     39.13  .      Q  .         .         V         .
18.833     18.8899     37.56  .      Q  .         .         V         .
18.917     19.1383     36.07  .      Q  .         .         V         .
19.000     19.3753     34.41  .     Q   .         .         .V        .
19.083     19.6029     33.05  .     Q   .         .         .V        .
19.167     19.8219     31.79  .     Q   .         .         .V        .
19.250     20.0323     30.54  .     Q   .         .         . V       .
19.333     20.2331     29.16  .    Q    .         .         . V       .
19.417     20.4252     27.89  .    Q    .         .         . V       .
19.500     20.6095     26.77  .    Q    .         .         .  V      .
19.583     20.7863     25.66  .    Q    .         .         .  V      .
19.667     20.9549     24.48  .   Q     .         .         .  V      .
19.750     21.1150     23.25  .   Q     .         .         .   V     .
19.833     21.2683     22.25  .   Q     .         .         .   V     .
19.917     21.4149     21.29  .   Q     .         .         .   V     .
20.000     21.5549     20.33  .   Q     .         .         .   V     .
--------------------------------------------------------------------------------
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1205.0
10%	345.0
20%	240.0
30%	185.0
40%	145.0
50%	110.0
60%	80.0
70%	50.0
80%	25.0
90%	10.0

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END OF FLOODSCx ROUTING ANALYSIS

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              F L O O D    R O U T I N G    A N A L Y S I S
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                          Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED N - EXISTING - SAUH                                            *
* 2022-09-29                                                               *
 **************************************************************************

  FILE NAME: 87_N_EX.DAT
  TIME/DATE OF STUDY: 08:25 09/30/2022



****************************************************************************
  FLOW PROCESS FROM NODE   9000.00 TO NODE   9006.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =     494.760 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.892 HOURS
```

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.590

LOW LOSS FRACTION = 0.778

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.17

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.978

30-MINUTE FACTOR = 0.978

1-HOUR FACTOR = 0.978

3-HOUR FACTOR = 0.997

6-HOUR FACTOR = 0.998

24-HOUR FACTOR = 0.999

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 9.342

===

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.411	24.596
2	1.397	58.991
3	2.963	93.704
4	5.109	128.413

5	7.826	162.543
6	11.561	223.496
7	17.536	357.545
8	26.249	521.314
9	35.074	528.050
10	42.666	454.272
11	48.731	362.906
12	53.867	307.300
13	58.142	255.794
14	61.601	206.988
15	64.547	176.245
16	67.129	154.490
17	69.495	141.601
18	71.669	130.072
19	73.558	113.052
20	75.263	101.979
21	76.875	96.449
22	78.385	90.395
23	79.647	75.465
24	80.880	73.786
25	82.019	68.157
26	83.029	60.420
27	84.034	60.182
28	84.964	55.604
29	85.861	53.671
30	86.734	52.245
31	87.495	45.559
32	88.243	44.733
33	88.916	40.298
34	89.478	33.612
35	90.038	33.500
36	90.573	31.999
37	91.096	31.298
38	91.608	30.660
39	92.065	27.308
40	92.513	26.832

41	92.948	26.007
42	93.359	24.618
43	93.769	24.506
44	94.117	20.865
45	94.435	19.002
46	94.753	19.014
47	95.070	19.002
48	95.388	19.002
49	95.680	17.450
50	95.924	14.611
51	96.167	14.536
52	96.410	14.536
53	96.652	14.510
54	96.887	14.035
55	97.065	10.683
56	97.232	10.008
57	97.401	10.057
58	97.569	10.082
59	97.736	10.008
60	97.859	7.331
61	97.952	5.554
62	98.046	5.630
63	98.139	5.554
64	98.232	5.604
65	98.331	5.930
66	98.443	6.680
67	98.555	6.705
68	98.667	6.705
69	98.779	6.705
70	98.891	6.705
71	99.004	6.730
72	99.116	6.705
73	99.228	6.705
74	99.340	6.705
75	99.452	6.705
76	99.564	6.705

77	99.676	6.705
78	99.788	6.705
79	99.900	6.705
80	100.000	5.979

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0021	0.0006
13	0.0027	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0038	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0041	0.0032	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0070	0.0054	0.0015
146	0.0070	0.0055	0.0016
147	0.0072	0.0056	0.0016
148	0.0073	0.0057	0.0016
149	0.0075	0.0058	0.0017
150	0.0076	0.0059	0.0017
151	0.0078	0.0060	0.0017
152	0.0079	0.0061	0.0017
153	0.0081	0.0063	0.0018
154	0.0082	0.0064	0.0018
155	0.0084	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0088	0.0068	0.0020
158	0.0089	0.0069	0.0020
159	0.0092	0.0072	0.0020
160	0.0094	0.0073	0.0021
161	0.0097	0.0075	0.0021
162	0.0098	0.0077	0.0022
163	0.0102	0.0079	0.0023
164	0.0104	0.0081	0.0023
165	0.0108	0.0084	0.0024
166	0.0110	0.0086	0.0024
167	0.0115	0.0089	0.0025
168	0.0117	0.0091	0.0026
169	0.0203	0.0158	0.0045
170	0.0207	0.0161	0.0046
171	0.0215	0.0167	0.0048
172	0.0220	0.0171	0.0049
173	0.0230	0.0179	0.0051
174	0.0235	0.0183	0.0052

175	0.0247	0.0192	0.0055
176	0.0253	0.0197	0.0056
177	0.0268	0.0208	0.0059
178	0.0276	0.0215	0.0061
179	0.0294	0.0229	0.0065
180	0.0304	0.0236	0.0067
181	0.0327	0.0254	0.0073
182	0.0340	0.0265	0.0076
183	0.0371	0.0289	0.0082
184	0.0390	0.0303	0.0087
185	0.0603	0.0469	0.0134
186	0.0634	0.0492	0.0143
187	0.0711	0.0492	0.0220
188	0.0763	0.0492	0.0271
189	0.0987	0.0492	0.0495
190	0.1093	0.0492	0.0602
191	0.1475	0.0492	0.0984
192	0.1931	0.0492	0.1439
193	0.4714	0.0492	0.4222
194	0.1242	0.0492	0.0750
195	0.0824	0.0492	0.0333
196	0.0669	0.0492	0.0178
197	0.0411	0.0319	0.0091
198	0.0355	0.0276	0.0079
199	0.0315	0.0245	0.0070
200	0.0284	0.0221	0.0063
201	0.0260	0.0203	0.0058
202	0.0241	0.0187	0.0053
203	0.0224	0.0175	0.0050
204	0.0211	0.0164	0.0047
205	0.0120	0.0093	0.0027
206	0.0112	0.0087	0.0025
207	0.0106	0.0082	0.0023
208	0.0100	0.0078	0.0022
209	0.0095	0.0074	0.0021
210	0.0091	0.0071	0.0020

211	0.0087	0.0067	0.0019
212	0.0083	0.0065	0.0018
213	0.0080	0.0062	0.0018
214	0.0077	0.0060	0.0017
215	0.0074	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0041	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0040	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0032	0.0025	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0031	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0007
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0022	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.04

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.39

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 83.9566

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 57.2921

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	125.0	250.0	375.0	500.0
0.083	0.0001	0.01	Q	.	.	.	.
0.167	0.0004	0.05	Q	.	.	.	.
0.250	0.0011	0.10	Q	.	.	.	.
0.333	0.0023	0.17	Q	.	.	.	.
0.417	0.0041	0.26	Q	.	.	.	.
0.500	0.0068	0.39	Q	.	.	.	.
0.583	0.0108	0.59	Q	.	.	.	.
0.667	0.0169	0.88	Q	.	.	.	.
0.750	0.0251	1.18	Q	.	.	.	.
0.833	0.0350	1.44	Q	.	.	.	.
0.917	0.0464	1.65	Q	.	.	.	.
1.000	0.0590	1.83	Q	.	.	.	.
1.083	0.0726	1.98	Q	.	.	.	.
1.167	0.0871	2.10	Q	.	.	.	.
1.250	0.1024	2.21	Q	.	.	.	.
1.333	0.1183	2.31	Q	.	.	.	.
1.417	0.1348	2.40	Q	.	.	.	.
1.500	0.1519	2.48	Q	.	.	.	.
1.583	0.1695	2.55	Q	.	.	.	.
1.667	0.1875	2.62	Q	.	.	.	.
1.750	0.2060	2.69	Q	.	.	.	.
1.833	0.2250	2.75	Q	.	.	.	.
1.917	0.2443	2.80	Q	.	.	.	.
2.000	0.2640	2.86	Q	.	.	.	.

2.083	0.2840	2.91	Q	.	.	.	.
2.167	0.3043	2.96	Q	.	.	.	.
2.250	0.3250	3.00	Q	.	.	.	.
2.333	0.3460	3.05	Q	.	.	.	.
2.417	0.3673	3.09	Q	.	.	.	.
2.500	0.3889	3.13	Q	.	.	.	.
2.583	0.4107	3.17	Q	.	.	.	.
2.667	0.4328	3.21	Q	.	.	.	.
2.750	0.4552	3.25	Q	.	.	.	.
2.833	0.4778	3.28	Q	.	.	.	.
2.917	0.5007	3.32	Q	.	.	.	.
3.000	0.5238	3.35	Q	.	.	.	.
3.083	0.5471	3.38	Q	.	.	.	.
3.167	0.5706	3.42	Q	.	.	.	.
3.250	0.5944	3.45	Q	.	.	.	.
3.333	0.6184	3.48	Q	.	.	.	.
3.417	0.6425	3.51	Q	.	.	.	.
3.500	0.6669	3.54	Q	.	.	.	.
3.583	0.6916	3.57	Q	.	.	.	.
3.667	0.7164	3.60	Q	.	.	.	.
3.750	0.7414	3.63	Q	.	.	.	.
3.833	0.7666	3.66	Q	.	.	.	.
3.917	0.7920	3.69	Q	.	.	.	.
4.000	0.8176	3.72	Q	.	.	.	.
4.083	0.8434	3.75	Q	.	.	.	.
4.167	0.8694	3.77	Q	.	.	.	.
4.250	0.8956	3.80	Q	.	.	.	.
4.333	0.9219	3.83	Q	.	.	.	.
4.417	0.9485	3.86	Q	.	.	.	.
4.500	0.9752	3.88	Q	.	.	.	.
4.583	1.0022	3.91	Q	.	.	.	.
4.667	1.0293	3.94	Q	.	.	.	.
4.750	1.0566	3.96	Q	.	.	.	.
4.833	1.0840	3.99	Q	.	.	.	.
4.917	1.1117	4.02	Q	.	.	.	.
5.000	1.1395	4.04	Q	.	.	.	.

5.083	1.1676	4.07	Q	.	.	.	.
5.167	1.1957	4.09	Q	.	.	.	.
5.250	1.2241	4.12	Q	.	.	.	.
5.333	1.2527	4.14	Q	.	.	.	.
5.417	1.2814	4.17	Q	.	.	.	.
5.500	1.3103	4.20	Q	.	.	.	.
5.583	1.3394	4.23	Q	.	.	.	.
5.667	1.3687	4.25	Q	.	.	.	.
5.750	1.3982	4.28	Q	.	.	.	.
5.833	1.4278	4.31	Q	.	.	.	.
5.917	1.4577	4.34	QV	.	.	.	.
6.000	1.4878	4.37	QV	.	.	.	.
6.083	1.5181	4.40	QV	.	.	.	.
6.167	1.5486	4.43	QV	.	.	.	.
6.250	1.5793	4.46	QV	.	.	.	.
6.333	1.6102	4.49	QV	.	.	.	.
6.417	1.6413	4.52	QV	.	.	.	.
6.500	1.6727	4.55	QV	.	.	.	.
6.583	1.7042	4.58	QV	.	.	.	.
6.667	1.7360	4.61	QV	.	.	.	.
6.750	1.7680	4.64	QV	.	.	.	.
6.833	1.8002	4.67	QV	.	.	.	.
6.917	1.8326	4.70	QV	.	.	.	.
7.000	1.8652	4.73	QV	.	.	.	.
7.083	1.8980	4.76	QV	.	.	.	.
7.167	1.9310	4.79	QV	.	.	.	.
7.250	1.9642	4.83	QV	.	.	.	.
7.333	1.9977	4.86	QV	.	.	.	.
7.417	2.0314	4.89	QV	.	.	.	.
7.500	2.0653	4.92	QV	.	.	.	.
7.583	2.0994	4.96	QV	.	.	.	.
7.667	2.1338	4.99	QV	.	.	.	.
7.750	2.1684	5.03	QV	.	.	.	.
7.833	2.2033	5.06	QV	.	.	.	.
7.917	2.2384	5.10	QV	.	.	.	.
8.000	2.2737	5.13	QV	.	.	.	.

8.083	2.3093	5.17	QV	.	.	.	.
8.167	2.3452	5.21	QV	.	.	.	.
8.250	2.3813	5.25	QV	.	.	.	.
8.333	2.4177	5.29	QV	.	.	.	.
8.417	2.4544	5.32	QV	.	.	.	.
8.500	2.4914	5.37	QV	.	.	.	.
8.583	2.5286	5.41	QV	.	.	.	.
8.667	2.5661	5.45	QV	.	.	.	.
8.750	2.6039	5.49	QV	.	.	.	.
8.833	2.6420	5.53	QV	.	.	.	.
8.917	2.6804	5.58	QV	.	.	.	.
9.000	2.7192	5.62	QV	.	.	.	.
9.083	2.7582	5.67	QV	.	.	.	.
9.167	2.7975	5.71	QV	.	.	.	.
9.250	2.8372	5.76	QV	.	.	.	.
9.333	2.8772	5.81	Q V	.	.	.	.
9.417	2.9176	5.86	Q V	.	.	.	.
9.500	2.9583	5.91	Q V	.	.	.	.
9.583	2.9993	5.96	Q V	.	.	.	.
9.667	3.0407	6.01	Q V	.	.	.	.
9.750	3.0825	6.07	Q V	.	.	.	.
9.833	3.1246	6.12	Q V	.	.	.	.
9.917	3.1672	6.17	Q V	.	.	.	.
10.000	3.2101	6.23	Q V	.	.	.	.
10.083	3.2534	6.29	Q V	.	.	.	.
10.167	3.2971	6.35	Q V	.	.	.	.
10.250	3.3413	6.41	Q V	.	.	.	.
10.333	3.3858	6.47	Q V	.	.	.	.
10.417	3.4308	6.53	Q V	.	.	.	.
10.500	3.4763	6.60	Q V	.	.	.	.
10.583	3.5221	6.66	Q V	.	.	.	.
10.667	3.5685	6.73	Q V	.	.	.	.
10.750	3.6153	6.80	Q V	.	.	.	.
10.833	3.6627	6.87	Q V	.	.	.	.
10.917	3.7105	6.94	Q V	.	.	.	.
11.000	3.7588	7.02	Q V	.	.	.	.

11.083	3.8077	7.09	Q V	.	.	.	.
11.167	3.8571	7.17	Q V	.	.	.	.
11.250	3.9070	7.25	Q V	.	.	.	.
11.333	3.9575	7.33	Q V	.	.	.	.
11.417	4.0086	7.42	Q V	.	.	.	.
11.500	4.0603	7.51	Q V	.	.	.	.
11.583	4.1126	7.59	Q V	.	.	.	.
11.667	4.1655	7.69	Q V	.	.	.	.
11.750	4.2191	7.78	Q V	.	.	.	.
11.833	4.2734	7.88	Q V	.	.	.	.
11.917	4.3283	7.98	Q V	.	.	.	.
12.000	4.3839	8.08	Q V	.	.	.	.
12.083	4.4403	8.18	Q V	.	.	.	.
12.167	4.4973	8.28	Q V	.	.	.	.
12.250	4.5550	8.38	Q V	.	.	.	.
12.333	4.6134	8.48	Q V	.	.	.	.
12.417	4.6725	8.58	Q V	.	.	.	.
12.500	4.7322	8.67	Q V	.	.	.	.
12.583	4.7925	8.75	Q V	.	.	.	.
12.667	4.8532	8.82	Q V	.	.	.	.
12.750	4.9144	8.88	Q V	.	.	.	.
12.833	4.9761	8.96	Q V	.	.	.	.
12.917	5.0385	9.06	Q V	.	.	.	.
13.000	5.1016	9.16	Q V	.	.	.	.
13.083	5.1655	9.28	Q V	.	.	.	.
13.167	5.2303	9.41	Q V	.	.	.	.
13.250	5.2961	9.55	Q V	.	.	.	.
13.333	5.3630	9.71	Q V	.	.	.	.
13.417	5.4309	9.86	Q V	.	.	.	.
13.500	5.5000	10.03	Q V	.	.	.	.
13.583	5.5704	10.21	Q V	.	.	.	.
13.667	5.6420	10.40	Q V	.	.	.	.
13.750	5.7150	10.60	Q V	.	.	.	.
13.833	5.7894	10.81	Q V	.	.	.	.
13.917	5.8654	11.03	Q V	.	.	.	.
14.000	5.9430	11.27	Q V	.	.	.	.

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14.083      6.0227     11.56  Q   V     .         .         .         .
14.167      6.1048     11.93  Q   V     .         .         .         .
14.250      6.1901     12.38  Q   V     .         .         .         .
14.333      6.2790     12.91  .Q  V     .         .         .         .
14.417      6.3722     13.53  .Q  V     .         .         .         .
14.500      6.4706     14.28  .Q  V     .         .         .         .
14.583      6.5760     15.31  .Q  V     .         .         .         .
14.667      6.6908     16.67  .Q  V     .         .         .         .
14.750      6.8153     18.08  .Q  V     .         .         .         .
14.833      6.9491     19.43  .Q  V     .         .         .         .
14.917      7.0915     20.67  .Q  V     .         .         .         .
15.000      7.2422     21.88  .Q   V    .         .         .         .
15.083      7.4010     23.06  .Q   V    .         .         .         .
15.167      7.5679     24.23  .Q   V    .         .         .         .
15.250      7.7431     25.44  . Q  V    .         .         .         .
15.333      7.9270     26.70  . Q  V    .         .         .         .
15.417      8.1209     28.15  . Q  V    .         .         .         .
15.500      8.3265     29.86  . Q  V    .         .         .         .
15.583      8.5468     31.99  . Q  V    .         .         .         .
15.667      8.7863     34.77  . Q   V   .         .         .         .
15.750      9.0534     38.78  .  Q  V   .         .         .         .
15.833      9.3608     44.63  .  Q  V   .         .         .         .
15.917      9.7298     53.59  .   Q V   .         .         .         .
16.000     10.1947     67.50  .    Q V  .         .         .         .
16.083     10.8395     93.62  .      Q  .         .         .         .
16.167     11.7131    126.85  .       V Q         .         .         .
16.250     12.8398    163.59  .       V .  Q      .         .         .
16.333     14.2456    204.12  .        V.     Q   .         .         .
16.417     15.9552    248.23  .         .V       Q.         .         .
16.500     18.0534    304.67  .         . V       .   Q     .         .
16.583     20.6628    378.88  .         .   V     .         Q         .
16.667     23.7147    443.13  .         .     V   .         .    Q    .
16.750     26.7191    436.24  .         .       V .         .   Q     .
16.833     29.3951    388.55  .         .         V         .Q        .
16.917     31.6737    330.86  .         .         . V   Q   .         .
17.000     33.6394    285.41  .         .         . QV      .         .
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17.083     35.3280    245.19  .         .        Q.   V     .         .
17.167     36.7770    210.40  .         .     Q   .    V    .         .
17.250     38.0539    185.40  .         .   Q     .     V   .         .
17.333     39.2017    166.67  .         .  Q      .      V  .         .
17.417     40.2538    152.76  .         . Q       .       V .         .
17.500     41.2203    140.35  .         .Q        .       V .         .
17.583     42.0952    127.03  .         Q         .        V.         .
17.667     42.8970    116.43  .        Q.         .        V.         .
17.750     43.6422    108.19  .       Q .         .         V         .
17.833     44.3324    100.22  .       Q .         .         V         .
17.917     44.9559     90.54  .      Q  .         .         .V        .
18.000     45.5448     85.50  .     Q   .         .         .V        .
18.083     46.0949     79.87  .     Q   .         .         . V       .
18.167     46.6061     74.23  .    Q    .         .         . V       .
18.250     47.0965     71.21  .    Q    .         .         . V       .
18.333     47.5595     67.21  .    Q    .         .         .  V      .
18.417     48.0006     64.05  .    Q    .         .         .  V      .
18.500     48.4202     60.93  .   Q     .         .         .  V      .
18.583     48.8085     56.38  .   Q     .         .         .   V     .
18.667     49.1777     53.61  .   Q     .         .         .   V     .
18.750     49.5212     49.87  .  Q      .         .         .   V     .
18.833     49.8372     45.88  .  Q      .         .         .   V     .
18.917     50.1421     44.28  .  Q      .         .         .    V    .
19.000     50.4350     42.53  .  Q      .         .         .    V    .
19.083     50.7180     41.08  .  Q      .         .         .    V    .
19.167     50.9908     39.61  .  Q      .         .         .    V    .
19.250     51.2483     37.39  . Q       .         .         .    V    .
19.333     51.4969     36.10  . Q       .         .         .    V    .
19.417     51.7363     34.76  . Q       .         .         .     V   .
19.500     51.9652     33.24  . Q       .         .         .     V   .
19.583     52.1856     32.01  . Q       .         .         .     V   .
19.667     52.3907     29.78  . Q       .         .         .     V   .
19.750     52.5856     28.30  . Q       .         .         .     V   .
19.833     52.7755     27.57  . Q       .         .         .     V   .
19.917     52.9606     26.87  . Q       .         .         .     V   .
20.000     53.1401     26.06  . Q       .         .         .      V  .
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20.083     53.3101     24.69  .Q        .         .         .      V  .
20.167     53.4688     23.03  .Q        .         .         .      V  .
20.250     53.6226     22.34  .Q        .         .         .      V  .
20.333     53.7724     21.74  .Q        .         .         .      V  .
20.417     53.9173     21.04  .Q        .         .         .      V  .
20.500     54.0554     20.06  .Q        .         .         .      V  .
20.583     54.1811     18.25  .Q        .         .         .      V  .
20.667     54.3010     17.40  .Q        .         .         .      V  .
20.750     54.4171     16.87  .Q        .         .         .      V  .
20.833     54.5294     16.30  .Q        .         .         .       V .
20.917     54.6365     15.56  .Q        .         .         .       V .
21.000     54.7332     14.04  .Q        .         .         .       V .
21.083     54.8226     12.98  .Q        .         .         .       V .
21.167     54.9100     12.70  .Q        .         .         .       V .
21.250     54.9962     12.52  .Q        .         .         .       V .
21.333     55.0821     12.47  Q         .         .         .       V .
21.417     55.1685     12.55  .Q        .         .         .       V .
21.500     55.2563     12.74  .Q        .         .         .       V .
21.583     55.3436     12.67  .Q        .         .         .       V .
21.667     55.4301     12.57  .Q        .         .         .       V .
21.750     55.5158     12.44  Q         .         .         .       V .
21.833     55.6007     12.32  Q         .         .         .       V .
21.917     55.6847     12.20  Q         .         .         .       V .
22.000     55.7677     12.06  Q         .         .         .       V .
22.083     55.8497     11.91  Q         .         .         .       V .
22.167     55.9306     11.75  Q         .         .         .        V.
22.250     56.0101     11.54  Q         .         .         .        V.
22.333     56.0878     11.28  Q         .         .         .        V.
22.417     56.1628     10.89  Q         .         .         .        V.
22.500     56.2345     10.41  Q         .         .         .        V.
22.583     56.3010      9.66  Q         .         .         .        V.
22.667     56.3592      8.45  Q         .         .         .        V.
22.750     56.3993      5.82  Q         .         .         .        V.
22.833     56.4357      5.30  Q         .         .         .        V.
22.917     56.4705      5.04  Q         .         .         .        V.
23.000     56.5041      4.88  Q         .         .         .        V.
```

23.083	56.5370	4.78	Q	.	.	.	V.
23.167	56.5693	4.69	Q	.	.	.	V.
23.250	56.6010	4.60	Q	.	.	.	V.
23.333	56.6321	4.52	Q	.	.	.	V.
23.417	56.6627	4.44	Q	.	.	.	V.
23.500	56.6927	4.37	Q	.	.	.	V.
23.583	56.7223	4.30	Q	.	.	.	V.
23.667	56.7515	4.23	Q	.	.	.	V.
23.750	56.7803	4.18	Q	.	.	.	V.
23.833	56.8087	4.13	Q	.	.	.	V.
23.917	56.8368	4.08	Q	.	.	.	V.
24.000	56.8646	4.04	Q	.	.	.	V.
24.083	56.8920	3.98	Q	.	.	.	V.
24.167	56.9189	3.90	Q	.	.	.	V.
24.250	56.9451	3.81	Q	.	.	.	V.
24.333	56.9705	3.69	Q	.	.	.	V.
24.417	56.9951	3.56	Q	.	.	.	V.
24.500	57.0185	3.40	Q	.	.	.	V.
24.583	57.0403	3.17	Q	.	.	.	V.
24.667	57.0599	2.85	Q	.	.	.	V.
24.750	57.0773	2.52	Q	.	.	.	V.
24.833	57.0927	2.24	Q	.	.	.	V.
24.917	57.1066	2.01	Q	.	.	.	V.
25.000	57.1191	1.82	Q	.	.	.	V.
25.083	57.1306	1.66	Q	.	.	.	V.
25.167	57.1411	1.53	Q	.	.	.	V.
25.250	57.1508	1.41	Q	.	.	.	V.
25.333	57.1598	1.31	Q	.	.	.	V.
25.417	57.1682	1.22	Q	.	.	.	V.
25.500	57.1760	1.13	Q	.	.	.	V.
25.583	57.1833	1.06	Q	.	.	.	V.
25.667	57.1901	0.99	Q	.	.	.	V.
25.750	57.1964	0.92	Q	.	.	.	V.
25.833	57.2024	0.86	Q	.	.	.	V.
25.917	57.2080	0.81	Q	.	.	.	V.
26.000	57.2132	0.76	Q	.	.	.	V.

26.083	57.2181	0.72	Q	.	.	.	V.
26.167	57.2228	0.67	Q	.	.	.	V.
26.250	57.2271	0.63	Q	.	.	.	V.
26.333	57.2313	0.60	Q	.	.	.	V.
26.417	57.2351	0.56	Q	.	.	.	V.
26.500	57.2387	0.52	Q	.	.	.	V.
26.583	57.2421	0.49	Q	.	.	.	V.
26.667	57.2453	0.46	Q	.	.	.	V.
26.750	57.2483	0.44	Q	.	.	.	V.
26.833	57.2512	0.41	Q	.	.	.	V.
26.917	57.2539	0.39	Q	.	.	.	V.
27.000	57.2564	0.37	Q	.	.	.	V.
27.083	57.2588	0.35	Q	.	.	.	V.
27.167	57.2610	0.33	Q	.	.	.	V.
27.250	57.2632	0.31	Q	.	.	.	V.
27.333	57.2652	0.29	Q	.	.	.	V.
27.417	57.2670	0.27	Q	.	.	.	V.
27.500	57.2688	0.26	Q	.	.	.	V.
27.583	57.2705	0.24	Q	.	.	.	V.
27.667	57.2720	0.23	Q	.	.	.	V.
27.750	57.2735	0.21	Q	.	.	.	V.
27.833	57.2749	0.20	Q	.	.	.	V.
27.917	57.2762	0.19	Q	.	.	.	V.
28.000	57.2774	0.18	Q	.	.	.	V.
28.083	57.2785	0.16	Q	.	.	.	V.
28.167	57.2796	0.15	Q	.	.	.	V.
28.250	57.2806	0.14	Q	.	.	.	V.
28.333	57.2815	0.14	Q	.	.	.	V.
28.417	57.2823	0.13	Q	.	.	.	V.
28.500	57.2832	0.12	Q	.	.	.	V.
28.583	57.2839	0.11	Q	.	.	.	V.
28.667	57.2846	0.10	Q	.	.	.	V.
28.750	57.2853	0.10	Q	.	.	.	V.
28.833	57.2859	0.09	Q	.	.	.	V.
28.917	57.2865	0.08	Q	.	.	.	V.
29.000	57.2870	0.08	Q	.	.	.	V.

```
   29.083     57.2875      0.07  Q         .         .         .        V.
   29.167     57.2880      0.07  Q         .         .         .        V.
   29.250     57.2885      0.07  Q         .         .         .        V.
   29.333     57.2889      0.06  Q         .         .         .        V.
   29.417     57.2893      0.06  Q         .         .         .        V.
   29.500     57.2897      0.06  Q         .         .         .        V.
   29.583     57.2901      0.05  Q         .         .         .        V.
   29.667     57.2904      0.05  Q         .         .         .        V.
   29.750     57.2907      0.04  Q         .         .         .        V.
   29.833     57.2910      0.04  Q         .         .         .        V.
   29.917     57.2912      0.03  Q         .         .         .        V.
   30.000     57.2914      0.03  Q         .         .         .        V.
   30.083     57.2916      0.03  Q         .         .         .        V.
   30.167     57.2918      0.02  Q         .         .         .        V.
   30.250     57.2919      0.02  Q         .         .         .        V.
   30.333     57.2920      0.01  Q         .         .         .        V.
   30.417     57.2921      0.01  Q         .         .         .        V.
   30.500     57.2921      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                Duration
        Peak Flow Rate                     (minutes)
    =======================                =========
              0%                            1830.0
             10%                             185.0
             20%                             115.0
             30%                              80.0
             40%                              60.0
             50%                              45.0
             60%                              35.0
             70%                              25.0
             80%                              20.0
             90%                              10.0
```

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END OF FLOODSCx ROUTING ANALYSIS

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              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
         (c) Copyright 1989-2015 Advanced Engineering Software (aes)
            Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                          Analysis prepared by:








 ************************* DESCRIPTION OF STUDY *************************
* 40.087                                                                   *
* WATERSHED N - PROPOSED - UH                                              *
* 2022-09-29                                                               *
 **************************************************************************

  FILE NAME: 87_N_PR.DAT
  TIME/DATE OF STUDY: 08:30 09/30/2022



****************************************************************************
  FLOW PROCESS FROM NODE   9000.00 TO NODE   9005.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =     209.790 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.817 HOURS
```

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.504

LOW LOSS FRACTION = 0.686

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.17

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.991

30-MINUTE FACTOR = 0.991

1-HOUR FACTOR = 0.991

3-HOUR FACTOR = 0.999

6-HOUR FACTOR = 0.999

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 10.200

==

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.449	11.387
2	1.591	28.983
3	3.407	46.070
4	5.900	63.265

5	9.137	82.119
6	14.404	133.620
7	22.423	203.448
8	32.477	255.091
9	41.119	219.265
10	47.992	174.381
11	53.692	144.606
12	58.342	117.995
13	62.056	94.217
14	65.196	79.672
15	67.935	69.486
16	70.443	63.632
17	72.660	56.249
18	74.613	49.550
19	76.395	45.229
20	78.087	42.912
21	79.501	35.881
22	80.847	34.161
23	82.085	31.411
24	83.187	27.959
25	84.274	27.575
26	85.269	25.246
27	86.248	24.842
28	87.140	22.615
29	87.956	20.701
30	88.737	19.809
31	89.366	15.969
32	89.978	15.517
33	90.564	14.876
34	91.135	14.492
35	91.687	14.001
36	92.181	12.529
37	92.669	12.389
38	93.130	11.694
39	93.579	11.388
40	93.996	10.586

41	94.345	8.861
42	94.692	8.798
43	95.039	8.798
44	95.386	8.803
45	95.701	7.987
46	95.967	6.748
47	96.232	6.729
48	96.497	6.719
49	96.762	6.743
50	96.988	5.723
51	97.172	4.664
52	97.355	4.644
53	97.539	4.664
54	97.722	4.654
55	97.858	3.459
56	97.961	2.594
57	98.063	2.594
58	98.164	2.575
59	98.267	2.604
60	98.382	2.925
61	98.505	3.109
62	98.627	3.100
63	98.750	3.119
64	98.872	3.090
65	98.994	3.109
66	99.117	3.109
67	99.239	3.109
68	99.362	3.109
69	99.485	3.109
70	99.607	3.109
71	99.730	3.109
72	99.852	3.109
73	99.975	3.109
74	100.000	0.640

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0017	0.0008
2	0.0025	0.0017	0.0008
3	0.0025	0.0017	0.0008
4	0.0025	0.0017	0.0008
5	0.0026	0.0018	0.0008
6	0.0026	0.0018	0.0008
7	0.0026	0.0018	0.0008
8	0.0026	0.0018	0.0008
9	0.0026	0.0018	0.0008
10	0.0026	0.0018	0.0008
11	0.0026	0.0018	0.0008
12	0.0026	0.0018	0.0008
13	0.0026	0.0018	0.0008
14	0.0027	0.0018	0.0008
15	0.0027	0.0018	0.0008
16	0.0027	0.0018	0.0008
17	0.0027	0.0019	0.0008
18	0.0027	0.0019	0.0008
19	0.0027	0.0019	0.0009
20	0.0027	0.0019	0.0009
21	0.0027	0.0019	0.0009
22	0.0028	0.0019	0.0009
23	0.0028	0.0019	0.0009
24	0.0028	0.0019	0.0009
25	0.0028	0.0019	0.0009
26	0.0028	0.0019	0.0009
27	0.0028	0.0019	0.0009
28	0.0028	0.0019	0.0009
29	0.0029	0.0020	0.0009
30	0.0029	0.0020	0.0009

31	0.0029	0.0020	0.0009
32	0.0029	0.0020	0.0009
33	0.0029	0.0020	0.0009
34	0.0029	0.0020	0.0009
35	0.0029	0.0020	0.0009
36	0.0029	0.0020	0.0009
37	0.0030	0.0020	0.0009
38	0.0030	0.0020	0.0009
39	0.0030	0.0021	0.0009
40	0.0030	0.0021	0.0009
41	0.0030	0.0021	0.0010
42	0.0030	0.0021	0.0010
43	0.0031	0.0021	0.0010
44	0.0031	0.0021	0.0010
45	0.0031	0.0021	0.0010
46	0.0031	0.0021	0.0010
47	0.0031	0.0021	0.0010
48	0.0031	0.0022	0.0010
49	0.0032	0.0022	0.0010
50	0.0032	0.0022	0.0010
51	0.0032	0.0022	0.0010
52	0.0032	0.0022	0.0010
53	0.0032	0.0022	0.0010
54	0.0032	0.0022	0.0010
55	0.0033	0.0022	0.0010
56	0.0033	0.0023	0.0010
57	0.0033	0.0023	0.0010
58	0.0033	0.0023	0.0010
59	0.0033	0.0023	0.0011
60	0.0034	0.0023	0.0011
61	0.0034	0.0023	0.0011
62	0.0034	0.0023	0.0011
63	0.0034	0.0024	0.0011
64	0.0034	0.0024	0.0011
65	0.0035	0.0024	0.0011
66	0.0035	0.0024	0.0011

67	0.0035	0.0024	0.0011
68	0.0035	0.0024	0.0011
69	0.0036	0.0024	0.0011
70	0.0036	0.0025	0.0011
71	0.0036	0.0025	0.0011
72	0.0036	0.0025	0.0011
73	0.0037	0.0025	0.0011
74	0.0037	0.0025	0.0012
75	0.0037	0.0025	0.0012
76	0.0037	0.0025	0.0012
77	0.0038	0.0026	0.0012
78	0.0038	0.0026	0.0012
79	0.0038	0.0026	0.0012
80	0.0038	0.0026	0.0012
81	0.0039	0.0026	0.0012
82	0.0039	0.0027	0.0012
83	0.0039	0.0027	0.0012
84	0.0039	0.0027	0.0012
85	0.0040	0.0027	0.0012
86	0.0040	0.0027	0.0013
87	0.0040	0.0028	0.0013
88	0.0040	0.0028	0.0013
89	0.0041	0.0028	0.0013
90	0.0041	0.0028	0.0013
91	0.0042	0.0028	0.0013
92	0.0042	0.0029	0.0013
93	0.0042	0.0029	0.0013
94	0.0042	0.0029	0.0013
95	0.0043	0.0029	0.0013
96	0.0043	0.0030	0.0014
97	0.0044	0.0030	0.0014
98	0.0044	0.0030	0.0014
99	0.0044	0.0030	0.0014
100	0.0045	0.0031	0.0014
101	0.0045	0.0031	0.0014
102	0.0045	0.0031	0.0014

103	0.0046	0.0031	0.0014
104	0.0046	0.0032	0.0014
105	0.0047	0.0032	0.0015
106	0.0047	0.0032	0.0015
107	0.0048	0.0033	0.0015
108	0.0048	0.0033	0.0015
109	0.0048	0.0033	0.0015
110	0.0049	0.0033	0.0015
111	0.0049	0.0034	0.0015
112	0.0050	0.0034	0.0016
113	0.0050	0.0035	0.0016
114	0.0051	0.0035	0.0016
115	0.0051	0.0035	0.0016
116	0.0052	0.0035	0.0016
117	0.0052	0.0036	0.0016
118	0.0053	0.0036	0.0017
119	0.0054	0.0037	0.0017
120	0.0054	0.0037	0.0017
121	0.0055	0.0038	0.0017
122	0.0055	0.0038	0.0017
123	0.0056	0.0038	0.0018
124	0.0056	0.0039	0.0018
125	0.0057	0.0039	0.0018
126	0.0058	0.0040	0.0018
127	0.0059	0.0040	0.0018
128	0.0059	0.0041	0.0019
129	0.0060	0.0041	0.0019
130	0.0061	0.0042	0.0019
131	0.0062	0.0042	0.0019
132	0.0062	0.0043	0.0020
133	0.0063	0.0043	0.0020
134	0.0064	0.0044	0.0020
135	0.0065	0.0045	0.0020
136	0.0066	0.0045	0.0021
137	0.0067	0.0046	0.0021
138	0.0067	0.0046	0.0021

139	0.0069	0.0047	0.0022
140	0.0069	0.0048	0.0022
141	0.0071	0.0049	0.0022
142	0.0072	0.0049	0.0022
143	0.0073	0.0050	0.0023
144	0.0074	0.0051	0.0023
145	0.0069	0.0047	0.0022
146	0.0070	0.0048	0.0022
147	0.0072	0.0049	0.0022
148	0.0072	0.0050	0.0023
149	0.0074	0.0051	0.0023
150	0.0075	0.0052	0.0024
151	0.0077	0.0053	0.0024
152	0.0078	0.0054	0.0025
153	0.0080	0.0055	0.0025
154	0.0081	0.0056	0.0026
155	0.0084	0.0057	0.0026
156	0.0085	0.0058	0.0027
157	0.0087	0.0060	0.0027
158	0.0089	0.0061	0.0028
159	0.0092	0.0063	0.0029
160	0.0093	0.0064	0.0029
161	0.0096	0.0066	0.0030
162	0.0098	0.0067	0.0031
163	0.0101	0.0070	0.0032
164	0.0103	0.0071	0.0032
165	0.0107	0.0074	0.0034
166	0.0109	0.0075	0.0034
167	0.0114	0.0078	0.0036
168	0.0116	0.0080	0.0037
169	0.0197	0.0135	0.0062
170	0.0201	0.0138	0.0063
171	0.0209	0.0143	0.0066
172	0.0214	0.0146	0.0067
173	0.0223	0.0153	0.0070
174	0.0229	0.0157	0.0072

175	0.0240	0.0165	0.0075
176	0.0247	0.0169	0.0078
177	0.0261	0.0179	0.0082
178	0.0269	0.0185	0.0084
179	0.0287	0.0197	0.0090
180	0.0297	0.0204	0.0093
181	0.0320	0.0219	0.0100
182	0.0333	0.0228	0.0105
183	0.0364	0.0250	0.0114
184	0.0382	0.0262	0.0120
185	0.0610	0.0419	0.0192
186	0.0642	0.0420	0.0222
187	0.0721	0.0420	0.0301
188	0.0773	0.0420	0.0353
189	0.1004	0.0420	0.0584
190	0.1112	0.0420	0.0692
191	0.1498	0.0420	0.1078
192	0.1958	0.0420	0.1538
193	0.4755	0.0420	0.4335
194	0.1262	0.0420	0.0842
195	0.0835	0.0420	0.0415
196	0.0678	0.0420	0.0258
197	0.0403	0.0276	0.0126
198	0.0348	0.0238	0.0109
199	0.0308	0.0211	0.0097
200	0.0278	0.0190	0.0087
201	0.0254	0.0174	0.0080
202	0.0234	0.0161	0.0074
203	0.0218	0.0150	0.0069
204	0.0205	0.0140	0.0064
205	0.0119	0.0082	0.0037
206	0.0112	0.0077	0.0035
207	0.0105	0.0072	0.0033
208	0.0100	0.0068	0.0031
209	0.0095	0.0065	0.0030
210	0.0090	0.0062	0.0028

211	0.0086	0.0059	0.0027
212	0.0082	0.0057	0.0026
213	0.0079	0.0054	0.0025
214	0.0076	0.0052	0.0024
215	0.0073	0.0050	0.0023
216	0.0071	0.0049	0.0022
217	0.0075	0.0051	0.0023
218	0.0072	0.0050	0.0023
219	0.0070	0.0048	0.0022
220	0.0068	0.0047	0.0021
221	0.0066	0.0045	0.0021
222	0.0064	0.0044	0.0020
223	0.0063	0.0043	0.0020
224	0.0061	0.0042	0.0019
225	0.0060	0.0041	0.0019
226	0.0058	0.0040	0.0018
227	0.0057	0.0039	0.0018
228	0.0056	0.0038	0.0017
229	0.0054	0.0037	0.0017
230	0.0053	0.0036	0.0017
231	0.0052	0.0036	0.0016
232	0.0051	0.0035	0.0016
233	0.0050	0.0034	0.0016
234	0.0049	0.0034	0.0015
235	0.0048	0.0033	0.0015
236	0.0047	0.0032	0.0015
237	0.0046	0.0032	0.0015
238	0.0046	0.0031	0.0014
239	0.0045	0.0031	0.0014
240	0.0044	0.0030	0.0014
241	0.0043	0.0030	0.0014
242	0.0043	0.0029	0.0013
243	0.0042	0.0029	0.0013
244	0.0041	0.0028	0.0013
245	0.0041	0.0028	0.0013
246	0.0040	0.0027	0.0013

247	0.0039	0.0027	0.0012
248	0.0039	0.0027	0.0012
249	0.0038	0.0026	0.0012
250	0.0038	0.0026	0.0012
251	0.0037	0.0026	0.0012
252	0.0037	0.0025	0.0012
253	0.0036	0.0025	0.0011
254	0.0036	0.0025	0.0011
255	0.0035	0.0024	0.0011
256	0.0035	0.0024	0.0011
257	0.0035	0.0024	0.0011
258	0.0034	0.0023	0.0011
259	0.0034	0.0023	0.0011
260	0.0033	0.0023	0.0010
261	0.0033	0.0023	0.0010
262	0.0033	0.0022	0.0010
263	0.0032	0.0022	0.0010
264	0.0032	0.0022	0.0010
265	0.0031	0.0022	0.0010
266	0.0031	0.0021	0.0010
267	0.0031	0.0021	0.0010
268	0.0030	0.0021	0.0010
269	0.0030	0.0021	0.0009
270	0.0030	0.0020	0.0009
271	0.0030	0.0020	0.0009
272	0.0029	0.0020	0.0009
273	0.0029	0.0020	0.0009
274	0.0029	0.0020	0.0009
275	0.0028	0.0020	0.0009
276	0.0028	0.0019	0.0009
277	0.0028	0.0019	0.0009
278	0.0028	0.0019	0.0009
279	0.0027	0.0019	0.0009
280	0.0027	0.0019	0.0009
281	0.0027	0.0018	0.0008
282	0.0027	0.0018	0.0008

283	0.0026	0.0018	0.0008
284	0.0026	0.0018	0.0008
285	0.0026	0.0018	0.0008
286	0.0026	0.0018	0.0008
287	0.0026	0.0018	0.0008
288	0.0025	0.0017	0.0008

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 1.77

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.66

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 30.9186

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 29.0061

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	75.0	150.0	225.0	300.0
0.083	0.0001	0.01	Q	.	.	.	.
0.167	0.0003	0.03	Q	.	.	.	.
0.250	0.0008	0.07	Q	.	.	.	.
0.333	0.0016	0.12	Q	.	.	.	.
0.417	0.0028	0.18	Q	.	.	.	.
0.500	0.0048	0.29	Q	.	.	.	.
0.583	0.0080	0.45	Q	.	.	.	.
0.667	0.0125	0.66	Q	.	.	.	.
0.750	0.0182	0.83	Q	.	.	.	.
0.833	0.0249	0.97	Q	.	.	.	.
0.917	0.0324	1.09	Q	.	.	.	.
1.000	0.0406	1.19	Q	.	.	.	.
1.083	0.0494	1.27	Q	.	.	.	.
1.167	0.0586	1.34	Q	.	.	.	.
1.250	0.0682	1.40	Q	.	.	.	.
1.333	0.0782	1.45	Q	.	.	.	.
1.417	0.0886	1.50	Q	.	.	.	.
1.500	0.0992	1.55	Q	.	.	.	.
1.583	0.1102	1.59	Q	.	.	.	.
1.667	0.1215	1.63	Q	.	.	.	.
1.750	0.1330	1.67	Q	.	.	.	.
1.833	0.1447	1.70	Q	.	.	.	.
1.917	0.1566	1.74	Q	.	.	.	.
2.000	0.1688	1.77	Q	.	.	.	.

2.083	0.1812	1.80	Q	.	.	.	.
2.167	0.1937	1.82	Q	.	.	.	.
2.250	0.2065	1.85	Q	.	.	.	.
2.333	0.2194	1.88	Q	.	.	.	.
2.417	0.2325	1.90	Q	.	.	.	.
2.500	0.2458	1.93	Q	.	.	.	.
2.583	0.2592	1.95	Q	.	.	.	.
2.667	0.2727	1.97	Q	.	.	.	.
2.750	0.2864	1.99	Q	.	.	.	.
2.833	0.3003	2.01	Q	.	.	.	.
2.917	0.3143	2.03	Q	.	.	.	.
3.000	0.3284	2.05	Q	.	.	.	.
3.083	0.3426	2.07	Q	.	.	.	.
3.167	0.3570	2.09	Q	.	.	.	.
3.250	0.3715	2.11	Q	.	.	.	.
3.333	0.3862	2.13	Q	.	.	.	.
3.417	0.4009	2.14	Q	.	.	.	.
3.500	0.4158	2.16	Q	.	.	.	.
3.583	0.4308	2.18	Q	.	.	.	.
3.667	0.4460	2.20	Q	.	.	.	.
3.750	0.4612	2.21	Q	.	.	.	.
3.833	0.4766	2.23	Q	.	.	.	.
3.917	0.4920	2.25	Q	.	.	.	.
4.000	0.5076	2.26	Q	.	.	.	.
4.083	0.5233	2.28	Q	.	.	.	.
4.167	0.5391	2.30	Q	.	.	.	.
4.250	0.5550	2.31	Q	.	.	.	.
4.333	0.5711	2.33	Q	.	.	.	.
4.417	0.5872	2.34	Q	.	.	.	.
4.500	0.6034	2.36	Q	.	.	.	.
4.583	0.6198	2.37	Q	.	.	.	.
4.667	0.6362	2.39	Q	.	.	.	.
4.750	0.6528	2.40	Q	.	.	.	.
4.833	0.6694	2.42	Q	.	.	.	.
4.917	0.6862	2.43	Q	.	.	.	.
5.000	0.7030	2.45	Q	.	.	.	.

5.083	0.7200	2.46	Q	.	.	.	.
5.167	0.7371	2.48	QV	.	.	.	.
5.250	0.7543	2.50	QV	.	.	.	.
5.333	0.7716	2.51	QV	.	.	.	.
5.417	0.7890	2.53	QV	.	.	.	.
5.500	0.8065	2.55	QV	.	.	.	.
5.583	0.8242	2.56	QV	.	.	.	.
5.667	0.8419	2.58	QV	.	.	.	.
5.750	0.8598	2.60	QV	.	.	.	.
5.833	0.8778	2.61	QV	.	.	.	.
5.917	0.8960	2.63	QV	.	.	.	.
6.000	0.9142	2.65	QV	.	.	.	.
6.083	0.9326	2.67	QV	.	.	.	.
6.167	0.9511	2.69	QV	.	.	.	.
6.250	0.9697	2.70	QV	.	.	.	.
6.333	0.9884	2.72	QV	.	.	.	.
6.417	1.0073	2.73	QV	.	.	.	.
6.500	1.0262	2.75	QV	.	.	.	.
6.583	1.0453	2.77	QV	.	.	.	.
6.667	1.0645	2.79	QV	.	.	.	.
6.750	1.0838	2.80	QV	.	.	.	.
6.833	1.1032	2.82	QV	.	.	.	.
6.917	1.1228	2.84	QV	.	.	.	.
7.000	1.1424	2.86	QV	.	.	.	.
7.083	1.1623	2.88	QV	.	.	.	.
7.167	1.1822	2.90	QV	.	.	.	.
7.250	1.2023	2.91	QV	.	.	.	.
7.333	1.2225	2.93	QV	.	.	.	.
7.417	1.2428	2.95	QV	.	.	.	.
7.500	1.2633	2.97	QV	.	.	.	.
7.583	1.2839	3.00	QV	.	.	.	.
7.667	1.3047	3.02	QV	.	.	.	.
7.750	1.3256	3.04	QV	.	.	.	.
7.833	1.3467	3.06	QV	.	.	.	.
7.917	1.3679	3.08	QV	.	.	.	.
8.000	1.3893	3.10	QV	.	.	.	.

8.083	1.4108	3.13	QV	.	.	.	.
8.167	1.4325	3.15	QV	.	.	.	.
8.250	1.4543	3.17	Q V	.	.	.	.
8.333	1.4763	3.20	Q V	.	.	.	.
8.417	1.4985	3.22	Q V	.	.	.	.
8.500	1.5208	3.24	Q V	.	.	.	.
8.583	1.5434	3.27	Q V	.	.	.	.
8.667	1.5660	3.29	Q V	.	.	.	.
8.750	1.5889	3.32	Q V	.	.	.	.
8.833	1.6120	3.35	Q V	.	.	.	.
8.917	1.6352	3.37	Q V	.	.	.	.
9.000	1.6586	3.40	Q V	.	.	.	.
9.083	1.6822	3.43	Q V	.	.	.	.
9.167	1.7060	3.46	Q V	.	.	.	.
9.250	1.7300	3.49	Q V	.	.	.	.
9.333	1.7542	3.52	Q V	.	.	.	.
9.417	1.7787	3.55	Q V	.	.	.	.
9.500	1.8033	3.58	Q V	.	.	.	.
9.583	1.8281	3.61	Q V	.	.	.	.
9.667	1.8532	3.64	Q V	.	.	.	.
9.750	1.8785	3.67	Q V	.	.	.	.
9.833	1.9040	3.71	Q V	.	.	.	.
9.917	1.9298	3.74	Q V	.	.	.	.
10.000	1.9557	3.77	Q V	.	.	.	.
10.083	1.9820	3.81	Q V	.	.	.	.
10.167	2.0085	3.85	Q V	.	.	.	.
10.250	2.0352	3.88	Q V	.	.	.	.
10.333	2.0622	3.92	Q V	.	.	.	.
10.417	2.0895	3.96	Q V	.	.	.	.
10.500	2.1170	4.00	Q V	.	.	.	.
10.583	2.1448	4.04	Q V	.	.	.	.
10.667	2.1729	4.08	Q V	.	.	.	.
10.750	2.2013	4.12	Q V	.	.	.	.
10.833	2.2300	4.17	Q V	.	.	.	.
10.917	2.2590	4.21	Q V	.	.	.	.
11.000	2.2883	4.26	Q V	.	.	.	.

11.083	2.3179	4.30	Q	V	.	.	.	.	
11.167	2.3479	4.35	Q	V	.	.	.	.	
11.250	2.3782	4.40	Q	V	.	.	.	.	
11.333	2.4089	4.45	Q	V	.	.	.	.	
11.417	2.4399	4.50	Q	V	.	.	.	.	
11.500	2.4713	4.56	Q	V	.	.	.	.	
11.583	2.5030	4.61	Q	V	.	.	.	.	
11.667	2.5352	4.67	Q	V	.	.	.	.	
11.750	2.5677	4.72	Q	V	.	.	.	.	
11.833	2.6006	4.78	Q	V	.	.	.	.	
11.917	2.6340	4.85	Q	V	.	.	.	.	
12.000	2.6678	4.91	Q	V	.	.	.	.	
12.083	2.7021	4.97	Q	V	.	.	.	.	
12.167	2.7367	5.03	Q	V	.	.	.	.	
12.250	2.7718	5.09	Q	V	.	.	.	.	
12.333	2.8073	5.15	Q	V	.	.	.	.	
12.417	2.8432	5.21	Q	V	.	.	.	.	
12.500	2.8794	5.26	Q	V	.	.	.	.	
12.583	2.9159	5.30	Q		V	.	.	.	.
12.667	2.9526	5.33	Q		V	.	.	.	.
12.750	2.9896	5.37	Q		V	.	.	.	.
12.833	3.0269	5.42	Q		V	.	.	.	.
12.917	3.0646	5.48	Q		V	.	.	.	.
13.000	3.1028	5.55	Q		V	.	.	.	.
13.083	3.1415	5.62	Q		V	.	.	.	.
13.167	3.1808	5.70	Q		V	.	.	.	.
13.250	3.2207	5.79	Q		V	.	.	.	.
13.333	3.2612	5.88	Q		V	.	.	.	.
13.417	3.3024	5.98	Q		V	.	.	.	.
13.500	3.3444	6.09	Q		V	.	.	.	.
13.583	3.3871	6.20	Q		V	.	.	.	.
13.667	3.4306	6.32	Q		V	.	.	.	.
13.750	3.4749	6.44	Q		V	.	.	.	.
13.833	3.5202	6.57	Q		V	.	.	.	.
13.917	3.5664	6.71	Q		V	.	.	.	.
14.000	3.6137	6.86	Q		V	.	.	.	.

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14.083      3.6622      7.04  Q    V    .         .         .         .
14.167      3.7123      7.27  Q    V    .         .         .         .
14.250      3.7643      7.56  .Q   V    .         .         .         .
14.333      3.8187      7.90  .Q   V    .         .         .         .
14.417      3.8759      8.30  .Q   V    .         .         .         .
14.500      3.9368      8.84  .Q   V    .         .         .         .
14.583      4.0026      9.56  .Q   V    .         .         .         .
14.667      4.0745     10.44  .Q   V    .         .         .         .
14.750      4.1521     11.26  .Q   V    .         .         .         .
14.833      4.2348     12.02  .Q   V    .         .         .         .
14.917      4.3225     12.73  .Q   V    .         .         .         .
15.000      4.4150     13.43  .Q    V   .         .         .         .
15.083      4.5122     14.12  .Q    V   .         .         .         .
15.167      4.6143     14.82  .Q    V   .         .         .         .
15.250      4.7214     15.55  . Q   V   .         .         .         .
15.333      4.8338     16.33  . Q   V   .         .         .         .
15.417      4.9525     17.23  . Q   V   .         .         .         .
15.500      5.0789     18.35  . Q    V  .         .         .         .
15.583      5.2149     19.76  . Q    V  .         .         .         .
15.667      5.3636     21.58  . Q    V  .         .         .         .
15.750      5.5296     24.10  .  Q   V  .         .         .         .
15.833      5.7210     27.79  .  Q   V  .         .         .         .
15.917      5.9504     33.31  .   Q   V .         .         .         .
16.000      6.2367     41.57  .    Q  V .         .         .         .
16.083      6.6204     55.71  .      Q V.         .         .         .
16.167      7.1294     73.90  .        Q.         .         .         .
16.250      7.7732     93.48  .         V Q       .         .         .
16.333      8.5646    114.91  .         .V   Q    .         .         .
16.417      9.5183    138.48  .         .  V    Q .         .         .
16.500     10.7016    171.82  .         .   V     . Q       .         .
16.583     12.1114    204.70  .         .     V   .      Q  .         .
16.667     13.6278    220.19  .         .       V .        Q.         .
16.750     14.9998    199.20  .         .         V     Q   .         .
16.833     16.1770    170.93  .         .         . Q       .         .
16.917     17.1891    146.96  .         .        Q.  V      .         .
17.000     18.0533    125.47  .         .     Q   .   V     .         .
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17.083     18.7926    107.34  .         .   Q     .    V    .         .
17.167     19.4430     94.44  .         . Q       .     V   .         .
17.250     20.0263     84.69  .         .Q        .      V  .         .
17.333     20.5592     77.39  .         Q         .       V .         .
17.417     21.0435     70.32  .        Q.         .        V.         .
17.500     21.4845     64.04  .       Q .         .        V.         .
17.583     21.8898     58.84  .      Q  .         .         V         .
17.667     22.2644     54.39  .      Q  .         .         V         .
17.750     22.6022     49.06  .     Q   .         .         .V        .
17.833     22.9174     45.76  .     Q   .         .         .V        .
17.917     23.2104     42.55  .    Q    .         .         . V       .
18.000     23.4822     39.46  .    Q    .         .         . V       .
18.083     23.7410     37.57  .    Q    .         .         . V       .
18.167     23.9840     35.28  .   Q     .         .         .  V      .
18.250     24.2151     33.56  .   Q     .         .         .  V      .
18.333     24.4311     31.37  .   Q     .         .         .  V      .
18.417     24.6329     29.30  .  Q      .         .         .  V      .
18.500     24.8230     27.60  .  Q      .         .         .   V     .
18.583     24.9967     25.23  .  Q      .         .         .   V     .
18.667     25.1627     24.10  .  Q      .         .         .   V     .
18.750     25.3218     23.10  .  Q      .         .         .   V     .
18.833     25.4748     22.21  . Q       .         .         .    V    .
18.917     25.6216     21.32  . Q       .         .         .    V    .
19.000     25.7605     20.17  . Q       .         .         .    V    .
19.083     25.8943     19.44  . Q       .         .         .    V    .
19.167     26.0223     18.58  . Q       .         .         .    V    .
19.250     26.1450     17.81  . Q       .         .         .     V   .
19.333     26.2613     16.89  . Q       .         .         .     V   .
19.417     26.3700     15.78  . Q       .         .         .     V   .
19.500     26.4751     15.27  . Q       .         .         .     V   .
19.583     26.5772     14.83  .Q        .         .         .     V   .
19.667     26.6760     14.34  .Q        .         .         .     V   .
19.750     26.7695     13.58  .Q        .         .         .     V   .
19.833     26.8572     12.74  .Q        .         .         .      V  .
19.917     26.9421     12.33  .Q        .         .         .      V  .
20.000     27.0243     11.94  .Q        .         .         .      V  .
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20.083	27.1035	11.49	.Q	.	.	.	V .
20.167	27.1772	10.71	.Q	.	.	.	V .
20.250	27.2458	9.96	.Q	.	.	.	V .
20.333	27.3119	9.60	.Q	.	.	.	V .
20.417	27.3757	9.26	.Q	.	.	.	V .
20.500	27.4368	8.87	.Q	.	.	.	V .
20.583	27.4927	8.12	.Q	.	.	.	V .
20.667	27.5448	7.56	.Q	.	.	.	V .
20.750	27.5956	7.38	Q	.	.	.	V .
20.833	27.6456	7.26	Q	.	.	.	V .
20.917	27.6953	7.21	Q	.	.	.	V .
21.000	27.7454	7.27	Q	.	.	.	V .
21.083	27.7954	7.27	Q	.	.	.	V .
21.167	27.8450	7.20	Q	.	.	.	V .
21.250	27.8941	7.12	Q	.	.	.	V .
21.333	27.9425	7.03	Q	.	.	.	V .
21.417	27.9903	6.95	Q	.	.	.	V .
21.500	28.0374	6.84	Q	.	.	.	V .
21.583	28.0838	6.73	Q	.	.	.	V .
21.667	28.1293	6.60	Q	.	.	.	V .
21.750	28.1737	6.46	Q	.	.	.	V .
21.833	28.2168	6.25	Q	.	.	.	V .
21.917	28.2581	6.01	Q	.	.	.	V .
22.000	28.2971	5.66	Q	.	.	.	V.
22.083	28.3327	5.17	Q	.	.	.	V.
22.167	28.3601	3.97	Q	.	.	.	V.
22.250	28.3839	3.45	Q	.	.	.	V.
22.333	28.4064	3.26	Q	.	.	.	V.
22.417	28.4280	3.14	Q	.	.	.	V.
22.500	28.4491	3.07	Q	.	.	.	V.
22.583	28.4698	3.00	Q	.	.	.	V.
22.667	28.4901	2.94	Q	.	.	.	V.
22.750	28.5099	2.89	Q	.	.	.	V.
22.833	28.5295	2.83	Q	.	.	.	V.
22.917	28.5487	2.79	Q	.	.	.	V.
23.000	28.5675	2.74	Q	.	.	.	V.

23.083	28.5861	2.69	Q	.	.	.	V.
23.167	28.6044	2.66	Q	.	.	.	V.
23.250	28.6224	2.62	Q	.	.	.	V.
23.333	28.6403	2.59	Q	.	.	.	V.
23.417	28.6579	2.56	Q	.	.	.	V.
23.500	28.6753	2.53	Q	.	.	.	V.
23.583	28.6925	2.50	Q	.	.	.	V.
23.667	28.7095	2.47	Q	.	.	.	V.
23.750	28.7264	2.44	Q	.	.	.	V.
23.833	28.7430	2.42	Q	.	.	.	V.
23.917	28.7595	2.39	Q	.	.	.	V.
24.000	28.7757	2.36	Q	.	.	.	V.
24.083	28.7918	2.33	Q	.	.	.	V.
24.167	28.8075	2.28	Q	.	.	.	V.
24.250	28.8228	2.22	Q	.	.	.	V.
24.333	28.8377	2.15	Q	.	.	.	V.
24.417	28.8519	2.06	Q	.	.	.	V.
24.500	28.8652	1.94	Q	.	.	.	V.
24.583	28.8773	1.76	Q	.	.	.	V.
24.667	28.8880	1.54	Q	.	.	.	V.
24.750	28.8973	1.35	Q	.	.	.	V.
24.833	28.9055	1.20	Q	.	.	.	V.
24.917	28.9129	1.07	Q	.	.	.	V.
25.000	28.9196	0.97	Q	.	.	.	V.
25.083	28.9257	0.89	Q	.	.	.	V.
25.167	28.9313	0.81	Q	.	.	.	V.
25.250	28.9365	0.75	Q	.	.	.	V.
25.333	28.9412	0.69	Q	.	.	.	V.
25.417	28.9457	0.64	Q	.	.	.	V.
25.500	28.9498	0.60	Q	.	.	.	V.
25.583	28.9536	0.55	Q	.	.	.	V.
25.667	28.9571	0.51	Q	.	.	.	V.
25.750	28.9604	0.48	Q	.	.	.	V.
25.833	28.9635	0.45	Q	.	.	.	V.
25.917	28.9664	0.42	Q	.	.	.	V.
26.000	28.9691	0.39	Q	.	.	.	V.

26.083	28.9716	0.37	Q	.	.	.	V.
26.167	28.9740	0.34	Q	.	.	.	V.
26.250	28.9762	0.32	Q	.	.	.	V.
26.333	28.9783	0.30	Q	.	.	.	V.
26.417	28.9802	0.28	Q	.	.	.	V.
26.500	28.9820	0.26	Q	.	.	.	V.
26.583	28.9837	0.25	Q	.	.	.	V.
26.667	28.9853	0.23	Q	.	.	.	V.
26.750	28.9868	0.22	Q	.	.	.	V.
26.833	28.9882	0.20	Q	.	.	.	V.
26.917	28.9895	0.19	Q	.	.	.	V.
27.000	28.9907	0.18	Q	.	.	.	V.
27.083	28.9919	0.17	Q	.	.	.	V.
27.167	28.9930	0.16	Q	.	.	.	V.
27.250	28.9940	0.15	Q	.	.	.	V.
27.333	28.9949	0.14	Q	.	.	.	V.
27.417	28.9958	0.13	Q	.	.	.	V.
27.500	28.9966	0.12	Q	.	.	.	V.
27.583	28.9974	0.11	Q	.	.	.	V.
27.667	28.9981	0.10	Q	.	.	.	V.
27.750	28.9988	0.10	Q	.	.	.	V.
27.833	28.9994	0.09	Q	.	.	.	V.
27.917	29.0000	0.08	Q	.	.	.	V.
28.000	29.0005	0.08	Q	.	.	.	V.
28.083	29.0010	0.07	Q	.	.	.	V.
28.167	29.0015	0.07	Q	.	.	.	V.
28.250	29.0019	0.06	Q	.	.	.	V.
28.333	29.0023	0.06	Q	.	.	.	V.
28.417	29.0027	0.05	Q	.	.	.	V.
28.500	29.0030	0.05	Q	.	.	.	V.
28.583	29.0034	0.05	Q	.	.	.	V.
28.667	29.0037	0.04	Q	.	.	.	V.
28.750	29.0039	0.04	Q	.	.	.	V.
28.833	29.0042	0.04	Q	.	.	.	V.
28.917	29.0045	0.04	Q	.	.	.	V.
29.000	29.0047	0.03	Q	.	.	.	V.

```
  29.083     29.0049      0.03  Q         .         .         .        V.
  29.167     29.0051      0.03  Q         .         .         .        V.
  29.250     29.0053      0.03  Q         .         .         .        V.
  29.333     29.0055      0.02  Q         .         .         .        V.
  29.417     29.0056      0.02  Q         .         .         .        V.
  29.500     29.0057      0.02  Q         .         .         .        V.
  29.583     29.0058      0.02  Q         .         .         .        V.
  29.667     29.0059      0.01  Q         .         .         .        V.
  29.750     29.0060      0.01  Q         .         .         .        V.
  29.833     29.0061      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
              0%                              1790.0
             10%                               190.0
             20%                               110.0
             30%                                80.0
             40%                                60.0
             50%                                45.0
             60%                                35.0
             70%                                25.0
             80%                                15.0
             90%                                15.0


 ****************************************************************************
  FLOW PROCESS FROM NODE   9100.00 TO NODE   9005.00 IS CODE =   1
 ----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
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 (UNIT-HYDROGRAPH ADDED TO STREAM #2)

    WATERSHED AREA =      69.850 ACRES
    BASEFLOW =   0.000 CFS/SQUARE-MILE
    *USER ENTERED "LAG" TIME =    0.365 HOURS
     CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
     THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
     MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
    DESERT(UNDEVELOPED) S-GRAPH SELECTED
    MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.504
    LOW LOSS FRACTION = 0.686
    *HYDROGRAPH MODEL #1 SPECIFIED*

    SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.48
    SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  1.17
    SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.60
    SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  2.24
    SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.56
    SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  3.43

    PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
      5-MINUTE FACTOR = 0.997
     30-MINUTE FACTOR = 0.997
      1-HOUR FACTOR = 0.997
      3-HOUR FACTOR = 1.000
      6-HOUR FACTOR = 1.000
     24-HOUR FACTOR = 1.000

    UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
    UNIT INTERVAL PERCENTAGE OF LAG-TIME =  22.831



=============================================================================
                      UNIT HYDROGRAPH DETERMINATION
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INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	1.192	10.066
2	5.630	37.492
3	15.457	83.015
4	35.277	167.428
5	51.219	134.668
6	61.293	85.100
7	68.027	56.890
8	73.210	43.778
9	77.275	34.343
10	80.524	27.450
11	83.190	22.518
12	85.506	19.559
13	87.531	17.107
14	89.189	14.007
15	90.536	11.384
16	91.776	10.476
17	92.867	9.214
18	93.854	8.334
19	94.661	6.818
20	95.429	6.493
21	96.069	5.403
22	96.662	5.007
23	97.147	4.096
24	97.557	3.472
25	97.893	2.834
26	98.122	1.934
27	98.362	2.028
28	98.634	2.299
29	98.908	2.315
30	99.182	2.314
31	99.456	2.314
32	99.730	2.314

33	100.000	2.281

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UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0017	0.0008
2	0.0025	0.0017	0.0008
3	0.0025	0.0017	0.0008
4	0.0025	0.0017	0.0008
5	0.0026	0.0018	0.0008
6	0.0026	0.0018	0.0008
7	0.0026	0.0018	0.0008
8	0.0026	0.0018	0.0008
9	0.0026	0.0018	0.0008
10	0.0026	0.0018	0.0008
11	0.0026	0.0018	0.0008
12	0.0026	0.0018	0.0008
13	0.0026	0.0018	0.0008
14	0.0027	0.0018	0.0008
15	0.0027	0.0018	0.0008
16	0.0027	0.0018	0.0008
17	0.0027	0.0018	0.0008
18	0.0027	0.0019	0.0008
19	0.0027	0.0019	0.0009
20	0.0027	0.0019	0.0009
21	0.0027	0.0019	0.0009
22	0.0028	0.0019	0.0009
23	0.0028	0.0019	0.0009
24	0.0028	0.0019	0.0009
25	0.0028	0.0019	0.0009
26	0.0028	0.0019	0.0009
27	0.0028	0.0019	0.0009
28	0.0028	0.0019	0.0009
29	0.0029	0.0020	0.0009
30	0.0029	0.0020	0.0009

31	0.0029	0.0020	0.0009
32	0.0029	0.0020	0.0009
33	0.0029	0.0020	0.0009
34	0.0029	0.0020	0.0009
35	0.0029	0.0020	0.0009
36	0.0029	0.0020	0.0009
37	0.0030	0.0020	0.0009
38	0.0030	0.0020	0.0009
39	0.0030	0.0021	0.0009
40	0.0030	0.0021	0.0009
41	0.0030	0.0021	0.0010
42	0.0030	0.0021	0.0010
43	0.0031	0.0021	0.0010
44	0.0031	0.0021	0.0010
45	0.0031	0.0021	0.0010
46	0.0031	0.0021	0.0010
47	0.0031	0.0021	0.0010
48	0.0031	0.0022	0.0010
49	0.0032	0.0022	0.0010
50	0.0032	0.0022	0.0010
51	0.0032	0.0022	0.0010
52	0.0032	0.0022	0.0010
53	0.0032	0.0022	0.0010
54	0.0032	0.0022	0.0010
55	0.0033	0.0022	0.0010
56	0.0033	0.0023	0.0010
57	0.0033	0.0023	0.0010
58	0.0033	0.0023	0.0010
59	0.0033	0.0023	0.0011
60	0.0034	0.0023	0.0011
61	0.0034	0.0023	0.0011
62	0.0034	0.0023	0.0011
63	0.0034	0.0024	0.0011
64	0.0034	0.0024	0.0011
65	0.0035	0.0024	0.0011
66	0.0035	0.0024	0.0011

67	0.0035	0.0024	0.0011
68	0.0035	0.0024	0.0011
69	0.0036	0.0024	0.0011
70	0.0036	0.0025	0.0011
71	0.0036	0.0025	0.0011
72	0.0036	0.0025	0.0011
73	0.0037	0.0025	0.0011
74	0.0037	0.0025	0.0012
75	0.0037	0.0025	0.0012
76	0.0037	0.0025	0.0012
77	0.0037	0.0026	0.0012
78	0.0038	0.0026	0.0012
79	0.0038	0.0026	0.0012
80	0.0038	0.0026	0.0012
81	0.0039	0.0026	0.0012
82	0.0039	0.0027	0.0012
83	0.0039	0.0027	0.0012
84	0.0039	0.0027	0.0012
85	0.0040	0.0027	0.0012
86	0.0040	0.0027	0.0013
87	0.0040	0.0028	0.0013
88	0.0040	0.0028	0.0013
89	0.0041	0.0028	0.0013
90	0.0041	0.0028	0.0013
91	0.0042	0.0028	0.0013
92	0.0042	0.0029	0.0013
93	0.0042	0.0029	0.0013
94	0.0042	0.0029	0.0013
95	0.0043	0.0029	0.0013
96	0.0043	0.0030	0.0014
97	0.0044	0.0030	0.0014
98	0.0044	0.0030	0.0014
99	0.0044	0.0030	0.0014
100	0.0045	0.0031	0.0014
101	0.0045	0.0031	0.0014
102	0.0045	0.0031	0.0014

103	0.0046	0.0031	0.0014
104	0.0046	0.0032	0.0014
105	0.0047	0.0032	0.0015
106	0.0047	0.0032	0.0015
107	0.0048	0.0033	0.0015
108	0.0048	0.0033	0.0015
109	0.0048	0.0033	0.0015
110	0.0049	0.0033	0.0015
111	0.0049	0.0034	0.0015
112	0.0050	0.0034	0.0016
113	0.0050	0.0035	0.0016
114	0.0051	0.0035	0.0016
115	0.0051	0.0035	0.0016
116	0.0052	0.0035	0.0016
117	0.0052	0.0036	0.0016
118	0.0053	0.0036	0.0017
119	0.0054	0.0037	0.0017
120	0.0054	0.0037	0.0017
121	0.0055	0.0038	0.0017
122	0.0055	0.0038	0.0017
123	0.0056	0.0038	0.0018
124	0.0056	0.0039	0.0018
125	0.0057	0.0039	0.0018
126	0.0058	0.0040	0.0018
127	0.0059	0.0040	0.0018
128	0.0059	0.0041	0.0019
129	0.0060	0.0041	0.0019
130	0.0061	0.0042	0.0019
131	0.0062	0.0042	0.0019
132	0.0062	0.0043	0.0020
133	0.0063	0.0043	0.0020
134	0.0064	0.0044	0.0020
135	0.0065	0.0045	0.0020
136	0.0066	0.0045	0.0021
137	0.0067	0.0046	0.0021
138	0.0067	0.0046	0.0021

139	0.0069	0.0047	0.0022
140	0.0069	0.0048	0.0022
141	0.0071	0.0049	0.0022
142	0.0072	0.0049	0.0022
143	0.0073	0.0050	0.0023
144	0.0074	0.0051	0.0023
145	0.0069	0.0047	0.0022
146	0.0070	0.0048	0.0022
147	0.0071	0.0049	0.0022
148	0.0072	0.0050	0.0023
149	0.0074	0.0051	0.0023
150	0.0075	0.0051	0.0024
151	0.0077	0.0053	0.0024
152	0.0078	0.0053	0.0024
153	0.0080	0.0055	0.0025
154	0.0081	0.0056	0.0025
155	0.0083	0.0057	0.0026
156	0.0085	0.0058	0.0027
157	0.0087	0.0060	0.0027
158	0.0089	0.0061	0.0028
159	0.0091	0.0063	0.0029
160	0.0093	0.0064	0.0029
161	0.0096	0.0066	0.0030
162	0.0098	0.0067	0.0031
163	0.0101	0.0069	0.0032
164	0.0103	0.0071	0.0032
165	0.0107	0.0073	0.0034
166	0.0109	0.0075	0.0034
167	0.0114	0.0078	0.0036
168	0.0116	0.0080	0.0036
169	0.0194	0.0133	0.0061
170	0.0198	0.0136	0.0062
171	0.0206	0.0141	0.0065
172	0.0211	0.0144	0.0066
173	0.0220	0.0151	0.0069
174	0.0226	0.0155	0.0071

175	0.0237	0.0163	0.0075
176	0.0244	0.0167	0.0077
177	0.0258	0.0177	0.0081
178	0.0266	0.0182	0.0083
179	0.0283	0.0194	0.0089
180	0.0293	0.0201	0.0092
181	0.0316	0.0217	0.0099
182	0.0329	0.0226	0.0103
183	0.0360	0.0247	0.0113
184	0.0378	0.0260	0.0119
185	0.0614	0.0420	0.0194
186	0.0647	0.0420	0.0227
187	0.0725	0.0420	0.0305
188	0.0778	0.0420	0.0358
189	0.1011	0.0420	0.0591
190	0.1119	0.0420	0.0699
191	0.1508	0.0420	0.1088
192	0.1971	0.0420	0.1551
193	0.4785	0.0420	0.4365
194	0.1270	0.0420	0.0850
195	0.0840	0.0420	0.0420
196	0.0682	0.0420	0.0262
197	0.0399	0.0274	0.0125
198	0.0344	0.0236	0.0108
199	0.0304	0.0209	0.0096
200	0.0274	0.0188	0.0086
201	0.0251	0.0172	0.0079
202	0.0231	0.0159	0.0073
203	0.0215	0.0148	0.0068
204	0.0202	0.0138	0.0063
205	0.0119	0.0081	0.0037
206	0.0111	0.0076	0.0035
207	0.0105	0.0072	0.0033
208	0.0099	0.0068	0.0031
209	0.0094	0.0065	0.0030
210	0.0090	0.0062	0.0028

211	0.0086	0.0059	0.0027
212	0.0082	0.0056	0.0026
213	0.0079	0.0054	0.0025
214	0.0076	0.0052	0.0024
215	0.0073	0.0050	0.0023
216	0.0071	0.0048	0.0022
217	0.0075	0.0051	0.0023
218	0.0072	0.0050	0.0023
219	0.0070	0.0048	0.0022
220	0.0068	0.0047	0.0021
221	0.0066	0.0045	0.0021
222	0.0064	0.0044	0.0020
223	0.0063	0.0043	0.0020
224	0.0061	0.0042	0.0019
225	0.0060	0.0041	0.0019
226	0.0058	0.0040	0.0018
227	0.0057	0.0039	0.0018
228	0.0056	0.0038	0.0017
229	0.0054	0.0037	0.0017
230	0.0053	0.0036	0.0017
231	0.0052	0.0036	0.0016
232	0.0051	0.0035	0.0016
233	0.0050	0.0034	0.0016
234	0.0049	0.0034	0.0015
235	0.0048	0.0033	0.0015
236	0.0047	0.0032	0.0015
237	0.0046	0.0032	0.0015
238	0.0046	0.0031	0.0014
239	0.0045	0.0031	0.0014
240	0.0044	0.0030	0.0014
241	0.0043	0.0030	0.0014
242	0.0043	0.0029	0.0013
243	0.0042	0.0029	0.0013
244	0.0041	0.0028	0.0013
245	0.0041	0.0028	0.0013
246	0.0040	0.0027	0.0013

247	0.0039	0.0027	0.0012
248	0.0039	0.0027	0.0012
249	0.0038	0.0026	0.0012
250	0.0038	0.0026	0.0012
251	0.0037	0.0026	0.0012
252	0.0037	0.0025	0.0012
253	0.0036	0.0025	0.0011
254	0.0036	0.0025	0.0011
255	0.0035	0.0024	0.0011
256	0.0035	0.0024	0.0011
257	0.0035	0.0024	0.0011
258	0.0034	0.0023	0.0011
259	0.0034	0.0023	0.0011
260	0.0033	0.0023	0.0010
261	0.0033	0.0023	0.0010
262	0.0033	0.0022	0.0010
263	0.0032	0.0022	0.0010
264	0.0032	0.0022	0.0010
265	0.0031	0.0022	0.0010
266	0.0031	0.0021	0.0010
267	0.0031	0.0021	0.0010
268	0.0030	0.0021	0.0010
269	0.0030	0.0021	0.0009
270	0.0030	0.0020	0.0009
271	0.0030	0.0020	0.0009
272	0.0029	0.0020	0.0009
273	0.0029	0.0020	0.0009
274	0.0029	0.0020	0.0009
275	0.0028	0.0019	0.0009
276	0.0028	0.0019	0.0009
277	0.0028	0.0019	0.0009
278	0.0028	0.0019	0.0009
279	0.0027	0.0019	0.0009
280	0.0027	0.0019	0.0009
281	0.0027	0.0018	0.0008
282	0.0027	0.0018	0.0008

283	0.0026	0.0018	0.0008
284	0.0026	0.0018	0.0008
285	0.0026	0.0018	0.0008
286	0.0026	0.0018	0.0008
287	0.0026	0.0018	0.0008
288	0.0025	0.0017	0.0008

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 1.76

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.67

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 10.2591

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 9.6986

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
0.083	0.0001	0.01	Q	.	.	.	.
0.167	0.0003	0.04	Q	.	.	.	.
0.250	0.0010	0.10	Q	.	.	.	.
0.333	0.0027	0.24	Q	.	.	.	.
0.417	0.0050	0.34	Q	.	.	.	.
0.500	0.0079	0.41	Q	.	.	.	.
0.583	0.0110	0.46	Q	.	.	.	.
0.667	0.0144	0.50	Q	.	.	.	.
0.750	0.0180	0.52	Q	.	.	.	.
0.833	0.0218	0.55	Q	.	.	.	.
0.917	0.0257	0.57	Q	.	.	.	.
1.000	0.0298	0.59	Q	.	.	.	.
1.083	0.0339	0.60	Q	.	.	.	.
1.167	0.0382	0.62	Q	.	.	.	.
1.250	0.0425	0.63	Q	.	.	.	.
1.333	0.0469	0.64	Q	.	.	.	.
1.417	0.0513	0.65	Q	.	.	.	.
1.500	0.0559	0.66	Q	.	.	.	.
1.583	0.0605	0.67	Q	.	.	.	.
1.667	0.0651	0.67	Q	.	.	.	.
1.750	0.0698	0.68	Q	.	.	.	.
1.833	0.0745	0.69	Q	.	.	.	.
1.917	0.0793	0.69	Q	.	.	.	.
2.000	0.0842	0.70	Q	.	.	.	.

2.083	0.0890	0.71	Q	.	.	.	.
2.167	0.0939	0.71	Q	.	.	.	.
2.250	0.0988	0.72	Q	.	.	.	.
2.333	0.1038	0.72	Q	.	.	.	.
2.417	0.1088	0.73	Q	.	.	.	.
2.500	0.1139	0.73	Q	.	.	.	.
2.583	0.1189	0.74	Q	.	.	.	.
2.667	0.1240	0.74	Q	.	.	.	.
2.750	0.1292	0.75	Q	.	.	.	.
2.833	0.1344	0.75	Q	.	.	.	.
2.917	0.1396	0.75	Q	.	.	.	.
3.000	0.1448	0.76	Q	.	.	.	.
3.083	0.1500	0.76	Q	.	.	.	.
3.167	0.1553	0.77	Q	.	.	.	.
3.250	0.1606	0.77	Q	.	.	.	.
3.333	0.1659	0.77	Q	.	.	.	.
3.417	0.1713	0.78	Q	.	.	.	.
3.500	0.1766	0.78	Q	.	.	.	.
3.583	0.1821	0.78	Q	.	.	.	.
3.667	0.1875	0.79	Q	.	.	.	.
3.750	0.1929	0.79	Q	.	.	.	.
3.833	0.1984	0.80	Q	.	.	.	.
3.917	0.2040	0.80	Q	.	.	.	.
4.000	0.2095	0.81	Q	.	.	.	.
4.083	0.2151	0.81	Q	.	.	.	.
4.167	0.2207	0.81	Q	.	.	.	.
4.250	0.2263	0.82	Q	.	.	.	.
4.333	0.2320	0.82	Q	.	.	.	.
4.417	0.2377	0.83	Q	.	.	.	.
4.500	0.2434	0.83	QV	.	.	.	.
4.583	0.2492	0.84	QV	.	.	.	.
4.667	0.2549	0.84	QV	.	.	.	.
4.750	0.2608	0.85	QV	.	.	.	.
4.833	0.2666	0.85	QV	.	.	.	.
4.917	0.2725	0.85	QV	.	.	.	.
5.000	0.2784	0.86	QV	.	.	.	.

5.083	0.2844	0.86	QV	.	.	.	.
5.167	0.2904	0.87	QV	.	.	.	.
5.250	0.2964	0.87	QV	.	.	.	.
5.333	0.3025	0.88	QV	.	.	.	.
5.417	0.3086	0.88	QV	.	.	.	.
5.500	0.3147	0.89	QV	.	.	.	.
5.583	0.3208	0.90	QV	.	.	.	.
5.667	0.3271	0.90	QV	.	.	.	.
5.750	0.3333	0.91	QV	.	.	.	.
5.833	0.3396	0.91	QV	.	.	.	.
5.917	0.3459	0.92	QV	.	.	.	.
6.000	0.3523	0.92	QV	.	.	.	.
6.083	0.3587	0.93	QV	.	.	.	.
6.167	0.3651	0.93	QV	.	.	.	.
6.250	0.3716	0.94	QV	.	.	.	.
6.333	0.3781	0.95	QV	.	.	.	.
6.417	0.3847	0.95	QV	.	.	.	.
6.500	0.3913	0.96	QV	.	.	.	.
6.583	0.3979	0.97	QV	.	.	.	.
6.667	0.4046	0.97	QV	.	.	.	.
6.750	0.4113	0.98	QV	.	.	.	.
6.833	0.4181	0.98	QV	.	.	.	.
6.917	0.4250	0.99	QV	.	.	.	.
7.000	0.4318	1.00	QV	.	.	.	.
7.083	0.4388	1.01	QV	.	.	.	.
7.167	0.4457	1.01	QV	.	.	.	.
7.250	0.4527	1.02	QV	.	.	.	.
7.333	0.4598	1.03	QV	.	.	.	.
7.417	0.4669	1.03	QV	.	.	.	.
7.500	0.4741	1.04	QV	.	.	.	.
7.583	0.4813	1.05	QV	.	.	.	.
7.667	0.4886	1.06	Q V	.	.	.	.
7.750	0.4960	1.06	Q V	.	.	.	.
7.833	0.5033	1.07	Q V	.	.	.	.
7.917	0.5108	1.08	Q V	.	.	.	.
8.000	0.5183	1.09	Q V	.	.	.	.

8.083	0.5258	1.10	Q	V	.	.	.	.
8.167	0.5335	1.11	Q	V	.	.	.	.
8.250	0.5411	1.11	Q	V	.	.	.	.
8.333	0.5489	1.12	Q	V	.	.	.	.
8.417	0.5567	1.13	Q	V	.	.	.	.
8.500	0.5646	1.14	Q	V	.	.	.	.
8.583	0.5725	1.15	Q	V	.	.	.	.
8.667	0.5805	1.16	Q	V	.	.	.	.
8.750	0.5885	1.17	Q	V	.	.	.	.
8.833	0.5967	1.18	Q	V	.	.	.	.
8.917	0.6049	1.19	Q	V	.	.	.	.
9.000	0.6132	1.20	Q	V	.	.	.	.
9.083	0.6215	1.21	Q	V	.	.	.	.
9.167	0.6299	1.22	Q	V	.	.	.	.
9.250	0.6384	1.23	Q	V	.	.	.	.
9.333	0.6470	1.24	Q	V	.	.	.	.
9.417	0.6556	1.26	Q	V	.	.	.	.
9.500	0.6644	1.27	Q	V	.	.	.	.
9.583	0.6732	1.28	Q	V	.	.	.	.
9.667	0.6821	1.29	Q	V	.	.	.	.
9.750	0.6911	1.30	Q	V	.	.	.	.
9.833	0.7001	1.32	Q	V	.	.	.	.
9.917	0.7093	1.33	Q	V	.	.	.	.
10.000	0.7186	1.34	Q	V	.	.	.	.
10.083	0.7279	1.36	Q	V	.	.	.	.
10.167	0.7373	1.37	Q	V	.	.	.	.
10.250	0.7469	1.39	Q	V	.	.	.	.
10.333	0.7565	1.40	Q	V	.	.	.	.
10.417	0.7663	1.41	Q	V	.	.	.	.
10.500	0.7761	1.43	Q	V	.	.	.	.
10.583	0.7861	1.45	Q	V	.	.	.	.
10.667	0.7962	1.46	Q	V	.	.	.	.
10.750	0.8063	1.48	Q	V	.	.	.	.
10.833	0.8166	1.50	Q	V	.	.	.	.
10.917	0.8271	1.51	Q	V	.	.	.	.
11.000	0.8376	1.53	Q	V	.	.	.	.

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11.083      0.8483      1.55  Q  V      .         .         .         .
11.167      0.8591      1.57  Q  V      .         .         .         .
11.250      0.8700      1.59  Q  V      .         .         .         .
11.333      0.8811      1.61  Q  V      .         .         .         .
11.417      0.8923      1.63  Q  V      .         .         .         .
11.500      0.9037      1.65  Q  V      .         .         .         .
11.583      0.9152      1.67  Q  V      .         .         .         .
11.667      0.9268      1.69  Q  V      .         .         .         .
11.750      0.9386      1.72  Q  V      .         .         .         .
11.833      0.9506      1.74  Q  V      .         .         .         .
11.917      0.9628      1.77  Q  V      .         .         .         .
12.000      0.9751      1.79  Q   V     .         .         .         .
12.083      0.9876      1.82  Q   V     .         .         .         .
12.167      1.0003      1.84  Q   V     .         .         .         .
12.250      1.0130      1.85  Q   V     .         .         .         .
12.333      1.0257      1.84  Q   V     .         .         .         .
12.417      1.0384      1.84  Q   V     .         .         .         .
12.500      1.0511      1.86  Q   V     .         .         .         .
12.583      1.0641      1.88  Q   V     .         .         .         .
12.667      1.0771      1.90  Q   V     .         .         .         .
12.750      1.0904      1.93  Q   V     .         .         .         .
12.833      1.1039      1.96  Q   V     .         .         .         .
12.917      1.1176      1.99  Q   V     .         .         .         .
13.000      1.1315      2.02  Q   V     .         .         .         .
13.083      1.1456      2.06  Q   V     .         .         .         .
13.167      1.1600      2.09  Q   V     .         .         .         .
13.250      1.1747      2.13  Q   V     .         .         .         .
13.333      1.1897      2.18  Q   V     .         .         .         .
13.417      1.2050      2.22  Q   V     .         .         .         .
13.500      1.2207      2.27  Q    V    .         .         .         .
13.583      1.2367      2.32  Q    V    .         .         .         .
13.667      1.2530      2.37  Q    V    .         .         .         .
13.750      1.2697      2.43  Q    V    .         .         .         .
13.833      1.2869      2.49  Q    V    .         .         .         .
13.917      1.3045      2.55  Q    V    .         .         .         .
14.000      1.3225      2.62  Q    V    .         .         .         .
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14.083      1.3412      2.72  Q    V    .         .         .         .
14.167      1.3610      2.88  Q    V    .         .         .         .
14.250      1.3827      3.15  Q    V    .         .         .         .
14.333      1.4077      3.63  Q    V    .         .         .         .
14.417      1.4355      4.04  Q    V    .         .         .         .
14.500      1.4656      4.36  Q     V   .         .         .         .
14.583      1.4974      4.62  Q     V   .         .         .         .
14.667      1.5310      4.88  Q     V   .         .         .         .
14.750      1.5663      5.12  .Q    V   .         .         .         .
14.833      1.6032      5.37  .Q    V   .         .         .         .
14.917      1.6420      5.62  .Q    V   .         .         .         .
15.000      1.6825      5.89  .Q    V   .         .         .         .
15.083      1.7251      6.18  .Q     V  .         .         .         .
15.167      1.7698      6.49  .Q     V  .         .         .         .
15.250      1.8168      6.83  .Q     V  .         .         .         .
15.333      1.8665      7.21  .Q     V  .         .         .         .
15.417      1.9195      7.69  .Q     V  .         .         .         .
15.500      1.9777      8.45  .Q      V .         .         .         .
15.583      2.0442      9.67  .Q      V .         .         .         .
15.667      2.1258     11.84  . Q     V .         .         .         .
15.750      2.2269     14.69  . Q      V.         .         .         .
15.833      2.3555     18.67  .  Q     V.         .         .         .
15.917      2.5220     24.18  .   Q     V         .         .         .
16.000      2.7486     32.90  .     Q   .V        .         .         .
16.083      3.0726     47.04  .        Q. V       .         .         .
16.167      3.5470     68.89  .         .  QV     .         .         .
16.250      4.1992     94.70  .         .      VQ .         .         .
16.333      5.0444    122.72  .         .         V   Q     .         .
16.417      5.7708    105.47  .         .         .Q V      .         .
16.500      6.3139     78.87  .         .    Q    .     V   .         .
16.583      6.7265     59.91  .         .Q        .      V  .         .
16.667      7.0548     47.67  .        Q.         .        V.         .
16.750      7.3229     38.93  .      Q  .         .         V         .
16.833      7.5478     32.65  .     Q   .         .         .V        .
16.917      7.7410     28.05  .    Q    .         .         .V        .
17.000      7.9110     24.69  .   Q     .         .         . V       .
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17.083      8.0615     21.84  .   Q     .         .         .  V      .
17.167      8.1927     19.05  .  Q      .         .         .  V      .
17.250      8.3071     16.62  .  Q      .         .         .   V     .
17.333      8.4089     14.78  . Q       .         .         .   V     .
17.417      8.4989     13.07  . Q       .         .         .    V    .
17.500      8.5796     11.71  . Q       .         .         .    V    .
17.583      8.6508     10.34  . Q       .         .         .    V    .
17.667      8.7157      9.43  .Q        .         .         .    V    .
17.750      8.7735      8.39  .Q        .         .         .     V   .
17.833      8.8259      7.61  .Q        .         .         .     V   .
17.917      8.8724      6.75  .Q        .         .         .     V   .
18.000      8.9140      6.04  .Q        .         .         .     V   .
18.083      8.9513      5.41  .Q        .         .         .     V   .
18.167      8.9845      4.83  Q         .         .         .      V  .
18.250      9.0166      4.66  Q         .         .         .      V  .
18.333      9.0483      4.61  Q         .         .         .      V  .
18.417      9.0791      4.47  Q         .         .         .      V  .
18.500      9.1086      4.28  Q         .         .         .      V  .
18.583      9.1365      4.05  Q         .         .         .      V  .
18.667      9.1623      3.74  Q         .         .         .      V  .
18.750      9.1851      3.32  Q         .         .         .      V  .
18.833      9.2008      2.28  Q         .         .         .      V  .
18.917      9.2148      2.04  Q         .         .         .       V .
19.000      9.2279      1.90  Q         .         .         .       V .
19.083      9.2403      1.80  Q         .         .         .       V .
19.167      9.2523      1.74  Q         .         .         .       V .
19.250      9.2639      1.69  Q         .         .         .       V .
19.333      9.2752      1.63  Q         .         .         .       V .
19.417      9.2861      1.59  Q         .         .         .       V .
19.500      9.2967      1.54  Q         .         .         .       V .
19.583      9.3071      1.50  Q         .         .         .       V .
19.667      9.3171      1.46  Q         .         .         .       V .
19.750      9.3269      1.42  Q         .         .         .       V .
19.833      9.3365      1.39  Q         .         .         .       V .
19.917      9.3459      1.36  Q         .         .         .       V .
20.000      9.3551      1.34  Q         .         .         .       V .
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20.083	9.3641	1.31	Q	.	.	.	V .
20.167	9.3729	1.28	Q	.	.	.	V .
20.250	9.3816	1.26	Q	.	.	.	V .
20.333	9.3901	1.24	Q	.	.	.	V .
20.417	9.3985	1.21	Q	.	.	.	V .
20.500	9.4067	1.19	Q	.	.	.	V .
20.583	9.4148	1.17	Q	.	.	.	V .
20.667	9.4227	1.15	Q	.	.	.	V .
20.750	9.4305	1.14	Q	.	.	.	V .
20.833	9.4382	1.12	Q	.	.	.	V .
20.917	9.4458	1.10	Q	.	.	.	V .
21.000	9.4533	1.08	Q	.	.	.	V .
21.083	9.4606	1.07	Q	.	.	.	V.
21.167	9.4678	1.05	Q	.	.	.	V.
21.250	9.4750	1.03	Q	.	.	.	V.
21.333	9.4820	1.02	Q	.	.	.	V.
21.417	9.4889	1.01	Q	.	.	.	V.
21.500	9.4957	0.99	Q	.	.	.	V.
21.583	9.5025	0.98	Q	.	.	.	V.
21.667	9.5091	0.96	Q	.	.	.	V.
21.750	9.5157	0.95	Q	.	.	.	V.
21.833	9.5221	0.94	Q	.	.	.	V.
21.917	9.5285	0.93	Q	.	.	.	V.
22.000	9.5348	0.92	Q	.	.	.	V.
22.083	9.5411	0.91	Q	.	.	.	V.
22.167	9.5472	0.89	Q	.	.	.	V.
22.250	9.5533	0.88	Q	.	.	.	V.
22.333	9.5593	0.87	Q	.	.	.	V.
22.417	9.5653	0.86	Q	.	.	.	V.
22.500	9.5712	0.85	Q	.	.	.	V.
22.583	9.5770	0.84	Q	.	.	.	V.
22.667	9.5827	0.83	Q	.	.	.	V.
22.750	9.5884	0.83	Q	.	.	.	V.
22.833	9.5940	0.82	Q	.	.	.	V.
22.917	9.5996	0.81	Q	.	.	.	V.
23.000	9.6051	0.80	Q	.	.	.	V.

23.083	9.6106	0.79	Q	.	.	.	V.
23.167	9.6160	0.78	Q	.	.	.	V.
23.250	9.6213	0.78	Q	.	.	.	V.
23.333	9.6266	0.77	Q	.	.	.	V.
23.417	9.6318	0.76	Q	.	.	.	V.
23.500	9.6370	0.75	Q	.	.	.	V.
23.583	9.6421	0.75	Q	.	.	.	V.
23.667	9.6472	0.74	Q	.	.	.	V.
23.750	9.6523	0.73	Q	.	.	.	V.
23.833	9.6573	0.73	Q	.	.	.	V.
23.917	9.6622	0.72	Q	.	.	.	V.
24.000	9.6671	0.71	Q	.	.	.	V.
24.083	9.6719	0.70	Q	.	.	.	V.
24.167	9.6765	0.66	Q	.	.	.	V.
24.250	9.6806	0.59	Q	.	.	.	V.
24.333	9.6837	0.45	Q	.	.	.	V.
24.417	9.6861	0.34	Q	.	.	.	V.
24.500	9.6879	0.27	Q	.	.	.	V.
24.583	9.6895	0.23	Q	.	.	.	V.
24.667	9.6908	0.19	Q	.	.	.	V.
24.750	9.6919	0.16	Q	.	.	.	V.
24.833	9.6929	0.14	Q	.	.	.	V.
24.917	9.6937	0.12	Q	.	.	.	V.
25.000	9.6944	0.10	Q	.	.	.	V.
25.083	9.6950	0.09	Q	.	.	.	V.
25.167	9.6955	0.08	Q	.	.	.	V.
25.250	9.6960	0.07	Q	.	.	.	V.
25.333	9.6964	0.06	Q	.	.	.	V.
25.417	9.6967	0.05	Q	.	.	.	V.
25.500	9.6970	0.04	Q	.	.	.	V.
25.583	9.6973	0.04	Q	.	.	.	V.
25.667	9.6975	0.03	Q	.	.	.	V.
25.750	9.6977	0.03	Q	.	.	.	V.
25.833	9.6979	0.02	Q	.	.	.	V.
25.917	9.6980	0.02	Q	.	.	.	V.
26.000	9.6981	0.02	Q	.	.	.	V.

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   26.083      9.6982      0.01  Q         .         .         .        V.
   26.167      9.6983      0.01  Q         .         .         .        V.
   26.250      9.6984      0.01  Q         .         .         .        V.
   26.333      9.6985      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
              0%                             1580.0
             10%                              105.0
             20%                               65.0
             30%                               45.0
             40%                               30.0
             50%                               25.0
             60%                               20.0
             70%                               15.0
             80%                               10.0
             90%                                5.0


 ****************************************************************************
   FLOW PROCESS FROM NODE   9200.00 TO NODE   9005.00 IS CODE =   1
 ----------------------------------------------------------------------------
   >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
 ============================================================================

       (UNIT-HYDROGRAPH ADDED TO STREAM #3)

          WATERSHED AREA =      92.820 ACRES
          BASEFLOW =   0.000 CFS/SQUARE-MILE
          *USER ENTERED "LAG" TIME =    0.438 HOURS
           CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
```

THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.504

LOW LOSS FRACTION = 0.686

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.17

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.996

30-MINUTE FACTOR = 0.996

1-HOUR FACTOR = 0.996

3-HOUR FACTOR = 0.999

6-HOUR FACTOR = 1.000

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 19.026

==

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.927	10.402
2	4.153	36.221

3	10.082	66.551
4	22.980	144.787
5	40.057	191.699
6	52.329	137.760
7	60.662	93.536
8	66.545	66.036
9	71.233	52.625
10	75.001	42.298
11	78.180	35.690
12	80.774	29.122
13	82.985	24.814
14	84.955	22.117
15	86.739	20.020
16	88.282	17.323
17	89.536	14.074
18	90.645	12.454
19	91.683	11.653
20	92.605	10.348
21	93.461	9.614
22	94.208	8.379
23	94.855	7.262
24	95.492	7.158
25	96.020	5.916
26	96.514	5.552
27	96.969	5.110
28	97.318	3.913
29	97.660	3.835
30	97.913	2.842
31	98.103	2.134
32	98.297	2.183
33	98.520	2.503
34	98.748	2.560
35	98.977	2.565
36	99.205	2.561
37	99.433	2.561
38	99.661	2.561

39	99.889	2.561
40	100.000	1.243

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0017	0.0008
2	0.0025	0.0017	0.0008
3	0.0025	0.0017	0.0008
4	0.0025	0.0017	0.0008
5	0.0026	0.0018	0.0008
6	0.0026	0.0018	0.0008
7	0.0026	0.0018	0.0008
8	0.0026	0.0018	0.0008
9	0.0026	0.0018	0.0008
10	0.0026	0.0018	0.0008
11	0.0026	0.0018	0.0008
12	0.0026	0.0018	0.0008
13	0.0026	0.0018	0.0008
14	0.0027	0.0018	0.0008
15	0.0027	0.0018	0.0008
16	0.0027	0.0018	0.0008
17	0.0027	0.0018	0.0008
18	0.0027	0.0019	0.0008
19	0.0027	0.0019	0.0009
20	0.0027	0.0019	0.0009
21	0.0027	0.0019	0.0009
22	0.0028	0.0019	0.0009
23	0.0028	0.0019	0.0009
24	0.0028	0.0019	0.0009
25	0.0028	0.0019	0.0009
26	0.0028	0.0019	0.0009
27	0.0028	0.0019	0.0009
28	0.0028	0.0019	0.0009
29	0.0029	0.0020	0.0009
30	0.0029	0.0020	0.0009

31	0.0029	0.0020	0.0009
32	0.0029	0.0020	0.0009
33	0.0029	0.0020	0.0009
34	0.0029	0.0020	0.0009
35	0.0029	0.0020	0.0009
36	0.0029	0.0020	0.0009
37	0.0030	0.0020	0.0009
38	0.0030	0.0020	0.0009
39	0.0030	0.0021	0.0009
40	0.0030	0.0021	0.0009
41	0.0030	0.0021	0.0010
42	0.0030	0.0021	0.0010
43	0.0031	0.0021	0.0010
44	0.0031	0.0021	0.0010
45	0.0031	0.0021	0.0010
46	0.0031	0.0021	0.0010
47	0.0031	0.0021	0.0010
48	0.0031	0.0022	0.0010
49	0.0032	0.0022	0.0010
50	0.0032	0.0022	0.0010
51	0.0032	0.0022	0.0010
52	0.0032	0.0022	0.0010
53	0.0032	0.0022	0.0010
54	0.0032	0.0022	0.0010
55	0.0033	0.0022	0.0010
56	0.0033	0.0023	0.0010
57	0.0033	0.0023	0.0010
58	0.0033	0.0023	0.0010
59	0.0033	0.0023	0.0011
60	0.0034	0.0023	0.0011
61	0.0034	0.0023	0.0011
62	0.0034	0.0023	0.0011
63	0.0034	0.0024	0.0011
64	0.0034	0.0024	0.0011
65	0.0035	0.0024	0.0011
66	0.0035	0.0024	0.0011

67	0.0035	0.0024	0.0011
68	0.0035	0.0024	0.0011
69	0.0036	0.0024	0.0011
70	0.0036	0.0025	0.0011
71	0.0036	0.0025	0.0011
72	0.0036	0.0025	0.0011
73	0.0037	0.0025	0.0011
74	0.0037	0.0025	0.0012
75	0.0037	0.0025	0.0012
76	0.0037	0.0025	0.0012
77	0.0037	0.0026	0.0012
78	0.0038	0.0026	0.0012
79	0.0038	0.0026	0.0012
80	0.0038	0.0026	0.0012
81	0.0039	0.0026	0.0012
82	0.0039	0.0027	0.0012
83	0.0039	0.0027	0.0012
84	0.0039	0.0027	0.0012
85	0.0040	0.0027	0.0012
86	0.0040	0.0027	0.0013
87	0.0040	0.0028	0.0013
88	0.0040	0.0028	0.0013
89	0.0041	0.0028	0.0013
90	0.0041	0.0028	0.0013
91	0.0042	0.0028	0.0013
92	0.0042	0.0029	0.0013
93	0.0042	0.0029	0.0013
94	0.0042	0.0029	0.0013
95	0.0043	0.0029	0.0013
96	0.0043	0.0030	0.0014
97	0.0044	0.0030	0.0014
98	0.0044	0.0030	0.0014
99	0.0044	0.0030	0.0014
100	0.0045	0.0031	0.0014
101	0.0045	0.0031	0.0014
102	0.0045	0.0031	0.0014

103	0.0046	0.0031	0.0014
104	0.0046	0.0032	0.0014
105	0.0047	0.0032	0.0015
106	0.0047	0.0032	0.0015
107	0.0048	0.0033	0.0015
108	0.0048	0.0033	0.0015
109	0.0048	0.0033	0.0015
110	0.0049	0.0033	0.0015
111	0.0049	0.0034	0.0015
112	0.0050	0.0034	0.0016
113	0.0050	0.0035	0.0016
114	0.0051	0.0035	0.0016
115	0.0051	0.0035	0.0016
116	0.0052	0.0035	0.0016
117	0.0052	0.0036	0.0016
118	0.0053	0.0036	0.0017
119	0.0054	0.0037	0.0017
120	0.0054	0.0037	0.0017
121	0.0055	0.0038	0.0017
122	0.0055	0.0038	0.0017
123	0.0056	0.0038	0.0018
124	0.0056	0.0039	0.0018
125	0.0057	0.0039	0.0018
126	0.0058	0.0040	0.0018
127	0.0059	0.0040	0.0018
128	0.0059	0.0041	0.0019
129	0.0060	0.0041	0.0019
130	0.0061	0.0042	0.0019
131	0.0062	0.0042	0.0019
132	0.0062	0.0043	0.0020
133	0.0063	0.0043	0.0020
134	0.0064	0.0044	0.0020
135	0.0065	0.0045	0.0020
136	0.0066	0.0045	0.0021
137	0.0067	0.0046	0.0021
138	0.0067	0.0046	0.0021

139	0.0069	0.0047	0.0022
140	0.0069	0.0048	0.0022
141	0.0071	0.0049	0.0022
142	0.0072	0.0049	0.0022
143	0.0073	0.0050	0.0023
144	0.0074	0.0051	0.0023
145	0.0069	0.0047	0.0022
146	0.0070	0.0048	0.0022
147	0.0071	0.0049	0.0022
148	0.0072	0.0050	0.0023
149	0.0074	0.0051	0.0023
150	0.0075	0.0051	0.0024
151	0.0077	0.0053	0.0024
152	0.0078	0.0053	0.0024
153	0.0080	0.0055	0.0025
154	0.0081	0.0056	0.0025
155	0.0083	0.0057	0.0026
156	0.0085	0.0058	0.0027
157	0.0087	0.0060	0.0027
158	0.0089	0.0061	0.0028
159	0.0091	0.0063	0.0029
160	0.0093	0.0064	0.0029
161	0.0096	0.0066	0.0030
162	0.0098	0.0067	0.0031
163	0.0101	0.0069	0.0032
164	0.0103	0.0071	0.0032
165	0.0107	0.0073	0.0034
166	0.0109	0.0075	0.0034
167	0.0114	0.0078	0.0036
168	0.0116	0.0080	0.0036
169	0.0194	0.0133	0.0061
170	0.0198	0.0136	0.0062
171	0.0207	0.0142	0.0065
172	0.0211	0.0145	0.0066
173	0.0221	0.0151	0.0069
174	0.0226	0.0155	0.0071

175	0.0238	0.0163	0.0075
176	0.0244	0.0168	0.0077
177	0.0258	0.0177	0.0081
178	0.0266	0.0183	0.0084
179	0.0284	0.0195	0.0089
180	0.0294	0.0202	0.0092
181	0.0317	0.0217	0.0099
182	0.0330	0.0226	0.0104
183	0.0361	0.0247	0.0113
184	0.0379	0.0260	0.0119
185	0.0614	0.0420	0.0194
186	0.0646	0.0420	0.0226
187	0.0724	0.0420	0.0304
188	0.0777	0.0420	0.0357
189	0.1010	0.0420	0.0590
190	0.1118	0.0420	0.0698
191	0.1506	0.0420	0.1086
192	0.1969	0.0420	0.1549
193	0.4780	0.0420	0.4360
194	0.1269	0.0420	0.0849
195	0.0840	0.0420	0.0420
196	0.0682	0.0420	0.0262
197	0.0400	0.0274	0.0125
198	0.0344	0.0236	0.0108
199	0.0305	0.0209	0.0096
200	0.0275	0.0188	0.0086
201	0.0251	0.0172	0.0079
202	0.0232	0.0159	0.0073
203	0.0216	0.0148	0.0068
204	0.0202	0.0139	0.0064
205	0.0119	0.0081	0.0037
206	0.0111	0.0076	0.0035
207	0.0105	0.0072	0.0033
208	0.0099	0.0068	0.0031
209	0.0094	0.0065	0.0030
210	0.0090	0.0062	0.0028

211	0.0086	0.0059	0.0027
212	0.0082	0.0056	0.0026
213	0.0079	0.0054	0.0025
214	0.0076	0.0052	0.0024
215	0.0073	0.0050	0.0023
216	0.0071	0.0048	0.0022
217	0.0075	0.0051	0.0023
218	0.0072	0.0050	0.0023
219	0.0070	0.0048	0.0022
220	0.0068	0.0047	0.0021
221	0.0066	0.0045	0.0021
222	0.0064	0.0044	0.0020
223	0.0063	0.0043	0.0020
224	0.0061	0.0042	0.0019
225	0.0060	0.0041	0.0019
226	0.0058	0.0040	0.0018
227	0.0057	0.0039	0.0018
228	0.0056	0.0038	0.0017
229	0.0054	0.0037	0.0017
230	0.0053	0.0036	0.0017
231	0.0052	0.0036	0.0016
232	0.0051	0.0035	0.0016
233	0.0050	0.0034	0.0016
234	0.0049	0.0034	0.0015
235	0.0048	0.0033	0.0015
236	0.0047	0.0032	0.0015
237	0.0046	0.0032	0.0015
238	0.0046	0.0031	0.0014
239	0.0045	0.0031	0.0014
240	0.0044	0.0030	0.0014
241	0.0043	0.0030	0.0014
242	0.0043	0.0029	0.0013
243	0.0042	0.0029	0.0013
244	0.0041	0.0028	0.0013
245	0.0041	0.0028	0.0013
246	0.0040	0.0027	0.0013

247	0.0039	0.0027	0.0012
248	0.0039	0.0027	0.0012
249	0.0038	0.0026	0.0012
250	0.0038	0.0026	0.0012
251	0.0037	0.0026	0.0012
252	0.0037	0.0025	0.0012
253	0.0036	0.0025	0.0011
254	0.0036	0.0025	0.0011
255	0.0035	0.0024	0.0011
256	0.0035	0.0024	0.0011
257	0.0035	0.0024	0.0011
258	0.0034	0.0023	0.0011
259	0.0034	0.0023	0.0011
260	0.0033	0.0023	0.0010
261	0.0033	0.0023	0.0010
262	0.0033	0.0022	0.0010
263	0.0032	0.0022	0.0010
264	0.0032	0.0022	0.0010
265	0.0031	0.0022	0.0010
266	0.0031	0.0021	0.0010
267	0.0031	0.0021	0.0010
268	0.0030	0.0021	0.0010
269	0.0030	0.0021	0.0009
270	0.0030	0.0020	0.0009
271	0.0030	0.0020	0.0009
272	0.0029	0.0020	0.0009
273	0.0029	0.0020	0.0009
274	0.0029	0.0020	0.0009
275	0.0028	0.0019	0.0009
276	0.0028	0.0019	0.0009
277	0.0028	0.0019	0.0009
278	0.0028	0.0019	0.0009
279	0.0027	0.0019	0.0009
280	0.0027	0.0019	0.0009
281	0.0027	0.0018	0.0008
282	0.0027	0.0018	0.0008

283	0.0026	0.0018	0.0008
284	0.0026	0.0018	0.0008
285	0.0026	0.0018	0.0008
286	0.0026	0.0018	0.0008
287	0.0026	0.0018	0.0008
288	0.0025	0.0017	0.0008

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 1.76

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.67

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 13.6406

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 12.8789

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================================================================================

                         2 4 - H O U R   S T O R M
                     R U N O F F   H Y D R O G R A P H

================================================================================
                 HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
          (Note: Time indicated is at END of Each Unit Intervals)
--------------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       50.0     100.0     150.0     200.0
--------------------------------------------------------------------------------
   0.083      0.0001      0.01  Q          .         .         .         .
   0.167      0.0003      0.04  Q          .         .         .         .
   0.250      0.0009      0.09  Q          .         .         .         .
   0.333      0.0023      0.20  Q          .         .         .         .
   0.417      0.0048      0.36  Q          .         .         .         .
   0.500      0.0080      0.47  Q          .         .         .         .
   0.583      0.0117      0.54  Q          .         .         .         .
   0.667      0.0159      0.60  Q          .         .         .         .
   0.750      0.0203      0.64  Q          .         .         .         .
   0.833      0.0249      0.68  Q          .         .         .         .
   0.917      0.0298      0.71  Q          .         .         .         .
   1.000      0.0349      0.73  Q          .         .         .         .
   1.083      0.0401      0.76  Q          .         .         .         .
   1.167      0.0454      0.78  Q          .         .         .         .
   1.250      0.0509      0.80  Q          .         .         .         .
   1.333      0.0565      0.81  Q          .         .         .         .
   1.417      0.0623      0.83  Q          .         .         .         .
   1.500      0.0681      0.84  Q          .         .         .         .
   1.583      0.0739      0.86  Q          .         .         .         .
   1.667      0.0799      0.87  Q          .         .         .         .
   1.750      0.0860      0.88  Q          .         .         .         .
   1.833      0.0921      0.89  Q          .         .         .         .
   1.917      0.0983      0.90  Q          .         .         .         .
   2.000      0.1045      0.91  Q          .         .         .         .
```

2.083	0.1109	0.92	Q	.	.	.	.
2.167	0.1172	0.93	Q	.	.	.	.
2.250	0.1237	0.93	Q	.	.	.	.
2.333	0.1301	0.94	Q	.	.	.	.
2.417	0.1367	0.95	Q	.	.	.	.
2.500	0.1433	0.96	Q	.	.	.	.
2.583	0.1499	0.96	Q	.	.	.	.
2.667	0.1566	0.97	Q	.	.	.	.
2.750	0.1633	0.97	Q	.	.	.	.
2.833	0.1700	0.98	Q	.	.	.	.
2.917	0.1768	0.99	Q	.	.	.	.
3.000	0.1837	0.99	Q	.	.	.	.
3.083	0.1906	1.00	Q	.	.	.	.
3.167	0.1975	1.01	Q	.	.	.	.
3.250	0.2045	1.02	Q	.	.	.	.
3.333	0.2115	1.02	Q	.	.	.	.
3.417	0.2186	1.03	Q	.	.	.	.
3.500	0.2257	1.03	Q	.	.	.	.
3.583	0.2329	1.04	Q	.	.	.	.
3.667	0.2400	1.04	Q	.	.	.	.
3.750	0.2472	1.05	Q	.	.	.	.
3.833	0.2545	1.05	Q	.	.	.	.
3.917	0.2618	1.06	Q	.	.	.	.
4.000	0.2691	1.06	Q	.	.	.	.
4.083	0.2765	1.07	Q	.	.	.	.
4.167	0.2839	1.07	Q	.	.	.	.
4.250	0.2913	1.08	Q	.	.	.	.
4.333	0.2988	1.09	Q	.	.	.	.
4.417	0.3063	1.09	Q	.	.	.	.
4.500	0.3139	1.10	Q	.	.	.	.
4.583	0.3215	1.10	Q	.	.	.	.
4.667	0.3291	1.11	QV	.	.	.	.
4.750	0.3368	1.12	QV	.	.	.	.
4.833	0.3445	1.12	QV	.	.	.	.
4.917	0.3523	1.13	QV	.	.	.	.
5.000	0.3601	1.13	QV	.	.	.	.

5.083	0.3680	1.14	QV	.	.	.	.
5.167	0.3759	1.15	QV	.	.	.	.
5.250	0.3838	1.15	QV	.	.	.	.
5.333	0.3918	1.16	QV	.	.	.	.
5.417	0.3998	1.17	QV	.	.	.	.
5.500	0.4079	1.17	QV	.	.	.	.
5.583	0.4161	1.18	QV	.	.	.	.
5.667	0.4243	1.19	QV	.	.	.	.
5.750	0.4325	1.20	QV	.	.	.	.
5.833	0.4408	1.20	QV	.	.	.	.
5.917	0.4491	1.21	QV	.	.	.	.
6.000	0.4575	1.22	QV	.	.	.	.
6.083	0.4659	1.23	QV	.	.	.	.
6.167	0.4744	1.23	QV	.	.	.	.
6.250	0.4830	1.24	QV	.	.	.	.
6.333	0.4916	1.25	QV	.	.	.	.
6.417	0.5002	1.26	QV	.	.	.	.
6.500	0.5089	1.26	QV	.	.	.	.
6.583	0.5177	1.27	QV	.	.	.	.
6.667	0.5265	1.28	QV	.	.	.	.
6.750	0.5354	1.29	QV	.	.	.	.
6.833	0.5443	1.30	QV	.	.	.	.
6.917	0.5534	1.31	QV	.	.	.	.
7.000	0.5624	1.32	QV	.	.	.	.
7.083	0.5715	1.33	QV	.	.	.	.
7.167	0.5807	1.33	QV	.	.	.	.
7.250	0.5900	1.34	QV	.	.	.	.
7.333	0.5993	1.35	QV	.	.	.	.
7.417	0.6087	1.36	QV	.	.	.	.
7.500	0.6181	1.37	QV	.	.	.	.
7.583	0.6277	1.38	QV	.	.	.	.
7.667	0.6372	1.39	QV	.	.	.	.
7.750	0.6469	1.40	Q V	.	.	.	.
7.833	0.6566	1.41	Q V	.	.	.	.
7.917	0.6664	1.42	Q V	.	.	.	.
8.000	0.6763	1.43	Q V	.	.	.	.

8.083	0.6863	1.45	Q V	.	.	.	.
8.167	0.6963	1.46	Q V	.	.	.	.
8.250	0.7064	1.47	Q V	.	.	.	.
8.333	0.7166	1.48	Q V	.	.	.	.
8.417	0.7269	1.49	Q V	.	.	.	.
8.500	0.7372	1.50	Q V	.	.	.	.
8.583	0.7477	1.52	Q V	.	.	.	.
8.667	0.7582	1.53	Q V	.	.	.	.
8.750	0.7688	1.54	Q V	.	.	.	.
8.833	0.7795	1.55	Q V	.	.	.	.
8.917	0.7903	1.57	Q V	.	.	.	.
9.000	0.8012	1.58	Q V	.	.	.	.
9.083	0.8121	1.59	Q V	.	.	.	.
9.167	0.8232	1.61	Q V	.	.	.	.
9.250	0.8344	1.62	Q V	.	.	.	.
9.333	0.8457	1.64	Q V	.	.	.	.
9.417	0.8570	1.65	Q V	.	.	.	.
9.500	0.8685	1.67	Q V	.	.	.	.
9.583	0.8801	1.68	Q V	.	.	.	.
9.667	0.8918	1.70	Q V	.	.	.	.
9.750	0.9036	1.71	Q V	.	.	.	.
9.833	0.9155	1.73	Q V	.	.	.	.
9.917	0.9276	1.75	Q V	.	.	.	.
10.000	0.9397	1.76	Q V	.	.	.	.
10.083	0.9520	1.78	Q V	.	.	.	.
10.167	0.9644	1.80	Q V	.	.	.	.
10.250	0.9769	1.82	Q V	.	.	.	.
10.333	0.9896	1.84	Q V	.	.	.	.
10.417	1.0024	1.86	Q V	.	.	.	.
10.500	1.0153	1.88	Q V	.	.	.	.
10.583	1.0284	1.90	Q V	.	.	.	.
10.667	1.0416	1.92	Q V	.	.	.	.
10.750	1.0549	1.94	Q V	.	.	.	.
10.833	1.0684	1.96	Q V	.	.	.	.
10.917	1.0821	1.98	Q V	.	.	.	.
11.000	1.0959	2.01	Q V	.	.	.	.

11.083	1.1099	2.03	Q	V	.	.	.	.
11.167	1.1241	2.06	Q	V	.	.	.	.
11.250	1.1384	2.08	Q	V	.	.	.	.
11.333	1.1529	2.11	Q	V	.	.	.	.
11.417	1.1676	2.13	Q	V	.	.	.	.
11.500	1.1825	2.16	Q	V	.	.	.	.
11.583	1.1975	2.19	Q	V	.	.	.	.
11.667	1.2128	2.22	Q	V	.	.	.	.
11.750	1.2283	2.25	Q	V	.	.	.	.
11.833	1.2440	2.28	Q	V	.	.	.	.
11.917	1.2599	2.31	Q	V	.	.	.	.
12.000	1.2760	2.34	Q	V	.	.	.	.
12.083	1.2923	2.37	Q	V	.	.	.	.
12.167	1.3089	2.40	Q	V	.	.	.	.
12.250	1.3256	2.42	Q	V	.	.	.	.
12.333	1.3423	2.43	Q	V	.	.	.	.
12.417	1.3591	2.43	Q	V	.	.	.	.
12.500	1.3759	2.44	Q	V	.	.	.	.
12.583	1.3929	2.46	Q	V	.	.	.	.
12.667	1.4100	2.49	Q	V	.	.	.	.
12.750	1.4274	2.52	Q	V	.	.	.	.
12.833	1.4450	2.56	Q	V	.	.	.	.
12.917	1.4629	2.60	Q	V	.	.	.	.
13.000	1.4811	2.64	Q	V	.	.	.	.
13.083	1.4996	2.69	Q	V	.	.	.	.
13.167	1.5185	2.73	Q	V	.	.	.	.
13.250	1.5376	2.78	Q	V	.	.	.	.
13.333	1.5572	2.84	Q	V	.	.	.	.
13.417	1.5771	2.89	Q	V	.	.	.	.
13.500	1.5975	2.95	Q	V	.	.	.	.
13.583	1.6182	3.02	Q	V	.	.	.	.
13.667	1.6395	3.08	Q	V	.	.	.	.
13.750	1.6612	3.16	Q	V	.	.	.	.
13.833	1.6835	3.23	Q	V	.	.	.	.
13.917	1.7063	3.31	Q	V	.	.	.	.
14.000	1.7296	3.39	Q	V	.	.	.	.

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14.083      1.7538      3.51  Q    V    .         .         .         .
14.167      1.7792      3.69  Q    V    .         .         .         .
14.250      1.8064      3.94  Q    V    .         .         .         .
14.333      1.8366      4.39  Q    V    .         .         .         .
14.417      1.8708      4.96  Q    V    .         .         .         .
14.500      1.9081      5.42  .Q   V    .         .         .         .
14.583      1.9481      5.80  .Q    V   .         .         .         .
14.667      1.9904      6.14  .Q    V   .         .         .         .
14.750      2.0349      6.47  .Q    V   .         .         .         .
14.833      2.0816      6.79  .Q    V   .         .         .         .
14.917      2.1306      7.12  .Q    V   .         .         .         .
15.000      2.1820      7.46  .Q    V   .         .         .         .
15.083      2.2358      7.82  .Q    V   .         .         .         .
15.167      2.2923      8.20  .Q     V  .         .         .         .
15.250      2.3517      8.63  .Q     V  .         .         .         .
15.333      2.4144      9.09  .Q     V  .         .         .         .
15.417      2.4810      9.68  .Q     V  .         .         .         .
15.500      2.5534     10.51  . Q    V  .         .         .         .
15.583      2.6343     11.74  . Q     V .         .         .         .
15.667      2.7296     13.83  . Q     V .         .         .         .
15.750      2.8468     17.02  .  Q    V .         .         .         .
15.833      2.9940     21.37  .   Q    V.         .         .         .
15.917      3.1823     27.34  .    Q   V.         .         .         .
16.000      3.4328     36.38  .      Q  V         .         .         .
16.083      3.7896     51.80  .         QV        .         .         .
16.167      4.2988     73.94  .         .  VQ     .         .         .
16.250      4.9777     98.57  .         .    V   Q.         .         .
16.333      5.8868    131.99  .         .       V .     Q   .         .
16.417      6.8805    144.29  .         .         .V      Q .         .
16.500      7.6871    117.11  .         .         .  Q      .         .
16.583      8.3108     90.56  .         .       Q .    V    .         .
16.667      8.7990     70.90  .         .   Q     .      V  .         .
16.750      9.1989     58.05  .         .Q        .       V .         .
16.833      9.5340     48.67  .        Q.         .        V.         .
16.917      9.8231     41.97  .       Q .         .         V         .
17.000     10.0734     36.35  .      Q  .         .         .V        .
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17.083     10.2947     32.13  .     Q    .         .         .V        .
17.167     10.4936     28.88  .    Q     .         .         . V       .
17.250     10.6728     26.03  .    Q     .         .         .  V      .
17.333     10.8314     23.03  .   Q      .         .         .  V      .
17.417     10.9694     20.03  .   Q      .         .         .   V     .
17.500     11.0929     17.94  .  Q       .         .         .   V     .
17.583     11.2058     16.40  .  Q       .         .         .   V     .
17.667     11.3085     14.90  . Q        .         .         .    V    .
17.750     11.4027     13.68  . Q        .         .         .    V    .
17.833     11.4882     12.42  . Q        .         .         .    V    .
17.917     11.5660     11.29  . Q        .         .         .    V    .
18.000     11.6385     10.52  . Q        .         .         .     V   .
18.083     11.7039      9.50  .Q         .         .         .     V   .
18.167     11.7643      8.77  .Q         .         .         .     V   .
18.250     11.8198      8.06  .Q         .         .         .     V   .
18.333     11.8694      7.20  .Q         .         .         .     V   .
18.417     11.9157      6.73  .Q         .         .         .      V  .
18.500     11.9574      6.05  .Q         .         .         .      V  .
18.583     11.9957      5.56  .Q         .         .         .      V  .
18.667     12.0329      5.41  .Q         .         .         .      V  .
18.750     12.0699      5.37  .Q         .         .         .      V  .
18.833     12.1061      5.26  .Q         .         .         .      V  .
18.917     12.1413      5.11  .Q         .         .         .      V  .
19.000     12.1752      4.92  Q          .         .         .      V  .
19.083     12.2076      4.69  Q          .         .         .      V  .
19.167     12.2379      4.41  Q          .         .         .       V .
19.250     12.2656      4.01  Q          .         .         .       V .
19.333     12.2876      3.20  Q          .         .         .       V .
19.417     12.3048      2.50  Q          .         .         .       V .
19.500     12.3207      2.30  Q          .         .         .       V .
19.583     12.3357      2.18  Q          .         .         .       V .
19.667     12.3501      2.09  Q          .         .         .       V .
19.750     12.3641      2.03  Q          .         .         .       V .
19.833     12.3777      1.97  Q          .         .         .       V .
19.917     12.3909      1.92  Q          .         .         .       V .
20.000     12.4038      1.87  Q          .         .         .       V .
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20.083	12.4163	1.82	Q	.	.	.	V .
20.167	12.4286	1.78	Q	.	.	.	V .
20.250	12.4405	1.74	Q	.	.	.	V .
20.333	12.4522	1.70	Q	.	.	.	V .
20.417	12.4637	1.67	Q	.	.	.	V .
20.500	12.4749	1.64	Q	.	.	.	V .
20.583	12.4860	1.61	Q	.	.	.	V .
20.667	12.4969	1.58	Q	.	.	.	V .
20.750	12.5075	1.55	Q	.	.	.	V .
20.833	12.5180	1.52	Q	.	.	.	V .
20.917	12.5284	1.50	Q	.	.	.	V .
21.000	12.5385	1.48	Q	.	.	.	V .
21.083	12.5485	1.45	Q	.	.	.	V .
21.167	12.5584	1.43	Q	.	.	.	V.
21.250	12.5681	1.41	Q	.	.	.	V.
21.333	12.5776	1.39	Q	.	.	.	V.
21.417	12.5870	1.37	Q	.	.	.	V.
21.500	12.5963	1.35	Q	.	.	.	V.
21.583	12.6055	1.33	Q	.	.	.	V.
21.667	12.6145	1.31	Q	.	.	.	V.
21.750	12.6234	1.29	Q	.	.	.	V.
21.833	12.6322	1.28	Q	.	.	.	V.
21.917	12.6409	1.26	Q	.	.	.	V.
22.000	12.6494	1.24	Q	.	.	.	V.
22.083	12.6579	1.23	Q	.	.	.	V.
22.167	12.6662	1.21	Q	.	.	.	V.
22.250	12.6745	1.20	Q	.	.	.	V.
22.333	12.6826	1.18	Q	.	.	.	V.
22.417	12.6907	1.17	Q	.	.	.	V.
22.500	12.6986	1.15	Q	.	.	.	V.
22.583	12.7065	1.14	Q	.	.	.	V.
22.667	12.7142	1.13	Q	.	.	.	V.
22.750	12.7219	1.12	Q	.	.	.	V.
22.833	12.7295	1.10	Q	.	.	.	V.
22.917	12.7370	1.09	Q	.	.	.	V.
23.000	12.7445	1.08	Q	.	.	.	V.

23.083	12.7518	1.07	Q	.	.	.	V.
23.167	12.7591	1.06	Q	.	.	.	V.
23.250	12.7663	1.05	Q	.	.	.	V.
23.333	12.7735	1.04	Q	.	.	.	V.
23.417	12.7805	1.03	Q	.	.	.	V.
23.500	12.7875	1.02	Q	.	.	.	V.
23.583	12.7944	1.01	Q	.	.	.	V.
23.667	12.8013	1.00	Q	.	.	.	V.
23.750	12.8081	0.99	Q	.	.	.	V.
23.833	12.8148	0.98	Q	.	.	.	V.
23.917	12.8215	0.97	Q	.	.	.	V.
24.000	12.8281	0.96	Q	.	.	.	V.
24.083	12.8346	0.94	Q	.	.	.	V.
24.167	12.8408	0.91	Q	.	.	.	V.
24.250	12.8466	0.84	Q	.	.	.	V.
24.333	12.8516	0.72	Q	.	.	.	V.
24.417	12.8555	0.57	Q	.	.	.	V.
24.500	12.8586	0.45	Q	.	.	.	V.
24.583	12.8612	0.37	Q	.	.	.	V.
24.667	12.8634	0.32	Q	.	.	.	V.
24.750	12.8653	0.27	Q	.	.	.	V.
24.833	12.8669	0.24	Q	.	.	.	V.
24.917	12.8684	0.21	Q	.	.	.	V.
25.000	12.8696	0.18	Q	.	.	.	V.
25.083	12.8708	0.16	Q	.	.	.	V.
25.167	12.8718	0.14	Q	.	.	.	V.
25.250	12.8726	0.13	Q	.	.	.	V.
25.333	12.8734	0.11	Q	.	.	.	V.
25.417	12.8741	0.10	Q	.	.	.	V.
25.500	12.8747	0.09	Q	.	.	.	V.
25.583	12.8752	0.08	Q	.	.	.	V.
25.667	12.8757	0.07	Q	.	.	.	V.
25.750	12.8761	0.06	Q	.	.	.	V.
25.833	12.8765	0.05	Q	.	.	.	V.
25.917	12.8769	0.05	Q	.	.	.	V.
26.000	12.8771	0.04	Q	.	.	.	V.

```
  26.083     12.8774      0.04  Q         .         .         .        V.
  26.167     12.8776      0.03  Q         .         .         .        V.
  26.250     12.8778      0.03  Q         .         .         .        V.
  26.333     12.8780      0.03  Q         .         .         .        V.
  26.417     12.8781      0.02  Q         .         .         .        V.
  26.500     12.8783      0.02  Q         .         .         .        V.
  26.583     12.8784      0.02  Q         .         .         .        V.
  26.667     12.8785      0.02  Q         .         .         .        V.
  26.750     12.8786      0.01  Q         .         .         .        V.
  26.833     12.8787      0.01  Q         .         .         .        V.
  26.917     12.8787      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                Duration
       Peak Flow Rate                     (minutes)
   =======================                =========
              0%                            1615.0
             10%                             120.0
             20%                              75.0
             30%                              50.0
             40%                              40.0
             50%                              30.0
             60%                              25.0
             70%                              15.0
             80%                              15.0
             90%                              10.0


 ****************************************************************************
  FLOW PROCESS FROM NODE   9005.00 TO NODE   9005.00 IS CODE =   7
 ----------------------------------------------------------------------------
  >>>>>STREAM NUMBER 2 ADDED TO STREAM NUMBER 3<<<<<
 ============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE   9005.00 TO NODE   9005.00 IS CODE = 3.1
----------------------------------------------------------------------------
  >>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #3<<<<<
============================================================================

                     INFLOW
                   (STREAM 3)
                        |
                        |
                        V                 __effective depth
                    -----------          |   (and volume)
                   |           |    |    |
                   |           |    |....V........
                   | detention |<-->|           outflow
                   |   basin   |    |.........________
                    -----------     |    ^    |  \
                        |           |  dead   |   basin outlet
                        V           | storage |
                     OUTFLOW         ---------
                   (STREAM 3)



          ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 3
          THROUGH A FLOW-THROUGH DETENTION BASIN
          SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
            DEAD STORAGE(AF) =      0.000
            SPECIFIED DEAD STORAGE(AF) FILLED =      0.000
            SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET =      0.000
            DETENTION BASIN CONSTANT LOSS RATE(CFS) =    0.00


          BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:
```

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	5.00	4.000
3	2.00	20.00	10.000
4	3.00	254.70	16.000

==

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):

(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;

MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
14.083	0.000	6.22	0.00	0.48	2.4	1.934
14.167	0.000	6.57	0.00	0.49	2.4	1.962
14.250	0.000	7.09	0.00	0.50	2.5	1.994
14.333	0.000	8.02	0.00	0.51	2.5	2.032
14.417	0.000	9.00	0.00	0.52	2.6	2.076
14.500	0.000	9.78	0.00	0.53	2.6	2.125
14.583	0.000	10.43	0.00	0.54	2.7	2.179
14.667	0.000	11.02	0.00	0.56	2.8	2.235
14.750	0.000	11.59	0.00	0.57	2.8	2.296
14.833	0.000	12.16	0.00	0.59	2.9	2.359
14.917	0.000	12.74	0.00	0.61	3.0	2.427
15.000	0.000	13.35	0.00	0.62	3.1	2.497
15.083	0.000	13.99	0.00	0.64	3.2	2.572
15.167	0.000	14.70	0.00	0.66	3.3	2.651
15.250	0.000	15.45	0.00	0.68	3.4	2.734
15.333	0.000	16.31	0.00	0.71	3.5	2.822
15.417	0.000	17.37	0.00	0.73	3.6	2.917
15.500	0.000	18.96	0.00	0.76	3.7	3.022

15.583	0.000	21.41	0.00	0.79	3.9	3.143
15.667	0.000	25.67	0.00	0.82	4.0	3.292
15.750	0.000	31.71	0.00	0.87	4.2	3.481
15.833	0.000	40.04	0.00	0.93	4.5	3.726
15.917	0.000	51.52	0.00	1.01	4.9	4.047
16.000	0.000	69.28	0.00	1.08	5.7	4.485
16.083	0.000	98.84	0.00	1.19	7.0	5.118
16.167	0.000	142.83	0.00	1.34	8.9	6.040
16.250	0.000	193.27	0.00	1.55	11.7	7.291
16.333	0.000	254.72	0.00	1.82	15.3	8.940
16.417	0.000	249.76	0.00	2.08	27.8	10.468
16.500	0.000	195.98	0.00	2.24	57.0	11.425
16.583	0.000	150.47	0.00	2.31	84.6	11.879
16.667	0.000	118.56	0.00	2.34	96.5	12.031
16.750	0.000	96.98	0.00	2.34	99.1	12.016
16.833	0.000	81.32	0.00	2.32	96.8	11.909
16.917	0.000	70.02	0.00	2.29	91.8	11.760
17.000	0.000	61.04	0.00	2.27	85.5	11.591
17.083	0.000	53.97	0.00	2.24	78.9	11.420
17.167	0.000	47.93	0.00	2.21	72.3	11.252
17.250	0.000	42.65	0.00	2.18	65.8	11.092
17.333	0.000	37.80	0.00	2.16	59.8	10.941
17.417	0.000	33.10	0.00	2.13	54.0	10.797
17.500	0.000	29.65	0.00	2.11	48.6	10.666
17.583	0.000	26.73	0.00	2.09	43.8	10.549
17.667	0.000	24.33	0.00	2.07	39.4	10.445
17.750	0.000	22.07	0.00	2.06	35.6	10.352
17.833	0.000	20.03	0.00	2.04	32.1	10.269
17.917	0.000	18.04	0.00	2.03	29.0	10.193
18.000	0.000	16.57	0.00	2.02	26.2	10.126
18.083	0.000	14.91	0.00	2.01	23.7	10.065
18.167	0.000	13.60	0.00	2.00	21.5	10.011
18.250	0.000	12.72	0.00	1.99	20.2	9.960
18.333	0.000	11.80	0.00	1.98	19.8	9.904
18.417	0.000	11.20	0.00	1.97	19.7	9.846
18.500	0.000	10.32	0.00	1.96	19.5	9.783

18.583	0.000	9.62	0.00	1.95	19.4	9.715
18.667	0.000	9.15	0.00	1.94	19.2	9.646
18.750	0.000	8.70	0.00	1.93	19.0	9.575
18.833	0.000	7.53	0.00	1.92	18.8	9.497
18.917	0.000	7.15	0.00	1.90	18.6	9.418
19.000	0.000	6.82	0.00	1.89	18.4	9.338
19.083	0.000	6.50	0.00	1.88	18.2	9.257
19.167	0.000	6.15	0.00	1.86	18.0	9.175
19.250	0.000	5.70	0.00	1.85	17.8	9.092
19.333	0.000	4.83	0.00	1.83	17.6	9.003
19.417	0.000	4.09	0.00	1.82	17.4	8.912
19.500	0.000	3.84	0.00	1.80	17.2	8.820
19.583	0.000	3.68	0.00	1.79	16.9	8.729
19.667	0.000	3.55	0.00	1.77	16.7	8.638
19.750	0.000	3.45	0.00	1.76	16.5	8.548
19.833	0.000	3.36	0.00	1.74	16.3	8.460
19.917	0.000	3.28	0.00	1.73	16.0	8.372

```
  PROCESS SUMMARY OF STORAGE:
    INFLOW  VOLUME =     22.577 AF
    BASIN  STORAGE =      0.000 AF (WITH      0.000 AF INITIALLY FILLED)
    OUTFLOW VOLUME =     22.577 AF
    LOSS    VOLUME =      0.000 AF


****************************************************************************
  FLOW PROCESS FROM NODE   9005.00 TO NODE   9005.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>STREAM NUMBER 1 ADDED TO STREAM NUMBER 3<<<<<
============================================================================



****************************************************************************
  FLOW PROCESS FROM NODE   9005.00 TO NODE   9006.00 IS CODE = 5.1
----------------------------------------------------------------------------
  >>>>>MODEL CHANNEL ROUTING OF STREAM #3 BY THE TRANSLATION METHOD<<<<<
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         THE TRANSLATION MODEL NEGLECTS ALL STORAGE ATTENUATION EFFECTS,
         AND MOVES THE STREAM 3 RUNOFF HYDROGRAPH FORWARD IN TIME.

         ASSUMED REGULAR CHANNEL INFORMATION:
           BASEWIDTH(FT) =  100.00     CHANNEL Z =  5.00
           UPSTREAM ELEVATION(FT) =     452.75
           DOWNSTREAM ELEVATION(FT) =     416.66
           CHANNEL LENGTH(FT) =    2622.38     MANNING'S FACTOR = 0.050
           CONSTANT LOSS RATE(CFS) =    0.00

         MEAN-FLOW RATE NORMAL-DEPTH FLOW VELOCITIES(FPS) ARE AS FOLLOWS:
                                (FLOW RATE (CFS)) [FLOW VELOCITY (FPS)]
           AVERAGED PEAK  5-MINUTE: (     316.7).......[  3.22]
           AVERAGED PEAK 15-MINUTE: (     301.4).......[  3.18]
           AVERAGED PEAK 30-MINUTE: (     273.3).......[  3.04]
           AVERAGED PEAK  1-HOUR:   (     221.5).......[  2.83]
           AVERAGED PEAK  3-HOUR:   (     120.8).......[  2.24]
           AVERAGED PEAK  6-HOUR:   (      74.0).......[  1.86]
           AVERAGED PEAK 24-HOUR:   (      24.1).......[  1.16]
         USER-SPECIFIED CHANNEL AVERAGE FLOW VELOCITY(FPS) =   3.000
         HYDROGRAPH TRANSLATION TIME
         = (CHANNEL LENGTH)/(AVERAGE FLOW  VELOCITY)
         = (   2622.38)/(  3.000) =   0.243 HRS

         TRANSLATION METHOD CHANNEL ROUTING RESULTS:
                                             OUTFLOW LESS
          MODEL        INFLOW     ROUTED      LOSS
           TIME      (STREAM 3)    FLOW     (STREAM 3)
          (HRS)        (CFS)       (CFS)      (CFS)
          14.000         9.23        8.73        8.73
          14.083         9.44        8.90        8.90
          14.167         9.71        9.06        9.06
          14.250        10.03        9.25        9.25
          14.333        10.42        9.46        9.46
```

14.417	10.87	9.74	9.74
14.500	11.46	10.07	10.07
14.583	12.25	10.45	10.45
14.667	13.20	10.92	10.92
14.750	14.09	11.53	11.53
14.833	14.92	12.33	12.33
14.917	15.73	13.27	13.27
15.000	16.51	14.16	14.16
15.083	17.28	14.99	14.99
15.167	18.08	15.79	15.79
15.250	18.91	16.58	16.58
15.333	19.80	17.35	17.35
15.417	20.82	18.15	18.15
15.500	22.06	18.99	18.99
15.583	23.61	19.89	19.89
15.667	25.61	20.93	20.93
15.750	28.34	22.19	22.19
15.833	32.30	23.78	23.78
15.917	38.20	25.84	25.84
16.000	47.24	28.68	28.68
16.083	62.72	32.81	32.81
16.167	82.84	38.98	38.98
16.250	105.15	48.57	48.57
16.333	130.20	64.45	64.45
16.417	166.31	84.77	84.77
16.500	228.85	107.31	107.31
16.583	289.31	133.31	133.31
16.667	316.65	171.70	171.70
16.750	298.35	234.06	234.06
16.833	267.71	291.67	291.67
16.917	238.73	315.07	315.07
17.000	211.01	295.71	295.71
17.083	186.22	265.21	265.21
17.167	166.69	236.34	236.34
17.250	150.54	208.87	208.87
17.333	137.15	184.54	184.54

17.417	124.31	165.30	165.30
17.500	112.66	149.39	149.39
17.583	102.61	136.04	136.04
17.667	93.83	123.31	123.31
17.750	84.64	111.79	111.79
17.833	77.90	101.85	101.85
17.917	71.58	93.04	93.04
18.000	65.71	84.06	84.06
18.083	61.32	77.35	77.35
18.167	56.77	71.07	71.07
18.250	53.73	65.33	65.33
18.333	51.20	60.93	60.93
18.417	48.99	56.51	56.51
18.500	47.14	53.51	53.51
18.583	44.60	51.01	51.01
18.667	43.30	48.83	48.83
18.750	42.13	46.92	46.92
18.833	41.05	44.49	44.49
18.917	39.96	43.20	43.20
19.000	38.61	42.04	42.04
19.083	37.68	40.96	40.96
19.167	36.62	39.84	39.84
19.250	35.64	38.53	38.53
19.333	34.51	37.59	37.59
19.417	33.17	36.54	36.54
19.500	32.43	35.54	35.54
19.583	31.76	34.39	34.39
19.667	31.05	33.11	33.11
19.750	30.06	32.37	32.37
19.833	29.00	31.70	31.70
19.917	28.37	30.96	30.96
20.000	27.76	29.97	29.97

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PROCESS SUMMARY OF STORAGE:

INFLOW VOLUME =   51.583 AF

OUTFLOW VOLUME =   51.583 AF

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    LOSS    VOLUME =      0.000 AF



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  FLOW PROCESS FROM NODE   9006.00 TO NODE   9006.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #4)

         WATERSHED AREA =     119.470 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.428 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         DESERT(UNDEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.590
         LOW LOSS FRACTION = 0.778
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.48
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  1.17
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.60
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  2.24
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.56
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  3.43

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.995
          30-MINUTE FACTOR = 0.995
           1-HOUR FACTOR = 0.995
           3-HOUR FACTOR = 0.999
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000
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UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 19.470

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UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.957	13.820
2	4.310	48.460
3	10.607	90.981
4	24.411	199.439
5	41.562	247.799
6	53.598	173.914
7	61.662	116.510
8	67.429	83.320
9	72.053	66.808
10	75.744	53.327
11	78.860	45.024
12	81.410	36.843
13	83.582	31.383
14	85.534	28.197
15	87.283	25.280
16	88.775	21.553
17	89.972	17.295
18	91.081	16.023
19	92.090	14.575
20	93.003	13.195
21	93.842	12.124
22	94.533	9.980
23	95.195	9.566

24	95.795	8.677
25	96.303	7.328
26	96.801	7.198
27	97.187	5.586
28	97.538	5.064
29	97.844	4.426
30	98.044	2.884
31	98.239	2.820
32	98.460	3.189
33	98.693	3.377
34	98.927	3.377
35	99.161	3.371
36	99.394	3.371
37	99.627	3.371
38	99.860	3.371
39	100.000	2.016

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0020	0.0006
13	0.0026	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0037	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0040	0.0031	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0069	0.0054	0.0015
146	0.0070	0.0054	0.0016
147	0.0071	0.0056	0.0016
148	0.0072	0.0056	0.0016
149	0.0074	0.0058	0.0016
150	0.0075	0.0058	0.0017
151	0.0077	0.0060	0.0017
152	0.0078	0.0061	0.0017
153	0.0080	0.0062	0.0018
154	0.0081	0.0063	0.0018
155	0.0084	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0087	0.0068	0.0019
158	0.0089	0.0069	0.0020
159	0.0091	0.0071	0.0020
160	0.0093	0.0072	0.0021
161	0.0096	0.0075	0.0021
162	0.0098	0.0076	0.0022
163	0.0101	0.0079	0.0022
164	0.0103	0.0080	0.0023
165	0.0107	0.0083	0.0024
166	0.0109	0.0085	0.0024
167	0.0114	0.0089	0.0025
168	0.0116	0.0090	0.0026
169	0.0195	0.0152	0.0043
170	0.0199	0.0155	0.0044
171	0.0207	0.0161	0.0046
172	0.0212	0.0165	0.0047
173	0.0221	0.0172	0.0049
174	0.0227	0.0176	0.0050

175	0.0238	0.0185	0.0053
176	0.0245	0.0190	0.0054
177	0.0259	0.0202	0.0057
178	0.0267	0.0208	0.0059
179	0.0285	0.0221	0.0063
180	0.0295	0.0229	0.0065
181	0.0317	0.0247	0.0070
182	0.0331	0.0257	0.0073
183	0.0361	0.0281	0.0080
184	0.0380	0.0295	0.0084
185	0.0613	0.0477	0.0136
186	0.0645	0.0492	0.0153
187	0.0724	0.0492	0.0232
188	0.0776	0.0492	0.0284
189	0.1008	0.0492	0.0517
190	0.1117	0.0492	0.0625
191	0.1505	0.0492	0.1013
192	0.1966	0.0492	0.1475
193	0.4774	0.0492	0.4283
194	0.1267	0.0492	0.0776
195	0.0839	0.0492	0.0347
196	0.0681	0.0492	0.0189
197	0.0400	0.0311	0.0089
198	0.0345	0.0269	0.0077
199	0.0305	0.0238	0.0068
200	0.0275	0.0214	0.0061
201	0.0252	0.0196	0.0056
202	0.0232	0.0181	0.0052
203	0.0216	0.0168	0.0048
204	0.0203	0.0158	0.0045
205	0.0119	0.0092	0.0026
206	0.0111	0.0087	0.0025
207	0.0105	0.0082	0.0023
208	0.0099	0.0077	0.0022
209	0.0094	0.0073	0.0021
210	0.0090	0.0070	0.0020

211	0.0086	0.0067	0.0019
212	0.0082	0.0064	0.0018
213	0.0079	0.0061	0.0018
214	0.0076	0.0059	0.0017
215	0.0073	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0040	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0039	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0031	0.0024	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0030	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0006
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0021	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.02

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.41

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 20.0934

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 14.0396

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================================================================================

                      2 4 - H O U R   S T O R M
                    R U N O F F   H Y D R O G R A P H

================================================================================
             HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
--------------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       50.0     100.0     150.0     200.0
--------------------------------------------------------------------------------
   0.083      0.0001      0.01  Q         .         .         .         .
   0.167      0.0003      0.03  Q         .         .         .         .
   0.250      0.0009      0.09  Q         .         .         .         .
   0.333      0.0022      0.20  Q         .         .         .         .
   0.417      0.0046      0.34  Q         .         .         .         .
   0.500      0.0076      0.44  Q         .         .         .         .
   0.583      0.0110      0.50  Q         .         .         .         .
   0.667      0.0148      0.55  Q         .         .         .         .
   0.750      0.0189      0.59  Q         .         .         .         .
   0.833      0.0232      0.62  Q         .         .         .         .
   0.917      0.0276      0.65  Q         .         .         .         .
   1.000      0.0323      0.67  Q         .         .         .         .
   1.083      0.0371      0.69  Q         .         .         .         .
   1.167      0.0420      0.71  Q         .         .         .         .
   1.250      0.0470      0.73  Q         .         .         .         .
   1.333      0.0521      0.75  Q         .         .         .         .
   1.417      0.0574      0.76  Q         .         .         .         .
   1.500      0.0627      0.77  Q         .         .         .         .
   1.583      0.0681      0.78  Q         .         .         .         .
   1.667      0.0735      0.79  Q         .         .         .         .
   1.750      0.0790      0.80  Q         .         .         .         .
   1.833      0.0846      0.81  Q         .         .         .         .
   1.917      0.0903      0.82  Q         .         .         .         .
   2.000      0.0960      0.83  Q         .         .         .         .
```

2.083	0.1018	0.84	Q	.	.	.	.
2.167	0.1076	0.85	Q	.	.	.	.
2.250	0.1135	0.85	Q	.	.	.	.
2.333	0.1194	0.86	Q	.	.	.	.
2.417	0.1254	0.87	Q	.	.	.	.
2.500	0.1314	0.87	Q	.	.	.	.
2.583	0.1374	0.88	Q	.	.	.	.
2.667	0.1435	0.88	Q	.	.	.	.
2.750	0.1496	0.89	Q	.	.	.	.
2.833	0.1558	0.90	Q	.	.	.	.
2.917	0.1620	0.90	Q	.	.	.	.
3.000	0.1682	0.91	Q	.	.	.	.
3.083	0.1745	0.91	Q	.	.	.	.
3.167	0.1808	0.92	Q	.	.	.	.
3.250	0.1872	0.93	Q	.	.	.	.
3.333	0.1936	0.93	Q	.	.	.	.
3.417	0.2001	0.93	Q	.	.	.	.
3.500	0.2065	0.94	Q	.	.	.	.
3.583	0.2130	0.94	Q	.	.	.	.
3.667	0.2196	0.95	Q	.	.	.	.
3.750	0.2261	0.95	Q	.	.	.	.
3.833	0.2327	0.96	Q	.	.	.	.
3.917	0.2394	0.96	Q	.	.	.	.
4.000	0.2460	0.97	Q	.	.	.	.
4.083	0.2528	0.97	Q	.	.	.	.
4.167	0.2595	0.98	Q	.	.	.	.
4.250	0.2663	0.98	Q	.	.	.	.
4.333	0.2731	0.99	Q	.	.	.	.
4.417	0.2799	0.99	Q	.	.	.	.
4.500	0.2868	1.00	Q	.	.	.	.
4.583	0.2937	1.01	Q	.	.	.	.
4.667	0.3007	1.01	Q	.	.	.	.
4.750	0.3077	1.02	Q	.	.	.	.
4.833	0.3147	1.02	Q	.	.	.	.
4.917	0.3218	1.03	Q	.	.	.	.
5.000	0.3289	1.03	Q	.	.	.	.

5.083	0.3361	1.04	Q	.	.	.	.
5.167	0.3433	1.05	Q	.	.	.	.
5.250	0.3505	1.05	Q	.	.	.	.
5.333	0.3578	1.06	QV	.	.	.	.
5.417	0.3651	1.06	QV	.	.	.	.
5.500	0.3725	1.07	QV	.	.	.	.
5.583	0.3799	1.08	QV	.	.	.	.
5.667	0.3874	1.08	QV	.	.	.	.
5.750	0.3949	1.09	QV	.	.	.	.
5.833	0.4024	1.10	QV	.	.	.	.
5.917	0.4100	1.10	QV	.	.	.	.
6.000	0.4177	1.11	QV	.	.	.	.
6.083	0.4254	1.12	QV	.	.	.	.
6.167	0.4331	1.12	QV	.	.	.	.
6.250	0.4409	1.13	QV	.	.	.	.
6.333	0.4487	1.14	QV	.	.	.	.
6.417	0.4566	1.14	QV	.	.	.	.
6.500	0.4645	1.15	QV	.	.	.	.
6.583	0.4725	1.16	QV	.	.	.	.
6.667	0.4806	1.17	QV	.	.	.	.
6.750	0.4886	1.18	QV	.	.	.	.
6.833	0.4968	1.18	QV	.	.	.	.
6.917	0.5050	1.19	QV	.	.	.	.
7.000	0.5132	1.20	QV	.	.	.	.
7.083	0.5216	1.21	QV	.	.	.	.
7.167	0.5299	1.22	QV	.	.	.	.
7.250	0.5384	1.22	QV	.	.	.	.
7.333	0.5469	1.23	QV	.	.	.	.
7.417	0.5554	1.24	QV	.	.	.	.
7.500	0.5640	1.25	QV	.	.	.	.
7.583	0.5727	1.26	QV	.	.	.	.
7.667	0.5814	1.27	QV	.	.	.	.
7.750	0.5902	1.28	QV	.	.	.	.
7.833	0.5991	1.29	QV	.	.	.	.
7.917	0.6080	1.30	QV	.	.	.	.
8.000	0.6170	1.31	QV	.	.	.	.

8.083	0.6261	1.32	QV	.	.	.	.
8.167	0.6352	1.33	QV	.	.	.	.
8.250	0.6445	1.34	QV	.	.	.	.
8.333	0.6537	1.35	QV	.	.	.	.
8.417	0.6631	1.36	QV	.	.	.	.
8.500	0.6725	1.37	QV	.	.	.	.
8.583	0.6820	1.38	QV	.	.	.	.
8.667	0.6916	1.39	QV	.	.	.	.
8.750	0.7013	1.40	QV	.	.	.	.
8.833	0.7110	1.42	Q V	.	.	.	.
8.917	0.7209	1.43	Q V	.	.	.	.
9.000	0.7308	1.44	Q V	.	.	.	.
9.083	0.7408	1.45	Q V	.	.	.	.
9.167	0.7509	1.47	Q V	.	.	.	.
9.250	0.7611	1.48	Q V	.	.	.	.
9.333	0.7713	1.49	Q V	.	.	.	.
9.417	0.7817	1.51	Q V	.	.	.	.
9.500	0.7922	1.52	Q V	.	.	.	.
9.583	0.8027	1.53	Q V	.	.	.	.
9.667	0.8134	1.55	Q V	.	.	.	.
9.750	0.8242	1.56	Q V	.	.	.	.
9.833	0.8350	1.58	Q V	.	.	.	.
9.917	0.8460	1.59	Q V	.	.	.	.
10.000	0.8571	1.61	Q V	.	.	.	.
10.083	0.8683	1.62	Q V	.	.	.	.
10.167	0.8796	1.64	Q V	.	.	.	.
10.250	0.8910	1.66	Q V	.	.	.	.
10.333	0.9025	1.68	Q V	.	.	.	.
10.417	0.9142	1.69	Q V	.	.	.	.
10.500	0.9260	1.71	Q V	.	.	.	.
10.583	0.9379	1.73	Q V	.	.	.	.
10.667	0.9499	1.75	Q V	.	.	.	.
10.750	0.9621	1.77	Q V	.	.	.	.
10.833	0.9744	1.79	Q V	.	.	.	.
10.917	0.9869	1.81	Q V	.	.	.	.
11.000	0.9995	1.83	Q V	.	.	.	.

11.083	1.0122	1.85	Q V	.	.	.	.
11.167	1.0251	1.87	Q V	.	.	.	.
11.250	1.0382	1.90	Q V	.	.	.	.
11.333	1.0514	1.92	Q V	.	.	.	.
11.417	1.0648	1.94	Q V	.	.	.	.
11.500	1.0784	1.97	Q V	.	.	.	.
11.583	1.0921	2.00	Q V	.	.	.	.
11.667	1.1060	2.02	Q V	.	.	.	.
11.750	1.1201	2.05	Q V	.	.	.	.
11.833	1.1345	2.08	Q V	.	.	.	.
11.917	1.1490	2.11	Q V	.	.	.	.
12.000	1.1637	2.14	Q V	.	.	.	.
12.083	1.1786	2.16	Q V	.	.	.	.
12.167	1.1937	2.19	Q V	.	.	.	.
12.250	1.2089	2.21	Q V	.	.	.	.
12.333	1.2241	2.22	Q V	.	.	.	.
12.417	1.2394	2.22	Q V	.	.	.	.
12.500	1.2547	2.23	Q V	.	.	.	.
12.583	1.2702	2.25	Q V	.	.	.	.
12.667	1.2858	2.27	Q V	.	.	.	.
12.750	1.3017	2.30	Q V	.	.	.	.
12.833	1.3178	2.34	Q V	.	.	.	.
12.917	1.3341	2.37	Q V	.	.	.	.
13.000	1.3507	2.41	Q V	.	.	.	.
13.083	1.3676	2.45	Q V	.	.	.	.
13.167	1.3848	2.50	Q V	.	.	.	.
13.250	1.4023	2.54	Q V	.	.	.	.
13.333	1.4201	2.59	Q V	.	.	.	.
13.417	1.4383	2.64	Q V	.	.	.	.
13.500	1.4569	2.70	Q V	.	.	.	.
13.583	1.4759	2.76	Q V	.	.	.	.
13.667	1.4953	2.82	Q V	.	.	.	.
13.750	1.5151	2.88	Q V	.	.	.	.
13.833	1.5355	2.95	Q V	.	.	.	.
13.917	1.5563	3.02	Q V	.	.	.	.
14.000	1.5776	3.10	Q V	.	.	.	.

```
14.083      1.5997      3.21  Q   V     .         .         .         .
14.167      1.6230      3.37  Q   V     .         .         .         .
14.250      1.6479      3.62  Q   V     .         .         .         .
14.333      1.6758      4.05  Q   V     .         .         .         .
14.417      1.7072      4.57  Q   V     .         .         .         .
14.500      1.7416      4.99  Q   V     .         .         .         .
14.583      1.7784      5.34  .Q   V    .         .         .         .
14.667      1.8172      5.64  .Q   V    .         .         .         .
14.750      1.8581      5.94  .Q   V    .         .         .         .
14.833      1.9011      6.23  .Q   V    .         .         .         .
14.917      1.9461      6.54  .Q   V    .         .         .         .
15.000      1.9933      6.85  .Q   V    .         .         .         .
15.083      2.0427      7.18  .Q   V    .         .         .         .
15.167      2.0946      7.54  .Q   V    .         .         .         .
15.250      2.1492      7.92  .Q    V   .         .         .         .
15.333      2.2067      8.35  .Q    V   .         .         .         .
15.417      2.2679      8.89  .Q    V   .         .         .         .
15.500      2.3344      9.65  .Q    V   .         .         .         .
15.583      2.4089     10.81  . Q   V   .         .         .         .
15.667      2.4974     12.86  . Q    V  .         .         .         .
15.750      2.6081     16.08  .  Q   V  .         .         .         .
15.833      2.7525     20.96  .   Q  V  .         .         .         .
15.917      2.9468     28.22  .    Q  V .         .         .         .
16.000      3.2210     39.81  .      Q V.         .         .         .
16.083      3.6331     59.83  .         VQ        .         .         .
16.167      4.2462     89.03  .         . V    Q  .         .         .
16.250      5.0849    121.78  .         .   V     .   Q     .         .
16.333      6.2289    166.10  .         .      V  .         .  Q      .
16.417      7.4470    176.87  .         .         .V        .    Q    .
16.500      8.4090    139.68  .         .         .  V   Q  .         .
16.583      9.1348    105.39  .         .         .Q    V   .         .
16.667      9.6960     81.49  .         .     Q   .      V  .         .
16.750     10.1526     66.30  .         .  Q      .       V .         .
16.833     10.5320     55.08  .         .Q        .         V         .
16.917     10.8573     47.24  .        Q.         .         V         .
17.000     11.1373     40.66  .       Q .         .         .V        .
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17.083     11.3834     35.73  .      Q  .         .         . V       .
17.167     11.6041     32.04  .     Q   .         .         .  V      .
17.250     11.8015     28.67  .    Q    .         .         .  V      .
17.333     11.9745     25.11  .    Q    .         .         .   V     .
17.417     12.1239     21.70  .   Q     .         .         .   V     .
17.500     12.2590     19.62  .  Q      .         .         .   V     .
17.583     12.3817     17.82  .  Q      .         .         .    V    .
17.667     12.4934     16.21  .  Q      .         .         .    V    .
17.750     12.5953     14.79  . Q       .         .         .    V    .
17.833     12.6861     13.19  . Q       .         .         .     V   .
17.917     12.7701     12.20  . Q       .         .         .     V   .
18.000     12.8468     11.14  . Q       .         .         .     V   .
18.083     12.9158     10.01  . Q       .         .         .     V   .
18.167     12.9796      9.27  .Q        .         .         .     V   .
18.250     13.0358      8.15  .Q        .         .         .      V  .
18.333     13.0871      7.45  .Q        .         .         .      V  .
18.417     13.1338      6.78  .Q        .         .         .      V  .
18.500     13.1749      5.97  .Q        .         .         .      V  .
18.583     13.2145      5.75  .Q        .         .         .      V  .
18.667     13.2541      5.74  .Q        .         .         .      V  .
18.750     13.2932      5.68  .Q        .         .         .      V  .
18.833     13.3314      5.54  .Q        .         .         .      V  .
18.917     13.3683      5.36  .Q        .         .         .       V .
19.000     13.4035      5.11  .Q        .         .         .       V .
19.083     13.4365      4.79  Q         .         .         .       V .
19.167     13.4663      4.33  Q         .         .         .       V .
19.250     13.4898      3.41  Q         .         .         .       V .
19.333     13.5063      2.40  Q         .         .         .       V .
19.417     13.5211      2.15  Q         .         .         .       V .
19.500     13.5351      2.02  Q         .         .         .       V .
19.583     13.5484      1.94  Q         .         .         .       V .
19.667     13.5614      1.88  Q         .         .         .       V .
19.750     13.5740      1.83  Q         .         .         .       V .
19.833     13.5862      1.78  Q         .         .         .       V .
19.917     13.5981      1.73  Q         .         .         .       V .
20.000     13.6097      1.69  Q         .         .         .       V .
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20.083	13.6211	1.64	Q	.	.	.	V .
20.167	13.6321	1.60	Q	.	.	.	V .
20.250	13.6429	1.57	Q	.	.	.	V .
20.333	13.6535	1.54	Q	.	.	.	V .
20.417	13.6639	1.51	Q	.	.	.	V .
20.500	13.6741	1.48	Q	.	.	.	V .
20.583	13.6841	1.45	Q	.	.	.	V .
20.667	13.6940	1.43	Q	.	.	.	V.
20.750	13.7036	1.40	Q	.	.	.	V.
20.833	13.7131	1.38	Q	.	.	.	V.
20.917	13.7225	1.36	Q	.	.	.	V.
21.000	13.7317	1.34	Q	.	.	.	V.
21.083	13.7408	1.32	Q	.	.	.	V.
21.167	13.7497	1.30	Q	.	.	.	V.
21.250	13.7585	1.28	Q	.	.	.	V.
21.333	13.7672	1.26	Q	.	.	.	V.
21.417	13.7757	1.24	Q	.	.	.	V.
21.500	13.7842	1.22	Q	.	.	.	V.
21.583	13.7925	1.21	Q	.	.	.	V.
21.667	13.8006	1.19	Q	.	.	.	V.
21.750	13.8087	1.17	Q	.	.	.	V.
21.833	13.8167	1.16	Q	.	.	.	V.
21.917	13.8246	1.14	Q	.	.	.	V.
22.000	13.8323	1.13	Q	.	.	.	V.
22.083	13.8400	1.11	Q	.	.	.	V.
22.167	13.8476	1.10	Q	.	.	.	V.
22.250	13.8551	1.09	Q	.	.	.	V.
22.333	13.8624	1.07	Q	.	.	.	V.
22.417	13.8697	1.06	Q	.	.	.	V.
22.500	13.8770	1.05	Q	.	.	.	V.
22.583	13.8841	1.04	Q	.	.	.	V.
22.667	13.8912	1.02	Q	.	.	.	V.
22.750	13.8981	1.01	Q	.	.	.	V.
22.833	13.9050	1.00	Q	.	.	.	V.
22.917	13.9119	0.99	Q	.	.	.	V.
23.000	13.9186	0.98	Q	.	.	.	V.

23.083	13.9253	0.97	Q	.	.	.	V.
23.167	13.9319	0.96	Q	.	.	.	V.
23.250	13.9385	0.95	Q	.	.	.	V.
23.333	13.9449	0.94	Q	.	.	.	V.
23.417	13.9513	0.93	Q	.	.	.	V.
23.500	13.9577	0.92	Q	.	.	.	V.
23.583	13.9640	0.91	Q	.	.	.	V.
23.667	13.9702	0.90	Q	.	.	.	V.
23.750	13.9764	0.90	Q	.	.	.	V.
23.833	13.9825	0.89	Q	.	.	.	V.
23.917	13.9886	0.88	Q	.	.	.	V.
24.000	13.9946	0.87	Q	.	.	.	V.
24.083	14.0005	0.86	Q	.	.	.	V.
24.167	14.0061	0.82	Q	.	.	.	V.
24.250	14.0114	0.76	Q	.	.	.	V.
24.333	14.0158	0.65	Q	.	.	.	V.
24.417	14.0193	0.50	Q	.	.	.	V.
24.500	14.0220	0.40	Q	.	.	.	V.
24.583	14.0243	0.33	Q	.	.	.	V.
24.667	14.0262	0.28	Q	.	.	.	V.
24.750	14.0279	0.24	Q	.	.	.	V.
24.833	14.0294	0.21	Q	.	.	.	V.
24.917	14.0306	0.18	Q	.	.	.	V.
25.000	14.0317	0.16	Q	.	.	.	V.
25.083	14.0327	0.14	Q	.	.	.	V.
25.167	14.0336	0.13	Q	.	.	.	V.
25.250	14.0343	0.11	Q	.	.	.	V.
25.333	14.0350	0.10	Q	.	.	.	V.
25.417	14.0356	0.09	Q	.	.	.	V.
25.500	14.0361	0.08	Q	.	.	.	V.
25.583	14.0366	0.07	Q	.	.	.	V.
25.667	14.0370	0.06	Q	.	.	.	V.
25.750	14.0374	0.05	Q	.	.	.	V.
25.833	14.0377	0.05	Q	.	.	.	V.
25.917	14.0380	0.04	Q	.	.	.	V.
26.000	14.0382	0.04	Q	.	.	.	V.

```
  26.083     14.0385      0.03  Q         .         .         .        V.
  26.167     14.0386      0.03  Q         .         .         .        V.
  26.250     14.0388      0.02  Q         .         .         .        V.
  26.333     14.0389      0.02  Q         .         .         .        V.
  26.417     14.0391      0.02  Q         .         .         .        V.
  26.500     14.0392      0.02  Q         .         .         .        V.
  26.583     14.0393      0.01  Q         .         .         .        V.
  26.667     14.0394      0.01  Q         .         .         .        V.
  26.750     14.0394      0.01  Q         .         .         .        V.
  26.833     14.0395      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
               0%                             1610.0
              10%                              110.0
              20%                               70.0
              30%                               50.0
              40%                               35.0
              50%                               30.0
              60%                               20.0
              70%                               15.0
              80%                               10.0
              90%                               10.0


 ****************************************************************************
  FLOW PROCESS FROM NODE   9006.00 TO NODE   9006.00 IS CODE =   7
 ----------------------------------------------------------------------------
  >>>>>STREAM NUMBER 3 ADDED TO STREAM NUMBER 4<<<<<
 ============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE   9006.00 TO NODE   9006.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>VIEW STREAM NUMBER 4 HYDROGRAPH<<<<<
============================================================================

            STREAM HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      100.0     200.0     300.0     400.0
----------------------------------------------------------------------------
  14.000      6.1545     11.84  .Q V      .         .         .         .
  14.083      6.2379     12.10  .Q V      .         .         .         .
  14.167      6.3235     12.44  .Q V      .         .         .         .
  14.250      6.4121     12.86  .Q V      .         .         .         .
  14.333      6.5052     13.51  .Q V      .         .         .         .
  14.417      6.6037     14.31  .Q  V     .         .         .         .
  14.500      6.7074     15.06  .Q  V     .         .         .         .
  14.583      6.8162     15.79  .Q  V     .         .         .         .
  14.667      6.9302     16.56  .Q  V     .         .         .         .
  14.750      7.0505     17.47  .Q  V     .         .         .         .
  14.833      7.1784     18.57  .Q  V     .         .         .         .
  14.917      7.3148     19.81  .Q  V     .         .         .         .
  15.000      7.4596     21.01  . Q V     .         .         .         .
  15.083      7.6123     22.17  . Q V     .         .         .         .
  15.167      7.7729     23.33  . Q V     .         .         .         .
  15.250      7.9417     24.50  . Q V     .         .         .         .
  15.333      8.1187     25.71  . Q V     .         .         .         .
  15.417      8.3050     27.04  . Q  V    .         .         .         .
  15.500      8.5022     28.64  . Q  V    .         .         .         .
  15.583      8.7137     30.70  .  Q V    .         .         .         .
  15.667      8.9463     33.79  .  Q V    .         .         .         .
  15.750      9.2099     38.27  .  Q V    .         .         .         .
  15.833      9.5180     44.74  .   QV    .         .         .         .
  15.917      9.8904     54.06  .    QV   .         .         .         .
```

```
16.000     10.3621     68.49  .     Q   .         .         .         .
16.083     11.0001     92.64  .     V  Q.         .         .         .
16.167     11.8817    128.01  .      V  . Q       .         .         .
16.250     13.0549    170.36  .      V  .      Q  .         .         .
16.333     14.6427    230.55  .       V .         .  Q      .         .
16.417     16.4447    261.64  .         V         .     Q   .         .
16.500     18.1457    246.99  .         .V        .   Q     .         .
16.583     19.7897    238.70  .         . V       .  Q      .         .
16.667     21.5334    253.19  .         .  V      .    Q    .         .
16.750     23.6020    300.36  .         .   V     .         Q         .
16.833     25.9901    346.75  .         .    V    .         .   Q     .
16.917     28.4853    362.31  .         .      V  .         .     Q   .
17.000     30.8019    336.37  .         .       V .         .  Q      .
17.083     32.8745    300.94  .         .         V         Q         .
17.167     34.7229    268.38  .         .         .V    Q  .         .
17.250     36.3588    237.54  .         .         . VQ     .         .
17.333     37.8027    209.65  .         .         Q  V     .         .
17.417     39.0905    187.00  .         .       Q .  V     .         .
17.500     40.2545    169.01  .         .     Q   .   V    .         .
17.583     41.3142    153.87  .         .    Q    .    V   .         .
17.667     42.2751    139.52  .         .  Q      .    V   .         .
17.750     43.1469    126.58  .         . Q       .     V  .         .
17.833     43.9392    115.04  .         .Q        .     V  .         .
17.917     44.6639    105.24  .         Q         .      V .         .
18.000     45.3196     95.20  .        Q.         .      V .         .
18.083     45.9213     87.36  .       Q .         .      V .         .
18.167     46.4746     80.34  .       Q .         .       V.         .
18.250     46.9806     73.48  .      Q  .         .       V.         .
18.333     47.4515     68.38  .     Q   .         .       V.         .
18.417     47.8874     63.29  .     Q   .         .        V.        .
18.500     48.2971     59.48  .    Q    .         .        V.        .
18.583     48.6880     56.76  .    Q    .         .        V.        .
18.667     49.0638     54.57  .    Q    .         .        V.        .
18.750     49.4261     52.60  .    Q    .         .         V         .
18.833     49.7707     50.03  .    Q    .         .         V         .
18.917     50.1051     48.56  .   Q     .         .         V         .
```

```
   19.000     50.4297     47.14  .   Q     .         .         V         .
   19.083     50.7448     45.75  .   Q     .         .         V         .
   19.167     51.0491     44.18  .   Q     .         .         .V        .
   19.250     51.3379     41.94  .   Q     .         .         .V        .
   19.333     51.6133     39.99  .  Q      .         .         .V        .
   19.417     51.8797     38.69  .  Q      .         .         .V        .
   19.500     52.1385     37.57  .  Q      .         .         .V        .
   19.583     52.3887     36.34  .  Q      .         .         .V        .
   19.667     52.6297     34.99  .  Q      .         .         . V       .
   19.750     52.8653     34.20  .  Q      .         .         . V       .
   19.833     53.0958     33.48  .  Q      .         .         . V       .
   19.917     53.3210     32.69  .  Q      .         .         . V       .
   20.000     53.5390     31.66  .  Q      .         .         . V       .
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                Duration
        Peak Flow Rate                     (minutes)
    =======================                =========
              0%                            1205.0
             10%                             235.0
             20%                             135.0
             30%                             105.0
             40%                              85.0
             50%                              70.0
             60%                              60.0
             70%                              35.0
             80%                              25.0
             90%                              15.0
 ============================================================================


   END OF FLOODSCx ROUTING ANALYSIS
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              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
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                           Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED P - EXISTING                                                   *
* 2022-09-30                                                               *
 **************************************************************************

  FILE NAME: 87_P_EX.DAT
  TIME/DATE OF STUDY: 09:54 09/30/2022


****************************************************************************
  FLOW PROCESS FROM NODE   3000.00 TO NODE   3005.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =     100.500 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.710 HOURS
```

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.590

LOW LOSS FRACTION = 0.778

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.17

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.996

30-MINUTE FACTOR = 0.996

1-HOUR FACTOR = 0.996

3-HOUR FACTOR = 0.999

6-HOUR FACTOR = 1.000

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 11.737

===

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.516	6.277
2	1.960	17.542
3	4.285	28.261
4	7.522	39.350

5	12.423	59.567
6	20.841	102.313
7	32.255	138.727
8	42.076	119.359
9	49.688	92.517
10	55.844	74.825
11	60.572	57.470
12	64.390	46.401
13	67.626	39.328
14	70.523	35.210
15	73.036	30.554
16	75.219	26.525
17	77.235	24.508
18	79.012	21.601
19	80.562	18.833
20	82.014	17.653
21	83.286	15.456
22	84.519	14.985
23	85.652	13.773
24	86.748	13.324
25	87.705	11.624
26	88.621	11.137
27	89.362	9.006
28	90.064	8.531
29	90.733	8.127
30	91.388	7.969
31	91.983	7.231
32	92.547	6.848
33	93.084	6.533
34	93.601	6.278
35	94.067	5.673
36	94.467	4.854
37	94.866	4.850
38	95.265	4.850
39	95.643	4.603
40	95.954	3.774

41	96.259	3.709
42	96.564	3.707
43	96.862	3.620
44	97.090	2.771
45	97.301	2.565
46	97.512	2.569
47	97.723	2.556
48	97.875	1.849
49	97.992	1.428
50	98.109	1.424
51	98.227	1.428
52	98.353	1.537
53	98.494	1.707
54	98.635	1.715
55	98.776	1.711
56	98.917	1.711
57	99.058	1.715
58	99.198	1.711
59	99.339	1.711
60	99.480	1.711
61	99.621	1.711
62	99.762	1.711
63	99.902	1.711
64	100.000	1.187

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0020	0.0006
13	0.0026	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0037	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0040	0.0031	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0069	0.0054	0.0015
146	0.0070	0.0054	0.0016
147	0.0071	0.0056	0.0016
148	0.0072	0.0056	0.0016
149	0.0074	0.0058	0.0016
150	0.0075	0.0058	0.0017
151	0.0077	0.0060	0.0017
152	0.0078	0.0061	0.0017
153	0.0080	0.0062	0.0018
154	0.0081	0.0063	0.0018
155	0.0083	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0087	0.0068	0.0019
158	0.0089	0.0069	0.0020
159	0.0091	0.0071	0.0020
160	0.0093	0.0072	0.0021
161	0.0096	0.0075	0.0021
162	0.0098	0.0076	0.0022
163	0.0101	0.0079	0.0022
164	0.0103	0.0080	0.0023
165	0.0107	0.0083	0.0024
166	0.0109	0.0085	0.0024
167	0.0114	0.0089	0.0025
168	0.0116	0.0090	0.0026
169	0.0194	0.0151	0.0043
170	0.0198	0.0154	0.0044
171	0.0207	0.0161	0.0046
172	0.0211	0.0164	0.0047
173	0.0221	0.0172	0.0049
174	0.0226	0.0176	0.0050

175	0.0238	0.0185	0.0053
176	0.0244	0.0190	0.0054
177	0.0259	0.0201	0.0057
178	0.0266	0.0207	0.0059
179	0.0284	0.0221	0.0063
180	0.0294	0.0229	0.0065
181	0.0317	0.0247	0.0070
182	0.0330	0.0257	0.0073
183	0.0361	0.0281	0.0080
184	0.0379	0.0295	0.0084
185	0.0613	0.0477	0.0136
186	0.0646	0.0492	0.0154
187	0.0724	0.0492	0.0233
188	0.0777	0.0492	0.0285
189	0.1005	0.0492	0.0513
190	0.1113	0.0492	0.0621
191	0.1502	0.0492	0.1010
192	0.1965	0.0492	0.1474
193	0.4798	0.0492	0.4307
194	0.1264	0.0492	0.0772
195	0.0839	0.0492	0.0348
196	0.0681	0.0492	0.0190
197	0.0400	0.0311	0.0089
198	0.0345	0.0268	0.0077
199	0.0305	0.0237	0.0068
200	0.0275	0.0214	0.0061
201	0.0251	0.0195	0.0056
202	0.0232	0.0180	0.0051
203	0.0216	0.0168	0.0048
204	0.0202	0.0157	0.0045
205	0.0119	0.0092	0.0026
206	0.0111	0.0087	0.0025
207	0.0105	0.0082	0.0023
208	0.0099	0.0077	0.0022
209	0.0094	0.0073	0.0021
210	0.0090	0.0070	0.0020

211	0.0086	0.0067	0.0019
212	0.0082	0.0064	0.0018
213	0.0079	0.0061	0.0018
214	0.0076	0.0059	0.0017
215	0.0073	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0040	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0039	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0031	0.0024	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0030	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0006
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0021	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.02

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.41

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 16.8953

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 11.8191

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0001	0.01	Q	.	.	.	.
0.250	0.0003	0.03	Q	.	.	.	.
0.333	0.0007	0.05	Q	.	.	.	.
0.417	0.0013	0.08	Q	.	.	.	.
0.500	0.0022	0.14	Q	.	.	.	.
0.583	0.0038	0.22	Q	.	.	.	.
0.667	0.0057	0.29	Q	.	.	.	.
0.750	0.0081	0.34	Q	.	.	.	.
0.833	0.0107	0.38	Q	.	.	.	.
0.917	0.0136	0.42	Q	.	.	.	.
1.000	0.0167	0.45	Q	.	.	.	.
1.083	0.0199	0.47	Q	.	.	.	.
1.167	0.0233	0.49	Q	.	.	.	.
1.250	0.0268	0.51	Q	.	.	.	.
1.333	0.0304	0.53	Q	.	.	.	.
1.417	0.0342	0.54	Q	.	.	.	.
1.500	0.0380	0.56	Q	.	.	.	.
1.583	0.0419	0.57	Q	.	.	.	.
1.667	0.0459	0.58	Q	.	.	.	.
1.750	0.0500	0.59	Q	.	.	.	.
1.833	0.0542	0.60	Q	.	.	.	.
1.917	0.0584	0.62	Q	.	.	.	.
2.000	0.0627	0.63	Q	.	.	.	.

2.083	0.0671	0.63	Q	.	.	.	.
2.167	0.0715	0.64	Q	.	.	.	.
2.250	0.0760	0.65	Q	.	.	.	.
2.333	0.0806	0.66	Q	.	.	.	.
2.417	0.0852	0.67	Q	.	.	.	.
2.500	0.0898	0.67	Q	.	.	.	.
2.583	0.0945	0.68	Q	.	.	.	.
2.667	0.0992	0.69	Q	.	.	.	.
2.750	0.1040	0.70	Q	.	.	.	.
2.833	0.1089	0.70	Q	.	.	.	.
2.917	0.1138	0.71	Q	.	.	.	.
3.000	0.1187	0.71	Q	.	.	.	.
3.083	0.1236	0.72	Q	.	.	.	.
3.167	0.1286	0.73	Q	.	.	.	.
3.250	0.1337	0.73	Q	.	.	.	.
3.333	0.1388	0.74	Q	.	.	.	.
3.417	0.1439	0.74	Q	.	.	.	.
3.500	0.1491	0.75	Q	.	.	.	.
3.583	0.1543	0.76	Q	.	.	.	.
3.667	0.1595	0.76	Q	.	.	.	.
3.750	0.1648	0.77	Q	.	.	.	.
3.833	0.1701	0.77	Q	.	.	.	.
3.917	0.1755	0.78	Q	.	.	.	.
4.000	0.1808	0.78	Q	.	.	.	.
4.083	0.1863	0.79	Q	.	.	.	.
4.167	0.1917	0.79	Q	.	.	.	.
4.250	0.1972	0.80	Q	.	.	.	.
4.333	0.2027	0.80	Q	.	.	.	.
4.417	0.2083	0.81	Q	.	.	.	.
4.500	0.2139	0.81	Q	.	.	.	.
4.583	0.2195	0.82	Q	.	.	.	.
4.667	0.2251	0.82	Q	.	.	.	.
4.750	0.2308	0.83	Q	.	.	.	.
4.833	0.2366	0.83	Q	.	.	.	.
4.917	0.2423	0.84	Q	.	.	.	.
5.000	0.2482	0.84	Q	.	.	.	.

5.083	0.2540	0.85	Q	.	.	.	.
5.167	0.2599	0.86	Q	.	.	.	.
5.250	0.2658	0.86	Q	.	.	.	.
5.333	0.2718	0.87	Q	.	.	.	.
5.417	0.2778	0.87	Q	.	.	.	.
5.500	0.2838	0.88	Q	.	.	.	.
5.583	0.2899	0.88	Q	.	.	.	.
5.667	0.2960	0.89	QV	.	.	.	.
5.750	0.3022	0.89	QV	.	.	.	.
5.833	0.3083	0.90	QV	.	.	.	.
5.917	0.3145	0.90	QV	.	.	.	.
6.000	0.3208	0.91	QV	.	.	.	.
6.083	0.3271	0.91	QV	.	.	.	.
6.167	0.3334	0.92	QV	.	.	.	.
6.250	0.3398	0.92	QV	.	.	.	.
6.333	0.3462	0.93	QV	.	.	.	.
6.417	0.3526	0.94	QV	.	.	.	.
6.500	0.3591	0.94	QV	.	.	.	.
6.583	0.3656	0.95	QV	.	.	.	.
6.667	0.3722	0.95	QV	.	.	.	.
6.750	0.3788	0.96	QV	.	.	.	.
6.833	0.3855	0.97	QV	.	.	.	.
6.917	0.3922	0.97	QV	.	.	.	.
7.000	0.3989	0.98	QV	.	.	.	.
7.083	0.4057	0.98	QV	.	.	.	.
7.167	0.4125	0.99	QV	.	.	.	.
7.250	0.4194	1.00	QV	.	.	.	.
7.333	0.4263	1.00	QV	.	.	.	.
7.417	0.4333	1.01	QV	.	.	.	.
7.500	0.4403	1.02	QV	.	.	.	.
7.583	0.4474	1.03	QV	.	.	.	.
7.667	0.4545	1.03	QV	.	.	.	.
7.750	0.4616	1.04	QV	.	.	.	.
7.833	0.4688	1.05	QV	.	.	.	.
7.917	0.4761	1.06	QV	.	.	.	.
8.000	0.4834	1.06	QV	.	.	.	.

8.083	0.4908	1.07	QV	.	.	.	.
8.167	0.4983	1.08	QV	.	.	.	.
8.250	0.5057	1.09	QV	.	.	.	.
8.333	0.5133	1.10	QV	.	.	.	.
8.417	0.5209	1.10	QV	.	.	.	.
8.500	0.5285	1.11	QV	.	.	.	.
8.583	0.5363	1.12	QV	.	.	.	.
8.667	0.5440	1.13	QV	.	.	.	.
8.750	0.5519	1.14	QV	.	.	.	.
8.833	0.5598	1.15	QV	.	.	.	.
8.917	0.5678	1.16	QV	.	.	.	.
9.000	0.5758	1.17	QV	.	.	.	.
9.083	0.5839	1.18	QV	.	.	.	.
9.167	0.5921	1.19	Q V	.	.	.	.
9.250	0.6003	1.20	Q V	.	.	.	.
9.333	0.6086	1.21	Q V	.	.	.	.
9.417	0.6170	1.22	Q V	.	.	.	.
9.500	0.6255	1.23	Q V	.	.	.	.
9.583	0.6340	1.24	Q V	.	.	.	.
9.667	0.6426	1.25	Q V	.	.	.	.
9.750	0.6513	1.26	Q V	.	.	.	.
9.833	0.6601	1.27	Q V	.	.	.	.
9.917	0.6689	1.29	Q V	.	.	.	.
10.000	0.6779	1.30	Q V	.	.	.	.
10.083	0.6869	1.31	Q V	.	.	.	.
10.167	0.6960	1.32	Q V	.	.	.	.
10.250	0.7052	1.34	Q V	.	.	.	.
10.333	0.7145	1.35	Q V	.	.	.	.
10.417	0.7239	1.36	Q V	.	.	.	.
10.500	0.7333	1.38	Q V	.	.	.	.
10.583	0.7429	1.39	Q V	.	.	.	.
10.667	0.7526	1.40	Q V	.	.	.	.
10.750	0.7624	1.42	Q V	.	.	.	.
10.833	0.7722	1.43	Q V	.	.	.	.
10.917	0.7822	1.45	Q V	.	.	.	.
11.000	0.7923	1.47	Q V	.	.	.	.

11.083	0.8025	1.48	Q	V	.	.	.	.
11.167	0.8129	1.50	Q	V	.	.	.	.
11.250	0.8233	1.52	Q	V	.	.	.	.
11.333	0.8339	1.53	Q	V	.	.	.	.
11.417	0.8446	1.55	Q	V	.	.	.	.
11.500	0.8554	1.57	Q	V	.	.	.	.
11.583	0.8663	1.59	Q	V	.	.	.	.
11.667	0.8774	1.61	Q	V	.	.	.	.
11.750	0.8887	1.63	Q	V	.	.	.	.
11.833	0.9001	1.65	Q	V	.	.	.	.
11.917	0.9116	1.67	Q	V	.	.	.	.
12.000	0.9233	1.70	Q	V	.	.	.	.
12.083	0.9351	1.72	Q	V	.	.	.	.
12.167	0.9471	1.74	Q	V	.	.	.	.
12.250	0.9592	1.76	Q	V	.	.	.	.
12.333	0.9715	1.78	Q	V	.	.	.	.
12.417	0.9838	1.80	Q	V	.	.	.	.
12.500	0.9963	1.81	Q	V	.	.	.	.
12.583	1.0088	1.82	Q	V	.	.	.	.
12.667	1.0214	1.83	Q	V	.	.	.	.
12.750	1.0341	1.84	Q	V	.	.	.	.
12.833	1.0469	1.86	Q	V	.	.	.	.
12.917	1.0599	1.89	Q	V	.	.	.	.
13.000	1.0731	1.91	Q	V	.	.	.	.
13.083	1.0865	1.94	Q	V	.	.	.	.
13.167	1.1000	1.97	Q	V	.	.	.	.
13.250	1.1138	2.00	Q	V	.	.	.	.
13.333	1.1279	2.04	Q	V	.	.	.	.
13.417	1.1421	2.07	Q	V	.	.	.	.
13.500	1.1567	2.11	Q	V	.	.	.	.
13.583	1.1715	2.15	Q	V	.	.	.	.
13.667	1.1866	2.19	Q	V	.	.	.	.
13.750	1.2020	2.24	Q	V	.	.	.	.
13.833	1.2177	2.28	Q	V	.	.	.	.
13.917	1.2338	2.33	Q	V	.	.	.	.
14.000	1.2502	2.39	Q	V	.	.	.	.

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14.083      1.2671      2.45  Q   V     .         .         .         .
14.167      1.2846      2.54  Q   V     .         .         .         .
14.250      1.3029      2.65  Q   V     .         .         .         .
14.333      1.3221      2.79  Q   V     .         .         .         .
14.417      1.3425      2.96  Q   V     .         .         .         .
14.500      1.3646      3.21  Q   V     .         .         .         .
14.583      1.3888      3.52  Q   V     .         .         .         .
14.667      1.4151      3.82  Q   V     .         .         .         .
14.750      1.4433      4.09  Q   V     .         .         .         .
14.833      1.4732      4.34  Q   V     .         .         .         .
14.917      1.5047      4.57  Q    V    .         .         .         .
15.000      1.5378      4.81  Q    V    .         .         .         .
15.083      1.5725      5.04  .Q   V    .         .         .         .
15.167      1.6089      5.29  .Q   V    .         .         .         .
15.250      1.6472      5.55  .Q   V    .         .         .         .
15.333      1.6873      5.83  .Q   V    .         .         .         .
15.417      1.7298      6.17  .Q   V    .         .         .         .
15.500      1.7752      6.59  .Q    V   .         .         .         .
15.583      1.8244      7.14  .Q    V   .         .         .         .
15.667      1.8789      7.91  .Q    V   .         .         .         .
15.750      1.9415      9.09  .Q    V   .         .         .         .
15.833      2.0170     10.97  . Q   V   .         .         .         .
15.917      2.1126     13.88  . Q    V  .         .         .         .
16.000      2.2384     18.26  .  Q   V  .         .         .         .
16.083      2.4191     26.24  .    Q  V .         .         .         .
16.167      2.6752     37.18  .      Q V.         .         .         .
16.250      3.0130     49.05  .        QV         .         .         .
16.333      3.4391     61.87  .         .VQ       .         .         .
16.417      3.9768     78.07  .         .  V Q    .         .         .
16.500      4.6551     98.50  .         .    V   Q.         .         .
16.583      5.4147    110.29  .         .       V . Q       .         .
16.667      6.0963     98.97  .         .        QV         .         .
16.750      6.6650     82.57  .         .     Q   . V       .         .
16.833      7.1397     68.93  .         .  Q      .   V     .         .
16.917      7.5296     56.61  .         .Q        .    V    .         .
17.000      7.8593     47.87  .        Q.         .     V   .         .
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17.083      8.1467     41.74  .       Q .         .      V  .         .
17.167      8.4038     37.33  .      Q  .         .       V .         .
17.250      8.6332     33.30  .     Q   .         .        V.         .
17.333      8.8391     29.90  .    Q    .         .        V.         .
17.417      9.0274     27.34  .    Q    .         .         V         .
17.500      9.1975     24.69  .   Q     .         .         .V        .
17.583      9.3507     22.25  .   Q     .         .         .V        .
17.667      9.4922     20.54  .   Q     .         .         . V       .
17.750      9.6213     18.75  .  Q      .         .         . V       .
17.833      9.7428     17.64  .  Q      .         .         . V       .
17.917      9.8557     16.40  .  Q      .         .         .  V      .
18.000      9.9619     15.41  .  Q      .         .         .  V      .
18.083     10.0589     14.08  . Q       .         .         .   V     .
18.167     10.1494     13.14  . Q       .         .         .   V     .
18.250     10.2307     11.82  . Q       .         .         .   V     .
18.333     10.3074     11.13  . Q       .         .         .   V     .
18.417     10.3802     10.57  . Q       .         .         .    V    .
18.500     10.4498     10.12  . Q       .         .         .    V    .
18.583     10.5154      9.52  .Q        .         .         .    V    .
18.667     10.5777      9.04  .Q        .         .         .    V    .
18.750     10.6370      8.61  .Q        .         .         .    V    .
18.833     10.6934      8.18  .Q        .         .         .     V   .
18.917     10.7461      7.66  .Q        .         .         .     V   .
19.000     10.7950      7.11  .Q        .         .         .     V   .
19.083     10.8423      6.86  .Q        .         .         .     V   .
19.167     10.8879      6.62  .Q        .         .         .     V   .
19.250     10.9311      6.28  .Q        .         .         .     V   .
19.333     10.9709      5.78  .Q        .         .         .      V  .
19.417     11.0091      5.54  .Q        .         .         .      V  .
19.500     11.0457      5.32  .Q        .         .         .      V  .
19.583     11.0805      5.05  .Q        .         .         .      V  .
19.667     11.1118      4.55  Q         .         .         .      V  .
19.750     11.1414      4.29  Q         .         .         .      V  .
19.833     11.1696      4.11  Q         .         .         .      V  .
19.917     11.1965      3.90  Q         .         .         .      V  .
20.000     11.2205      3.49  Q         .         .         .      V  .
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20.083	11.2428	3.23	Q . . . V .
20.167	11.2644	3.15	Q . . . V .
20.250	11.2859	3.11	Q . . . V .
20.333	11.3075	3.14	Q . . . V .
20.417	11.3293	3.17	Q . . . V .
20.500	11.3510	3.15	Q . . . V .
20.583	11.3724	3.11	Q . . . V .
20.667	11.3936	3.07	Q . . . V .
20.750	11.4144	3.03	Q . . . V .
20.833	11.4349	2.97	Q . . . V .
20.917	11.4550	2.91	Q . . . V .
21.000	11.4745	2.83	Q . . . V .
21.083	11.4932	2.72	Q . . . V .
21.167	11.5110	2.58	Q . . . V .
21.250	11.5273	2.37	Q . . . V.
21.333	11.5408	1.95	Q . . . V.
21.417	11.5503	1.39	Q . . . V.
21.500	11.5590	1.26	Q . . . V.
21.583	11.5673	1.20	Q . . . V.
21.667	11.5753	1.16	Q . . . V.
21.750	11.5831	1.13	Q . . . V.
21.833	11.5907	1.11	Q . . . V.
21.917	11.5981	1.08	Q . . . V.
22.000	11.6055	1.06	Q . . . V.
22.083	11.6126	1.04	Q . . . V.
22.167	11.6197	1.02	Q . . . V.
22.250	11.6266	1.00	Q . . . V.
22.333	11.6334	0.99	Q . . . V.
22.417	11.6401	0.97	Q . . . V.
22.500	11.6467	0.96	Q . . . V.
22.583	11.6532	0.95	Q . . . V.
22.667	11.6597	0.93	Q . . . V.
22.750	11.6660	0.92	Q . . . V.
22.833	11.6723	0.91	Q . . . V.
22.917	11.6785	0.90	Q . . . V.
23.000	11.6846	0.89	Q . . . V.

23.083	11.6906	0.88	Q	.	.	.	V.
23.167	11.6966	0.87	Q	.	.	.	V.
23.250	11.7025	0.86	Q	.	.	.	V.
23.333	11.7084	0.85	Q	.	.	.	V.
23.417	11.7141	0.84	Q	.	.	.	V.
23.500	11.7199	0.83	Q	.	.	.	V.
23.583	11.7255	0.82	Q	.	.	.	V.
23.667	11.7311	0.81	Q	.	.	.	V.
23.750	11.7366	0.80	Q	.	.	.	V.
23.833	11.7421	0.79	Q	.	.	.	V.
23.917	11.7475	0.79	Q	.	.	.	V.
24.000	11.7529	0.78	Q	.	.	.	V.
24.083	11.7582	0.77	Q	.	.	.	V.
24.167	11.7633	0.75	Q	.	.	.	V.
24.250	11.7683	0.73	Q	.	.	.	V.
24.333	11.7731	0.70	Q	.	.	.	V.
24.417	11.7776	0.66	Q	.	.	.	V.
24.500	11.7817	0.59	Q	.	.	.	V.
24.583	11.7853	0.51	Q	.	.	.	V.
24.667	11.7883	0.44	Q	.	.	.	V.
24.750	11.7909	0.38	Q	.	.	.	V.
24.833	11.7933	0.34	Q	.	.	.	V.
24.917	11.7954	0.30	Q	.	.	.	V.
25.000	11.7973	0.27	Q	.	.	.	V.
25.083	11.7990	0.25	Q	.	.	.	V.
25.167	11.8005	0.23	Q	.	.	.	V.
25.250	11.8020	0.21	Q	.	.	.	V.
25.333	11.8033	0.19	Q	.	.	.	V.
25.417	11.8045	0.18	Q	.	.	.	V.
25.500	11.8056	0.16	Q	.	.	.	V.
25.583	11.8067	0.15	Q	.	.	.	V.
25.667	11.8076	0.14	Q	.	.	.	V.
25.750	11.8085	0.13	Q	.	.	.	V.
25.833	11.8093	0.12	Q	.	.	.	V.
25.917	11.8101	0.11	Q	.	.	.	V.
26.000	11.8108	0.10	Q	.	.	.	V.

26.083	11.8114	0.09	Q	.	.	.	V.
26.167	11.8121	0.09	Q	.	.	.	V.
26.250	11.8126	0.08	Q	.	.	.	V.
26.333	11.8131	0.08	Q	.	.	.	V.
26.417	11.8136	0.07	Q	.	.	.	V.
26.500	11.8141	0.07	Q	.	.	.	V.
26.583	11.8145	0.06	Q	.	.	.	V.
26.667	11.8149	0.06	Q	.	.	.	V.
26.750	11.8152	0.05	Q	.	.	.	V.
26.833	11.8156	0.05	Q	.	.	.	V.
26.917	11.8159	0.04	Q	.	.	.	V.
27.000	11.8162	0.04	Q	.	.	.	V.
27.083	11.8164	0.04	Q	.	.	.	V.
27.167	11.8167	0.04	Q	.	.	.	V.
27.250	11.8169	0.03	Q	.	.	.	V.
27.333	11.8171	0.03	Q	.	.	.	V.
27.417	11.8173	0.03	Q	.	.	.	V.
27.500	11.8175	0.03	Q	.	.	.	V.
27.583	11.8176	0.02	Q	.	.	.	V.
27.667	11.8178	0.02	Q	.	.	.	V.
27.750	11.8179	0.02	Q	.	.	.	V.
27.833	11.8181	0.02	Q	.	.	.	V.
27.917	11.8182	0.02	Q	.	.	.	V.
28.000	11.8183	0.02	Q	.	.	.	V.
28.083	11.8184	0.01	Q	.	.	.	V.
28.167	11.8185	0.01	Q	.	.	.	V.
28.250	11.8186	0.01	Q	.	.	.	V.
28.333	11.8186	0.01	Q	.	.	.	V.
28.417	11.8187	0.01	Q	.	.	.	V.
28.500	11.8188	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated   Duration

Peak Flow Rate	(minutes)
0%	1710.0
10%	150.0
20%	95.0
30%	70.0
40%	50.0
50%	40.0
60%	30.0
70%	25.0
80%	15.0
90%	5.0

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END OF FLOODSCx ROUTING ANALYSIS

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              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
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            Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                         Analysis prepared by:








 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED P - PROPOSED - UH                                              *
* 2022-10-03                                                               *
 **************************************************************************

  FILE NAME: 87_P_PR.DAT
  TIME/DATE OF STUDY: 11:37 10/03/2022



****************************************************************************
  FLOW PROCESS FROM NODE   3000.00 TO NODE   3003.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      30.800 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.450 HOURS
```

```
 CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
 THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
 MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
DESERT(UNDEVELOPED) S-GRAPH SELECTED
MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.504
LOW LOSS FRACTION = 0.686
*HYDROGRAPH MODEL #1 SPECIFIED*

SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.48
SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  1.16
SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.60
SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  2.24
SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.56
SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
  5-MINUTE FACTOR = 0.999
 30-MINUTE FACTOR = 0.999
  1-HOUR FACTOR = 0.999
  3-HOUR FACTOR = 1.000
  6-HOUR FACTOR = 1.000
 24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
UNIT INTERVAL PERCENTAGE OF LAG-TIME =  18.519
```

```
============================================================================
                      UNIT HYDROGRAPH DETERMINATION

----------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
----------------------------------------------------------------------------
        1                 0.893                   3.327
```

2	3.980	11.497
3	9.509	20.598
4	21.370	44.181
5	38.278	62.980
6	50.785	46.587
7	59.473	32.363
8	65.486	22.397
9	70.257	17.769
10	74.118	14.382
11	77.352	12.047
12	80.011	9.904
13	82.295	8.507
14	84.272	7.365
15	86.075	6.714
16	87.663	5.917
17	89.026	5.077
18	90.137	4.138
19	91.184	3.902
20	92.133	3.534
21	93.002	3.234
22	93.804	2.988
23	94.467	2.470
24	95.096	2.345
25	95.690	2.210
26	96.178	1.819
27	96.659	1.793
28	97.067	1.518
29	97.400	1.241
30	97.727	1.216
31	97.948	0.825
32	98.133	0.690
33	98.325	0.715
34	98.544	0.816
35	98.767	0.828
36	98.989	0.827
37	99.211	0.827

38	99.433	0.827
39	99.655	0.827
40	99.877	0.827
41	100.000	0.457

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0017	0.0008
2	0.0025	0.0017	0.0008
3	0.0025	0.0017	0.0008
4	0.0025	0.0017	0.0008
5	0.0026	0.0018	0.0008
6	0.0026	0.0018	0.0008
7	0.0026	0.0018	0.0008
8	0.0026	0.0018	0.0008
9	0.0026	0.0018	0.0008
10	0.0026	0.0018	0.0008
11	0.0026	0.0018	0.0008
12	0.0026	0.0018	0.0008
13	0.0026	0.0018	0.0008
14	0.0027	0.0018	0.0008
15	0.0027	0.0018	0.0008
16	0.0027	0.0018	0.0008
17	0.0027	0.0018	0.0008
18	0.0027	0.0019	0.0008
19	0.0027	0.0019	0.0009
20	0.0027	0.0019	0.0009
21	0.0027	0.0019	0.0009
22	0.0028	0.0019	0.0009
23	0.0028	0.0019	0.0009
24	0.0028	0.0019	0.0009
25	0.0028	0.0019	0.0009
26	0.0028	0.0019	0.0009
27	0.0028	0.0019	0.0009
28	0.0028	0.0019	0.0009
29	0.0029	0.0020	0.0009
30	0.0029	0.0020	0.0009

31	0.0029	0.0020	0.0009
32	0.0029	0.0020	0.0009
33	0.0029	0.0020	0.0009
34	0.0029	0.0020	0.0009
35	0.0029	0.0020	0.0009
36	0.0029	0.0020	0.0009
37	0.0030	0.0020	0.0009
38	0.0030	0.0020	0.0009
39	0.0030	0.0021	0.0009
40	0.0030	0.0021	0.0009
41	0.0030	0.0021	0.0010
42	0.0030	0.0021	0.0010
43	0.0031	0.0021	0.0010
44	0.0031	0.0021	0.0010
45	0.0031	0.0021	0.0010
46	0.0031	0.0021	0.0010
47	0.0031	0.0021	0.0010
48	0.0031	0.0022	0.0010
49	0.0032	0.0022	0.0010
50	0.0032	0.0022	0.0010
51	0.0032	0.0022	0.0010
52	0.0032	0.0022	0.0010
53	0.0032	0.0022	0.0010
54	0.0032	0.0022	0.0010
55	0.0033	0.0022	0.0010
56	0.0033	0.0023	0.0010
57	0.0033	0.0023	0.0010
58	0.0033	0.0023	0.0010
59	0.0033	0.0023	0.0011
60	0.0034	0.0023	0.0011
61	0.0034	0.0023	0.0011
62	0.0034	0.0023	0.0011
63	0.0034	0.0024	0.0011
64	0.0034	0.0024	0.0011
65	0.0035	0.0024	0.0011
66	0.0035	0.0024	0.0011

67	0.0035	0.0024	0.0011
68	0.0035	0.0024	0.0011
69	0.0036	0.0024	0.0011
70	0.0036	0.0025	0.0011
71	0.0036	0.0025	0.0011
72	0.0036	0.0025	0.0011
73	0.0036	0.0025	0.0011
74	0.0037	0.0025	0.0012
75	0.0037	0.0025	0.0012
76	0.0037	0.0025	0.0012
77	0.0037	0.0026	0.0012
78	0.0038	0.0026	0.0012
79	0.0038	0.0026	0.0012
80	0.0038	0.0026	0.0012
81	0.0039	0.0026	0.0012
82	0.0039	0.0027	0.0012
83	0.0039	0.0027	0.0012
84	0.0039	0.0027	0.0012
85	0.0040	0.0027	0.0012
86	0.0040	0.0027	0.0013
87	0.0040	0.0028	0.0013
88	0.0040	0.0028	0.0013
89	0.0041	0.0028	0.0013
90	0.0041	0.0028	0.0013
91	0.0042	0.0028	0.0013
92	0.0042	0.0029	0.0013
93	0.0042	0.0029	0.0013
94	0.0042	0.0029	0.0013
95	0.0043	0.0029	0.0013
96	0.0043	0.0030	0.0014
97	0.0044	0.0030	0.0014
98	0.0044	0.0030	0.0014
99	0.0044	0.0030	0.0014
100	0.0045	0.0031	0.0014
101	0.0045	0.0031	0.0014
102	0.0045	0.0031	0.0014

103	0.0046	0.0031	0.0014
104	0.0046	0.0032	0.0014
105	0.0047	0.0032	0.0015
106	0.0047	0.0032	0.0015
107	0.0048	0.0033	0.0015
108	0.0048	0.0033	0.0015
109	0.0048	0.0033	0.0015
110	0.0049	0.0033	0.0015
111	0.0049	0.0034	0.0015
112	0.0050	0.0034	0.0016
113	0.0050	0.0035	0.0016
114	0.0051	0.0035	0.0016
115	0.0051	0.0035	0.0016
116	0.0052	0.0035	0.0016
117	0.0052	0.0036	0.0016
118	0.0053	0.0036	0.0017
119	0.0054	0.0037	0.0017
120	0.0054	0.0037	0.0017
121	0.0055	0.0038	0.0017
122	0.0055	0.0038	0.0017
123	0.0056	0.0038	0.0018
124	0.0056	0.0039	0.0018
125	0.0057	0.0039	0.0018
126	0.0058	0.0040	0.0018
127	0.0059	0.0040	0.0018
128	0.0059	0.0041	0.0019
129	0.0060	0.0041	0.0019
130	0.0061	0.0042	0.0019
131	0.0062	0.0042	0.0019
132	0.0062	0.0043	0.0020
133	0.0063	0.0043	0.0020
134	0.0064	0.0044	0.0020
135	0.0065	0.0045	0.0020
136	0.0066	0.0045	0.0021
137	0.0067	0.0046	0.0021
138	0.0067	0.0046	0.0021

139	0.0069	0.0047	0.0022
140	0.0069	0.0048	0.0022
141	0.0071	0.0049	0.0022
142	0.0072	0.0049	0.0022
143	0.0073	0.0050	0.0023
144	0.0074	0.0051	0.0023
145	0.0069	0.0047	0.0022
146	0.0070	0.0048	0.0022
147	0.0071	0.0049	0.0022
148	0.0072	0.0050	0.0023
149	0.0074	0.0051	0.0023
150	0.0075	0.0051	0.0024
151	0.0077	0.0053	0.0024
152	0.0078	0.0053	0.0024
153	0.0080	0.0055	0.0025
154	0.0081	0.0056	0.0025
155	0.0083	0.0057	0.0026
156	0.0085	0.0058	0.0027
157	0.0087	0.0060	0.0027
158	0.0088	0.0061	0.0028
159	0.0091	0.0063	0.0029
160	0.0093	0.0064	0.0029
161	0.0096	0.0066	0.0030
162	0.0098	0.0067	0.0031
163	0.0101	0.0069	0.0032
164	0.0103	0.0071	0.0032
165	0.0107	0.0073	0.0034
166	0.0109	0.0075	0.0034
167	0.0114	0.0078	0.0036
168	0.0116	0.0080	0.0036
169	0.0193	0.0132	0.0061
170	0.0197	0.0135	0.0062
171	0.0205	0.0141	0.0064
172	0.0210	0.0144	0.0066
173	0.0219	0.0151	0.0069
174	0.0225	0.0154	0.0071

175	0.0236	0.0162	0.0074
176	0.0243	0.0167	0.0076
177	0.0257	0.0176	0.0081
178	0.0265	0.0182	0.0083
179	0.0282	0.0194	0.0089
180	0.0292	0.0201	0.0092
181	0.0315	0.0216	0.0099
182	0.0328	0.0225	0.0103
183	0.0359	0.0246	0.0113
184	0.0377	0.0259	0.0118
185	0.0632	0.0420	0.0212
186	0.0664	0.0420	0.0244
187	0.0743	0.0420	0.0323
188	0.0796	0.0420	0.0376
189	0.0995	0.0420	0.0575
190	0.1102	0.0420	0.0682
191	0.1490	0.0420	0.1070
192	0.1952	0.0420	0.1532
193	0.4793	0.0420	0.4373
194	0.1253	0.0420	0.0833
195	0.0858	0.0420	0.0438
196	0.0700	0.0420	0.0280
197	0.0398	0.0273	0.0125
198	0.0343	0.0235	0.0108
199	0.0303	0.0208	0.0095
200	0.0273	0.0187	0.0086
201	0.0250	0.0171	0.0078
202	0.0230	0.0158	0.0072
203	0.0214	0.0147	0.0067
204	0.0201	0.0138	0.0063
205	0.0119	0.0081	0.0037
206	0.0111	0.0076	0.0035
207	0.0105	0.0072	0.0033
208	0.0099	0.0068	0.0031
209	0.0094	0.0065	0.0030
210	0.0090	0.0062	0.0028

211	0.0086	0.0059	0.0027
212	0.0082	0.0056	0.0026
213	0.0079	0.0054	0.0025
214	0.0076	0.0052	0.0024
215	0.0073	0.0050	0.0023
216	0.0071	0.0048	0.0022
217	0.0075	0.0051	0.0023
218	0.0072	0.0050	0.0023
219	0.0070	0.0048	0.0022
220	0.0068	0.0047	0.0021
221	0.0066	0.0045	0.0021
222	0.0064	0.0044	0.0020
223	0.0063	0.0043	0.0020
224	0.0061	0.0042	0.0019
225	0.0060	0.0041	0.0019
226	0.0058	0.0040	0.0018
227	0.0057	0.0039	0.0018
228	0.0056	0.0038	0.0017
229	0.0054	0.0037	0.0017
230	0.0053	0.0036	0.0017
231	0.0052	0.0036	0.0016
232	0.0051	0.0035	0.0016
233	0.0050	0.0034	0.0016
234	0.0049	0.0034	0.0015
235	0.0048	0.0033	0.0015
236	0.0047	0.0032	0.0015
237	0.0046	0.0032	0.0015
238	0.0046	0.0031	0.0014
239	0.0045	0.0031	0.0014
240	0.0044	0.0030	0.0014
241	0.0043	0.0030	0.0014
242	0.0043	0.0029	0.0013
243	0.0042	0.0029	0.0013
244	0.0041	0.0028	0.0013
245	0.0041	0.0028	0.0013
246	0.0040	0.0027	0.0013

247	0.0039	0.0027	0.0012
248	0.0039	0.0027	0.0012
249	0.0038	0.0026	0.0012
250	0.0038	0.0026	0.0012
251	0.0037	0.0026	0.0012
252	0.0037	0.0025	0.0012
253	0.0036	0.0025	0.0011
254	0.0036	0.0025	0.0011
255	0.0035	0.0024	0.0011
256	0.0035	0.0024	0.0011
257	0.0035	0.0024	0.0011
258	0.0034	0.0023	0.0011
259	0.0034	0.0023	0.0011
260	0.0033	0.0023	0.0010
261	0.0033	0.0023	0.0010
262	0.0033	0.0022	0.0010
263	0.0032	0.0022	0.0010
264	0.0032	0.0022	0.0010
265	0.0031	0.0022	0.0010
266	0.0031	0.0021	0.0010
267	0.0031	0.0021	0.0010
268	0.0030	0.0021	0.0010
269	0.0030	0.0021	0.0009
270	0.0030	0.0020	0.0009
271	0.0030	0.0020	0.0009
272	0.0029	0.0020	0.0009
273	0.0029	0.0020	0.0009
274	0.0029	0.0020	0.0009
275	0.0028	0.0019	0.0009
276	0.0028	0.0019	0.0009
277	0.0028	0.0019	0.0009
278	0.0028	0.0019	0.0009
279	0.0027	0.0019	0.0009
280	0.0027	0.0019	0.0009
281	0.0027	0.0018	0.0008
282	0.0027	0.0018	0.0008

283	0.0026	0.0018	0.0008
284	0.0026	0.0018	0.0008
285	0.0026	0.0018	0.0008
286	0.0026	0.0018	0.0008
287	0.0026	0.0018	0.0008
288	0.0025	0.0017	0.0008

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 1.76

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.67

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 4.5192

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 4.2817

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

==

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

```
--------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       12.5      25.0      37.5      50.0
--------------------------------------------------------------------------
   0.083      0.0000      0.00  Q         .         .         .         .
   0.167      0.0001      0.01  Q         .         .         .         .
   0.250      0.0003      0.03  Q         .         .         .         .
   0.333      0.0007      0.06  Q         .         .         .         .
   0.417      0.0015      0.11  Q         .         .         .         .
   0.500      0.0025      0.15  Q         .         .         .         .
   0.583      0.0038      0.18  Q         .         .         .         .
   0.667      0.0051      0.19  Q         .         .         .         .
   0.750      0.0065      0.21  Q         .         .         .         .
   0.833      0.0081      0.22  Q         .         .         .         .
   0.917      0.0097      0.23  Q         .         .         .         .
   1.000      0.0113      0.24  Q         .         .         .         .
   1.083      0.0130      0.25  Q         .         .         .         .
   1.167      0.0148      0.26  Q         .         .         .         .
   1.250      0.0166      0.26  Q         .         .         .         .
   1.333      0.0185      0.27  Q         .         .         .         .
   1.417      0.0203      0.27  Q         .         .         .         .
   1.500      0.0223      0.28  Q         .         .         .         .
   1.583      0.0242      0.28  Q         .         .         .         .
   1.667      0.0262      0.29  Q         .         .         .         .
   1.750      0.0282      0.29  Q         .         .         .         .
   1.833      0.0302      0.29  Q         .         .         .         .
   1.917      0.0322      0.30  Q         .         .         .         .
   2.000      0.0343      0.30  Q         .         .         .         .
```

2.083	0.0364	0.30	Q	.	.	.	.
2.167	0.0385	0.31	Q	.	.	.	.
2.250	0.0406	0.31	Q	.	.	.	.
2.333	0.0428	0.31	Q	.	.	.	.
2.417	0.0449	0.31	Q	.	.	.	.
2.500	0.0471	0.32	Q	.	.	.	.
2.583	0.0493	0.32	Q	.	.	.	.
2.667	0.0515	0.32	Q	.	.	.	.
2.750	0.0537	0.32	Q	.	.	.	.
2.833	0.0560	0.32	Q	.	.	.	.
2.917	0.0582	0.33	Q	.	.	.	.
3.000	0.0605	0.33	Q	.	.	.	.
3.083	0.0628	0.33	Q	.	.	.	.
3.167	0.0651	0.33	Q	.	.	.	.
3.250	0.0674	0.34	Q	.	.	.	.
3.333	0.0697	0.34	Q	.	.	.	.
3.417	0.0720	0.34	Q	.	.	.	.
3.500	0.0744	0.34	Q	.	.	.	.
3.583	0.0768	0.34	Q	.	.	.	.
3.667	0.0791	0.35	Q	.	.	.	.
3.750	0.0815	0.35	Q	.	.	.	.
3.833	0.0839	0.35	Q	.	.	.	.
3.917	0.0863	0.35	Q	.	.	.	.
4.000	0.0888	0.35	Q	.	.	.	.
4.083	0.0912	0.35	Q	.	.	.	.
4.167	0.0937	0.36	Q	.	.	.	.
4.250	0.0961	0.36	Q	.	.	.	.
4.333	0.0986	0.36	Q	.	.	.	.
4.417	0.1011	0.36	Q	.	.	.	.
4.500	0.1036	0.36	Q	.	.	.	.
4.583	0.1061	0.37	Q	.	.	.	.
4.667	0.1087	0.37	QV	.	.	.	.
4.750	0.1112	0.37	QV	.	.	.	.
4.833	0.1138	0.37	QV	.	.	.	.
4.917	0.1163	0.37	QV	.	.	.	.
5.000	0.1189	0.38	QV	.	.	.	.

5.083	0.1215	0.38	QV	.	.	.	.
5.167	0.1242	0.38	QV	.	.	.	.
5.250	0.1268	0.38	QV	.	.	.	.
5.333	0.1294	0.38	QV	.	.	.	.
5.417	0.1321	0.39	QV	.	.	.	.
5.500	0.1348	0.39	QV	.	.	.	.
5.583	0.1375	0.39	QV	.	.	.	.
5.667	0.1402	0.39	QV	.	.	.	.
5.750	0.1429	0.40	QV	.	.	.	.
5.833	0.1457	0.40	QV	.	.	.	.
5.917	0.1484	0.40	QV	.	.	.	.
6.000	0.1512	0.40	QV	.	.	.	.
6.083	0.1540	0.41	QV	.	.	.	.
6.167	0.1568	0.41	QV	.	.	.	.
6.250	0.1597	0.41	QV	.	.	.	.
6.333	0.1625	0.41	QV	.	.	.	.
6.417	0.1654	0.42	QV	.	.	.	.
6.500	0.1683	0.42	QV	.	.	.	.
6.583	0.1712	0.42	QV	.	.	.	.
6.667	0.1741	0.42	QV	.	.	.	.
6.750	0.1770	0.43	QV	.	.	.	.
6.833	0.1800	0.43	QV	.	.	.	.
6.917	0.1830	0.43	QV	.	.	.	.
7.000	0.1860	0.44	QV	.	.	.	.
7.083	0.1890	0.44	QV	.	.	.	.
7.167	0.1920	0.44	QV	.	.	.	.
7.250	0.1951	0.45	QV	.	.	.	.
7.333	0.1982	0.45	QV	.	.	.	.
7.417	0.2013	0.45	QV	.	.	.	.
7.500	0.2044	0.45	QV	.	.	.	.
7.583	0.2076	0.46	QV	.	.	.	.
7.667	0.2108	0.46	QV	.	.	.	.
7.750	0.2140	0.46	QV	.	.	.	.
7.833	0.2172	0.47	Q V	.	.	.	.
7.917	0.2204	0.47	Q V	.	.	.	.
8.000	0.2237	0.48	Q V	.	.	.	.

8.083	0.2270	0.48	Q V		.	.	.	.
8.167	0.2303	0.48	Q V		.	.	.	.
8.250	0.2337	0.49	Q V		.	.	.	.
8.333	0.2371	0.49	Q V		.	.	.	.
8.417	0.2405	0.49	Q V		.	.	.	.
8.500	0.2439	0.50	Q V		.	.	.	.
8.583	0.2474	0.50	Q V		.	.	.	.
8.667	0.2508	0.51	Q V		.	.	.	.
8.750	0.2544	0.51	Q V		.	.	.	.
8.833	0.2579	0.51	Q V		.	.	.	.
8.917	0.2615	0.52	Q V		.	.	.	.
9.000	0.2651	0.52	Q V		.	.	.	.
9.083	0.2687	0.53	Q V		.	.	.	.
9.167	0.2724	0.53	Q V		.	.	.	.
9.250	0.2761	0.54	Q V		.	.	.	.
9.333	0.2798	0.54	Q V		.	.	.	.
9.417	0.2836	0.55	Q V		.	.	.	.
9.500	0.2874	0.55	Q V		.	.	.	.
9.583	0.2912	0.56	Q V		.	.	.	.
9.667	0.2951	0.56	Q V		.	.	.	.
9.750	0.2990	0.57	Q V		.	.	.	.
9.833	0.3029	0.57	Q V		.	.	.	.
9.917	0.3069	0.58	Q V		.	.	.	.
10.000	0.3110	0.58	Q V		.	.	.	.
10.083	0.3150	0.59	Q V		.	.	.	.
10.167	0.3191	0.60	Q V		.	.	.	.
10.250	0.3233	0.60	Q	V	.	.	.	.
10.333	0.3275	0.61	Q	V	.	.	.	.
10.417	0.3317	0.62	Q	V	.	.	.	.
10.500	0.3360	0.62	Q	V	.	.	.	.
10.583	0.3403	0.63	Q	V	.	.	.	.
10.667	0.3447	0.64	Q	V	.	.	.	.
10.750	0.3491	0.64	Q	V	.	.	.	.
10.833	0.3536	0.65	Q	V	.	.	.	.
10.917	0.3581	0.66	Q	V	.	.	.	.
11.000	0.3627	0.66	Q	V	.	.	.	.

11.083	0.3673	0.67	Q	V	.	.	.	.
11.167	0.3720	0.68	Q	V	.	.	.	.
11.250	0.3767	0.69	Q	V	.	.	.	.
11.333	0.3815	0.70	Q	V	.	.	.	.
11.417	0.3864	0.71	Q	V	.	.	.	.
11.500	0.3913	0.71	Q	V	.	.	.	.
11.583	0.3963	0.72	Q	V	.	.	.	.
11.667	0.4014	0.73	Q	V	.	.	.	.
11.750	0.4065	0.74	Q	V	.	.	.	.
11.833	0.4117	0.75	Q	V	.	.	.	.
11.917	0.4169	0.76	Q	V	.	.	.	.
12.000	0.4223	0.77	Q	V	.	.	.	.
12.083	0.4277	0.79	Q	V	.	.	.	.
12.167	0.4332	0.79	Q	V	.	.	.	.
12.250	0.4387	0.80	Q	V	.	.	.	.
12.333	0.4442	0.81	Q	V	.	.	.	.
12.417	0.4498	0.81	Q	V	.	.	.	.
12.500	0.4554	0.81	Q	V	.	.	.	.
12.583	0.4610	0.82	Q	V	.	.	.	.
12.667	0.4667	0.82	Q	V	.	.	.	.
12.750	0.4724	0.83	Q	V	.	.	.	.
12.833	0.4782	0.85	Q	V	.	.	.	.
12.917	0.4842	0.86	Q	V	.	.	.	.
13.000	0.4902	0.87	Q	V	.	.	.	.
13.083	0.4963	0.89	Q	V	.	.	.	.
13.167	0.5025	0.90	Q	V	.	.	.	.
13.250	0.5088	0.92	Q	V	.	.	.	.
13.333	0.5153	0.94	Q	V	.	.	.	.
13.417	0.5219	0.96	Q	V	.	.	.	.
13.500	0.5286	0.98	Q	V	.	.	.	.
13.583	0.5355	1.00	Q	V	.	.	.	.
13.667	0.5425	1.02	Q	V	.	.	.	.
13.750	0.5497	1.04	Q	V	.	.	.	.
13.833	0.5570	1.07	Q	V	.	.	.	.
13.917	0.5645	1.09	Q	V	.	.	.	.
14.000	0.5722	1.12	Q	V	.	.	.	.

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14.083      0.5802       1.16 Q    V    .         .         .         .
14.167      0.5886       1.21 Q    V    .         .         .         .
14.250      0.5975       1.30 .Q   V    .         .         .         .
14.333      0.6074       1.43 .Q   V    .         .         .         .
14.417      0.6185       1.62 .Q   V    .         .         .         .
14.500      0.6307       1.77 .Q   V    .         .         .         .
14.583      0.6438       1.90 .Q    V   .         .         .         .
14.667      0.6576       2.01 .Q    V   .         .         .         .
14.750      0.6722       2.12 .Q    V   .         .         .         .
14.833      0.6875       2.22 .Q    V   .         .         .         .
14.917      0.7035       2.33 .Q    V   .         .         .         .
15.000      0.7203       2.44 .Q    V   .         .         .         .
15.083      0.7380       2.56 . Q   V   .         .         .         .
15.167      0.7565       2.69 . Q    V  .         .         .         .
15.250      0.7759       2.82 . Q    V  .         .         .         .
15.333      0.7964       2.98 . Q    V  .         .         .         .
15.417      0.8183       3.17 . Q    V  .         .         .         .
15.500      0.8421       3.46 . Q    V  .         .         .         .
15.583      0.8690       3.90 .  Q    V .         .         .         .
15.667      0.9009       4.64 .  Q    V .         .         .         .
15.750      0.9406       5.77 .   Q   V .         .         .         .
15.833      0.9904       7.22 .    Q   V.         .         .         .
15.917      1.0533       9.14 .      Q V.         .         .         .
16.000      1.1354      11.91 .        QV         .         .         .
16.083      1.2504      16.70 .         .V Q      .         .         .
16.167      1.4132      23.64 .         .  V    Q .         .         .
16.250      1.6293      31.38 .         .    V    .    Q    .         .
16.333      1.9187      42.01 .         .      V  .         .  Q      .
16.417      2.2460      47.53 .         .         V         .       Q .
16.500      2.5169      39.33 .         .         .  V      .Q        .
16.583      2.7293      30.85 .         .         .   QV    .         .
16.667      2.8952      24.09 .         .        Q.      V  .         .
16.750      3.0308      19.68 .         .    Q    .       V .         .
16.833      3.1444      16.50 .         .  Q      .        V.         .
16.917      3.2421      14.18 .         .Q        .         V         .
17.000      3.3268      12.30 .        Q.         .         .V        .
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17.083      3.4017     10.88  .       Q .         .         .V        .
17.167      3.4686      9.71  .      Q  .         .         . V       .
17.250      3.5291      8.78  .      Q  .         .         . V       .
17.333      3.5831      7.83  .     Q   .         .         .  V      .
17.417      3.6306      6.90  .    Q    .         .         .  V      .
17.500      3.6723      6.06  .   Q     .         .         .   V     .
17.583      3.7105      5.55  .   Q     .         .         .   V     .
17.667      3.7454      5.07  .   Q     .         .         .   V     .
17.750      3.7774      4.65  .  Q      .         .         .    V    .
17.833      3.8068      4.27  .  Q      .         .         .    V    .
17.917      3.8333      3.85  .  Q      .         .         .    V    .
18.000      3.8579      3.57  . Q       .         .         .     V   .
18.083      3.8806      3.31  . Q       .         .         .     V   .
18.167      3.9012      2.99  . Q       .         .         .     V   .
18.250      3.9204      2.79  . Q       .         .         .     V   .
18.333      3.9379      2.54  . Q       .         .         .     V   .
18.417      3.9537      2.30  .Q        .         .         .     V   .
18.500      3.9686      2.15  .Q        .         .         .      V  .
18.583      3.9818      1.92  .Q        .         .         .      V  .
18.667      3.9942      1.80  .Q        .         .         .      V  .
18.750      4.0063      1.76  .Q        .         .         .      V  .
18.833      4.0183      1.74  .Q        .         .         .      V  .
18.917      4.0300      1.70  .Q        .         .         .      V  .
19.000      4.0414      1.65  .Q        .         .         .      V  .
19.083      4.0524      1.60  .Q        .         .         .      V  .
19.167      4.0629      1.52  .Q        .         .         .      V  .
19.250      4.0728      1.44  .Q        .         .         .       V .
19.333      4.0818      1.31  .Q        .         .         .       V .
19.417      4.0891      1.07  Q         .         .         .       V .
19.500      4.0948      0.82  Q         .         .         .       V .
19.583      4.1000      0.75  Q         .         .         .       V .
19.667      4.1049      0.71  Q         .         .         .       V .
19.750      4.1096      0.68  Q         .         .         .       V .
19.833      4.1142      0.66  Q         .         .         .       V .
19.917      4.1186      0.64  Q         .         .         .       V .
20.000      4.1229      0.63  Q         .         .         .       V .
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20.083	4.1271	0.61	Q	.	.	.	V	.
20.167	4.1312	0.60	Q	.	.	.	V	.
20.250	4.1353	0.58	Q	.	.	.	V	.
20.333	4.1392	0.57	Q	.	.	.	V	.
20.417	4.1430	0.56	Q	.	.	.	V	.
20.500	4.1468	0.55	Q	.	.	.	V	.
20.583	4.1504	0.54	Q	.	.	.	V	.
20.667	4.1541	0.53	Q	.	.	.	V	.
20.750	4.1576	0.52	Q	.	.	.	V	.
20.833	4.1611	0.51	Q	.	.	.	V	.
20.917	4.1646	0.50	Q	.	.	.	V	.
21.000	4.1679	0.49	Q	.	.	.	V	.
21.083	4.1713	0.48	Q	.	.	.	V	.
21.167	4.1746	0.48	Q	.	.	.	V	.
21.250	4.1778	0.47	Q	.	.	.	V.	
21.333	4.1810	0.46	Q	.	.	.	V.	
21.417	4.1841	0.46	Q	.	.	.	V.	
21.500	4.1872	0.45	Q	.	.	.	V.	
21.583	4.1903	0.44	Q	.	.	.	V.	
21.667	4.1933	0.44	Q	.	.	.	V.	
21.750	4.1962	0.43	Q	.	.	.	V.	
21.833	4.1992	0.42	Q	.	.	.	V.	
21.917	4.2020	0.42	Q	.	.	.	V.	
22.000	4.2049	0.41	Q	.	.	.	V.	
22.083	4.2077	0.41	Q	.	.	.	V.	
22.167	4.2105	0.40	Q	.	.	.	V.	
22.250	4.2132	0.40	Q	.	.	.	V.	
22.333	4.2159	0.39	Q	.	.	.	V.	
22.417	4.2186	0.39	Q	.	.	.	V.	
22.500	4.2213	0.38	Q	.	.	.	V.	
22.583	4.2239	0.38	Q	.	.	.	V.	
22.667	4.2265	0.38	Q	.	.	.	V.	
22.750	4.2290	0.37	Q	.	.	.	V.	
22.833	4.2315	0.37	Q	.	.	.	V.	
22.917	4.2340	0.36	Q	.	.	.	V.	
23.000	4.2365	0.36	Q	.	.	.	V.	

23.083	4.2390	0.36	Q	.	.	.	V.
23.167	4.2414	0.35	Q	.	.	.	V.
23.250	4.2438	0.35	Q	.	.	.	V.
23.333	4.2462	0.34	Q	.	.	.	V.
23.417	4.2485	0.34	Q	.	.	.	V.
23.500	4.2508	0.34	Q	.	.	.	V.
23.583	4.2531	0.33	Q	.	.	.	V.
23.667	4.2554	0.33	Q	.	.	.	V.
23.750	4.2577	0.33	Q	.	.	.	V.
23.833	4.2599	0.32	Q	.	.	.	V.
23.917	4.2621	0.32	Q	.	.	.	V.
24.000	4.2643	0.32	Q	.	.	.	V.
24.083	4.2665	0.31	Q	.	.	.	V.
24.167	4.2686	0.30	Q	.	.	.	V.
24.250	4.2705	0.28	Q	.	.	.	V.
24.333	4.2722	0.25	Q	.	.	.	V.
24.417	4.2735	0.19	Q	.	.	.	V.
24.500	4.2746	0.16	Q	.	.	.	V.
24.583	4.2755	0.13	Q	.	.	.	V.
24.667	4.2762	0.11	Q	.	.	.	V.
24.750	4.2769	0.09	Q	.	.	.	V.
24.833	4.2775	0.08	Q	.	.	.	V.
24.917	4.2780	0.07	Q	.	.	.	V.
25.000	4.2784	0.06	Q	.	.	.	V.
25.083	4.2788	0.06	Q	.	.	.	V.
25.167	4.2791	0.05	Q	.	.	.	V.
25.250	4.2794	0.04	Q	.	.	.	V.
25.333	4.2797	0.04	Q	.	.	.	V.
25.417	4.2799	0.03	Q	.	.	.	V.
25.500	4.2801	0.03	Q	.	.	.	V.
25.583	4.2803	0.03	Q	.	.	.	V.
25.667	4.2805	0.02	Q	.	.	.	V.
25.750	4.2807	0.02	Q	.	.	.	V.
25.833	4.2808	0.02	Q	.	.	.	V.
25.917	4.2809	0.02	Q	.	.	.	V.
26.000	4.2810	0.02	Q	.	.	.	V.

```
  26.083      4.2811      0.01  Q          .         .         .        V.
  26.167      4.2812      0.01  Q          .         .         .        V.
  26.250      4.2813      0.01  Q          .         .         .        V.
  26.333      4.2813      0.01  Q          .         .         .        V.
--------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                 Duration
       Peak Flow Rate                      (minutes)
   =======================                 =========
             0%                             1580.0
            10%                              120.0
            20%                               75.0
            30%                               50.0
            40%                               40.0
            50%                               30.0
            60%                               25.0
            70%                               15.0
            80%                               15.0
            90%                                5.0


 ****************************************************************************
  FLOW PROCESS FROM NODE   3100.00 TO NODE   3003.00 IS CODE =   1
 ----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
 ============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #2)

         WATERSHED AREA =      38.000 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.670 HOURS
         DESERT(UNDEVELOPED) S-GRAPH SELECTED
```

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.504

LOW LOSS FRACTION = 0.686

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.16

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.998

30-MINUTE FACTOR = 0.998

1-HOUR FACTOR = 0.998

3-HOUR FACTOR = 1.000

6-HOUR FACTOR = 1.000

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 12.438

===

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.547	2.515
2	2.134	7.294
3	4.711	11.844
4	8.327	16.615
5	14.322	27.549

6	24.551	47.011
7	36.303	54.007
8	45.700	43.184
9	52.974	33.429
10	58.671	26.184
11	63.045	20.100
12	66.660	16.614
13	69.813	14.488
14	72.581	12.721
15	74.941	10.844
16	77.088	9.868
17	78.988	8.733
18	80.631	7.552
19	82.149	6.977
20	83.494	6.179
21	84.777	5.896
22	85.972	5.490
23	87.087	5.126
24	88.083	4.578
25	88.982	4.130
26	89.730	3.437
27	90.457	3.344
28	91.154	3.202
29	91.814	3.032
30	92.412	2.749
31	92.991	2.661
32	93.539	2.518
33	94.042	2.313
34	94.467	1.951
35	94.889	1.943
36	95.312	1.944
37	95.702	1.789
38	96.027	1.495
39	96.350	1.484
40	96.674	1.488
41	96.965	1.338

42	97.191	1.041
43	97.415	1.028
44	97.639	1.028
45	97.832	0.891
46	97.959	0.583
47	98.084	0.572
48	98.208	0.572
49	98.339	0.603
50	98.488	0.684
51	98.637	0.686
52	98.786	0.686
53	98.936	0.687
54	99.085	0.686
55	99.234	0.686
56	99.384	0.686
57	99.533	0.686
58	99.682	0.686
59	99.831	0.686
60	99.980	0.686
61	100.000	0.091

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0017	0.0008
2	0.0025	0.0017	0.0008
3	0.0025	0.0017	0.0008
4	0.0025	0.0017	0.0008
5	0.0026	0.0018	0.0008
6	0.0026	0.0018	0.0008
7	0.0026	0.0018	0.0008
8	0.0026	0.0018	0.0008
9	0.0026	0.0018	0.0008
10	0.0026	0.0018	0.0008
11	0.0026	0.0018	0.0008
12	0.0026	0.0018	0.0008
13	0.0026	0.0018	0.0008
14	0.0027	0.0018	0.0008
15	0.0027	0.0018	0.0008
16	0.0027	0.0018	0.0008
17	0.0027	0.0018	0.0008
18	0.0027	0.0019	0.0008
19	0.0027	0.0019	0.0009
20	0.0027	0.0019	0.0009
21	0.0027	0.0019	0.0009
22	0.0028	0.0019	0.0009
23	0.0028	0.0019	0.0009
24	0.0028	0.0019	0.0009
25	0.0028	0.0019	0.0009
26	0.0028	0.0019	0.0009
27	0.0028	0.0019	0.0009
28	0.0028	0.0019	0.0009
29	0.0029	0.0020	0.0009
30	0.0029	0.0020	0.0009

31	0.0029	0.0020	0.0009
32	0.0029	0.0020	0.0009
33	0.0029	0.0020	0.0009
34	0.0029	0.0020	0.0009
35	0.0029	0.0020	0.0009
36	0.0029	0.0020	0.0009
37	0.0030	0.0020	0.0009
38	0.0030	0.0020	0.0009
39	0.0030	0.0021	0.0009
40	0.0030	0.0021	0.0009
41	0.0030	0.0021	0.0010
42	0.0030	0.0021	0.0010
43	0.0031	0.0021	0.0010
44	0.0031	0.0021	0.0010
45	0.0031	0.0021	0.0010
46	0.0031	0.0021	0.0010
47	0.0031	0.0021	0.0010
48	0.0031	0.0022	0.0010
49	0.0032	0.0022	0.0010
50	0.0032	0.0022	0.0010
51	0.0032	0.0022	0.0010
52	0.0032	0.0022	0.0010
53	0.0032	0.0022	0.0010
54	0.0032	0.0022	0.0010
55	0.0033	0.0022	0.0010
56	0.0033	0.0023	0.0010
57	0.0033	0.0023	0.0010
58	0.0033	0.0023	0.0010
59	0.0033	0.0023	0.0011
60	0.0034	0.0023	0.0011
61	0.0034	0.0023	0.0011
62	0.0034	0.0023	0.0011
63	0.0034	0.0024	0.0011
64	0.0034	0.0024	0.0011
65	0.0035	0.0024	0.0011
66	0.0035	0.0024	0.0011

67	0.0035	0.0024	0.0011
68	0.0035	0.0024	0.0011
69	0.0036	0.0024	0.0011
70	0.0036	0.0025	0.0011
71	0.0036	0.0025	0.0011
72	0.0036	0.0025	0.0011
73	0.0036	0.0025	0.0011
74	0.0037	0.0025	0.0012
75	0.0037	0.0025	0.0012
76	0.0037	0.0025	0.0012
77	0.0037	0.0026	0.0012
78	0.0038	0.0026	0.0012
79	0.0038	0.0026	0.0012
80	0.0038	0.0026	0.0012
81	0.0039	0.0026	0.0012
82	0.0039	0.0027	0.0012
83	0.0039	0.0027	0.0012
84	0.0039	0.0027	0.0012
85	0.0040	0.0027	0.0012
86	0.0040	0.0027	0.0013
87	0.0040	0.0028	0.0013
88	0.0040	0.0028	0.0013
89	0.0041	0.0028	0.0013
90	0.0041	0.0028	0.0013
91	0.0042	0.0028	0.0013
92	0.0042	0.0029	0.0013
93	0.0042	0.0029	0.0013
94	0.0042	0.0029	0.0013
95	0.0043	0.0029	0.0013
96	0.0043	0.0030	0.0014
97	0.0044	0.0030	0.0014
98	0.0044	0.0030	0.0014
99	0.0044	0.0030	0.0014
100	0.0045	0.0031	0.0014
101	0.0045	0.0031	0.0014
102	0.0045	0.0031	0.0014

103	0.0046	0.0031	0.0014
104	0.0046	0.0032	0.0014
105	0.0047	0.0032	0.0015
106	0.0047	0.0032	0.0015
107	0.0048	0.0033	0.0015
108	0.0048	0.0033	0.0015
109	0.0048	0.0033	0.0015
110	0.0049	0.0033	0.0015
111	0.0049	0.0034	0.0015
112	0.0050	0.0034	0.0016
113	0.0050	0.0035	0.0016
114	0.0051	0.0035	0.0016
115	0.0051	0.0035	0.0016
116	0.0052	0.0035	0.0016
117	0.0052	0.0036	0.0016
118	0.0053	0.0036	0.0017
119	0.0054	0.0037	0.0017
120	0.0054	0.0037	0.0017
121	0.0055	0.0038	0.0017
122	0.0055	0.0038	0.0017
123	0.0056	0.0038	0.0018
124	0.0056	0.0039	0.0018
125	0.0057	0.0039	0.0018
126	0.0058	0.0040	0.0018
127	0.0059	0.0040	0.0018
128	0.0059	0.0041	0.0019
129	0.0060	0.0041	0.0019
130	0.0061	0.0042	0.0019
131	0.0062	0.0042	0.0019
132	0.0062	0.0043	0.0020
133	0.0063	0.0043	0.0020
134	0.0064	0.0044	0.0020
135	0.0065	0.0045	0.0020
136	0.0066	0.0045	0.0021
137	0.0067	0.0046	0.0021
138	0.0067	0.0046	0.0021

139	0.0069	0.0047	0.0022
140	0.0069	0.0048	0.0022
141	0.0071	0.0049	0.0022
142	0.0072	0.0049	0.0022
143	0.0073	0.0050	0.0023
144	0.0074	0.0051	0.0023
145	0.0069	0.0047	0.0022
146	0.0070	0.0048	0.0022
147	0.0071	0.0049	0.0022
148	0.0072	0.0050	0.0023
149	0.0074	0.0051	0.0023
150	0.0075	0.0051	0.0024
151	0.0077	0.0053	0.0024
152	0.0078	0.0053	0.0024
153	0.0080	0.0055	0.0025
154	0.0081	0.0056	0.0025
155	0.0083	0.0057	0.0026
156	0.0085	0.0058	0.0027
157	0.0087	0.0060	0.0027
158	0.0088	0.0061	0.0028
159	0.0091	0.0063	0.0029
160	0.0093	0.0064	0.0029
161	0.0096	0.0066	0.0030
162	0.0098	0.0067	0.0031
163	0.0101	0.0069	0.0032
164	0.0103	0.0071	0.0032
165	0.0107	0.0073	0.0034
166	0.0109	0.0075	0.0034
167	0.0114	0.0078	0.0036
168	0.0116	0.0080	0.0036
169	0.0193	0.0133	0.0061
170	0.0197	0.0135	0.0062
171	0.0205	0.0141	0.0064
172	0.0210	0.0144	0.0066
173	0.0220	0.0151	0.0069
174	0.0225	0.0154	0.0071

175	0.0237	0.0162	0.0074
176	0.0243	0.0167	0.0076
177	0.0257	0.0176	0.0081
178	0.0265	0.0182	0.0083
179	0.0283	0.0194	0.0089
180	0.0293	0.0201	0.0092
181	0.0315	0.0216	0.0099
182	0.0328	0.0225	0.0103
183	0.0359	0.0246	0.0113
184	0.0377	0.0259	0.0119
185	0.0632	0.0420	0.0212
186	0.0664	0.0420	0.0244
187	0.0743	0.0420	0.0323
188	0.0796	0.0420	0.0376
189	0.0994	0.0420	0.0574
190	0.1102	0.0420	0.0682
191	0.1489	0.0420	0.1069
192	0.1951	0.0420	0.1531
193	0.4792	0.0420	0.4372
194	0.1252	0.0420	0.0832
195	0.0858	0.0420	0.0438
196	0.0700	0.0420	0.0280
197	0.0398	0.0273	0.0125
198	0.0343	0.0235	0.0108
199	0.0303	0.0208	0.0095
200	0.0273	0.0188	0.0086
201	0.0250	0.0171	0.0078
202	0.0231	0.0158	0.0072
203	0.0215	0.0147	0.0067
204	0.0201	0.0138	0.0063
205	0.0119	0.0081	0.0037
206	0.0111	0.0076	0.0035
207	0.0105	0.0072	0.0033
208	0.0099	0.0068	0.0031
209	0.0094	0.0065	0.0030
210	0.0090	0.0062	0.0028

211	0.0086	0.0059	0.0027
212	0.0082	0.0056	0.0026
213	0.0079	0.0054	0.0025
214	0.0076	0.0052	0.0024
215	0.0073	0.0050	0.0023
216	0.0071	0.0048	0.0022
217	0.0075	0.0051	0.0023
218	0.0072	0.0050	0.0023
219	0.0070	0.0048	0.0022
220	0.0068	0.0047	0.0021
221	0.0066	0.0045	0.0021
222	0.0064	0.0044	0.0020
223	0.0063	0.0043	0.0020
224	0.0061	0.0042	0.0019
225	0.0060	0.0041	0.0019
226	0.0058	0.0040	0.0018
227	0.0057	0.0039	0.0018
228	0.0056	0.0038	0.0017
229	0.0054	0.0037	0.0017
230	0.0053	0.0036	0.0017
231	0.0052	0.0036	0.0016
232	0.0051	0.0035	0.0016
233	0.0050	0.0034	0.0016
234	0.0049	0.0034	0.0015
235	0.0048	0.0033	0.0015
236	0.0047	0.0032	0.0015
237	0.0046	0.0032	0.0015
238	0.0046	0.0031	0.0014
239	0.0045	0.0031	0.0014
240	0.0044	0.0030	0.0014
241	0.0043	0.0030	0.0014
242	0.0043	0.0029	0.0013
243	0.0042	0.0029	0.0013
244	0.0041	0.0028	0.0013
245	0.0041	0.0028	0.0013
246	0.0040	0.0027	0.0013

247	0.0039	0.0027	0.0012
248	0.0039	0.0027	0.0012
249	0.0038	0.0026	0.0012
250	0.0038	0.0026	0.0012
251	0.0037	0.0026	0.0012
252	0.0037	0.0025	0.0012
253	0.0036	0.0025	0.0011
254	0.0036	0.0025	0.0011
255	0.0035	0.0024	0.0011
256	0.0035	0.0024	0.0011
257	0.0035	0.0024	0.0011
258	0.0034	0.0023	0.0011
259	0.0034	0.0023	0.0011
260	0.0033	0.0023	0.0010
261	0.0033	0.0023	0.0010
262	0.0033	0.0022	0.0010
263	0.0032	0.0022	0.0010
264	0.0032	0.0022	0.0010
265	0.0031	0.0022	0.0010
266	0.0031	0.0021	0.0010
267	0.0031	0.0021	0.0010
268	0.0030	0.0021	0.0010
269	0.0030	0.0021	0.0009
270	0.0030	0.0020	0.0009
271	0.0030	0.0020	0.0009
272	0.0029	0.0020	0.0009
273	0.0029	0.0020	0.0009
274	0.0029	0.0020	0.0009
275	0.0028	0.0019	0.0009
276	0.0028	0.0019	0.0009
277	0.0028	0.0019	0.0009
278	0.0028	0.0019	0.0009
279	0.0027	0.0019	0.0009
280	0.0027	0.0019	0.0009
281	0.0027	0.0018	0.0008
282	0.0027	0.0018	0.0008

283	0.0026	0.0018	0.0008
284	0.0026	0.0018	0.0008
285	0.0026	0.0018	0.0008
286	0.0026	0.0018	0.0008
287	0.0026	0.0018	0.0008
288	0.0025	0.0017	0.0008

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 1.76

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.67

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 5.5767

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 5.2814

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==========================================================================

                    2 4 - H O U R   S T O R M
                  R U N O F F   H Y D R O G R A P H

==========================================================================
              HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
--------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       12.5      25.0      37.5      50.0
--------------------------------------------------------------------------
   0.083      0.0000      0.00  Q         .         .         .         .
   0.167      0.0001      0.01  Q         .         .         .         .
   0.250      0.0002      0.02  Q         .         .         .         .
   0.333      0.0004      0.03  Q         .         .         .         .
   0.417      0.0008      0.05  Q         .         .         .         .
   0.500      0.0014      0.09  Q         .         .         .         .
   0.583      0.0023      0.13  Q         .         .         .         .
   0.667      0.0034      0.17  Q         .         .         .         .
   0.750      0.0048      0.19  Q         .         .         .         .
   0.833      0.0063      0.22  Q         .         .         .         .
   0.917      0.0079      0.23  Q         .         .         .         .
   1.000      0.0096      0.25  Q         .         .         .         .
   1.083      0.0113      0.26  Q         .         .         .         .
   1.167      0.0132      0.27  Q         .         .         .         .
   1.250      0.0151      0.28  Q         .         .         .         .
   1.333      0.0171      0.29  Q         .         .         .         .
   1.417      0.0192      0.30  Q         .         .         .         .
   1.500      0.0213      0.30  Q         .         .         .         .
   1.583      0.0234      0.31  Q         .         .         .         .
   1.667      0.0256      0.32  Q         .         .         .         .
   1.750      0.0278      0.32  Q         .         .         .         .
   1.833      0.0301      0.33  Q         .         .         .         .
   1.917      0.0324      0.33  Q         .         .         .         .
   2.000      0.0347      0.34  Q         .         .         .         .
```

2.083	0.0371	0.34	Q	.	.	.	.
2.167	0.0395	0.35	Q	.	.	.	.
2.250	0.0420	0.35	Q	.	.	.	.
2.333	0.0444	0.36	Q	.	.	.	.
2.417	0.0469	0.36	Q	.	.	.	.
2.500	0.0494	0.37	Q	.	.	.	.
2.583	0.0520	0.37	Q	.	.	.	.
2.667	0.0545	0.37	Q	.	.	.	.
2.750	0.0571	0.38	Q	.	.	.	.
2.833	0.0597	0.38	Q	.	.	.	.
2.917	0.0624	0.38	Q	.	.	.	.
3.000	0.0650	0.39	Q	.	.	.	.
3.083	0.0677	0.39	Q	.	.	.	.
3.167	0.0704	0.39	Q	.	.	.	.
3.250	0.0731	0.40	Q	.	.	.	.
3.333	0.0759	0.40	Q	.	.	.	.
3.417	0.0787	0.40	Q	.	.	.	.
3.500	0.0814	0.40	Q	.	.	.	.
3.583	0.0843	0.41	Q	.	.	.	.
3.667	0.0871	0.41	Q	.	.	.	.
3.750	0.0899	0.41	Q	.	.	.	.
3.833	0.0928	0.42	Q	.	.	.	.
3.917	0.0957	0.42	Q	.	.	.	.
4.000	0.0986	0.42	Q	.	.	.	.
4.083	0.1015	0.42	Q	.	.	.	.
4.167	0.1044	0.43	Q	.	.	.	.
4.250	0.1074	0.43	Q	.	.	.	.
4.333	0.1103	0.43	Q	.	.	.	.
4.417	0.1133	0.43	Q	.	.	.	.
4.500	0.1163	0.44	Q	.	.	.	.
4.583	0.1194	0.44	Q	.	.	.	.
4.667	0.1224	0.44	Q	.	.	.	.
4.750	0.1255	0.45	Q	.	.	.	.
4.833	0.1286	0.45	Q	.	.	.	.
4.917	0.1317	0.45	Q	.	.	.	.
5.000	0.1348	0.45	QV	.	.	.	.

5.083	0.1380	0.46	QV	.	.	.	.
5.167	0.1411	0.46	QV	.	.	.	.
5.250	0.1443	0.46	QV	.	.	.	.
5.333	0.1475	0.47	QV	.	.	.	.
5.417	0.1507	0.47	QV	.	.	.	.
5.500	0.1540	0.47	QV	.	.	.	.
5.583	0.1572	0.47	QV	.	.	.	.
5.667	0.1605	0.48	QV	.	.	.	.
5.750	0.1638	0.48	QV	.	.	.	.
5.833	0.1671	0.48	QV	.	.	.	.
5.917	0.1705	0.48	QV	.	.	.	.
6.000	0.1738	0.49	QV	.	.	.	.
6.083	0.1772	0.49	QV	.	.	.	.
6.167	0.1806	0.49	QV	.	.	.	.
6.250	0.1840	0.50	QV	.	.	.	.
6.333	0.1874	0.50	QV	.	.	.	.
6.417	0.1909	0.50	QV	.	.	.	.
6.500	0.1944	0.51	QV	.	.	.	.
6.583	0.1979	0.51	QV	.	.	.	.
6.667	0.2014	0.51	QV	.	.	.	.
6.750	0.2050	0.52	QV	.	.	.	.
6.833	0.2085	0.52	QV	.	.	.	.
6.917	0.2121	0.52	QV	.	.	.	.
7.000	0.2157	0.53	QV	.	.	.	.
7.083	0.2194	0.53	QV	.	.	.	.
7.167	0.2230	0.53	QV	.	.	.	.
7.250	0.2267	0.54	QV	.	.	.	.
7.333	0.2305	0.54	QV	.	.	.	.
7.417	0.2342	0.54	QV	.	.	.	.
7.500	0.2380	0.55	QV	.	.	.	.
7.583	0.2418	0.55	QV	.	.	.	.
7.667	0.2456	0.55	QV	.	.	.	.
7.750	0.2494	0.56	QV	.	.	.	.
7.833	0.2533	0.56	QV	.	.	.	.
7.917	0.2572	0.57	QV	.	.	.	.
8.000	0.2611	0.57	QV	.	.	.	.

8.083	0.2651	0.58	Q	V	.	.	.	.
8.167	0.2691	0.58	Q	V	.	.	.	.
8.250	0.2731	0.58	Q	V	.	.	.	.
8.333	0.2772	0.59	Q	V	.	.	.	.
8.417	0.2813	0.59	Q	V	.	.	.	.
8.500	0.2854	0.60	Q	V	.	.	.	.
8.583	0.2895	0.60	Q	V	.	.	.	.
8.667	0.2937	0.61	Q	V	.	.	.	.
8.750	0.2979	0.61	Q	V	.	.	.	.
8.833	0.3022	0.62	Q	V	.	.	.	.
8.917	0.3065	0.62	Q	V	.	.	.	.
9.000	0.3108	0.63	Q	V	.	.	.	.
9.083	0.3151	0.63	Q	V	.	.	.	.
9.167	0.3195	0.64	Q	V	.	.	.	.
9.250	0.3240	0.64	Q	V	.	.	.	.
9.333	0.3284	0.65	Q	V	.	.	.	.
9.417	0.3329	0.65	Q	V	.	.	.	.
9.500	0.3375	0.66	Q	V	.	.	.	.
9.583	0.3421	0.67	Q	V	.	.	.	.
9.667	0.3467	0.67	Q	V	.	.	.	.
9.750	0.3514	0.68	Q	V	.	.	.	.
9.833	0.3561	0.68	Q	V	.	.	.	.
9.917	0.3608	0.69	Q	V	.	.	.	.
10.000	0.3656	0.70	Q	V	.	.	.	.
10.083	0.3705	0.70	Q	V	.	.	.	.
10.167	0.3754	0.71	Q	V	.	.	.	.
10.250	0.3803	0.72	Q	V	.	.	.	.
10.333	0.3853	0.73	Q	V	.	.	.	.
10.417	0.3904	0.73	Q	V	.	.	.	.
10.500	0.3955	0.74	Q	V	.	.	.	.
10.583	0.4006	0.75	Q	V	.	.	.	.
10.667	0.4058	0.76	Q	V	.	.	.	.
10.750	0.4111	0.76	Q	V	.	.	.	.
10.833	0.4164	0.77	Q	V	.	.	.	.
10.917	0.4218	0.78	Q	V	.	.	.	.
11.000	0.4272	0.79	Q	V	.	.	.	.

11.083	0.4327	0.80	Q	V	.	.	.	.
11.167	0.4383	0.81	Q	V	.	.	.	.
11.250	0.4439	0.82	Q	V	.	.	.	.
11.333	0.4496	0.83	Q	V	.	.	.	.
11.417	0.4554	0.84	Q	V	.	.	.	.
11.500	0.4612	0.85	Q	V	.	.	.	.
11.583	0.4671	0.86	Q	V	.	.	.	.
11.667	0.4731	0.87	Q	V	.	.	.	.
11.750	0.4791	0.88	Q	V	.	.	.	.
11.833	0.4853	0.89	Q	V	.	.	.	.
11.917	0.4915	0.90	Q	V	.	.	.	.
12.000	0.4978	0.91	Q	V	.	.	.	.
12.083	0.5041	0.93	Q	V	.	.	.	.
12.167	0.5106	0.94	Q	V	.	.	.	.
12.250	0.5171	0.95	Q	V	.	.	.	.
12.333	0.5237	0.96	Q	V	.	.	.	.
12.417	0.5304	0.97	Q	V	.	.	.	.
12.500	0.5371	0.97	Q	V	.	.	.	.
12.583	0.5438	0.98	Q	V	.	.	.	.
12.667	0.5506	0.98	Q	V	.	.	.	.
12.750	0.5574	0.99	Q	V	.	.	.	.
12.833	0.5643	1.00	Q	V	.	.	.	.
12.917	0.5713	1.02	Q	V	.	.	.	.
13.000	0.5784	1.03	Q	V	.	.	.	.
13.083	0.5856	1.04	Q	V	.	.	.	.
13.167	0.5929	1.06	Q	V	.	.	.	.
13.250	0.6003	1.08	Q	V	.	.	.	.
13.333	0.6079	1.10	Q	V	.	.	.	.
13.417	0.6156	1.12	Q	V	.	.	.	.
13.500	0.6234	1.14	Q	V	.	.	.	.
13.583	0.6314	1.16	Q	V	.	.	.	.
13.667	0.6396	1.18	Q	V	.	.	.	.
13.750	0.6479	1.21	Q	V	.	.	.	.
13.833	0.6564	1.23	Q	V	.	.	.	.
13.917	0.6651	1.26	.Q	V	.	.	.	.
14.000	0.6739	1.29	.Q	V	.	.	.	.

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14.083      0.6831      1.33  .Q   V    .         .         .         .
14.167      0.6926      1.38  .Q   V    .         .         .         .
14.250      0.7025      1.44  .Q   V    .         .         .         .
14.333      0.7129      1.51  .Q   V    .         .         .         .
14.417      0.7240      1.62  .Q   V    .         .         .         .
14.500      0.7362      1.77  .Q   V    .         .         .         .
14.583      0.7496      1.94  .Q   V    .         .         .         .
14.667      0.7641      2.10  .Q   V    .         .         .         .
14.750      0.7795      2.24  .Q   V    .         .         .         .
14.833      0.7958      2.37  .Q    V   .         .         .         .
14.917      0.8130      2.49  .Q    V   .         .         .         .
15.000      0.8310      2.62  . Q   V   .         .         .         .
15.083      0.8499      2.75  . Q   V   .         .         .         .
15.167      0.8698      2.88  . Q   V   .         .         .         .
15.250      0.8906      3.03  . Q   V   .         .         .         .
15.333      0.9125      3.18  . Q   V   .         .         .         .
15.417      0.9357      3.37  . Q    V  .         .         .         .
15.500      0.9607      3.62  . Q    V  .         .         .         .
15.583      0.9879      3.96  .  Q   V  .         .         .         .
15.667      1.0183      4.41  .  Q   V  .         .         .         .
15.750      1.0533      5.08  .   Q  V  .         .         .         .
15.833      1.0955      6.14  .   Q   V .         .         .         .
15.917      1.1481      7.64  .     Q V .         .         .         .
16.000      1.2149      9.70  .      Q V.         .         .         .
16.083      1.3055     13.15  .        VQ         .         .         .
16.167      1.4281     17.81  .         V   Q     .         .         .
16.250      1.5847     22.73  .         . V     Q .         .         .
16.333      1.7784     28.13  .         .  V      . Q       .         .
16.417      2.0221     35.39  .         .    V    .       Q .         .
16.500      2.3219     43.53  .         .      V  .         .   Q     .
16.583      2.6321     45.04  .         .        V.         .     Q   .
16.667      2.9011     39.06  .         .         .V        .Q        .
16.750      3.1262     32.68  .         .         .  V  Q   .         .
16.833      3.3133     27.17  .         .         .Q   V    .         .
16.917      3.4686     22.55  .         .       Q .     V   .         .
17.000      3.6023     19.41  .         .    Q    .      V  .         .
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17.083      3.7206     17.17  .         .  Q      .       V .         .
17.167      3.8262     15.34  .         . Q       .       V .         .
17.250      3.9206     13.70  .         Q         .        V.         .
17.333      4.0066     12.48  .        Q.         .         V         .
17.417      4.0845     11.31  .        Q.         .         V         .
17.500      4.1546     10.18  .       Q .         .         .V        .
17.583      4.2188      9.33  .      Q  .         .         .V        .
17.667      4.2775      8.52  .     Q   .         .         . V       .
17.750      4.3322      7.95  .     Q   .         .         . V       .
17.833      4.3831      7.39  .    Q    .         .         .  V      .
17.917      4.4304      6.87  .    Q    .         .         .  V      .
18.000      4.4739      6.31  .    Q    .         .         .  V      .
18.083      4.5139      5.81  .   Q     .         .         .   V     .
18.167      4.5504      5.30  .   Q     .         .         .   V     .
18.250      4.5849      5.02  .   Q     .         .         .   V     .
18.333      4.6178      4.76  .  Q      .         .         .   V     .
18.417      4.6488      4.51  .  Q      .         .         .    V    .
18.500      4.6781      4.25  .  Q      .         .         .    V    .
18.583      4.7060      4.06  .  Q      .         .         .    V    .
18.667      4.7325      3.84  .  Q      .         .         .    V    .
18.750      4.7574      3.62  . Q       .         .         .     V   .
18.833      4.7805      3.36  . Q       .         .         .     V   .
18.917      4.8028      3.23  . Q       .         .         .     V   .
19.000      4.8242      3.10  . Q       .         .         .     V   .
19.083      4.8443      2.93  . Q       .         .         .     V   .
19.167      4.8630      2.72  . Q       .         .         .     V   .
19.250      4.8810      2.61  . Q       .         .         .     V   .
19.333      4.8981      2.49  .Q        .         .         .      V  .
19.417      4.9142      2.33  .Q        .         .         .      V  .
19.500      4.9288      2.13  .Q        .         .         .      V  .
19.583      4.9429      2.04  .Q        .         .         .      V  .
19.667      4.9562      1.94  .Q        .         .         .      V  .
19.750      4.9687      1.81  .Q        .         .         .      V  .
19.833      4.9800      1.64  .Q        .         .         .      V  .
19.917      4.9909      1.59  .Q        .         .         .      V  .
20.000      5.0016      1.56  .Q        .         .         .      V  .
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20.083	5.0123	1.55	.Q	.	.	.	V .
20.167	5.0230	1.56	.Q	.	.	.	V .
20.250	5.0336	1.54	.Q	.	.	.	V .
20.333	5.0441	1.52	.Q	.	.	.	V .
20.417	5.0544	1.50	.Q	.	.	.	V .
20.500	5.0645	1.47	.Q	.	.	.	V .
20.583	5.0744	1.43	.Q	.	.	.	V .
20.667	5.0840	1.40	.Q	.	.	.	V .
20.750	5.0933	1.35	.Q	.	.	.	V .
20.833	5.1022	1.29	.Q	.	.	.	V .
20.917	5.1105	1.21	Q	.	.	.	V .
21.000	5.1181	1.10	Q	.	.	.	V .
21.083	5.1238	0.82	Q	.	.	.	V .
21.167	5.1288	0.72	Q	.	.	.	V .
21.250	5.1335	0.68	Q	.	.	.	V .
21.333	5.1380	0.65	Q	.	.	.	V .
21.417	5.1424	0.64	Q	.	.	.	V .
21.500	5.1466	0.62	Q	.	.	.	V .
21.583	5.1508	0.61	Q	.	.	.	V.
21.667	5.1549	0.60	Q	.	.	.	V.
21.750	5.1589	0.58	Q	.	.	.	V.
21.833	5.1629	0.57	Q	.	.	.	V.
21.917	5.1667	0.56	Q	.	.	.	V.
22.000	5.1705	0.55	Q	.	.	.	V.
22.083	5.1743	0.54	Q	.	.	.	V.
22.167	5.1779	0.53	Q	.	.	.	V.
22.250	5.1816	0.53	Q	.	.	.	V.
22.333	5.1851	0.52	Q	.	.	.	V.
22.417	5.1887	0.51	Q	.	.	.	V.
22.500	5.1922	0.51	Q	.	.	.	V.
22.583	5.1956	0.50	Q	.	.	.	V.
22.667	5.1990	0.49	Q	.	.	.	V.
22.750	5.2023	0.49	Q	.	.	.	V.
22.833	5.2057	0.48	Q	.	.	.	V.
22.917	5.2089	0.48	Q	.	.	.	V.
23.000	5.2122	0.47	Q	.	.	.	V.

23.083	5.2154	0.46	Q	.	.	.	V.
23.167	5.2185	0.46	Q	.	.	.	V.
23.250	5.2216	0.45	Q	.	.	.	V.
23.333	5.2247	0.45	Q	.	.	.	V.
23.417	5.2278	0.44	Q	.	.	.	V.
23.500	5.2308	0.44	Q	.	.	.	V.
23.583	5.2338	0.43	Q	.	.	.	V.
23.667	5.2367	0.43	Q	.	.	.	V.
23.750	5.2397	0.42	Q	.	.	.	V.
23.833	5.2426	0.42	Q	.	.	.	V.
23.917	5.2454	0.42	Q	.	.	.	V.
24.000	5.2483	0.41	Q	.	.	.	V.
24.083	5.2511	0.41	Q	.	.	.	V.
24.167	5.2538	0.40	Q	.	.	.	V.
24.250	5.2564	0.38	Q	.	.	.	V.
24.333	5.2590	0.37	Q	.	.	.	V.
24.417	5.2613	0.34	Q	.	.	.	V.
24.500	5.2634	0.30	Q	.	.	.	V.
24.583	5.2652	0.26	Q	.	.	.	V.
24.667	5.2667	0.22	Q	.	.	.	V.
24.750	5.2680	0.19	Q	.	.	.	V.
24.833	5.2691	0.17	Q	.	.	.	V.
24.917	5.2702	0.15	Q	.	.	.	V.
25.000	5.2711	0.14	Q	.	.	.	V.
25.083	5.2720	0.12	Q	.	.	.	V.
25.167	5.2727	0.11	Q	.	.	.	V.
25.250	5.2734	0.10	Q	.	.	.	V.
25.333	5.2741	0.09	Q	.	.	.	V.
25.417	5.2747	0.09	Q	.	.	.	V.
25.500	5.2752	0.08	Q	.	.	.	V.
25.583	5.2757	0.07	Q	.	.	.	V.
25.667	5.2762	0.07	Q	.	.	.	V.
25.750	5.2766	0.06	Q	.	.	.	V.
25.833	5.2770	0.06	Q	.	.	.	V.
25.917	5.2774	0.05	Q	.	.	.	V.
26.000	5.2777	0.05	Q	.	.	.	V.

26.083	5.2780	0.04	Q	.	.	.	V.
26.167	5.2783	0.04	Q	.	.	.	V.
26.250	5.2786	0.04	Q	.	.	.	V.
26.333	5.2788	0.04	Q	.	.	.	V.
26.417	5.2791	0.03	Q	.	.	.	V.
26.500	5.2793	0.03	Q	.	.	.	V.
26.583	5.2795	0.03	Q	.	.	.	V.
26.667	5.2796	0.03	Q	.	.	.	V.
26.750	5.2798	0.02	Q	.	.	.	V.
26.833	5.2800	0.02	Q	.	.	.	V.
26.917	5.2801	0.02	Q	.	.	.	V.
27.000	5.2802	0.02	Q	.	.	.	V.
27.083	5.2804	0.02	Q	.	.	.	V.
27.167	5.2805	0.02	Q	.	.	.	V.
27.250	5.2806	0.01	Q	.	.	.	V.
27.333	5.2807	0.01	Q	.	.	.	V.
27.417	5.2807	0.01	Q	.	.	.	V.
27.500	5.2808	0.01	Q	.	.	.	V.
27.583	5.2809	0.01	Q	.	.	.	V.
27.667	5.2809	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1660.0
10%	165.0
20%	100.0
30%	70.0
40%	50.0
50%	45.0
60%	35.0
70%	25.0

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             80%                                 15.0

             90%                                 10.0



****************************************************************************
  FLOW PROCESS FROM NODE   3003.00 TO NODE   3003.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>STREAM NUMBER 2 ADDED TO STREAM NUMBER 1<<<<<
============================================================================



****************************************************************************
  FLOW PROCESS FROM NODE   3003.00 TO NODE   3003.00 IS CODE = 3.1
----------------------------------------------------------------------------
  >>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<
============================================================================

                     INFLOW
                   (STREAM 1)
                        |
                        |
                        V               __effective depth
                    -----------         |   (and volume)
                   |           |    |    |
                   |           |    |....V........
                   | detention |<-->|           outflow
                   |   basin   |    |.........________
                    -----------     |    ^    |  \
                        |           |  dead   |   basin outlet
                        V           | storage |
                     OUTFLOW         ---------
                   (STREAM 1)



          ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
```

THROUGH A FLOW-THROUGH DETENTION BASIN

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:

DEAD STORAGE(AF) = 0.000

SPECIFIED DEAD STORAGE(AF) FILLED = 0.000

SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000

DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	20.00	3.000
3	2.00	40.00	6.000
4	3.00	60.00	9.000
5	4.00	83.00	11.000

==

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):

(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;

MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
14.083	0.000	2.48	0.00	0.09	1.8	0.277
14.167	0.000	2.59	0.00	0.09	1.9	0.282
14.250	0.000	2.73	0.00	0.10	1.9	0.288
14.333	0.000	2.95	0.00	0.10	1.9	0.295
14.417	0.000	3.24	0.00	0.10	2.0	0.303
14.500	0.000	3.54	0.00	0.10	2.1	0.313
14.583	0.000	3.84	0.00	0.11	2.1	0.325
14.667	0.000	4.11	0.00	0.11	2.2	0.338

14.750	0.000	4.35	0.00	0.12	2.3	0.352
14.833	0.000	4.59	0.00	0.12	2.4	0.368
14.917	0.000	4.82	0.00	0.13	2.5	0.384
15.000	0.000	5.06	0.00	0.13	2.6	0.400
15.083	0.000	5.31	0.00	0.14	2.7	0.418
15.167	0.000	5.57	0.00	0.15	2.8	0.437
15.250	0.000	5.85	0.00	0.15	3.0	0.457
15.333	0.000	6.16	0.00	0.16	3.1	0.478
15.417	0.000	6.54	0.00	0.17	3.3	0.500
15.500	0.000	7.08	0.00	0.18	3.4	0.525
15.583	0.000	7.85	0.00	0.18	3.6	0.555
15.667	0.000	9.04	0.00	0.20	3.8	0.591
15.750	0.000	10.86	0.00	0.21	4.1	0.637
15.833	0.000	13.36	0.00	0.23	4.5	0.699
15.917	0.000	16.78	0.00	0.26	4.9	0.780
16.000	0.000	21.61	0.00	0.30	5.6	0.891
16.083	0.000	29.85	0.00	0.35	6.5	1.052
16.167	0.000	41.45	0.00	0.43	7.8	1.284
16.250	0.000	54.11	0.00	0.53	9.6	1.590
16.333	0.000	70.14	0.00	0.66	11.9	1.991
16.417	0.000	82.92	0.00	0.82	14.8	2.460
16.500	0.000	82.85	0.00	0.97	17.9	2.907
16.583	0.000	75.89	0.00	1.10	20.7	3.288
16.667	0.000	63.15	0.00	1.19	22.8	3.565
16.750	0.000	52.37	0.00	1.25	24.4	3.758
16.833	0.000	43.66	0.00	1.29	25.5	3.883
16.917	0.000	36.73	0.00	1.32	26.1	3.956
17.000	0.000	31.71	0.00	1.33	26.5	3.992
17.083	0.000	28.06	0.00	1.33	26.6	4.002
17.167	0.000	25.05	0.00	1.33	26.6	3.991
17.250	0.000	22.49	0.00	1.32	26.5	3.963
17.333	0.000	20.32	0.00	1.31	26.3	3.922
17.417	0.000	18.21	0.00	1.29	26.0	3.869
17.500	0.000	16.24	0.00	1.27	25.6	3.804
17.583	0.000	14.87	0.00	1.24	25.1	3.734
17.667	0.000	13.59	0.00	1.22	24.6	3.658

17.750	0.000	12.60	0.00	1.19	24.1	3.578
17.833	0.000	11.66	0.00	1.17	23.6	3.496
17.917	0.000	10.71	0.00	1.14	23.0	3.411
18.000	0.000	9.88	0.00	1.11	22.5	3.325
18.083	0.000	9.12	0.00	1.08	21.9	3.237
18.167	0.000	8.28	0.00	1.05	21.3	3.147
18.250	0.000	7.81	0.00	1.02	20.7	3.059
18.333	0.000	7.30	0.00	0.99	20.1	2.971
18.417	0.000	6.81	0.00	0.96	19.5	2.883
18.500	0.000	6.40	0.00	0.93	18.9	2.797
18.583	0.000	5.97	0.00	0.90	18.4	2.712
18.667	0.000	5.64	0.00	0.88	17.8	2.628
18.750	0.000	5.37	0.00	0.85	17.2	2.546
18.833	0.000	5.10	0.00	0.82	16.7	2.466
18.917	0.000	4.93	0.00	0.80	16.2	2.389
19.000	0.000	4.76	0.00	0.77	15.7	2.313
19.083	0.000	4.52	0.00	0.75	15.2	2.240
19.167	0.000	4.24	0.00	0.72	14.7	2.168
19.250	0.000	4.04	0.00	0.70	14.2	2.098
19.333	0.000	3.81	0.00	0.68	13.8	2.029
19.417	0.000	3.39	0.00	0.65	13.3	1.961
19.500	0.000	2.95	0.00	0.63	12.8	1.893
19.583	0.000	2.79	0.00	0.61	12.4	1.827
19.667	0.000	2.65	0.00	0.59	12.0	1.763
19.750	0.000	2.49	0.00	0.57	11.5	1.700
19.833	0.000	2.30	0.00	0.55	11.1	1.640
19.917	0.000	2.23	0.00	0.53	10.7	1.581

PROCESS SUMMARY OF STORAGE:

INFLOW VOLUME = 9.563 AF

BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)

OUTFLOW VOLUME = 9.563 AF

LOSS VOLUME = 0.000 AF

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FLOW PROCESS FROM NODE 3003.00 TO NODE 3005.00 IS CODE = 5.1

>>>>>MODEL CHANNEL ROUTING OF STREAM #1 BY THE TRANSLATION METHOD<<<<<

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THE TRANSLATION MODEL NEGLECTS ALL STORAGE ATTENUATION EFFECTS,

AND MOVES THE STREAM 1 RUNOFF HYDROGRAPH FORWARD IN TIME.

ASSUMED REGULAR CHANNEL INFORMATION:

BASEWIDTH(FT) = 100.00 CHANNEL Z = 5.00

UPSTREAM ELEVATION(FT) = 437.99

DOWNSTREAM ELEVATION(FT) = 410.10

CHANNEL LENGTH(FT) = 1586.22 MANNING'S FACTOR = 0.050

CONSTANT LOSS RATE(CFS) = 0.00

MEAN-FLOW RATE NORMAL-DEPTH FLOW VELOCITIES(FPS) ARE AS FOLLOWS:

(FLOW RATE (CFS)) [FLOW VELOCITY (FPS)]

AVERAGED PEAK 5-MINUTE: (26.6).......[1.38]

AVERAGED PEAK 15-MINUTE: (26.6).......[1.38]

AVERAGED PEAK 30-MINUTE: (26.5).......[1.37]

AVERAGED PEAK 1-HOUR: (25.8).......[1.34]

AVERAGED PEAK 3-HOUR: (21.2).......[1.19]

AVERAGED PEAK 6-HOUR: (14.7).......[1.01]

AVERAGED PEAK 24-HOUR: (4.8).......[0.69]

USER-SPECIFIED CHANNEL AVERAGE FLOW VELOCITY(FPS) = 2.092

HYDROGRAPH TRANSLATION TIME

= (CHANNEL LENGTH)/(AVERAGE FLOW VELOCITY)

= (1586.22)/(2.092) = 0.211 HRS

TRANSLATION METHOD CHANNEL ROUTING RESULTS:

MODEL TIME (HRS)	INFLOW (STREAM 1) (CFS)	ROUTED FLOW (CFS)	OUTFLOW LESS LOSS (STREAM 1) (CFS)
14.000	1.80	1.74	1.74
14.083	1.83	1.76	1.76

14.167	1.86	1.79	1.79
14.250	1.90	1.82	1.82
14.333	1.94	1.85	1.85
14.417	1.99	1.88	1.88
14.500	2.06	1.92	1.92
14.583	2.13	1.97	1.97
14.667	2.21	2.02	2.02
14.750	2.30	2.09	2.09
14.833	2.40	2.17	2.17
14.917	2.50	2.25	2.25
15.000	2.61	2.35	2.35
15.083	2.73	2.45	2.45
15.167	2.85	2.56	2.56
15.250	2.98	2.67	2.67
15.333	3.11	2.79	2.79
15.417	3.26	2.91	2.91
15.500	3.42	3.04	3.04
15.583	3.60	3.18	3.18
15.667	3.82	3.33	3.33
15.750	4.09	3.50	3.50
15.833	4.45	3.70	3.70
15.917	4.93	3.95	3.95
16.000	5.57	4.26	4.26
16.083	6.47	4.68	4.68
16.167	7.78	5.23	5.23
16.250	9.58	6.00	6.00
16.333	11.94	7.09	7.09
16.417	14.84	8.63	8.63
16.500	17.89	10.69	10.69
16.583	20.65	13.31	13.31
16.667	22.84	16.28	16.28
16.750	24.41	19.20	19.20
16.833	25.47	21.69	21.69
16.917	26.13	23.58	23.58
17.000	26.49	24.91	24.91
17.083	26.65	25.78	25.78

17.167	26.64	26.30	26.30
17.250	26.51	26.57	26.57
17.333	26.28	26.64	26.64
17.417	25.97	26.58	26.58
17.500	25.58	26.41	26.41
17.583	25.13	26.14	26.14
17.667	24.64	25.78	25.78
17.750	24.12	25.36	25.36
17.833	23.58	24.90	24.90
17.917	23.02	24.39	24.39
18.000	22.45	23.87	23.87
18.083	21.87	23.32	23.32
18.167	21.28	22.75	22.75
18.250	20.69	22.18	22.18
18.333	20.10	21.59	21.59
18.417	19.51	21.00	21.00
18.500	18.93	20.41	20.41
18.583	18.36	19.82	19.82
18.667	17.80	19.24	19.24
18.750	17.25	18.66	18.66
18.833	16.71	18.09	18.09
18.917	16.18	17.54	17.54
19.000	15.67	16.99	16.99
19.083	15.18	16.46	16.46
19.167	14.69	15.94	15.94
19.250	14.22	15.44	15.44
19.333	13.76	14.95	14.95
19.417	13.30	14.47	14.47
19.500	12.85	14.00	14.00
19.583	12.40	13.54	13.54
19.667	11.97	13.09	13.09
19.750	11.54	12.64	12.64
19.833	11.13	12.19	12.19
19.917	10.73	11.77	11.77
20.000	10.35	11.35	11.35

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  PROCESS SUMMARY OF STORAGE:
    INFLOW  VOLUME =      9.563 AF
    OUTFLOW VOLUME =      9.563 AF
    LOSS    VOLUME =      0.000 AF


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  FLOW PROCESS FROM NODE   3005.00 TO NODE   3005.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #3)

         WATERSHED AREA =      31.720 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.510 HOURS
         DESERT(UNDEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.590
         LOW LOSS FRACTION = 0.778
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.48
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  1.16
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.60
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  2.24
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.56
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  3.43

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.999
          30-MINUTE FACTOR = 0.999
           1-HOUR FACTOR = 0.999
           3-HOUR FACTOR = 1.000
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000
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UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 16.340

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.755	2.896
2	3.262	9.617
3	7.488	16.212
4	15.206	29.608
5	29.563	55.076
6	43.294	52.672
7	53.200	38.001
8	60.287	27.186
9	65.499	19.995
10	69.748	16.298
11	73.297	13.617
12	76.254	11.342
13	78.844	9.935
14	81.007	8.299
15	82.888	7.216
16	84.605	6.585
17	86.179	6.037
18	87.576	5.360
19	88.816	4.758
20	89.817	3.840
21	90.758	3.610
22	91.651	3.426
23	92.447	3.052

24	93.195	2.871
25	93.892	2.674
26	94.467	2.203
27	95.022	2.132
28	95.564	2.078
29	96.008	1.703
30	96.433	1.630
31	96.847	1.589
32	97.165	1.218
33	97.459	1.128
34	97.745	1.100
35	97.937	0.736
36	98.100	0.626
37	98.265	0.631
38	98.453	0.721
39	98.649	0.752
40	98.845	0.752
41	99.041	0.752
42	99.237	0.752
43	99.433	0.752
44	99.629	0.752
45	99.825	0.752
46	100.000	0.671

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UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0020	0.0006
13	0.0026	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0036	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0037	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0040	0.0031	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0069	0.0054	0.0015
146	0.0070	0.0054	0.0015
147	0.0071	0.0056	0.0016
148	0.0072	0.0056	0.0016
149	0.0074	0.0058	0.0016
150	0.0075	0.0058	0.0017
151	0.0077	0.0060	0.0017
152	0.0078	0.0061	0.0017
153	0.0080	0.0062	0.0018
154	0.0081	0.0063	0.0018
155	0.0083	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0087	0.0068	0.0019
158	0.0088	0.0069	0.0020
159	0.0091	0.0071	0.0020
160	0.0093	0.0072	0.0021
161	0.0096	0.0075	0.0021
162	0.0098	0.0076	0.0022
163	0.0101	0.0079	0.0022
164	0.0103	0.0080	0.0023
165	0.0107	0.0083	0.0024
166	0.0109	0.0085	0.0024
167	0.0114	0.0088	0.0025
168	0.0116	0.0090	0.0026
169	0.0193	0.0150	0.0043
170	0.0197	0.0153	0.0044
171	0.0205	0.0160	0.0046
172	0.0210	0.0163	0.0047
173	0.0220	0.0171	0.0049
174	0.0225	0.0175	0.0050

175	0.0236	0.0184	0.0052
176	0.0243	0.0189	0.0054
177	0.0257	0.0200	0.0057
178	0.0265	0.0206	0.0059
179	0.0282	0.0220	0.0063
180	0.0292	0.0227	0.0065
181	0.0315	0.0245	0.0070
182	0.0328	0.0255	0.0073
183	0.0359	0.0279	0.0080
184	0.0377	0.0294	0.0084
185	0.0632	0.0492	0.0140
186	0.0664	0.0492	0.0173
187	0.0743	0.0492	0.0252
188	0.0796	0.0492	0.0304
189	0.0994	0.0492	0.0503
190	0.1102	0.0492	0.0611
191	0.1490	0.0492	0.0998
192	0.1952	0.0492	0.1460
193	0.4793	0.0492	0.4302
194	0.1253	0.0492	0.0761
195	0.0858	0.0492	0.0367
196	0.0700	0.0492	0.0208
197	0.0398	0.0310	0.0088
198	0.0343	0.0267	0.0076
199	0.0303	0.0236	0.0067
200	0.0273	0.0213	0.0061
201	0.0250	0.0194	0.0055
202	0.0230	0.0179	0.0051
203	0.0214	0.0167	0.0048
204	0.0201	0.0156	0.0045
205	0.0119	0.0092	0.0026
206	0.0111	0.0087	0.0025
207	0.0105	0.0082	0.0023
208	0.0099	0.0077	0.0022
209	0.0094	0.0073	0.0021
210	0.0090	0.0070	0.0020

211	0.0086	0.0067	0.0019
212	0.0082	0.0064	0.0018
213	0.0079	0.0061	0.0018
214	0.0076	0.0059	0.0017
215	0.0073	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0040	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0039	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0031	0.0024	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0030	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0006
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0021	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.02

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.41

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 5.3272

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 3.7369

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===========================================================================

                        2 4 - H O U R   S T O R M
                      R U N O F F   H Y D R O G R A P H

===========================================================================
               HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
---------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       12.5      25.0      37.5      50.0
---------------------------------------------------------------------------
   0.083      0.0000      0.00  Q         .         .         .         .
   0.167      0.0001      0.01  Q         .         .         .         .
   0.250      0.0002      0.02  Q         .         .         .         .
   0.333      0.0004      0.03  Q         .         .         .         .
   0.417      0.0008      0.06  Q         .         .         .         .
   0.500      0.0015      0.09  Q         .         .         .         .
   0.583      0.0023      0.11  Q         .         .         .         .
   0.667      0.0032      0.13  Q         .         .         .         .
   0.750      0.0041      0.14  Q         .         .         .         .
   0.833      0.0052      0.15  Q         .         .         .         .
   0.917      0.0063      0.16  Q         .         .         .         .
   1.000      0.0074      0.17  Q         .         .         .         .
   1.083      0.0086      0.17  Q         .         .         .         .
   1.167      0.0099      0.18  Q         .         .         .         .
   1.250      0.0111      0.18  Q         .         .         .         .
   1.333      0.0124      0.19  Q         .         .         .         .
   1.417      0.0138      0.19  Q         .         .         .         .
   1.500      0.0151      0.20  Q         .         .         .         .
   1.583      0.0165      0.20  Q         .         .         .         .
   1.667      0.0179      0.20  Q         .         .         .         .
   1.750      0.0193      0.21  Q         .         .         .         .
   1.833      0.0207      0.21  Q         .         .         .         .
   1.917      0.0222      0.21  Q         .         .         .         .
   2.000      0.0237      0.21  Q         .         .         .         .
```

2.083	0.0251	0.22	Q	.	.	.	.
2.167	0.0266	0.22	Q	.	.	.	.
2.250	0.0282	0.22	Q	.	.	.	.
2.333	0.0297	0.22	Q	.	.	.	.
2.417	0.0312	0.22	Q	.	.	.	.
2.500	0.0328	0.23	Q	.	.	.	.
2.583	0.0344	0.23	Q	.	.	.	.
2.667	0.0360	0.23	Q	.	.	.	.
2.750	0.0376	0.23	Q	.	.	.	.
2.833	0.0392	0.23	Q	.	.	.	.
2.917	0.0408	0.24	Q	.	.	.	.
3.000	0.0424	0.24	Q	.	.	.	.
3.083	0.0440	0.24	Q	.	.	.	.
3.167	0.0457	0.24	Q	.	.	.	.
3.250	0.0474	0.24	Q	.	.	.	.
3.333	0.0490	0.24	Q	.	.	.	.
3.417	0.0507	0.24	Q	.	.	.	.
3.500	0.0524	0.25	Q	.	.	.	.
3.583	0.0541	0.25	Q	.	.	.	.
3.667	0.0558	0.25	Q	.	.	.	.
3.750	0.0576	0.25	Q	.	.	.	.
3.833	0.0593	0.25	Q	.	.	.	.
3.917	0.0611	0.25	Q	.	.	.	.
4.000	0.0628	0.26	Q	.	.	.	.
4.083	0.0646	0.26	Q	.	.	.	.
4.167	0.0664	0.26	Q	.	.	.	.
4.250	0.0681	0.26	Q	.	.	.	.
4.333	0.0699	0.26	Q	.	.	.	.
4.417	0.0717	0.26	Q	.	.	.	.
4.500	0.0736	0.26	Q	.	.	.	.
4.583	0.0754	0.26	Q	.	.	.	.
4.667	0.0772	0.27	Q	.	.	.	.
4.750	0.0791	0.27	Q	.	.	.	.
4.833	0.0809	0.27	Q	.	.	.	.
4.917	0.0828	0.27	Q	.	.	.	.
5.000	0.0847	0.27	Q	.	.	.	.

5.083	0.0865	0.27	Q	.	.	.	.
5.167	0.0884	0.28	Q	.	.	.	.
5.250	0.0903	0.28	Q	.	.	.	.
5.333	0.0923	0.28	Q	.	.	.	.
5.417	0.0942	0.28	QV	.	.	.	.
5.500	0.0961	0.28	QV	.	.	.	.
5.583	0.0981	0.28	QV	.	.	.	.
5.667	0.1000	0.29	QV	.	.	.	.
5.750	0.1020	0.29	QV	.	.	.	.
5.833	0.1040	0.29	QV	.	.	.	.
5.917	0.1060	0.29	QV	.	.	.	.
6.000	0.1080	0.29	QV	.	.	.	.
6.083	0.1100	0.29	QV	.	.	.	.
6.167	0.1121	0.30	QV	.	.	.	.
6.250	0.1141	0.30	QV	.	.	.	.
6.333	0.1162	0.30	QV	.	.	.	.
6.417	0.1183	0.30	QV	.	.	.	.
6.500	0.1204	0.30	QV	.	.	.	.
6.583	0.1225	0.31	QV	.	.	.	.
6.667	0.1246	0.31	QV	.	.	.	.
6.750	0.1267	0.31	QV	.	.	.	.
6.833	0.1288	0.31	QV	.	.	.	.
6.917	0.1310	0.31	QV	.	.	.	.
7.000	0.1332	0.32	QV	.	.	.	.
7.083	0.1354	0.32	QV	.	.	.	.
7.167	0.1376	0.32	QV	.	.	.	.
7.250	0.1398	0.32	QV	.	.	.	.
7.333	0.1420	0.32	QV	.	.	.	.
7.417	0.1443	0.33	QV	.	.	.	.
7.500	0.1465	0.33	QV	.	.	.	.
7.583	0.1488	0.33	QV	.	.	.	.
7.667	0.1511	0.33	QV	.	.	.	.
7.750	0.1534	0.34	QV	.	.	.	.
7.833	0.1557	0.34	QV	.	.	.	.
7.917	0.1581	0.34	QV	.	.	.	.
8.000	0.1605	0.34	QV	.	.	.	.

8.083	0.1628	0.35	QV	.	.	.	.
8.167	0.1652	0.35	QV	.	.	.	.
8.250	0.1677	0.35	QV	.	.	.	.
8.333	0.1701	0.35	QV	.	.	.	.
8.417	0.1726	0.36	QV	.	.	.	.
8.500	0.1750	0.36	QV	.	.	.	.
8.583	0.1775	0.36	QV	.	.	.	.
8.667	0.1801	0.37	QV	.	.	.	.
8.750	0.1826	0.37	QV	.	.	.	.
8.833	0.1852	0.37	QV	.	.	.	.
8.917	0.1877	0.37	Q V	.	.	.	.
9.000	0.1903	0.38	Q V	.	.	.	.
9.083	0.1930	0.38	Q V	.	.	.	.
9.167	0.1956	0.38	Q V	.	.	.	.
9.250	0.1983	0.39	Q V	.	.	.	.
9.333	0.2010	0.39	Q V	.	.	.	.
9.417	0.2037	0.39	Q V	.	.	.	.
9.500	0.2064	0.40	Q V	.	.	.	.
9.583	0.2092	0.40	Q V	.	.	.	.
9.667	0.2120	0.41	Q V	.	.	.	.
9.750	0.2148	0.41	Q V	.	.	.	.
9.833	0.2177	0.41	Q V	.	.	.	.
9.917	0.2206	0.42	Q V	.	.	.	.
10.000	0.2235	0.42	Q V	.	.	.	.
10.083	0.2264	0.43	Q V	.	.	.	.
10.167	0.2294	0.43	Q V	.	.	.	.
10.250	0.2323	0.43	Q V	.	.	.	.
10.333	0.2354	0.44	Q V	.	.	.	.
10.417	0.2384	0.44	Q V	.	.	.	.
10.500	0.2415	0.45	Q V	.	.	.	.
10.583	0.2446	0.45	Q V	.	.	.	.
10.667	0.2478	0.46	Q V	.	.	.	.
10.750	0.2510	0.46	Q V	.	.	.	.
10.833	0.2542	0.47	Q V	.	.	.	.
10.917	0.2575	0.47	Q V	.	.	.	.
11.000	0.2608	0.48	Q V	.	.	.	.

11.083	0.2641	0.48	Q V	.	.	.	.
11.167	0.2675	0.49	Q V	.	.	.	.
11.250	0.2709	0.50	Q V	.	.	.	.
11.333	0.2743	0.50	Q V	.	.	.	.
11.417	0.2778	0.51	Q V	.	.	.	.
11.500	0.2814	0.51	Q V	.	.	.	.
11.583	0.2850	0.52	Q V	.	.	.	.
11.667	0.2886	0.53	Q V	.	.	.	.
11.750	0.2923	0.53	Q V	.	.	.	.
11.833	0.2960	0.54	Q V	.	.	.	.
11.917	0.2998	0.55	Q V	.	.	.	.
12.000	0.3036	0.56	Q V	.	.	.	.
12.083	0.3075	0.56	Q V	.	.	.	.
12.167	0.3115	0.57	Q V	.	.	.	.
12.250	0.3154	0.58	Q V	.	.	.	.
12.333	0.3194	0.58	Q V	.	.	.	.
12.417	0.3235	0.58	Q V	.	.	.	.
12.500	0.3275	0.58	Q V	.	.	.	.
12.583	0.3315	0.59	Q V	.	.	.	.
12.667	0.3356	0.59	Q V	.	.	.	.
12.750	0.3398	0.60	Q V	.	.	.	.
12.833	0.3440	0.61	Q V	.	.	.	.
12.917	0.3482	0.62	Q V	.	.	.	.
13.000	0.3525	0.63	Q V	.	.	.	.
13.083	0.3569	0.64	Q V	.	.	.	.
13.167	0.3614	0.65	Q V	.	.	.	.
13.250	0.3660	0.66	Q V	.	.	.	.
13.333	0.3706	0.67	Q V	.	.	.	.
13.417	0.3753	0.69	Q V	.	.	.	.
13.500	0.3801	0.70	Q V	.	.	.	.
13.583	0.3850	0.71	Q V	.	.	.	.
13.667	0.3901	0.73	Q V	.	.	.	.
13.750	0.3952	0.75	Q V	.	.	.	.
13.833	0.4004	0.76	Q V	.	.	.	.
13.917	0.4058	0.78	Q V	.	.	.	.
14.000	0.4113	0.80	Q V	.	.	.	.

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14.083      0.4170      0.82  Q   V     .         .         .         .
14.167      0.4229      0.86  Q   V     .         .         .         .
14.250      0.4292      0.91  Q   V     .         .         .         .
14.333      0.4360      0.98  Q   V     .         .         .         .
14.417      0.4436      1.10  Q   V     .         .         .         .
14.500      0.4520      1.22  Q   V     .         .         .         .
14.583      0.4610      1.31  .Q  V     .         .         .         .
14.667      0.4707      1.40  .Q   V    .         .         .         .
14.750      0.4808      1.48  .Q   V    .         .         .         .
14.833      0.4915      1.55  .Q   V    .         .         .         .
14.917      0.5027      1.63  .Q   V    .         .         .         .
15.000      0.5145      1.71  .Q   V    .         .         .         .
15.083      0.5268      1.79  .Q   V    .         .         .         .
15.167      0.5398      1.88  .Q   V    .         .         .         .
15.250      0.5534      1.97  .Q   V    .         .         .         .
15.333      0.5677      2.08  .Q    V   .         .         .         .
15.417      0.5829      2.21  .Q    V   .         .         .         .
15.500      0.5994      2.39  .Q    V   .         .         .         .
15.583      0.6177      2.66  . Q   V   .         .         .         .
15.667      0.6390      3.09  . Q   V   .         .         .         .
15.750      0.6653      3.83  .  Q   V  .         .         .         .
15.833      0.6992      4.92  .  Q   V  .         .         .         .
15.917      0.7439      6.49  .    Q V  .         .         .         .
16.000      0.8044      8.79  .      QV .         .         .         .
16.083      0.8933     12.92  .        VQ         .         .         .
16.167      1.0226     18.77  .         V    Q    .         .         .
16.250      1.1957     25.14  .         . V       Q         .         .
16.333      1.4250     33.29  .         .    V    .     Q   .         .
16.417      1.7180     42.54  .         .       V .         .   Q     .
16.500      1.9940     40.08  .         .         .V        . Q       .
16.583      2.2150     32.08  .         .         .  V Q    .         .
16.667      2.3881     25.14  .         .         Q    V    .         .
16.750      2.5253     19.92  .         .    Q    .      V  .         .
16.833      2.6392     16.55  .         .  Q      .       V .         .
16.917      2.7364     14.11  .         .Q        .        V.         .
17.000      2.8202     12.18  .        Q.         .         V         .
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17.083      2.8943     10.76  .       Q .         .         V         .
17.167      2.9593      9.44  .      Q  .         .         .V        .
17.250      3.0174      8.43  .     Q   .         .         . V       .
17.333      3.0701      7.65  .     Q   .         .         . V       .
17.417      3.1178      6.93  .    Q    .         .         .  V      .
17.500      3.1605      6.20  .   Q     .         .         .  V      .
17.583      3.1987      5.55  .   Q     .         .         .   V     .
17.667      3.2324      4.90  .  Q      .         .         .   V     .
17.750      3.2636      4.52  .  Q      .         .         .   V     .
17.833      3.2926      4.21  .  Q      .         .         .    V    .
17.917      3.3192      3.86  .  Q      .         .         .    V    .
18.000      3.3440      3.60  . Q       .         .         .    V    .
18.083      3.3669      3.33  . Q       .         .         .     V   .
18.167      3.3876      3.01  . Q       .         .         .     V   .
18.250      3.4071      2.83  . Q       .         .         .     V   .
18.333      3.4254      2.66  . Q       .         .         .     V   .
18.417      3.4419      2.41  .Q        .         .         .     V   .
18.500      3.4575      2.26  .Q        .         .         .      V  .
18.583      3.4720      2.11  .Q        .         .         .      V  .
18.667      3.4850      1.88  .Q        .         .         .      V  .
18.750      3.4970      1.74  .Q        .         .         .      V  .
18.833      3.5082      1.63  .Q        .         .         .      V  .
18.917      3.5180      1.43  .Q        .         .         .      V  .
19.000      3.5273      1.34  .Q        .         .         .      V  .
19.083      3.5363      1.31  .Q        .         .         .      V  .
19.167      3.5454      1.32  .Q        .         .         .      V  .
19.250      3.5545      1.31  .Q        .         .         .       V .
19.333      3.5633      1.29  .Q        .         .         .       V .
19.417      3.5720      1.26  .Q        .         .         .       V .
19.500      3.5804      1.22  Q         .         .         .       V .
19.583      3.5885      1.17  Q         .         .         .       V .
19.667      3.5961      1.11  Q         .         .         .       V .
19.750      3.6032      1.02  Q         .         .         .       V .
19.833      3.6092      0.88  Q         .         .         .       V .
19.917      3.6132      0.58  Q         .         .         .       V .
20.000      3.6168      0.52  Q         .         .         .       V .
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20.083	3.6201	0.48	Q	.	.	.	V .
20.167	3.6233	0.46	Q	.	.	.	V .
20.250	3.6264	0.45	Q	.	.	.	V .
20.333	3.6294	0.44	Q	.	.	.	V .
20.417	3.6323	0.43	Q	.	.	.	V .
20.500	3.6352	0.42	Q	.	.	.	V .
20.583	3.6380	0.41	Q	.	.	.	V .
20.667	3.6407	0.40	Q	.	.	.	V .
20.750	3.6434	0.39	Q	.	.	.	V .
20.833	3.6460	0.38	Q	.	.	.	V.
20.917	3.6486	0.37	Q	.	.	.	V.
21.000	3.6511	0.37	Q	.	.	.	V.
21.083	3.6536	0.36	Q	.	.	.	V.
21.167	3.6561	0.35	Q	.	.	.	V.
21.250	3.6585	0.35	Q	.	.	.	V.
21.333	3.6608	0.34	Q	.	.	.	V.
21.417	3.6632	0.34	Q	.	.	.	V.
21.500	3.6655	0.33	Q	.	.	.	V.
21.583	3.6677	0.33	Q	.	.	.	V.
21.667	3.6700	0.32	Q	.	.	.	V.
21.750	3.6722	0.32	Q	.	.	.	V.
21.833	3.6743	0.32	Q	.	.	.	V.
21.917	3.6765	0.31	Q	.	.	.	V.
22.000	3.6786	0.31	Q	.	.	.	V.
22.083	3.6807	0.30	Q	.	.	.	V.
22.167	3.6827	0.30	Q	.	.	.	V.
22.250	3.6848	0.30	Q	.	.	.	V.
22.333	3.6868	0.29	Q	.	.	.	V.
22.417	3.6887	0.29	Q	.	.	.	V.
22.500	3.6907	0.28	Q	.	.	.	V.
22.583	3.6926	0.28	Q	.	.	.	V.
22.667	3.6946	0.28	Q	.	.	.	V.
22.750	3.6964	0.27	Q	.	.	.	V.
22.833	3.6983	0.27	Q	.	.	.	V.
22.917	3.7002	0.27	Q	.	.	.	V.
23.000	3.7020	0.27	Q	.	.	.	V.

23.083	3.7038	0.26	Q	.	.	.	V.
23.167	3.7056	0.26	Q	.	.	.	V.
23.250	3.7074	0.26	Q	.	.	.	V.
23.333	3.7091	0.25	Q	.	.	.	V.
23.417	3.7108	0.25	Q	.	.	.	V.
23.500	3.7125	0.25	Q	.	.	.	V.
23.583	3.7142	0.25	Q	.	.	.	V.
23.667	3.7159	0.24	Q	.	.	.	V.
23.750	3.7176	0.24	Q	.	.	.	V.
23.833	3.7192	0.24	Q	.	.	.	V.
23.917	3.7209	0.24	Q	.	.	.	V.
24.000	3.7225	0.23	Q	.	.	.	V.
24.083	3.7241	0.23	Q	.	.	.	V.
24.167	3.7256	0.22	Q	.	.	.	V.
24.250	3.7271	0.21	Q	.	.	.	V.
24.333	3.7284	0.19	Q	.	.	.	V.
24.417	3.7295	0.16	Q	.	.	.	V.
24.500	3.7304	0.13	Q	.	.	.	V.
24.583	3.7312	0.11	Q	.	.	.	V.
24.667	3.7318	0.09	Q	.	.	.	V.
24.750	3.7324	0.08	Q	.	.	.	V.
24.833	3.7329	0.07	Q	.	.	.	V.
24.917	3.7333	0.06	Q	.	.	.	V.
25.000	3.7337	0.06	Q	.	.	.	V.
25.083	3.7340	0.05	Q	.	.	.	V.
25.167	3.7343	0.04	Q	.	.	.	V.
25.250	3.7346	0.04	Q	.	.	.	V.
25.333	3.7349	0.04	Q	.	.	.	V.
25.417	3.7351	0.03	Q	.	.	.	V.
25.500	3.7353	0.03	Q	.	.	.	V.
25.583	3.7355	0.03	Q	.	.	.	V.
25.667	3.7356	0.02	Q	.	.	.	V.
25.750	3.7358	0.02	Q	.	.	.	V.
25.833	3.7359	0.02	Q	.	.	.	V.
25.917	3.7360	0.02	Q	.	.	.	V.
26.000	3.7361	0.02	Q	.	.	.	V.

```
  26.083      3.7362      0.01  Q         .         .         .        V.
  26.167      3.7363      0.01  Q         .         .         .        V.
  26.250      3.7364      0.01  Q         .         .         .        V.
  26.333      3.7365      0.01  Q         .         .         .        V.
  26.417      3.7365      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1585.0
10%	120.0
20%	75.0
30%	55.0
40%	40.0
50%	30.0
60%	20.0
70%	20.0
80%	10.0
90%	10.0

```
****************************************************************************
  FLOW PROCESS FROM NODE   3005.00 TO NODE   3005.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>STREAM NUMBER 1 ADDED TO STREAM NUMBER 3<<<<<
============================================================================


****************************************************************************
  FLOW PROCESS FROM NODE   3005.00 TO NODE   3005.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>VIEW STREAM NUMBER 3 HYDROGRAPH<<<<<
```

```
============================================================================

            STREAM HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

        (Note: Time indicated is at END of Each Unit Intervals)

----------------------------------------------------------------------------

 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       15.0      30.0      45.0      60.0

----------------------------------------------------------------------------

  14.000      1.3540      2.54  .Q  V     .         .         .         .

  14.083      1.3718      2.59  .Q  V     .         .         .         .

  14.167      1.3901      2.65  .Q  V     .         .         .         .

  14.250      1.4089      2.73  .Q  V     .         .         .         .

  14.333      1.4284      2.83  .Q  V     .         .         .         .

  14.417      1.4489      2.98  .Q  V     .         .         .         .

  14.500      1.4705      3.14  . Q V     .         .         .         .

  14.583      1.4931      3.28  . Q V     .         .         .         .

  14.667      1.5167      3.42  . Q V     .         .         .         .

  14.750      1.5412      3.57  . Q V     .         .         .         .

  14.833      1.5668      3.72  . Q V     .         .         .         .

  14.917      1.5936      3.88  . Q V     .         .         .         .

  15.000      1.6215      4.06  . Q V     .         .         .         .

  15.083      1.6507      4.24  . Q V     .         .         .         .

  15.167      1.6813      4.43  . Q  V    .         .         .         .

  15.250      1.7132      4.64  .  Q V    .         .         .         .

  15.333      1.7467      4.86  .  Q V    .         .         .         .

  15.417      1.7820      5.12  .  Q V    .         .         .         .

  15.500      1.8194      5.43  .  Q V    .         .         .         .

  15.583      1.8597      5.84  .  Q V    .         .         .         .

  15.667      1.9039      6.42  .   QV    .         .         .         .

  15.750      1.9544      7.33  .   QV    .         .         .         .

  15.833      2.0137      8.62  .    QV   .         .         .         .

  15.917      2.0856     10.44  .     Q   .         .         .         .

  16.000      2.1755     13.05  .     V Q .         .         .         .

  16.083      2.2967     17.59  .     V   .Q        .         .         .

  16.167      2.4620     24.00  .      V  .    Q    .         .         .

  16.250      2.6764     31.14  .       V .         Q         .         .

  16.333      2.9546     40.39  .       V .         .     Q   .         .
```

```
16.417      3.3070     51.17  .        V.         .         .   Q     .
16.500      3.6567     50.77  .         V         .         .  Q      .
16.583      3.9692     45.39  .         .V        .         Q         .
16.667      4.2545     41.42  .         . V       .      Q  .         .
16.750      4.5239     39.11  .         .  V      .     Q   .         .
16.833      4.7872     38.23  .         .   V     .    Q    .         .
16.917      5.0468     37.69  .         .    V    .    Q    .         .
17.000      5.3022     37.09  .         .    V    .   Q     .         .
17.083      5.5539     36.54  .         .     V   .   Q     .         .
17.167      5.8000     35.74  .         .      V  .  Q      .         .
17.250      6.0410     35.00  .         .       V .  Q      .         .
17.333      6.2773     34.30  .         .       V . Q       .         .
17.417      6.5080     33.51  .         .        V. Q       .         .
17.500      6.7326     32.60  .         .         VQ        .         .
17.583      6.9508     31.69  .         .         VQ        .         .
17.667      7.1621     30.68  .         .         QV        .         .
17.750      7.3679     29.89  .         .        Q. V       .         .
17.833      7.5684     29.10  .         .        Q. V       .         .
17.917      7.7630     28.26  .         .       Q .  V      .         .
18.000      7.9521     27.46  .         .       Q .  V      .         .
18.083      8.1356     26.65  .         .      Q  .   V     .         .
18.167      8.3130     25.76  .         .      Q  .    V    .         .
18.250      8.4852     25.01  .         .     Q   .    V    .         .
18.333      8.6523     24.25  .         .     Q   .     V   .         .
18.417      8.8135     23.41  .         .    Q    .     V   .         .
18.500      8.9696     22.67  .         .    Q    .     V   .         .
18.583      9.1206     21.93  .         .   Q     .      V  .         .
18.667      9.2661     21.12  .         .   Q     .      V  .         .
18.750      9.4066     20.41  .         .  Q      .       V .         .
18.833      9.5424     19.72  .         .  Q      .       V .         .
18.917      9.6730     18.97  .         . Q       .        V.         .
19.000      9.7993     18.33  .         . Q       .        V.         .
19.083      9.9217     17.77  .         .Q        .        V.         .
19.167     10.0406     17.26  .         .Q        .         V         .
19.250     10.1560     16.75  .         .Q        .         V         .
19.333     10.2678     16.24  .         Q         .         V         .
```

```
19.417     10.3761     15.73  .         Q         .         .V         .
19.500     10.4810     15.22  .         Q         .         .V         .
19.583     10.5823     14.71  .        Q.         .         .V         .
19.667     10.6801     14.20  .        Q.         .         . V        .
19.750     10.7742     13.66  .        Q.         .         . V        .
19.833     10.8642     13.08  .       Q .         .         . V        .
19.917     10.9492     12.34  .       Q .         .         . V        .
20.000     11.0310     11.87  .      Q  .         .         .  V       .
--------------------------------------------------------------------------------
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1205.0
10%	395.0
20%	270.0
30%	205.0
40%	155.0
50%	120.0
60%	85.0
70%	50.0
80%	20.0
90%	10.0

==

END OF FLOODSCx ROUTING ANALYSIS

```
****************************************************************************

              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
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                         Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED Q - EXISTING - SAUH                                            *
* 2022-09-30                                                               *
 **************************************************************************

  FILE NAME: 87_Q_EX.DAT
  TIME/DATE OF STUDY: 08:55 09/30/2022


****************************************************************************
  FLOW PROCESS FROM NODE   4000.00 TO NODE   4005.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =     239.500 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.740 HOURS
```

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.590

LOW LOSS FRACTION = 0.778

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.17

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.989

30-MINUTE FACTOR = 0.989

1-HOUR FACTOR = 0.989

3-HOUR FACTOR = 0.998

6-HOUR FACTOR = 0.999

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 11.261

==

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.495	14.352
2	1.843	39.038
3	4.004	62.578
4	6.997	86.703

5	11.264	123.581
6	18.577	211.837
7	29.346	311.894
8	39.333	289.279
9	47.252	229.358
10	53.631	184.765
11	58.705	146.991
12	62.701	115.742
13	66.050	96.999
14	68.973	84.645
15	71.616	76.565
16	73.881	65.613
17	75.897	58.390
18	77.796	55.010
19	79.400	46.445
20	80.886	43.057
21	82.232	38.985
22	83.449	35.225
23	84.622	33.977
24	85.705	31.392
25	86.756	30.433
26	87.673	26.557
27	88.559	25.673
28	89.281	20.900
29	89.956	19.562
30	90.604	18.753
31	91.234	18.261
32	91.827	17.160
33	92.368	15.668
34	92.897	15.337
35	93.395	14.408
36	93.877	13.975
37	94.275	11.534
38	94.658	11.092
39	95.041	11.087
40	95.424	11.087

41	95.758	9.685
42	96.051	8.475
43	96.344	8.490
44	96.637	8.480
45	96.913	8.007
46	97.123	6.079
47	97.326	5.877
48	97.528	5.857
49	97.730	5.837
50	97.874	4.190
51	97.987	3.255
52	98.099	3.265
53	98.212	3.255
54	98.330	3.436
55	98.465	3.888
56	98.600	3.909
57	98.735	3.918
58	98.870	3.918
59	99.005	3.908
60	99.140	3.908
61	99.275	3.908
62	99.410	3.908
63	99.545	3.908
64	99.680	3.908
65	99.815	3.908
66	99.950	3.908
67	100.000	1.460

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0020	0.0006
13	0.0027	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0038	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0040	0.0031	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0069	0.0054	0.0015
146	0.0070	0.0054	0.0016
147	0.0072	0.0056	0.0016
148	0.0073	0.0056	0.0016
149	0.0074	0.0058	0.0016
150	0.0075	0.0059	0.0017
151	0.0077	0.0060	0.0017
152	0.0078	0.0061	0.0017
153	0.0080	0.0062	0.0018
154	0.0081	0.0063	0.0018
155	0.0084	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0087	0.0068	0.0019
158	0.0089	0.0069	0.0020
159	0.0092	0.0071	0.0020
160	0.0093	0.0072	0.0021
161	0.0096	0.0075	0.0021
162	0.0098	0.0076	0.0022
163	0.0101	0.0079	0.0023
164	0.0103	0.0080	0.0023
165	0.0107	0.0084	0.0024
166	0.0109	0.0085	0.0024
167	0.0114	0.0089	0.0025
168	0.0117	0.0091	0.0026
169	0.0197	0.0154	0.0044
170	0.0201	0.0157	0.0045
171	0.0210	0.0163	0.0047
172	0.0214	0.0167	0.0048
173	0.0224	0.0174	0.0050
174	0.0229	0.0178	0.0051

175	0.0241	0.0188	0.0054
176	0.0248	0.0193	0.0055
177	0.0262	0.0204	0.0058
178	0.0270	0.0210	0.0060
179	0.0288	0.0224	0.0064
180	0.0298	0.0231	0.0066
181	0.0320	0.0249	0.0071
182	0.0334	0.0260	0.0074
183	0.0365	0.0284	0.0081
184	0.0383	0.0298	0.0085
185	0.0610	0.0474	0.0135
186	0.0642	0.0492	0.0150
187	0.0720	0.0492	0.0228
188	0.0772	0.0492	0.0280
189	0.1003	0.0492	0.0511
190	0.1111	0.0492	0.0619
191	0.1496	0.0492	0.1005
192	0.1956	0.0492	0.1464
193	0.4749	0.0492	0.4257
194	0.1260	0.0492	0.0769
195	0.0834	0.0492	0.0342
196	0.0677	0.0492	0.0185
197	0.0404	0.0314	0.0090
198	0.0348	0.0271	0.0077
199	0.0308	0.0240	0.0068
200	0.0278	0.0217	0.0062
201	0.0254	0.0198	0.0056
202	0.0235	0.0183	0.0052
203	0.0219	0.0170	0.0049
204	0.0205	0.0160	0.0046
205	0.0119	0.0093	0.0026
206	0.0112	0.0087	0.0025
207	0.0105	0.0082	0.0023
208	0.0100	0.0078	0.0022
209	0.0095	0.0074	0.0021
210	0.0090	0.0070	0.0020

211	0.0086	0.0067	0.0019
212	0.0083	0.0064	0.0018
213	0.0079	0.0062	0.0018
214	0.0076	0.0059	0.0017
215	0.0073	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0040	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0039	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0031	0.0025	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0031	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0006
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0022	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.02

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.40

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 40.3962

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 28.0135

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	75.0	150.0	225.0	300.0
0.083	0.0001	0.01	Q	.	.	.	.
0.167	0.0003	0.03	Q	.	.	.	.
0.250	0.0007	0.06	Q	.	.	.	.
0.333	0.0015	0.11	Q	.	.	.	.
0.417	0.0028	0.18	Q	.	.	.	.
0.500	0.0048	0.30	Q	.	.	.	.
0.583	0.0081	0.48	Q	.	.	.	.
0.667	0.0125	0.64	Q	.	.	.	.
0.750	0.0179	0.77	Q	.	.	.	.
0.833	0.0239	0.88	Q	.	.	.	.
0.917	0.0306	0.96	Q	.	.	.	.
1.000	0.0377	1.03	Q	.	.	.	.
1.083	0.0452	1.09	Q	.	.	.	.
1.167	0.0531	1.14	Q	.	.	.	.
1.250	0.0613	1.19	Q	.	.	.	.
1.333	0.0698	1.23	Q	.	.	.	.
1.417	0.0785	1.27	Q	.	.	.	.
1.500	0.0875	1.31	Q	.	.	.	.
1.583	0.0967	1.34	Q	.	.	.	.
1.667	0.1062	1.37	Q	.	.	.	.
1.750	0.1158	1.40	Q	.	.	.	.
1.833	0.1256	1.42	Q	.	.	.	.
1.917	0.1356	1.45	Q	.	.	.	.
2.000	0.1457	1.47	Q	.	.	.	.

2.083	0.1560	1.50	Q	.	.	.	.
2.167	0.1664	1.52	Q	.	.	.	.
2.250	0.1770	1.54	Q	.	.	.	.
2.333	0.1877	1.56	Q	.	.	.	.
2.417	0.1986	1.57	Q	.	.	.	.
2.500	0.2095	1.59	Q	.	.	.	.
2.583	0.2206	1.61	Q	.	.	.	.
2.667	0.2318	1.63	Q	.	.	.	.
2.750	0.2432	1.64	Q	.	.	.	.
2.833	0.2546	1.66	Q	.	.	.	.
2.917	0.2661	1.68	Q	.	.	.	.
3.000	0.2778	1.69	Q	.	.	.	.
3.083	0.2895	1.71	Q	.	.	.	.
3.167	0.3013	1.72	Q	.	.	.	.
3.250	0.3133	1.73	Q	.	.	.	.
3.333	0.3253	1.75	Q	.	.	.	.
3.417	0.3375	1.76	Q	.	.	.	.
3.500	0.3497	1.78	Q	.	.	.	.
3.583	0.3620	1.79	Q	.	.	.	.
3.667	0.3744	1.80	Q	.	.	.	.
3.750	0.3869	1.82	Q	.	.	.	.
3.833	0.3995	1.83	Q	.	.	.	.
3.917	0.4122	1.84	Q	.	.	.	.
4.000	0.4250	1.85	Q	.	.	.	.
4.083	0.4378	1.87	Q	.	.	.	.
4.167	0.4508	1.88	Q	.	.	.	.
4.250	0.4638	1.89	Q	.	.	.	.
4.333	0.4769	1.90	Q	.	.	.	.
4.417	0.4901	1.91	Q	.	.	.	.
4.500	0.5033	1.93	Q	.	.	.	.
4.583	0.5167	1.94	Q	.	.	.	.
4.667	0.5301	1.95	Q	.	.	.	.
4.750	0.5436	1.96	Q	.	.	.	.
4.833	0.5572	1.98	Q	.	.	.	.
4.917	0.5709	1.99	Q	.	.	.	.
5.000	0.5847	2.00	Q	.	.	.	.

5.083	0.5986	2.01	Q	.	.	.	.
5.167	0.6125	2.03	Q	.	.	.	.
5.250	0.6266	2.04	Q	.	.	.	.
5.333	0.6407	2.05	Q	.	.	.	.
5.417	0.6550	2.07	Q	.	.	.	.
5.500	0.6693	2.08	Q	.	.	.	.
5.583	0.6838	2.10	Q	.	.	.	.
5.667	0.6983	2.11	Q	.	.	.	.
5.750	0.7129	2.12	QV	.	.	.	.
5.833	0.7276	2.13	QV	.	.	.	.
5.917	0.7423	2.14	QV	.	.	.	.
6.000	0.7572	2.16	QV	.	.	.	.
6.083	0.7721	2.17	QV	.	.	.	.
6.167	0.7872	2.18	QV	.	.	.	.
6.250	0.8023	2.20	QV	.	.	.	.
6.333	0.8175	2.21	QV	.	.	.	.
6.417	0.8328	2.22	QV	.	.	.	.
6.500	0.8482	2.24	QV	.	.	.	.
6.583	0.8638	2.25	QV	.	.	.	.
6.667	0.8794	2.27	QV	.	.	.	.
6.750	0.8951	2.28	QV	.	.	.	.
6.833	0.9109	2.30	QV	.	.	.	.
6.917	0.9268	2.31	QV	.	.	.	.
7.000	0.9428	2.33	QV	.	.	.	.
7.083	0.9589	2.34	QV	.	.	.	.
7.167	0.9751	2.36	QV	.	.	.	.
7.250	0.9915	2.37	QV	.	.	.	.
7.333	1.0079	2.39	QV	.	.	.	.
7.417	1.0245	2.40	QV	.	.	.	.
7.500	1.0412	2.42	QV	.	.	.	.
7.583	1.0579	2.44	QV	.	.	.	.
7.667	1.0748	2.45	QV	.	.	.	.
7.750	1.0919	2.47	QV	.	.	.	.
7.833	1.1090	2.49	QV	.	.	.	.
7.917	1.1263	2.51	QV	.	.	.	.
8.000	1.1437	2.53	QV	.	.	.	.

8.083	1.1612	2.54	QV	.	.	.	.
8.167	1.1789	2.56	QV	.	.	.	.
8.250	1.1967	2.58	QV	.	.	.	.
8.333	1.2146	2.60	QV	.	.	.	.
8.417	1.2326	2.62	QV	.	.	.	.
8.500	1.2508	2.64	QV	.	.	.	.
8.583	1.2692	2.66	QV	.	.	.	.
8.667	1.2876	2.68	QV	.	.	.	.
8.750	1.3063	2.70	QV	.	.	.	.
8.833	1.3251	2.73	QV	.	.	.	.
8.917	1.3440	2.75	QV	.	.	.	.
9.000	1.3631	2.77	QV	.	.	.	.
9.083	1.3823	2.79	QV	.	.	.	.
9.167	1.4017	2.82	Q V	.	.	.	.
9.250	1.4213	2.84	Q V	.	.	.	.
9.333	1.4410	2.87	Q V	.	.	.	.
9.417	1.4609	2.89	Q V	.	.	.	.
9.500	1.4810	2.92	Q V	.	.	.	.
9.583	1.5013	2.94	Q V	.	.	.	.
9.667	1.5217	2.97	Q V	.	.	.	.
9.750	1.5423	2.99	Q V	.	.	.	.
9.833	1.5632	3.02	Q V	.	.	.	.
9.917	1.5842	3.05	Q V	.	.	.	.
10.000	1.6054	3.08	Q V	.	.	.	.
10.083	1.6268	3.11	Q V	.	.	.	.
10.167	1.6484	3.14	Q V	.	.	.	.
10.250	1.6702	3.17	Q V	.	.	.	.
10.333	1.6922	3.20	Q V	.	.	.	.
10.417	1.7145	3.23	Q V	.	.	.	.
10.500	1.7370	3.26	Q V	.	.	.	.
10.583	1.7597	3.30	Q V	.	.	.	.
10.667	1.7826	3.33	Q V	.	.	.	.
10.750	1.8058	3.37	Q V	.	.	.	.
10.833	1.8293	3.40	Q V	.	.	.	.
10.917	1.8530	3.44	Q V	.	.	.	.
11.000	1.8769	3.48	Q V	.	.	.	.

11.083	1.9011	3.52	Q V	.	.	.	.
11.167	1.9256	3.56	Q V	.	.	.	.
11.250	1.9504	3.60	Q V	.	.	.	.
11.333	1.9755	3.64	Q V	.	.	.	.
11.417	2.0008	3.68	Q V	.	.	.	.
11.500	2.0265	3.73	Q V	.	.	.	.
11.583	2.0525	3.77	Q V	.	.	.	.
11.667	2.0788	3.82	Q V	.	.	.	.
11.750	2.1054	3.87	Q V	.	.	.	.
11.833	2.1324	3.92	Q V	.	.	.	.
11.917	2.1597	3.97	Q V	.	.	.	.
12.000	2.1874	4.02	Q V	.	.	.	.
12.083	2.2154	4.07	Q V	.	.	.	.
12.167	2.2438	4.12	Q V	.	.	.	.
12.250	2.2726	4.17	Q V	.	.	.	.
12.333	2.3016	4.22	Q V	.	.	.	.
12.417	2.3310	4.26	Q V	.	.	.	.
12.500	2.3606	4.30	Q V	.	.	.	.
12.583	2.3903	4.32	Q V	.	.	.	.
12.667	2.4203	4.35	Q V	.	.	.	.
12.750	2.4504	4.38	Q V	.	.	.	.
12.833	2.4809	4.43	Q V	.	.	.	.
12.917	2.5118	4.48	Q V	.	.	.	.
13.000	2.5431	4.54	Q V	.	.	.	.
13.083	2.5748	4.61	Q V	.	.	.	.
13.167	2.6070	4.68	Q V	.	.	.	.
13.250	2.6397	4.75	Q V	.	.	.	.
13.333	2.6730	4.83	Q V	.	.	.	.
13.417	2.7069	4.92	Q V	.	.	.	.
13.500	2.7413	5.00	Q V	.	.	.	.
13.583	2.7764	5.10	Q V	.	.	.	.
13.667	2.8122	5.20	Q V	.	.	.	.
13.750	2.8488	5.30	Q V	.	.	.	.
13.833	2.8860	5.41	Q V	.	.	.	.
13.917	2.9241	5.53	Q V	.	.	.	.
14.000	2.9631	5.66	Q V	.	.	.	.

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14.083      3.0031      5.81  Q   V     .         .         .         .
14.167      3.0446      6.02  Q   V     .         .         .         .
14.250      3.0878      6.27  Q   V     .         .         .         .
14.333      3.1331      6.58  Q   V     .         .         .         .
14.417      3.1811      6.97  Q   V     .         .         .         .
14.500      3.2329      7.51  .Q  V     .         .         .         .
14.583      3.2897      8.25  .Q  V     .         .         .         .
14.667      3.3515      8.98  .Q  V     .         .         .         .
14.750      3.4178      9.63  .Q  V     .         .         .         .
14.833      3.4883     10.24  .Q  V     .         .         .         .
14.917      3.5628     10.82  .Q   V    .         .         .         .
15.000      3.6412     11.38  .Q   V    .         .         .         .
15.083      3.7234     11.94  .Q   V    .         .         .         .
15.167      3.8097     12.53  .Q   V    .         .         .         .
15.250      3.9003     13.15  .Q   V    .         .         .         .
15.333      3.9955     13.81  .Q   V    .         .         .         .
15.417      4.0959     14.59  .Q   V    .         .         .         .
15.500      4.2031     15.55  . Q   V   .         .         .         .
15.583      4.3189     16.81  . Q   V   .         .         .         .
15.667      4.4464     18.52  . Q   V   .         .         .         .
15.750      4.5918     21.11  . Q   V   .         .         .         .
15.833      4.7652     25.17  .  Q  V   .         .         .         .
15.917      4.9824     31.54  .   Q  V  .         .         .         .
16.000      5.2656     41.13  .    Q V  .         .         .         .
16.083      5.6699     58.71  .      QV .         .         .         .
16.167      6.2387     82.59  .       V .Q        .         .         .
16.250      6.9875    108.72  .        V.   Q     .         .         .
16.333      7.9299    136.84  .         .V      Q .         .         .
16.417      9.1070    170.91  .         .  V      . Q       .         .
16.500     10.5988    216.61  .         .    V    .       Q .         .
16.583     12.3353    252.14  .         .      V  .         .  Q      .
16.667     13.9603    235.95  .         .        V.         .Q        .
16.750     15.3402    200.36  .         .         .V     Q  .         .
16.833     16.4976    168.06  .         .         . QV      .         .
16.917     17.4610    139.88  .         .       Q .   V     .         .
17.000     18.2679    117.17  .         .    Q    .     V   .         .
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17.083     18.9671   101.52 .         .  Q      .      V  .         .
17.167     19.5880    90.16 .         . Q       .      V  .         .
17.250     20.1485    81.38 .         Q         .       V .         .
17.333     20.6497    72.77 .        Q.         .        V.         .
17.417     21.1044    66.02 .       Q .         .         V         .
17.500     21.5228    60.76 .       Q .         .         V         .
17.583     21.8970    54.32 .      Q  .         .         .V        .
17.667     22.2408    49.93 .     Q   .         .         .V        .
17.750     22.5569    45.90 .     Q   .         .         . V       .
17.833     22.8488    42.38 .    Q    .         .         . V       .
17.917     23.1241    39.97 .    Q    .         .         .  V      .
18.000     23.3809    37.29 .   Q     .         .         .  V      .
18.083     23.6229    35.14 .   Q     .         .         .  V      .
18.167     23.8446    32.19 .   Q     .         .         .   V     .
18.250     24.0524    30.17 .   Q     .         .         .   V     .
18.333     24.2399    27.23 .  Q      .         .         .   V     .
18.417     24.4162    25.60 .  Q      .         .         .   V     .
18.500     24.5842    24.40 .  Q      .         .         .    V    .
18.583     24.7451    23.37 .  Q      .         .         .    V    .
18.667     24.8981    22.21 . Q       .         .         .    V    .
18.750     25.0424    20.95 . Q       .         .         .    V    .
18.833     25.1808    20.09 . Q       .         .         .    V    .
18.917     25.3120    19.06 . Q       .         .         .     V   .
19.000     25.4369    18.14 . Q       .         .         .     V   .
19.083     25.5519    16.69 . Q       .         .         .     V   .
19.167     25.6619    15.97 . Q       .         .         .     V   .
19.250     25.7683    15.46 . Q       .         .         .     V   .
19.333     25.8709    14.89 .Q        .         .         .     V   .
19.417     25.9666    13.90 .Q        .         .         .      V  .
19.500     26.0562    13.01 .Q        .         .         .      V  .
19.583     26.1426    12.56 .Q        .         .         .      V  .
19.667     26.2257    12.06 .Q        .         .         .      V  .
19.750     26.3040    11.37 .Q        .         .         .      V  .
19.833     26.3748    10.27 .Q        .         .         .      V  .
19.917     26.4421     9.77 .Q        .         .         .      V  .
20.000     26.5066     9.37 .Q        .         .         .      V  .
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20.083	26.5679	8.90	.Q	.	.	.	V .
20.167	26.6229	7.98	.Q	.	.	.	V .
20.250	26.6738	7.39	Q	.	.	.	V .
20.333	26.7235	7.22	Q	.	.	.	V .
20.417	26.7726	7.14	Q	.	.	.	V .
20.500	26.8220	7.16	Q	.	.	.	V .
20.583	26.8721	7.27	Q	.	.	.	V .
20.667	26.9218	7.22	Q	.	.	.	V .
20.750	26.9710	7.15	Q	.	.	.	V .
20.833	27.0197	7.07	Q	.	.	.	V .
20.917	27.0677	6.97	Q	.	.	.	V .
21.000	27.1150	6.86	Q	.	.	.	V .
21.083	27.1614	6.74	Q	.	.	.	V .
21.167	27.2068	6.60	Q	.	.	.	V .
21.250	27.2509	6.39	Q	.	.	.	V .
21.333	27.2931	6.13	Q	.	.	.	V .
21.417	27.3328	5.76	Q	.	.	.	V.
21.500	27.3688	5.22	Q	.	.	.	V.
21.583	27.3959	3.93	Q	.	.	.	V.
21.667	27.4172	3.09	Q	.	.	.	V.
21.750	27.4369	2.87	Q	.	.	.	V.
21.833	27.4558	2.74	Q	.	.	.	V.
21.917	27.4741	2.66	Q	.	.	.	V.
22.000	27.4921	2.60	Q	.	.	.	V.
22.083	27.5096	2.55	Q	.	.	.	V.
22.167	27.5268	2.50	Q	.	.	.	V.
22.250	27.5437	2.45	Q	.	.	.	V.
22.333	27.5602	2.40	Q	.	.	.	V.
22.417	27.5765	2.36	Q	.	.	.	V.
22.500	27.5925	2.32	Q	.	.	.	V.
22.583	27.6082	2.28	Q	.	.	.	V.
22.667	27.6237	2.25	Q	.	.	.	V.
22.750	27.6390	2.22	Q	.	.	.	V.
22.833	27.6541	2.19	Q	.	.	.	V.
22.917	27.6691	2.17	Q	.	.	.	V.
23.000	27.6838	2.14	Q	.	.	.	V.

23.083	27.6983	2.11	Q	.	.	.	V.
23.167	27.7127	2.09	Q	.	.	.	V.
23.250	27.7269	2.06	Q	.	.	.	V.
23.333	27.7410	2.04	Q	.	.	.	V.
23.417	27.7549	2.02	Q	.	.	.	V.
23.500	27.7686	1.99	Q	.	.	.	V.
23.583	27.7822	1.97	Q	.	.	.	V.
23.667	27.7956	1.95	Q	.	.	.	V.
23.750	27.8089	1.93	Q	.	.	.	V.
23.833	27.8220	1.91	Q	.	.	.	V.
23.917	27.8350	1.89	Q	.	.	.	V.
24.000	27.8479	1.87	Q	.	.	.	V.
24.083	27.8606	1.84	Q	.	.	.	V.
24.167	27.8730	1.80	Q	.	.	.	V.
24.250	27.8851	1.75	Q	.	.	.	V.
24.333	27.8967	1.68	Q	.	.	.	V.
24.417	27.9077	1.60	Q	.	.	.	V.
24.500	27.9178	1.47	Q	.	.	.	V.
24.583	27.9266	1.28	Q	.	.	.	V.
24.667	27.9342	1.10	Q	.	.	.	V.
24.750	27.9408	0.96	Q	.	.	.	V.
24.833	27.9467	0.85	Q	.	.	.	V.
24.917	27.9519	0.76	Q	.	.	.	V.
25.000	27.9567	0.69	Q	.	.	.	V.
25.083	27.9610	0.63	Q	.	.	.	V.
25.167	27.9650	0.58	Q	.	.	.	V.
25.250	27.9686	0.53	Q	.	.	.	V.
25.333	27.9719	0.49	Q	.	.	.	V.
25.417	27.9750	0.45	Q	.	.	.	V.
25.500	27.9778	0.41	Q	.	.	.	V.
25.583	27.9805	0.38	Q	.	.	.	V.
25.667	27.9829	0.35	Q	.	.	.	V.
25.750	27.9852	0.33	Q	.	.	.	V.
25.833	27.9873	0.31	Q	.	.	.	V.
25.917	27.9893	0.28	Q	.	.	.	V.
26.000	27.9911	0.26	Q	.	.	.	V.

26.083	27.9928	0.24	Q	.	.	.	V.
26.167	27.9943	0.23	Q	.	.	.	V.
26.250	27.9958	0.21	Q	.	.	.	V.
26.333	27.9971	0.20	Q	.	.	.	V.
26.417	27.9984	0.18	Q	.	.	.	V.
26.500	27.9996	0.17	Q	.	.	.	V.
26.583	28.0007	0.16	Q	.	.	.	V.
26.667	28.0017	0.15	Q	.	.	.	V.
26.750	28.0027	0.14	Q	.	.	.	V.
26.833	28.0036	0.13	Q	.	.	.	V.
26.917	28.0044	0.12	Q	.	.	.	V.
27.000	28.0052	0.11	Q	.	.	.	V.
27.083	28.0059	0.10	Q	.	.	.	V.
27.167	28.0065	0.10	Q	.	.	.	V.
27.250	28.0072	0.09	Q	.	.	.	V.
27.333	28.0077	0.08	Q	.	.	.	V.
27.417	28.0082	0.08	Q	.	.	.	V.
27.500	28.0087	0.07	Q	.	.	.	V.
27.583	28.0092	0.07	Q	.	.	.	V.
27.667	28.0096	0.06	Q	.	.	.	V.
27.750	28.0100	0.05	Q	.	.	.	V.
27.833	28.0103	0.05	Q	.	.	.	V.
27.917	28.0106	0.05	Q	.	.	.	V.
28.000	28.0109	0.04	Q	.	.	.	V.
28.083	28.0112	0.04	Q	.	.	.	V.
28.167	28.0115	0.04	Q	.	.	.	V.
28.250	28.0117	0.04	Q	.	.	.	V.
28.333	28.0119	0.03	Q	.	.	.	V.
28.417	28.0122	0.03	Q	.	.	.	V.
28.500	28.0124	0.03	Q	.	.	.	V.
28.583	28.0125	0.03	Q	.	.	.	V.
28.667	28.0127	0.02	Q	.	.	.	V.
28.750	28.0128	0.02	Q	.	.	.	V.
28.833	28.0130	0.02	Q	.	.	.	V.
28.917	28.0131	0.02	Q	.	.	.	V.
29.000	28.0132	0.01	Q	.	.	.	V.

```
   29.083     28.0133      0.01  Q         .         .         .        V.
   29.167     28.0133      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
              0%                              1750.0
             10%                               155.0
             20%                                95.0
             30%                                70.0
             40%                                55.0
             50%                                40.0
             60%                                30.0
             70%                                20.0
             80%                                15.0
             90%                                10.0
 ============================================================================

   END OF FLOODSCx ROUTING ANALYSIS
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              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
         (c) Copyright 1989-2015 Advanced Engineering Software (aes)
            Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                         Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED Q - PROPOSED - UH                                              *
* 2022-10-03                                                               *
 **************************************************************************

  FILE NAME: 87_Q_PR.DAT
  TIME/DATE OF STUDY: 11:29 10/03/2022



****************************************************************************
  FLOW PROCESS FROM NODE   4000.00 TO NODE   4005.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =     132.800 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.680 HOURS
```

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.504

LOW LOSS FRACTION = 0.686

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.16

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.994

30-MINUTE FACTOR = 0.994

1-HOUR FACTOR = 0.994

3-HOUR FACTOR = 0.999

6-HOUR FACTOR = 1.000

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 12.255

==

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.539	8.660
2	2.088	24.881
3	4.599	40.318
4	8.114	56.451

5	13.806	91.422
6	23.543	156.383
7	35.271	188.363
8	44.798	152.994
9	52.148	118.049
10	57.979	93.649
11	62.429	71.478
12	66.092	58.817
13	69.256	50.826
14	72.072	45.216
15	74.463	38.406
16	76.607	34.440
17	78.569	31.498
18	80.209	26.344
19	81.766	25.013
20	83.109	21.562
21	84.406	20.833
22	85.594	19.083
23	86.740	18.401
24	87.739	16.050
25	88.687	15.214
26	89.450	12.261
27	90.180	11.721
28	90.873	11.127
29	91.549	10.871
30	92.153	9.693
31	92.737	9.384
32	93.285	8.803
33	93.817	8.534
34	94.258	7.093
35	94.675	6.693
36	95.092	6.691
37	95.505	6.632
38	95.849	5.524
39	96.167	5.119
40	96.486	5.112

41	96.803	5.094
42	97.054	4.034
43	97.275	3.548
44	97.495	3.543
45	97.715	3.527
46	97.876	2.585
47	97.998	1.966
48	98.121	1.966
49	98.244	1.971
50	98.379	2.181
51	98.526	2.360
52	98.673	2.360
53	98.820	2.360
54	98.968	2.370
55	99.114	2.355
56	99.261	2.355
57	99.408	2.355
58	99.554	2.355
59	99.701	2.355
60	99.847	2.355
61	99.994	2.355
62	100.000	0.095

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0017	0.0008
2	0.0025	0.0017	0.0008
3	0.0025	0.0017	0.0008
4	0.0025	0.0017	0.0008
5	0.0026	0.0018	0.0008
6	0.0026	0.0018	0.0008
7	0.0026	0.0018	0.0008
8	0.0026	0.0018	0.0008
9	0.0026	0.0018	0.0008
10	0.0026	0.0018	0.0008
11	0.0026	0.0018	0.0008
12	0.0026	0.0018	0.0008
13	0.0026	0.0018	0.0008
14	0.0027	0.0018	0.0008
15	0.0027	0.0018	0.0008
16	0.0027	0.0018	0.0008
17	0.0027	0.0019	0.0008
18	0.0027	0.0019	0.0008
19	0.0027	0.0019	0.0009
20	0.0027	0.0019	0.0009
21	0.0027	0.0019	0.0009
22	0.0028	0.0019	0.0009
23	0.0028	0.0019	0.0009
24	0.0028	0.0019	0.0009
25	0.0028	0.0019	0.0009
26	0.0028	0.0019	0.0009
27	0.0028	0.0019	0.0009
28	0.0028	0.0019	0.0009
29	0.0029	0.0020	0.0009
30	0.0029	0.0020	0.0009

31	0.0029	0.0020	0.0009
32	0.0029	0.0020	0.0009
33	0.0029	0.0020	0.0009
34	0.0029	0.0020	0.0009
35	0.0029	0.0020	0.0009
36	0.0029	0.0020	0.0009
37	0.0030	0.0020	0.0009
38	0.0030	0.0020	0.0009
39	0.0030	0.0021	0.0009
40	0.0030	0.0021	0.0009
41	0.0030	0.0021	0.0010
42	0.0030	0.0021	0.0010
43	0.0031	0.0021	0.0010
44	0.0031	0.0021	0.0010
45	0.0031	0.0021	0.0010
46	0.0031	0.0021	0.0010
47	0.0031	0.0021	0.0010
48	0.0031	0.0022	0.0010
49	0.0032	0.0022	0.0010
50	0.0032	0.0022	0.0010
51	0.0032	0.0022	0.0010
52	0.0032	0.0022	0.0010
53	0.0032	0.0022	0.0010
54	0.0032	0.0022	0.0010
55	0.0033	0.0022	0.0010
56	0.0033	0.0023	0.0010
57	0.0033	0.0023	0.0010
58	0.0033	0.0023	0.0010
59	0.0033	0.0023	0.0011
60	0.0034	0.0023	0.0011
61	0.0034	0.0023	0.0011
62	0.0034	0.0023	0.0011
63	0.0034	0.0024	0.0011
64	0.0034	0.0024	0.0011
65	0.0035	0.0024	0.0011
66	0.0035	0.0024	0.0011

67	0.0035	0.0024	0.0011
68	0.0035	0.0024	0.0011
69	0.0036	0.0024	0.0011
70	0.0036	0.0025	0.0011
71	0.0036	0.0025	0.0011
72	0.0036	0.0025	0.0011
73	0.0037	0.0025	0.0011
74	0.0037	0.0025	0.0012
75	0.0037	0.0025	0.0012
76	0.0037	0.0025	0.0012
77	0.0037	0.0026	0.0012
78	0.0038	0.0026	0.0012
79	0.0038	0.0026	0.0012
80	0.0038	0.0026	0.0012
81	0.0039	0.0026	0.0012
82	0.0039	0.0027	0.0012
83	0.0039	0.0027	0.0012
84	0.0039	0.0027	0.0012
85	0.0040	0.0027	0.0012
86	0.0040	0.0027	0.0013
87	0.0040	0.0028	0.0013
88	0.0040	0.0028	0.0013
89	0.0041	0.0028	0.0013
90	0.0041	0.0028	0.0013
91	0.0042	0.0028	0.0013
92	0.0042	0.0029	0.0013
93	0.0042	0.0029	0.0013
94	0.0042	0.0029	0.0013
95	0.0043	0.0029	0.0013
96	0.0043	0.0030	0.0014
97	0.0044	0.0030	0.0014
98	0.0044	0.0030	0.0014
99	0.0044	0.0030	0.0014
100	0.0045	0.0031	0.0014
101	0.0045	0.0031	0.0014
102	0.0045	0.0031	0.0014

103	0.0046	0.0031	0.0014
104	0.0046	0.0032	0.0014
105	0.0047	0.0032	0.0015
106	0.0047	0.0032	0.0015
107	0.0048	0.0033	0.0015
108	0.0048	0.0033	0.0015
109	0.0048	0.0033	0.0015
110	0.0049	0.0033	0.0015
111	0.0049	0.0034	0.0015
112	0.0050	0.0034	0.0016
113	0.0050	0.0035	0.0016
114	0.0051	0.0035	0.0016
115	0.0051	0.0035	0.0016
116	0.0052	0.0035	0.0016
117	0.0052	0.0036	0.0016
118	0.0053	0.0036	0.0017
119	0.0054	0.0037	0.0017
120	0.0054	0.0037	0.0017
121	0.0055	0.0038	0.0017
122	0.0055	0.0038	0.0017
123	0.0056	0.0038	0.0018
124	0.0056	0.0039	0.0018
125	0.0057	0.0039	0.0018
126	0.0058	0.0040	0.0018
127	0.0059	0.0040	0.0018
128	0.0059	0.0041	0.0019
129	0.0060	0.0041	0.0019
130	0.0061	0.0042	0.0019
131	0.0062	0.0042	0.0019
132	0.0062	0.0043	0.0020
133	0.0063	0.0043	0.0020
134	0.0064	0.0044	0.0020
135	0.0065	0.0045	0.0020
136	0.0066	0.0045	0.0021
137	0.0067	0.0046	0.0021
138	0.0067	0.0046	0.0021

139	0.0069	0.0047	0.0022
140	0.0069	0.0048	0.0022
141	0.0071	0.0049	0.0022
142	0.0072	0.0049	0.0022
143	0.0073	0.0050	0.0023
144	0.0074	0.0051	0.0023
145	0.0069	0.0047	0.0022
146	0.0070	0.0048	0.0022
147	0.0072	0.0049	0.0022
148	0.0072	0.0050	0.0023
149	0.0074	0.0051	0.0023
150	0.0075	0.0051	0.0024
151	0.0077	0.0053	0.0024
152	0.0078	0.0054	0.0024
153	0.0080	0.0055	0.0025
154	0.0081	0.0056	0.0026
155	0.0084	0.0057	0.0026
156	0.0085	0.0058	0.0027
157	0.0087	0.0060	0.0027
158	0.0089	0.0061	0.0028
159	0.0091	0.0063	0.0029
160	0.0093	0.0064	0.0029
161	0.0096	0.0066	0.0030
162	0.0098	0.0067	0.0031
163	0.0101	0.0069	0.0032
164	0.0103	0.0071	0.0032
165	0.0107	0.0074	0.0034
166	0.0109	0.0075	0.0034
167	0.0114	0.0078	0.0036
168	0.0116	0.0080	0.0037
169	0.0195	0.0134	0.0061
170	0.0199	0.0137	0.0062
171	0.0207	0.0142	0.0065
172	0.0212	0.0145	0.0067
173	0.0222	0.0152	0.0070
174	0.0227	0.0156	0.0071

175	0.0239	0.0164	0.0075
176	0.0245	0.0168	0.0077
177	0.0259	0.0178	0.0081
178	0.0267	0.0183	0.0084
179	0.0285	0.0195	0.0089
180	0.0295	0.0202	0.0093
181	0.0318	0.0218	0.0100
182	0.0331	0.0227	0.0104
183	0.0362	0.0248	0.0114
184	0.0380	0.0261	0.0119
185	0.0629	0.0420	0.0209
186	0.0661	0.0420	0.0241
187	0.0740	0.0420	0.0320
188	0.0792	0.0420	0.0372
189	0.0990	0.0420	0.0570
190	0.1097	0.0420	0.0677
191	0.1483	0.0420	0.1063
192	0.1943	0.0420	0.1523
193	0.4772	0.0420	0.4352
194	0.1247	0.0420	0.0827
195	0.0855	0.0420	0.0435
196	0.0697	0.0420	0.0277
197	0.0401	0.0275	0.0126
198	0.0345	0.0237	0.0108
199	0.0306	0.0210	0.0096
200	0.0276	0.0189	0.0087
201	0.0252	0.0173	0.0079
202	0.0233	0.0160	0.0073
203	0.0217	0.0149	0.0068
204	0.0203	0.0139	0.0064
205	0.0119	0.0082	0.0037
206	0.0111	0.0076	0.0035
207	0.0105	0.0072	0.0033
208	0.0099	0.0068	0.0031
209	0.0094	0.0065	0.0030
210	0.0090	0.0062	0.0028

211	0.0086	0.0059	0.0027
212	0.0082	0.0056	0.0026
213	0.0079	0.0054	0.0025
214	0.0076	0.0052	0.0024
215	0.0073	0.0050	0.0023
216	0.0071	0.0048	0.0022
217	0.0075	0.0051	0.0023
218	0.0072	0.0050	0.0023
219	0.0070	0.0048	0.0022
220	0.0068	0.0047	0.0021
221	0.0066	0.0045	0.0021
222	0.0064	0.0044	0.0020
223	0.0063	0.0043	0.0020
224	0.0061	0.0042	0.0019
225	0.0060	0.0041	0.0019
226	0.0058	0.0040	0.0018
227	0.0057	0.0039	0.0018
228	0.0056	0.0038	0.0017
229	0.0054	0.0037	0.0017
230	0.0053	0.0036	0.0017
231	0.0052	0.0036	0.0016
232	0.0051	0.0035	0.0016
233	0.0050	0.0034	0.0016
234	0.0049	0.0034	0.0015
235	0.0048	0.0033	0.0015
236	0.0047	0.0032	0.0015
237	0.0046	0.0032	0.0015
238	0.0046	0.0031	0.0014
239	0.0045	0.0031	0.0014
240	0.0044	0.0030	0.0014
241	0.0043	0.0030	0.0014
242	0.0043	0.0029	0.0013
243	0.0042	0.0029	0.0013
244	0.0041	0.0028	0.0013
245	0.0041	0.0028	0.0013
246	0.0040	0.0027	0.0013

247	0.0039	0.0027	0.0012
248	0.0039	0.0027	0.0012
249	0.0038	0.0026	0.0012
250	0.0038	0.0026	0.0012
251	0.0037	0.0026	0.0012
252	0.0037	0.0025	0.0012
253	0.0036	0.0025	0.0011
254	0.0036	0.0025	0.0011
255	0.0035	0.0024	0.0011
256	0.0035	0.0024	0.0011
257	0.0035	0.0024	0.0011
258	0.0034	0.0023	0.0011
259	0.0034	0.0023	0.0011
260	0.0033	0.0023	0.0010
261	0.0033	0.0023	0.0010
262	0.0033	0.0022	0.0010
263	0.0032	0.0022	0.0010
264	0.0032	0.0022	0.0010
265	0.0031	0.0022	0.0010
266	0.0031	0.0021	0.0010
267	0.0031	0.0021	0.0010
268	0.0030	0.0021	0.0010
269	0.0030	0.0021	0.0009
270	0.0030	0.0020	0.0009
271	0.0030	0.0020	0.0009
272	0.0029	0.0020	0.0009
273	0.0029	0.0020	0.0009
274	0.0029	0.0020	0.0009
275	0.0028	0.0020	0.0009
276	0.0028	0.0019	0.0009
277	0.0028	0.0019	0.0009
278	0.0028	0.0019	0.0009
279	0.0027	0.0019	0.0009
280	0.0027	0.0019	0.0009
281	0.0027	0.0018	0.0008
282	0.0027	0.0018	0.0008

283	0.0026	0.0018	0.0008
284	0.0026	0.0018	0.0008
285	0.0026	0.0018	0.0008
286	0.0026	0.0018	0.0008
287	0.0026	0.0018	0.0008
288	0.0025	0.0017	0.0008

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 1.77

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.66

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 19.5355

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 18.4035

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============================================================================

                       2 4 - H O U R   S T O R M
                     R U N O F F   H Y D R O G R A P H

============================================================================
              HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      50.0     100.0     150.0     200.0
----------------------------------------------------------------------------
   0.083      0.0000      0.01  Q         .         .         .         .
   0.167      0.0002      0.03  Q         .         .         .         .
   0.250      0.0006      0.06  Q         .         .         .         .
   0.333      0.0013      0.10  Q         .         .         .         .
   0.417      0.0026      0.18  Q         .         .         .         .
   0.500      0.0046      0.30  Q         .         .         .         .
   0.583      0.0077      0.45  Q         .         .         .         .
   0.667      0.0117      0.57  Q         .         .         .         .
   0.750      0.0163      0.67  Q         .         .         .         .
   0.833      0.0214      0.75  Q         .         .         .         .
   0.917      0.0270      0.81  Q         .         .         .         .
   1.000      0.0328      0.85  Q         .         .         .         .
   1.083      0.0390      0.90  Q         .         .         .         .
   1.167      0.0455      0.94  Q         .         .         .         .
   1.250      0.0522      0.97  Q         .         .         .         .
   1.333      0.0591      1.00  Q         .         .         .         .
   1.417      0.0662      1.03  Q         .         .         .         .
   1.500      0.0735      1.06  Q         .         .         .         .
   1.583      0.0810      1.08  Q         .         .         .         .
   1.667      0.0886      1.10  Q         .         .         .         .
   1.750      0.0963      1.13  Q         .         .         .         .
   1.833      0.1042      1.15  Q         .         .         .         .
   1.917      0.1123      1.17  Q         .         .         .         .
   2.000      0.1204      1.18  Q         .         .         .         .
```

2.083	0.1287	1.20	Q	.	.	.	.
2.167	0.1370	1.22	Q	.	.	.	.
2.250	0.1455	1.23	Q	.	.	.	.
2.333	0.1541	1.24	Q	.	.	.	.
2.417	0.1628	1.26	Q	.	.	.	.
2.500	0.1715	1.27	Q	.	.	.	.
2.583	0.1804	1.29	Q	.	.	.	.
2.667	0.1893	1.30	Q	.	.	.	.
2.750	0.1984	1.31	Q	.	.	.	.
2.833	0.2075	1.32	Q	.	.	.	.
2.917	0.2167	1.33	Q	.	.	.	.
3.000	0.2259	1.35	Q	.	.	.	.
3.083	0.2353	1.36	Q	.	.	.	.
3.167	0.2447	1.37	Q	.	.	.	.
3.250	0.2542	1.38	Q	.	.	.	.
3.333	0.2638	1.39	Q	.	.	.	.
3.417	0.2735	1.40	Q	.	.	.	.
3.500	0.2832	1.41	Q	.	.	.	.
3.583	0.2930	1.42	Q	.	.	.	.
3.667	0.3028	1.43	Q	.	.	.	.
3.750	0.3127	1.44	Q	.	.	.	.
3.833	0.3227	1.45	Q	.	.	.	.
3.917	0.3328	1.46	Q	.	.	.	.
4.000	0.3429	1.47	Q	.	.	.	.
4.083	0.3530	1.48	Q	.	.	.	.
4.167	0.3633	1.49	Q	.	.	.	.
4.250	0.3736	1.50	Q	.	.	.	.
4.333	0.3839	1.51	Q	.	.	.	.
4.417	0.3944	1.52	Q	.	.	.	.
4.500	0.4049	1.52	Q	.	.	.	.
4.583	0.4155	1.53	Q	.	.	.	.
4.667	0.4261	1.54	Q	.	.	.	.
4.750	0.4368	1.56	Q	.	.	.	.
4.833	0.4476	1.57	Q	.	.	.	.
4.917	0.4584	1.58	Q	.	.	.	.
5.000	0.4694	1.59	QV	.	.	.	.

5.083	0.4804	1.60	QV	.	.	.	.
5.167	0.4914	1.61	QV	.	.	.	.
5.250	0.5025	1.61	QV	.	.	.	.
5.333	0.5137	1.62	QV	.	.	.	.
5.417	0.5250	1.63	QV	.	.	.	.
5.500	0.5363	1.64	QV	.	.	.	.
5.583	0.5477	1.65	QV	.	.	.	.
5.667	0.5591	1.66	QV	.	.	.	.
5.750	0.5706	1.67	QV	.	.	.	.
5.833	0.5822	1.68	QV	.	.	.	.
5.917	0.5938	1.69	QV	.	.	.	.
6.000	0.6056	1.70	QV	.	.	.	.
6.083	0.6173	1.71	QV	.	.	.	.
6.167	0.6292	1.72	QV	.	.	.	.
6.250	0.6411	1.73	QV	.	.	.	.
6.333	0.6531	1.74	QV	.	.	.	.
6.417	0.6652	1.75	QV	.	.	.	.
6.500	0.6774	1.77	QV	.	.	.	.
6.583	0.6896	1.78	QV	.	.	.	.
6.667	0.7019	1.79	QV	.	.	.	.
6.750	0.7143	1.80	QV	.	.	.	.
6.833	0.7268	1.81	QV	.	.	.	.
6.917	0.7393	1.82	QV	.	.	.	.
7.000	0.7520	1.83	QV	.	.	.	.
7.083	0.7647	1.85	QV	.	.	.	.
7.167	0.7775	1.86	QV	.	.	.	.
7.250	0.7904	1.87	QV	.	.	.	.
7.333	0.8034	1.88	QV	.	.	.	.
7.417	0.8164	1.90	QV	.	.	.	.
7.500	0.8296	1.91	QV	.	.	.	.
7.583	0.8428	1.92	QV	.	.	.	.
7.667	0.8562	1.94	QV	.	.	.	.
7.750	0.8696	1.95	QV	.	.	.	.
7.833	0.8832	1.97	QV	.	.	.	.
7.917	0.8968	1.98	QV	.	.	.	.
8.000	0.9105	1.99	QV	.	.	.	.

8.083	0.9244	2.01	Q V	.	.	.	.
8.167	0.9383	2.02	Q V	.	.	.	.
8.250	0.9523	2.04	Q V	.	.	.	.
8.333	0.9665	2.05	Q V	.	.	.	.
8.417	0.9808	2.07	Q V	.	.	.	.
8.500	0.9951	2.09	Q V	.	.	.	.
8.583	1.0096	2.10	Q V	.	.	.	.
8.667	1.0242	2.12	Q V	.	.	.	.
8.750	1.0389	2.14	Q V	.	.	.	.
8.833	1.0538	2.15	Q V	.	.	.	.
8.917	1.0687	2.17	Q V	.	.	.	.
9.000	1.0838	2.19	Q V	.	.	.	.
9.083	1.0990	2.21	Q V	.	.	.	.
9.167	1.1143	2.23	Q V	.	.	.	.
9.250	1.1298	2.25	Q V	.	.	.	.
9.333	1.1454	2.26	Q V	.	.	.	.
9.417	1.1611	2.28	Q V	.	.	.	.
9.500	1.1770	2.30	Q V	.	.	.	.
9.583	1.1930	2.33	Q V	.	.	.	.
9.667	1.2092	2.35	Q V	.	.	.	.
9.750	1.2255	2.37	Q V	.	.	.	.
9.833	1.2419	2.39	Q V	.	.	.	.
9.917	1.2586	2.41	Q V	.	.	.	.
10.000	1.2753	2.44	Q V	.	.	.	.
10.083	1.2923	2.46	Q V	.	.	.	.
10.167	1.3094	2.48	Q V	.	.	.	.
10.250	1.3266	2.51	Q V	.	.	.	.
10.333	1.3441	2.53	Q V	.	.	.	.
10.417	1.3617	2.56	Q V	.	.	.	.
10.500	1.3795	2.58	Q V	.	.	.	.
10.583	1.3974	2.61	Q V	.	.	.	.
10.667	1.4156	2.64	Q V	.	.	.	.
10.750	1.4340	2.67	Q V	.	.	.	.
10.833	1.4525	2.69	Q V	.	.	.	.
10.917	1.4713	2.72	Q V	.	.	.	.
11.000	1.4902	2.75	Q V	.	.	.	.

11.083	1.5094	2.79	Q	V	.	.	.	.
11.167	1.5288	2.82	Q	V	.	.	.	.
11.250	1.5484	2.85	Q	V	.	.	.	.
11.333	1.5683	2.88	Q	V	.	.	.	.
11.417	1.5884	2.92	Q	V	.	.	.	.
11.500	1.6087	2.95	Q	V	.	.	.	.
11.583	1.6293	2.99	Q	V	.	.	.	.
11.667	1.6502	3.03	Q	V	.	.	.	.
11.750	1.6713	3.07	Q	V	.	.	.	.
11.833	1.6927	3.11	Q	V	.	.	.	.
11.917	1.7143	3.15	Q	V	.	.	.	.
12.000	1.7363	3.19	Q	V	.	.	.	.
12.083	1.7586	3.23	Q	V	.	.	.	.
12.167	1.7811	3.27	Q	V	.	.	.	.
12.250	1.8039	3.31	Q	V	.	.	.	.
12.333	1.8269	3.35	Q	V	.	.	.	.
12.417	1.8502	3.38	Q	V	.	.	.	.
12.500	1.8736	3.40	Q	V	.	.	.	.
12.583	1.8970	3.41	Q	V	.	.	.	.
12.667	1.9207	3.43	Q	V	.	.	.	.
12.750	1.9445	3.46	Q	V	.	.	.	.
12.833	1.9687	3.50	Q	V	.	.	.	.
12.917	1.9931	3.55	Q	V	.	.	.	.
13.000	2.0179	3.60	Q	V	.	.	.	.
13.083	2.0430	3.65	Q	V	.	.	.	.
13.167	2.0685	3.71	Q	V	.	.	.	.
13.250	2.0945	3.77	Q	V	.	.	.	.
13.333	2.1209	3.83	Q	V	.	.	.	.
13.417	2.1478	3.90	Q	V	.	.	.	.
13.500	2.1751	3.97	Q	V	.	.	.	.
13.583	2.2030	4.05	Q	V	.	.	.	.
13.667	2.2315	4.13	Q	V	.	.	.	.
13.750	2.2605	4.22	Q	V	.	.	.	.
13.833	2.2902	4.31	Q	V	.	.	.	.
13.917	2.3205	4.40	Q	V	.	.	.	.
14.000	2.3515	4.50	Q	V	.	.	.	.

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14.083      2.3834      4.63  Q    V    .         .         .         .
14.167      2.4165      4.80  Q    V    .         .         .         .
14.250      2.4510      5.02  .Q   V    .         .         .         .
14.333      2.4874      5.28  .Q   V    .         .         .         .
14.417      2.5263      5.64  .Q   V    .         .         .         .
14.500      2.5687      6.16  .Q   V    .         .         .         .
14.583      2.6154      6.77  .Q   V    .         .         .         .
14.667      2.6658      7.33  .Q   V    .         .         .         .
14.750      2.7197      7.83  .Q   V    .         .         .         .
14.833      2.7768      8.29  .Q    V   .         .         .         .
14.917      2.8369      8.73  .Q    V   .         .         .         .
15.000      2.9001      9.17  .Q    V   .         .         .         .
15.083      2.9663      9.62  .Q    V   .         .         .         .
15.167      3.0359     10.09  . Q   V   .         .         .         .
15.250      3.1088     10.59  . Q   V   .         .         .         .
15.333      3.1855     11.13  . Q   V   .         .         .         .
15.417      3.2667     11.79  . Q    V  .         .         .         .
15.500      3.3538     12.64  . Q    V  .         .         .         .
15.583      3.4487     13.79  . Q    V  .         .         .         .
15.667      3.5543     15.32  .  Q   V  .         .         .         .
15.750      3.6754     17.59  .  Q   V  .         .         .         .
15.833      3.8207     21.09  .   Q   V .         .         .         .
15.917      4.0009     26.17  .    Q  V .         .         .         .
16.000      4.2292     33.15  .     Q  V.         .         .         .
16.083      4.5383     44.89  .       QV.         .         .         .
16.167      4.9561     60.66  .         V Q       .         .         .
16.250      5.4891     77.40  .         .V   Q    .         .         .
16.333      6.1478     95.65  .         .  V     Q.         .         .
16.417      6.9732    119.83  .         .    V    .  Q      .         .
16.500      7.9915    147.87  .         .      V  .        Q.         .
16.583      9.0677    156.26  .         .        V.         .Q        .
16.667     10.0097    136.78  .         .         .V     Q  .         .
16.750     10.7989    114.60  .         .         . QV      .         .
16.833     11.4586     95.78  .         .        Q.   V     .         .
16.917     12.0053     79.37  .         .    Q    .     V   .         .
17.000     12.4750     68.21  .         .  Q      .      V  .         .
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17.083     12.8898     60.23  .         . Q       .       V .         .
17.167     13.2615     53.98  .         Q         .       V .         .
17.250     13.5934     48.19  .        Q.         .        V.         .
17.333     13.8948     43.77  .       Q .         .         V         .
17.417     14.1702     39.98  .      Q  .         .         V         .
17.500     14.4163     35.74  .      Q  .         .         .V        .
17.583     14.6431     32.93  .     Q   .         .         .V        .
17.667     14.8488     29.88  .    Q    .         .         . V       .
17.750     15.0414     27.96  .    Q    .         .         . V       .
17.833     15.2199     25.91  .    Q    .         .         .  V      .
17.917     15.3871     24.29  .   Q     .         .         .  V      .
18.000     15.5403     22.24  .   Q     .         .         .  V      .
18.083     15.6829     20.71  .   Q     .         .         .   V     .
18.167     15.8117     18.71  .  Q      .         .         .   V     .
18.250     15.9333     17.65  .  Q      .         .         .   V     .
18.333     16.0484     16.72  .  Q      .         .         .   V     .
18.417     16.1582     15.94  .  Q      .         .         .    V    .
18.500     16.2612     14.96  . Q       .         .         .    V    .
18.583     16.3595     14.28  . Q       .         .         .    V    .
18.667     16.4528     13.55  . Q       .         .         .    V    .
18.750     16.5416     12.88  . Q       .         .         .    V    .
18.833     16.6236     11.91  . Q       .         .         .     V   .
18.917     16.7016     11.33  . Q       .         .         .     V   .
19.000     16.7768     10.92  . Q       .         .         .     V   .
19.083     16.8488     10.46  . Q       .         .         .     V   .
19.167     16.9156      9.69  .Q        .         .         .     V   .
19.250     16.9788      9.18  .Q        .         .         .     V   .
19.333     17.0395      8.82  .Q        .         .         .      V  .
19.417     17.0974      8.41  .Q        .         .         .      V  .
19.500     17.1504      7.69  .Q        .         .         .      V  .
19.583     17.2000      7.21  .Q        .         .         .      V  .
19.667     17.2476      6.90  .Q        .         .         .      V  .
19.750     17.2928      6.57  .Q        .         .         .      V  .
19.833     17.3340      5.98  .Q        .         .         .      V  .
19.917     17.3723      5.57  .Q        .         .         .      V  .
20.000     17.4096      5.42  .Q        .         .         .      V  .
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20.083	17.4464	5.34	.Q	.	.	.	V .
20.167	17.4833	5.36	.Q	.	.	.	V .
20.250	17.5202	5.36	.Q	.	.	.	V .
20.333	17.5567	5.30	.Q	.	.	.	V .
20.417	17.5927	5.22	.Q	.	.	.	V .
20.500	17.6280	5.13	.Q	.	.	.	V .
20.583	17.6626	5.03	.Q	.	.	.	V .
20.667	17.6965	4.91	Q	.	.	.	V .
20.750	17.7294	4.78	Q	.	.	.	V .
20.833	17.7612	4.62	Q	.	.	.	V .
20.917	17.7917	4.42	Q	.	.	.	V .
21.000	17.8202	4.15	Q	.	.	.	V .
21.083	17.8461	3.76	Q	.	.	.	V .
21.167	17.8650	2.74	Q	.	.	.	V .
21.250	17.8820	2.48	Q	.	.	.	V .
21.333	17.8982	2.35	Q	.	.	.	V .
21.417	17.9137	2.25	Q	.	.	.	V .
21.500	17.9288	2.20	Q	.	.	.	V .
21.583	17.9436	2.15	Q	.	.	.	V.
21.667	17.9580	2.10	Q	.	.	.	V.
21.750	17.9722	2.06	Q	.	.	.	V.
21.833	17.9861	2.02	Q	.	.	.	V.
21.917	17.9997	1.98	Q	.	.	.	V.
22.000	18.0131	1.94	Q	.	.	.	V.
22.083	18.0262	1.90	Q	.	.	.	V.
22.167	18.0391	1.88	Q	.	.	.	V.
22.250	18.0518	1.85	Q	.	.	.	V.
22.333	18.0644	1.82	Q	.	.	.	V.
22.417	18.0768	1.80	Q	.	.	.	V.
22.500	18.0890	1.77	Q	.	.	.	V.
22.583	18.1010	1.75	Q	.	.	.	V.
22.667	18.1129	1.73	Q	.	.	.	V.
22.750	18.1247	1.71	Q	.	.	.	V.
22.833	18.1363	1.69	Q	.	.	.	V.
22.917	18.1478	1.67	Q	.	.	.	V.
23.000	18.1591	1.65	Q	.	.	.	V.

23.083	18.1703	1.63	Q	.	.	.	V.
23.167	18.1814	1.61	Q	.	.	.	V.
23.250	18.1924	1.59	Q	.	.	.	V.
23.333	18.2032	1.57	Q	.	.	.	V.
23.417	18.2139	1.55	Q	.	.	.	V.
23.500	18.2245	1.54	Q	.	.	.	V.
23.583	18.2349	1.52	Q	.	.	.	V.
23.667	18.2453	1.50	Q	.	.	.	V.
23.750	18.2556	1.49	Q	.	.	.	V.
23.833	18.2657	1.47	Q	.	.	.	V.
23.917	18.2758	1.46	Q	.	.	.	V.
24.000	18.2857	1.44	Q	.	.	.	V.
24.083	18.2955	1.42	Q	.	.	.	V.
24.167	18.3051	1.39	Q	.	.	.	V.
24.250	18.3143	1.34	Q	.	.	.	V.
24.333	18.3232	1.29	Q	.	.	.	V.
24.417	18.3315	1.20	Q	.	.	.	V.
24.500	18.3388	1.07	Q	.	.	.	V.
24.583	18.3451	0.91	Q	.	.	.	V.
24.667	18.3505	0.78	Q	.	.	.	V.
24.750	18.3552	0.68	Q	.	.	.	V.
24.833	18.3593	0.60	Q	.	.	.	V.
24.917	18.3630	0.54	Q	.	.	.	V.
25.000	18.3663	0.49	Q	.	.	.	V.
25.083	18.3694	0.44	Q	.	.	.	V.
25.167	18.3721	0.40	Q	.	.	.	V.
25.250	18.3746	0.37	Q	.	.	.	V.
25.333	18.3770	0.34	Q	.	.	.	V.
25.417	18.3791	0.31	Q	.	.	.	V.
25.500	18.3810	0.28	Q	.	.	.	V.
25.583	18.3828	0.26	Q	.	.	.	V.
25.667	18.3845	0.24	Q	.	.	.	V.
25.750	18.3860	0.22	Q	.	.	.	V.
25.833	18.3875	0.21	Q	.	.	.	V.
25.917	18.3888	0.19	Q	.	.	.	V.
26.000	18.3900	0.18	Q	.	.	.	V.

26.083	18.3911	0.16	Q	.	.	.	V.
26.167	18.3921	0.15	Q	.	.	.	V.
26.250	18.3931	0.14	Q	.	.	.	V.
26.333	18.3940	0.13	Q	.	.	.	V.
26.417	18.3948	0.12	Q	.	.	.	V.
26.500	18.3956	0.11	Q	.	.	.	V.
26.583	18.3963	0.10	Q	.	.	.	V.
26.667	18.3969	0.09	Q	.	.	.	V.
26.750	18.3975	0.09	Q	.	.	.	V.
26.833	18.3981	0.08	Q	.	.	.	V.
26.917	18.3986	0.07	Q	.	.	.	V.
27.000	18.3991	0.07	Q	.	.	.	V.
27.083	18.3995	0.06	Q	.	.	.	V.
27.167	18.3999	0.06	Q	.	.	.	V.
27.250	18.4003	0.05	Q	.	.	.	V.
27.333	18.4006	0.05	Q	.	.	.	V.
27.417	18.4009	0.04	Q	.	.	.	V.
27.500	18.4012	0.04	Q	.	.	.	V.
27.583	18.4014	0.04	Q	.	.	.	V.
27.667	18.4017	0.03	Q	.	.	.	V.
27.750	18.4019	0.03	Q	.	.	.	V.
27.833	18.4021	0.03	Q	.	.	.	V.
27.917	18.4023	0.03	Q	.	.	.	V.
28.000	18.4024	0.03	Q	.	.	.	V.
28.083	18.4026	0.02	Q	.	.	.	V.
28.167	18.4028	0.02	Q	.	.	.	V.
28.250	18.4029	0.02	Q	.	.	.	V.
28.333	18.4030	0.02	Q	.	.	.	V.
28.417	18.4031	0.02	Q	.	.	.	V.
28.500	18.4032	0.01	Q	.	.	.	V.
28.583	18.4033	0.01	Q	.	.	.	V.
28.667	18.4034	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1720.0
10%	165.0
20%	100.0
30%	70.0
40%	50.0
50%	40.0
60%	35.0
70%	25.0
80%	15.0
90%	10.0

```
****************************************************************************
  FLOW PROCESS FROM NODE   4005.00 TO NODE   4005.00 IS CODE = 3.1
----------------------------------------------------------------------------
  >>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<
============================================================================
```

```
  INFLOW
(STREAM 1)
     |
     |
     V                 __effective depth
 -----------           |   (and volume)
|           |    |     |
|           |    |....V........
| detention |<-->|           outflow
|   basin   |    |........._______
 -----------     |    ^    |  \
     |           |  dead   |   basin outlet
     V           | storage |
  OUTFLOW         ---------
```

(STREAM 1)

ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1

THROUGH A FLOW-THROUGH DETENTION BASIN

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:

DEAD STORAGE(AF) = 0.000

SPECIFIED DEAD STORAGE(AF) FILLED = 0.000

SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000

DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	40.00	5.000
3	2.00	80.00	10.000
4	3.00	120.00	15.000
5	4.00	157.00	20.000

===

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):

(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;

MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
14.083	0.000	4.63	0.00	0.09	3.6	0.450
14.167	0.000	4.80	0.00	0.09	3.6	0.459
14.250	0.000	5.02	0.00	0.09	3.7	0.468

14.333	0.000	5.28	0.00	0.10	3.8	0.478
14.417	0.000	5.64	0.00	0.10	3.9	0.490
14.500	0.000	6.16	0.00	0.10	4.0	0.505
14.583	0.000	6.77	0.00	0.10	4.1	0.523
14.667	0.000	7.33	0.00	0.11	4.3	0.544
14.750	0.000	7.83	0.00	0.11	4.4	0.568
14.833	0.000	8.29	0.00	0.12	4.6	0.593
14.917	0.000	8.73	0.00	0.12	4.8	0.620
15.000	0.000	9.17	0.00	0.13	5.1	0.648
15.083	0.000	9.62	0.00	0.14	5.3	0.678
15.167	0.000	10.09	0.00	0.14	5.5	0.709
15.250	0.000	10.59	0.00	0.15	5.8	0.742
15.333	0.000	11.13	0.00	0.16	6.1	0.777
15.417	0.000	11.79	0.00	0.16	6.4	0.814
15.500	0.000	12.64	0.00	0.17	6.7	0.855
15.583	0.000	13.79	0.00	0.18	7.0	0.902
15.667	0.000	15.32	0.00	0.19	7.4	0.956
15.750	0.000	17.59	0.00	0.20	7.9	1.023
15.833	0.000	21.09	0.00	0.22	8.5	1.109
15.917	0.000	26.17	0.00	0.25	9.3	1.225
16.000	0.000	33.15	0.00	0.28	10.4	1.382
16.083	0.000	44.89	0.00	0.32	12.0	1.608
16.167	0.000	60.66	0.00	0.39	14.1	1.929
16.250	0.000	77.40	0.00	0.47	17.1	2.344
16.333	0.000	95.65	0.00	0.57	20.8	2.859
16.417	0.000	119.83	0.00	0.70	25.5	3.509
16.500	0.000	147.87	0.00	0.86	31.3	4.312
16.583	0.000	156.26	0.00	1.03	37.8	5.128
16.667	0.000	136.78	0.00	1.15	43.6	5.770
16.750	0.000	114.60	0.00	1.25	48.0	6.229
16.833	0.000	95.78	0.00	1.31	51.1	6.537
16.917	0.000	79.37	0.00	1.34	53.0	6.718
17.000	0.000	68.21	0.00	1.36	54.1	6.815
17.083	0.000	60.23	0.00	1.37	54.7	6.853
17.167	0.000	53.98	0.00	1.37	54.8	6.848
17.250	0.000	48.19	0.00	1.36	54.6	6.804

17.333	0.000	43.77	0.00	1.35	54.1	6.732
17.417	0.000	39.98	0.00	1.33	53.5	6.639
17.500	0.000	35.74	0.00	1.30	52.6	6.523
17.583	0.000	32.93	0.00	1.28	51.7	6.394
17.667	0.000	29.88	0.00	1.25	50.6	6.251
17.750	0.000	27.96	0.00	1.22	49.4	6.103
17.833	0.000	25.91	0.00	1.19	48.2	5.950
17.917	0.000	24.29	0.00	1.16	47.0	5.793
18.000	0.000	22.24	0.00	1.13	45.7	5.632
18.083	0.000	20.71	0.00	1.09	44.4	5.469
18.167	0.000	18.71	0.00	1.06	43.1	5.301
18.250	0.000	17.65	0.00	1.03	41.7	5.135
18.333	0.000	16.72	0.00	0.99	40.4	4.972
18.417	0.000	15.94	0.00	0.96	39.1	4.812
18.500	0.000	14.96	0.00	0.93	37.9	4.654
18.583	0.000	14.28	0.00	0.90	36.6	4.500
18.667	0.000	13.55	0.00	0.87	35.4	4.350
18.750	0.000	12.88	0.00	0.84	34.2	4.203
18.833	0.000	11.91	0.00	0.81	33.0	4.057
18.917	0.000	11.33	0.00	0.78	31.9	3.916
19.000	0.000	10.92	0.00	0.76	30.8	3.779
19.083	0.000	10.46	0.00	0.73	29.7	3.646
19.167	0.000	9.69	0.00	0.70	28.6	3.516
19.250	0.000	9.18	0.00	0.68	27.6	3.389
19.333	0.000	8.82	0.00	0.65	26.6	3.266
19.417	0.000	8.41	0.00	0.63	25.7	3.147
19.500	0.000	7.69	0.00	0.61	24.7	3.030
19.583	0.000	7.21	0.00	0.58	23.8	2.916
19.667	0.000	6.90	0.00	0.56	22.9	2.806
19.750	0.000	6.57	0.00	0.54	22.0	2.700
19.833	0.000	5.98	0.00	0.52	21.2	2.595
19.917	0.000	5.57	0.00	0.50	20.4	2.493

PROCESS SUMMARY OF STORAGE:

INFLOW VOLUME = 18.403 AF

BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)

```
    OUTFLOW VOLUME =     18.403 AF
    LOSS    VOLUME =      0.000 AF


****************************************************************************
  FLOW PROCESS FROM NODE   4005.00 TO NODE   4006.00 IS CODE = 5.1
----------------------------------------------------------------------------
  >>>>>MODEL CHANNEL ROUTING OF STREAM #1 BY THE TRANSLATION METHOD<<<<<
============================================================================

         THE TRANSLATION MODEL NEGLECTS ALL STORAGE ATTENUATION EFFECTS,
         AND MOVES THE STREAM 1 RUNOFF HYDROGRAPH FORWARD IN TIME.

         ASSUMED REGULAR CHANNEL INFORMATION:
           BASEWIDTH(FT) =  100.00     CHANNEL Z =  5.00
           UPSTREAM ELEVATION(FT) =     419.94
           DOWNSTREAM ELEVATION(FT) =     347.76
           CHANNEL LENGTH(FT) =    3070.30     MANNING'S FACTOR = 0.050
           CONSTANT LOSS RATE(CFS) =    0.00

         MEAN-FLOW RATE NORMAL-DEPTH FLOW VELOCITIES(FPS) ARE AS FOLLOWS:
                                 (FLOW RATE (CFS)) [FLOW VELOCITY (FPS)]
           AVERAGED PEAK  5-MINUTE: (      54.8).......[  1.91]
           AVERAGED PEAK 15-MINUTE: (      54.7).......[  1.91]
           AVERAGED PEAK 30-MINUTE: (      54.3).......[  1.90]
           AVERAGED PEAK  1-HOUR:   (      52.9).......[  1.95]
           AVERAGED PEAK  3-HOUR:   (      42.3).......[  1.77]
           AVERAGED PEAK  6-HOUR:   (      28.8).......[  1.49]
           AVERAGED PEAK 24-HOUR:   (       9.2).......[  0.92]
         USER-SPECIFIED CHANNEL AVERAGE FLOW VELOCITY(FPS) =   2.950
         HYDROGRAPH TRANSLATION TIME
         = (CHANNEL LENGTH)/(AVERAGE FLOW  VELOCITY)
         = (   3070.30)/(  2.950) =   0.289 HRS

         TRANSLATION METHOD CHANNEL ROUTING RESULTS:
                                          OUTFLOW LESS
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MODEL TIME (HRS)	INFLOW (STREAM 1) (CFS)	ROUTED FLOW (CFS)	LOSS (STREAM 1) (CFS)
14.000	3.52	3.35	3.35
14.083	3.57	3.39	3.39
14.167	3.64	3.44	3.44
14.250	3.70	3.49	3.49
14.333	3.78	3.55	3.55
14.417	3.87	3.61	3.61
14.500	3.98	3.67	3.67
14.583	4.11	3.75	3.75
14.667	4.27	3.83	3.83
14.750	4.45	3.93	3.93
14.833	4.64	4.05	4.05
14.917	4.85	4.20	4.20
15.000	5.07	4.37	4.37
15.083	5.30	4.55	4.55
15.167	5.55	4.75	4.75
15.250	5.80	4.97	4.97
15.333	6.07	5.19	5.19
15.417	6.36	5.43	5.43
15.500	6.68	5.68	5.68
15.583	7.03	5.95	5.95
15.667	7.43	6.23	6.23
15.750	7.92	6.53	6.53
15.833	8.53	6.86	6.86
15.917	9.34	7.24	7.24
16.000	10.43	7.69	7.69
16.083	11.96	8.24	8.24
16.167	14.15	8.96	8.96
16.250	17.09	9.92	9.92
16.333	20.81	11.24	11.24
16.417	25.48	13.12	13.12
16.500	31.29	15.71	15.71
16.583	37.76	19.07	19.07
16.667	43.59	23.29	23.29

16.750	48.00	28.56	28.56
16.833	51.06	34.72	34.72
16.917	53.02	40.86	40.86
17.000	54.13	45.93	45.93
17.083	54.67	49.62	49.62
17.167	54.80	52.10	52.10
17.250	54.61	53.61	53.61
17.333	54.14	54.42	54.42
17.417	53.48	54.74	54.74
17.500	52.65	54.70	54.70
17.583	51.66	54.36	54.36
17.667	50.58	53.79	53.79
17.750	49.42	53.04	53.04
17.833	48.21	52.13	52.13
17.917	46.97	51.09	51.09
18.000	45.70	49.96	49.96
18.083	44.40	48.78	48.78
18.167	43.08	47.55	47.55
18.250	41.74	46.30	46.30
18.333	40.43	45.01	45.01
18.417	39.13	43.70	43.70
18.500	37.86	42.37	42.37
18.583	36.62	41.04	41.04
18.667	35.40	39.74	39.74
18.750	34.21	38.46	38.46
18.833	33.04	37.20	37.20
18.917	31.89	35.97	35.97
19.000	30.78	34.77	34.77
19.083	29.70	33.59	33.59
19.167	28.65	32.43	32.43
19.250	27.62	31.30	31.30
19.333	26.62	30.21	30.21
19.417	25.65	29.14	29.14
19.500	24.71	28.10	28.10
19.583	23.79	27.09	27.09
19.667	22.89	26.11	26.11

```
         19.750        22.02       25.15       25.15
         19.833        21.18       24.22       24.22
         19.917        20.35       23.31       23.31
         20.000        19.55       22.43       22.43
============================================================================
  PROCESS SUMMARY OF STORAGE:
    INFLOW  VOLUME =     18.403 AF
    OUTFLOW VOLUME =     18.403 AF
    LOSS    VOLUME =      0.000 AF



****************************************************************************
  FLOW PROCESS FROM NODE   4006.00 TO NODE   4006.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #2)

         WATERSHED AREA =     106.700 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.760 HOURS
         DESERT(UNDEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.590
         LOW LOSS FRACTION = 0.778
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.48
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  1.16
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.60
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  2.24
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.56
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  3.43

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.995
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30-MINUTE FACTOR = 0.995

1-HOUR FACTOR = 0.995

3-HOUR FACTOR = 0.999

6-HOUR FACTOR = 1.000

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 10.965

==

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.482	6.226
2	1.772	16.637
3	3.833	26.594
4	6.680	36.740
5	10.602	50.607
6	17.286	86.255
7	27.459	131.272
8	37.494	129.497
9	45.649	105.231
10	52.157	83.980
11	57.460	68.430
12	61.579	53.149
13	65.007	44.241
14	67.965	38.170
15	70.651	34.652
16	72.991	30.199
17	75.042	26.466
18	76.936	24.444

19	78.665	22.306
20	80.124	18.824
21	81.541	18.285
22	82.760	15.740
23	83.942	15.248
24	85.037	14.126
25	86.089	13.582
26	87.068	12.627
27	87.946	11.326
28	88.778	10.740
29	89.450	8.672
30	90.105	8.452
31	90.728	8.040
32	91.342	7.921
33	91.905	7.270
34	92.432	6.792
35	92.944	6.611
36	93.427	6.236
37	93.895	6.034
38	94.280	4.974
39	94.653	4.813
40	95.026	4.808
41	95.399	4.811
42	95.731	4.289
43	96.016	3.680
44	96.301	3.678
45	96.587	3.682
46	96.864	3.586
47	97.078	2.754
48	97.275	2.547
49	97.472	2.542
50	97.670	2.551
51	97.836	2.142
52	97.947	1.434
53	98.056	1.411
54	98.166	1.416

55	98.277	1.430
56	98.402	1.618
57	98.534	1.701
58	98.666	1.701
59	98.797	1.692
60	98.929	1.706
61	99.060	1.692
62	99.191	1.692
63	99.322	1.692
64	99.454	1.692
65	99.585	1.692
66	99.716	1.692
67	99.847	1.692
68	99.978	1.692
69	100.000	0.284

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UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0020	0.0006
13	0.0026	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0037	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0040	0.0031	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0069	0.0054	0.0015
146	0.0070	0.0054	0.0016
147	0.0071	0.0056	0.0016
148	0.0072	0.0056	0.0016
149	0.0074	0.0058	0.0016
150	0.0075	0.0058	0.0017
151	0.0077	0.0060	0.0017
152	0.0078	0.0061	0.0017
153	0.0080	0.0062	0.0018
154	0.0081	0.0063	0.0018
155	0.0083	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0087	0.0068	0.0019
158	0.0089	0.0069	0.0020
159	0.0091	0.0071	0.0020
160	0.0093	0.0072	0.0021
161	0.0096	0.0075	0.0021
162	0.0098	0.0076	0.0022
163	0.0101	0.0079	0.0022
164	0.0103	0.0080	0.0023
165	0.0107	0.0083	0.0024
166	0.0109	0.0085	0.0024
167	0.0114	0.0089	0.0025
168	0.0116	0.0090	0.0026
169	0.0195	0.0151	0.0043
170	0.0198	0.0154	0.0044
171	0.0207	0.0161	0.0046
172	0.0211	0.0164	0.0047
173	0.0221	0.0172	0.0049
174	0.0226	0.0176	0.0050

175	0.0238	0.0185	0.0053
176	0.0245	0.0190	0.0054
177	0.0259	0.0201	0.0057
178	0.0267	0.0207	0.0059
179	0.0284	0.0221	0.0063
180	0.0294	0.0229	0.0065
181	0.0317	0.0247	0.0070
182	0.0330	0.0257	0.0073
183	0.0361	0.0281	0.0080
184	0.0379	0.0295	0.0084
185	0.0630	0.0490	0.0140
186	0.0662	0.0492	0.0170
187	0.0741	0.0492	0.0249
188	0.0793	0.0492	0.0302
189	0.0991	0.0492	0.0499
190	0.1099	0.0492	0.0607
191	0.1485	0.0492	0.0993
192	0.1945	0.0492	0.1453
193	0.4777	0.0492	0.4285
194	0.1248	0.0492	0.0757
195	0.0856	0.0492	0.0364
196	0.0698	0.0492	0.0206
197	0.0400	0.0311	0.0089
198	0.0345	0.0268	0.0077
199	0.0305	0.0237	0.0068
200	0.0275	0.0214	0.0061
201	0.0251	0.0196	0.0056
202	0.0232	0.0181	0.0052
203	0.0216	0.0168	0.0048
204	0.0203	0.0158	0.0045
205	0.0119	0.0092	0.0026
206	0.0111	0.0087	0.0025
207	0.0105	0.0082	0.0023
208	0.0099	0.0077	0.0022
209	0.0094	0.0073	0.0021
210	0.0090	0.0070	0.0020

211	0.0086	0.0067	0.0019
212	0.0082	0.0064	0.0018
213	0.0079	0.0061	0.0018
214	0.0076	0.0059	0.0017
215	0.0073	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0040	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0039	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0031	0.0024	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0030	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0006
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0021	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.02

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.41

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 17.9516

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 12.5338

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0001	0.01	Q	.	.	.	.
0.250	0.0003	0.03	Q	.	.	.	.
0.333	0.0006	0.05	Q	.	.	.	.
0.417	0.0012	0.08	Q	.	.	.	.
0.500	0.0020	0.13	Q	.	.	.	.
0.583	0.0034	0.20	Q	.	.	.	.
0.667	0.0053	0.27	Q	.	.	.	.
0.750	0.0076	0.33	Q	.	.	.	.
0.833	0.0102	0.38	Q	.	.	.	.
0.917	0.0131	0.42	Q	.	.	.	.
1.000	0.0162	0.45	Q	.	.	.	.
1.083	0.0195	0.48	Q	.	.	.	.
1.167	0.0229	0.50	Q	.	.	.	.
1.250	0.0265	0.52	Q	.	.	.	.
1.333	0.0303	0.54	Q	.	.	.	.
1.417	0.0341	0.56	Q	.	.	.	.
1.500	0.0381	0.58	Q	.	.	.	.
1.583	0.0422	0.59	Q	.	.	.	.
1.667	0.0463	0.60	Q	.	.	.	.
1.750	0.0506	0.62	Q	.	.	.	.
1.833	0.0549	0.63	Q	.	.	.	.
1.917	0.0593	0.64	Q	.	.	.	.
2.000	0.0638	0.65	Q	.	.	.	.

2.083	0.0683	0.66	Q	.	.	.	.
2.167	0.0729	0.67	Q	.	.	.	.
2.250	0.0776	0.68	Q	.	.	.	.
2.333	0.0824	0.69	Q	.	.	.	.
2.417	0.0871	0.70	Q	.	.	.	.
2.500	0.0920	0.70	Q	.	.	.	.
2.583	0.0969	0.71	Q	.	.	.	.
2.667	0.1019	0.72	Q	.	.	.	.
2.750	0.1069	0.73	Q	.	.	.	.
2.833	0.1119	0.73	Q	.	.	.	.
2.917	0.1170	0.74	Q	.	.	.	.
3.000	0.1222	0.75	Q	.	.	.	.
3.083	0.1274	0.76	Q	.	.	.	.
3.167	0.1327	0.76	Q	.	.	.	.
3.250	0.1379	0.77	Q	.	.	.	.
3.333	0.1433	0.77	Q	.	.	.	.
3.417	0.1487	0.78	Q	.	.	.	.
3.500	0.1541	0.79	Q	.	.	.	.
3.583	0.1596	0.79	Q	.	.	.	.
3.667	0.1651	0.80	Q	.	.	.	.
3.750	0.1706	0.81	Q	.	.	.	.
3.833	0.1762	0.81	Q	.	.	.	.
3.917	0.1818	0.82	Q	.	.	.	.
4.000	0.1875	0.82	Q	.	.	.	.
4.083	0.1932	0.83	Q	.	.	.	.
4.167	0.1989	0.83	Q	.	.	.	.
4.250	0.2047	0.84	Q	.	.	.	.
4.333	0.2105	0.84	Q	.	.	.	.
4.417	0.2164	0.85	Q	.	.	.	.
4.500	0.2223	0.85	Q	.	.	.	.
4.583	0.2282	0.86	Q	.	.	.	.
4.667	0.2341	0.87	Q	.	.	.	.
4.750	0.2401	0.87	Q	.	.	.	.
4.833	0.2462	0.88	Q	.	.	.	.
4.917	0.2523	0.88	Q	.	.	.	.
5.000	0.2584	0.89	Q	.	.	.	.

5.083	0.2645	0.89	Q	.	.	.	.
5.167	0.2707	0.90	Q	.	.	.	.
5.250	0.2770	0.91	Q	.	.	.	.
5.333	0.2833	0.91	Q	.	.	.	.
5.417	0.2896	0.92	Q	.	.	.	.
5.500	0.2959	0.92	Q	.	.	.	.
5.583	0.3023	0.93	Q	.	.	.	.
5.667	0.3088	0.94	Q	.	.	.	.
5.750	0.3153	0.94	QV	.	.	.	.
5.833	0.3218	0.95	QV	.	.	.	.
5.917	0.3284	0.95	QV	.	.	.	.
6.000	0.3350	0.96	QV	.	.	.	.
6.083	0.3416	0.96	QV	.	.	.	.
6.167	0.3483	0.97	QV	.	.	.	.
6.250	0.3550	0.98	QV	.	.	.	.
6.333	0.3618	0.98	QV	.	.	.	.
6.417	0.3686	0.99	QV	.	.	.	.
6.500	0.3755	0.99	QV	.	.	.	.
6.583	0.3824	1.00	QV	.	.	.	.
6.667	0.3893	1.01	QV	.	.	.	.
6.750	0.3963	1.01	QV	.	.	.	.
6.833	0.4033	1.02	QV	.	.	.	.
6.917	0.4104	1.03	QV	.	.	.	.
7.000	0.4175	1.03	QV	.	.	.	.
7.083	0.4247	1.04	QV	.	.	.	.
7.167	0.4319	1.05	QV	.	.	.	.
7.250	0.4391	1.05	QV	.	.	.	.
7.333	0.4464	1.06	QV	.	.	.	.
7.417	0.4538	1.07	QV	.	.	.	.
7.500	0.4612	1.08	QV	.	.	.	.
7.583	0.4687	1.08	QV	.	.	.	.
7.667	0.4762	1.09	QV	.	.	.	.
7.750	0.4838	1.10	QV	.	.	.	.
7.833	0.4914	1.11	QV	.	.	.	.
7.917	0.4990	1.11	QV	.	.	.	.
8.000	0.5068	1.12	QV	.	.	.	.

8.083	0.5146	1.13	QV	.	.	.	.
8.167	0.5224	1.14	QV	.	.	.	.
8.250	0.5303	1.15	QV	.	.	.	.
8.333	0.5383	1.16	QV	.	.	.	.
8.417	0.5463	1.17	QV	.	.	.	.
8.500	0.5544	1.17	QV	.	.	.	.
8.583	0.5625	1.18	QV	.	.	.	.
8.667	0.5707	1.19	QV	.	.	.	.
8.750	0.5790	1.20	QV	.	.	.	.
8.833	0.5874	1.21	QV	.	.	.	.
8.917	0.5958	1.22	QV	.	.	.	.
9.000	0.6043	1.23	QV	.	.	.	.
9.083	0.6128	1.24	QV	.	.	.	.
9.167	0.6214	1.25	QV	.	.	.	.
9.250	0.6301	1.26	Q V	.	.	.	.
9.333	0.6389	1.27	Q V	.	.	.	.
9.417	0.6477	1.28	Q V	.	.	.	.
9.500	0.6567	1.30	Q V	.	.	.	.
9.583	0.6657	1.31	Q V	.	.	.	.
9.667	0.6747	1.32	Q V	.	.	.	.
9.750	0.6839	1.33	Q V	.	.	.	.
9.833	0.6931	1.34	Q V	.	.	.	.
9.917	0.7025	1.35	Q V	.	.	.	.
10.000	0.7119	1.37	Q V	.	.	.	.
10.083	0.7214	1.38	Q V	.	.	.	.
10.167	0.7310	1.39	Q V	.	.	.	.
10.250	0.7407	1.41	Q V	.	.	.	.
10.333	0.7505	1.42	Q V	.	.	.	.
10.417	0.7604	1.44	Q V	.	.	.	.
10.500	0.7703	1.45	Q V	.	.	.	.
10.583	0.7804	1.46	Q V	.	.	.	.
10.667	0.7906	1.48	Q V	.	.	.	.
10.750	0.8009	1.50	Q V	.	.	.	.
10.833	0.8113	1.51	Q V	.	.	.	.
10.917	0.8218	1.53	Q V	.	.	.	.
11.000	0.8325	1.54	Q V	.	.	.	.

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11.083      0.8432      1.56  Q V       .         .         .         .
11.167      0.8541      1.58  Q V       .         .         .         .
11.250      0.8651      1.60  Q V       .         .         .         .
11.333      0.8762      1.62  Q V       .         .         .         .
11.417      0.8875      1.63  Q V       .         .         .         .
11.500      0.8989      1.65  Q V       .         .         .         .
11.583      0.9104      1.67  Q V       .         .         .         .
11.667      0.9221      1.69  Q V       .         .         .         .
11.750      0.9339      1.72  Q V       .         .         .         .
11.833      0.9459      1.74  Q  V      .         .         .         .
11.917      0.9580      1.76  Q  V      .         .         .         .
12.000      0.9703      1.78  Q  V      .         .         .         .
12.083      0.9827      1.81  Q  V      .         .         .         .
12.167      0.9953      1.83  Q  V      .         .         .         .
12.250      1.0081      1.85  Q  V      .         .         .         .
12.333      1.0210      1.87  Q  V      .         .         .         .
12.417      1.0340      1.89  Q  V      .         .         .         .
12.500      1.0471      1.91  Q  V      .         .         .         .
12.583      1.0603      1.92  Q  V      .         .         .         .
12.667      1.0736      1.93  Q  V      .         .         .         .
12.750      1.0870      1.94  Q  V      .         .         .         .
12.833      1.1005      1.96  Q  V      .         .         .         .
12.917      1.1142      1.99  Q  V      .         .         .         .
13.000      1.1281      2.01  Q  V      .         .         .         .
13.083      1.1421      2.04  Q  V      .         .         .         .
13.167      1.1564      2.07  Q  V      .         .         .         .
13.250      1.1709      2.10  Q  V      .         .         .         .
13.333      1.1856      2.14  Q  V      .         .         .         .
13.417      1.2006      2.18  Q  V      .         .         .         .
13.500      1.2158      2.21  Q  V      .         .         .         .
13.583      1.2314      2.26  Q  V      .         .         .         .
13.667      1.2472      2.30  Q  V      .         .         .         .
13.750      1.2633      2.35  Q   V     .         .         .         .
13.833      1.2798      2.39  Q   V     .         .         .         .
13.917      1.2967      2.45  Q   V     .         .         .         .
14.000      1.3139      2.50  Q   V     .         .         .         .
```

```
14.083      1.3316      2.57  Q   V     .         .         .         .
14.167      1.3499      2.66  Q   V     .         .         .         .
14.250      1.3689      2.77  Q   V     .         .         .         .
14.333      1.3889      2.90  Q   V     .         .         .         .
14.417      1.4099      3.06  Q   V     .         .         .         .
14.500      1.4325      3.28  Q   V     .         .         .         .
14.583      1.4572      3.59  Q   V     .         .         .         .
14.667      1.4841      3.90  Q   V     .         .         .         .
14.750      1.5129      4.19  Q   V     .         .         .         .
14.833      1.5436      4.45  Q   V     .         .         .         .
14.917      1.5760      4.71  Q    V    .         .         .         .
15.000      1.6102      4.95  Q    V    .         .         .         .
15.083      1.6460      5.20  .Q   V    .         .         .         .
15.167      1.6836      5.46  .Q   V    .         .         .         .
15.250      1.7230      5.73  .Q   V    .         .         .         .
15.333      1.7645      6.02  .Q   V    .         .         .         .
15.417      1.8082      6.36  .Q   V    .         .         .         .
15.500      1.8550      6.79  .Q   V    .         .         .         .
15.583      1.9059      7.38  .Q    V   .         .         .         .
15.667      1.9622      8.18  .Q    V   .         .         .         .
15.750      2.0266      9.35  .Q    V   .         .         .         .
15.833      2.1033     11.15  . Q   V   .         .         .         .
15.917      2.1995     13.97  . Q    V  .         .         .         .
16.000      2.3250     18.22  .  Q   V  .         .         .         .
16.083      2.5030     25.84  .    Q V  .         .         .         .
16.167      2.7504     35.92  .      QV .         .         .         .
16.250      3.0727     46.81  .        Q.         .         .         .
16.333      3.4761     58.56  .         .Q        .         .         .
16.417      3.9759     72.57  .         . V Q     .         .         .
16.500      4.6105     92.15  .         .   V   Q .         .         .
16.583      5.3633    109.30  .         .      V  .Q        .         .
16.667      6.0916    105.76  .         .        V.Q        .         .
16.750      6.7212     91.42  .         .       Q .V        .         .
16.833      7.2510     76.92  .         .    Q    .  V      .         .
16.917      7.6962     64.64  .         . Q       .   V     .         .
17.000      8.0668     53.81  .         Q         .    V    .         .
```

```
17.083      8.3864     46.41  .        Q.         .     V   .         .
17.167      8.6687     41.00  .       Q .         .      V  .         .
17.250      8.9238     37.04  .      Q  .         .       V .         .
17.333      9.1527     33.24  .     Q   .         .        V.         .
17.417      9.3596     30.04  .     Q   .         .        V.         .
17.500      9.5493     27.55  .    Q    .         .         V         .
17.583      9.7224     25.14  .    Q    .         .         .V        .
17.667      9.8777     22.55  .   Q     .         .         .V        .
17.750     10.0228     21.07  .   Q     .         .         .V        .
17.833     10.1550     19.20  .  Q      .         .         . V       .
17.917     10.2797     18.10  .  Q      .         .         . V       .
18.000     10.3964     16.95  .  Q      .         .         .  V      .
18.083     10.5065     15.98  .  Q      .         .         .  V      .
18.167     10.6092     14.92  . Q       .         .         .  V      .
18.250     10.7041     13.77  . Q       .         .         .   V     .
18.333     10.7927     12.87  . Q       .         .         .   V     .
18.417     10.8728     11.63  . Q       .         .         .   V     .
18.500     10.9491     11.08  . Q       .         .         .   V     .
18.583     11.0218     10.56  . Q       .         .         .    V    .
18.667     11.0917     10.15  . Q       .         .         .    V    .
18.750     11.1579      9.60  .Q        .         .         .    V    .
18.833     11.2207      9.12  .Q        .         .         .    V    .
18.917     11.2809      8.74  .Q        .         .         .     V   .
19.000     11.3381      8.30  .Q        .         .         .     V   .
19.083     11.3925      7.90  .Q        .         .         .     V   .
19.167     11.4427      7.28  .Q        .         .         .     V   .
19.250     11.4908      6.98  .Q        .         .         .     V   .
19.333     11.5373      6.77  .Q        .         .         .     V   .
19.417     11.5823      6.53  .Q        .         .         .     V   .
19.500     11.6244      6.12  .Q        .         .         .      V  .
19.583     11.6637      5.71  .Q        .         .         .      V  .
19.667     11.7017      5.52  .Q        .         .         .      V  .
19.750     11.7383      5.31  .Q        .         .         .      V  .
19.833     11.7731      5.05  .Q        .         .         .      V  .
19.917     11.8045      4.57  Q         .         .         .      V  .
20.000     11.8343      4.31  Q         .         .         .      V  .
```

20.083	11.8628	4.14	Q	.	.	.	V	.
20.167	11.8901	3.96	Q	.	.	.	V	.
20.250	11.9152	3.64	Q	.	.	.	V	.
20.333	11.9377	3.28	Q	.	.	.	V	.
20.417	11.9596	3.17	Q	.	.	.	V	.
20.500	11.9811	3.13	Q	.	.	.	V	.
20.583	12.0026	3.11	Q	.	.	.	V	.
20.667	12.0244	3.16	Q	.	.	.	V	.
20.750	12.0462	3.17	Q	.	.	.	V	.
20.833	12.0678	3.14	Q	.	.	.	V	.
20.917	12.0892	3.11	Q	.	.	.	V	.
21.000	12.1104	3.07	Q	.	.	.	V	.
21.083	12.1312	3.03	Q	.	.	.	V	.
21.167	12.1518	2.98	Q	.	.	.	V	.
21.250	12.1719	2.92	Q	.	.	.	V	.
21.333	12.1915	2.85	Q	.	.	.	V	.
21.417	12.2105	2.76	Q	.	.	.	V	.
21.500	12.2287	2.64	Q	.	.	.	V.	
21.583	12.2458	2.47	Q	.	.	.	V.	
21.667	12.2611	2.23	Q	.	.	.	V.	
21.750	12.2719	1.57	Q	.	.	.	V.	
21.833	12.2810	1.33	Q	.	.	.	V.	
21.917	12.2895	1.24	Q	.	.	.	V.	
22.000	12.2977	1.19	Q	.	.	.	V.	
22.083	12.3057	1.16	Q	.	.	.	V.	
22.167	12.3135	1.13	Q	.	.	.	V.	
22.250	12.3211	1.11	Q	.	.	.	V.	
22.333	12.3286	1.09	Q	.	.	.	V.	
22.417	12.3360	1.07	Q	.	.	.	V.	
22.500	12.3432	1.05	Q	.	.	.	V.	
22.583	12.3503	1.03	Q	.	.	.	V.	
22.667	12.3573	1.01	Q	.	.	.	V.	
22.750	12.3641	1.00	Q	.	.	.	V.	
22.833	12.3709	0.98	Q	.	.	.	V.	
22.917	12.3776	0.97	Q	.	.	.	V.	
23.000	12.3842	0.96	Q	.	.	.	V.	

23.083	12.3907	0.95	Q	.	.	.	V.
23.167	12.3972	0.94	Q	.	.	.	V.
23.250	12.4035	0.92	Q	.	.	.	V.
23.333	12.4098	0.91	Q	.	.	.	V.
23.417	12.4161	0.90	Q	.	.	.	V.
23.500	12.4222	0.89	Q	.	.	.	V.
23.583	12.4283	0.88	Q	.	.	.	V.
23.667	12.4343	0.87	Q	.	.	.	V.
23.750	12.4403	0.86	Q	.	.	.	V.
23.833	12.4461	0.85	Q	.	.	.	V.
23.917	12.4520	0.85	Q	.	.	.	V.
24.000	12.4577	0.84	Q	.	.	.	V.
24.083	12.4634	0.82	Q	.	.	.	V.
24.167	12.4690	0.81	Q	.	.	.	V.
24.250	12.4744	0.78	Q	.	.	.	V.
24.333	12.4796	0.76	Q	.	.	.	V.
24.417	12.4845	0.72	Q	.	.	.	V.
24.500	12.4891	0.67	Q	.	.	.	V.
24.583	12.4932	0.59	Q	.	.	.	V.
24.667	12.4967	0.51	Q	.	.	.	V.
24.750	12.4997	0.44	Q	.	.	.	V.
24.833	12.5024	0.39	Q	.	.	.	V.
24.917	12.5048	0.35	Q	.	.	.	V.
25.000	12.5070	0.32	Q	.	.	.	V.
25.083	12.5090	0.29	Q	.	.	.	V.
25.167	12.5109	0.27	Q	.	.	.	V.
25.250	12.5125	0.24	Q	.	.	.	V.
25.333	12.5141	0.22	Q	.	.	.	V.
25.417	12.5155	0.21	Q	.	.	.	V.
25.500	12.5168	0.19	Q	.	.	.	V.
25.583	12.5181	0.18	Q	.	.	.	V.
25.667	12.5192	0.17	Q	.	.	.	V.
25.750	12.5202	0.15	Q	.	.	.	V.
25.833	12.5212	0.14	Q	.	.	.	V.
25.917	12.5221	0.13	Q	.	.	.	V.
26.000	12.5230	0.12	Q	.	.	.	V.

26.083	12.5238	0.12	Q	.	.	.	V.
26.167	12.5245	0.11	Q	.	.	.	V.
26.250	12.5252	0.10	Q	.	.	.	V.
26.333	12.5258	0.09	Q	.	.	.	V.
26.417	12.5264	0.09	Q	.	.	.	V.
26.500	12.5270	0.08	Q	.	.	.	V.
26.583	12.5275	0.08	Q	.	.	.	V.
26.667	12.5280	0.07	Q	.	.	.	V.
26.750	12.5285	0.07	Q	.	.	.	V.
26.833	12.5289	0.06	Q	.	.	.	V.
26.917	12.5293	0.06	Q	.	.	.	V.
27.000	12.5297	0.05	Q	.	.	.	V.
27.083	12.5300	0.05	Q	.	.	.	V.
27.167	12.5303	0.05	Q	.	.	.	V.
27.250	12.5306	0.04	Q	.	.	.	V.
27.333	12.5309	0.04	Q	.	.	.	V.
27.417	12.5311	0.04	Q	.	.	.	V.
27.500	12.5314	0.03	Q	.	.	.	V.
27.583	12.5316	0.03	Q	.	.	.	V.
27.667	12.5318	0.03	Q	.	.	.	V.
27.750	12.5320	0.03	Q	.	.	.	V.
27.833	12.5322	0.02	Q	.	.	.	V.
27.917	12.5323	0.02	Q	.	.	.	V.
28.000	12.5325	0.02	Q	.	.	.	V.
28.083	12.5326	0.02	Q	.	.	.	V.
28.167	12.5327	0.02	Q	.	.	.	V.
28.250	12.5328	0.02	Q	.	.	.	V.
28.333	12.5330	0.02	Q	.	.	.	V.
28.417	12.5331	0.02	Q	.	.	.	V.
28.500	12.5332	0.01	Q	.	.	.	V.
28.583	12.5332	0.01	Q	.	.	.	V.
28.667	12.5333	0.01	Q	.	.	.	V.
28.750	12.5334	0.01	Q	.	.	.	V.
28.833	12.5335	0.01	Q	.	.	.	V.
28.917	12.5335	0.01	Q	.	.	.	V.

```
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                Duration
       Peak Flow Rate                     (minutes)
   =======================                =========
             0%                            1735.0
            10%                             165.0
            20%                             100.0
            30%                              75.0
            40%                              55.0
            50%                              40.0
            60%                              30.0
            70%                              25.0
            80%                              20.0
            90%                              10.0


****************************************************************************
  FLOW PROCESS FROM NODE   4006.00 TO NODE   4006.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>STREAM NUMBER 1 ADDED TO STREAM NUMBER 2<<<<<
============================================================================


****************************************************************************
  FLOW PROCESS FROM NODE   4006.00 TO NODE   4006.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>VIEW STREAM NUMBER 2 HYDROGRAPH<<<<<
============================================================================

            STREAM HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       50.0     100.0     150.0     200.0
```

```
----------------------------------------------------------------------------
  14.000      3.1397      5.85  .Q  V     .         .         .         .
  14.083      3.1807      5.96  .Q  V     .         .         .         .
  14.167      3.2227      6.10  .Q  V     .         .         .         .
  14.250      3.2658      6.26  .Q  V     .         .         .         .
  14.333      3.3102      6.44  .Q  V     .         .         .         .
  14.417      3.3561      6.66  .Q  V     .         .         .         .
  14.500      3.4040      6.95  .Q  V     .         .         .         .
  14.583      3.4545      7.33  .Q  V     .         .         .         .
  14.667      3.5077      7.73  .Q  V     .         .         .         .
  14.750      3.5637      8.12  .Q  V     .         .         .         .
  14.833      3.6222      8.51  .Q  V     .         .         .         .
  14.917      3.6836      8.91  .Q  V     .         .         .         .
  15.000      3.7478      9.32  .Q  V     .         .         .         .
  15.083      3.8149      9.75  .Q  V     .         .         .         .
  15.167      3.8853     10.21  . Q  V    .         .         .         .
  15.250      3.9589     10.70  . Q  V    .         .         .         .
  15.333      4.0361     11.21  . Q  V    .         .         .         .
  15.417      4.1173     11.79  . Q  V    .         .         .         .
  15.500      4.2032     12.47  . Q  V    .         .         .         .
  15.583      4.2950     13.33  . Q  V    .         .         .         .
  15.667      4.3942     14.40  . Q  V    .         .         .         .
  15.750      4.5036     15.88  .  Q V    .         .         .         .
  15.833      4.6276     18.01  .  Q V    .         .         .         .
  15.917      4.7737     21.21  .   Q V   .         .         .         .
  16.000      4.9521     25.91  .    QV   .         .         .         .
  16.083      5.1868     34.08  .     Q   .         .         .         .
  16.167      5.4959     44.88  .      VQ .         .         .         .
  16.250      5.8866     56.72  .      V  .Q        .         .         .
  16.333      6.3673     69.80  .       V .  Q      .         .         .
  16.417      6.9575     85.69  .       V .      Q  .         .         .
  16.500      7.7003    107.86  .        V.         .Q        .         .
  16.583      8.5844    128.37  .         .V        .    Q    .         .
  16.667      9.4731    129.04  .         . V       .    Q    .         .
  16.750     10.2994    119.98  .         .  V      .  Q      .         .
  16.833     11.0683    111.65  .         .   V     . Q       .         .
```

```
16.917     11.7949    105.50  .         .    V    .Q        .         .
17.000     12.4818     99.74  .         .     V  Q.         .         .
17.083     13.1432     96.03  .         .     V  Q.         .         .
17.167     13.7843     93.10  .         .      VQ .         .         .
17.250     14.4086     90.65  .         .       Q .         .         .
17.333     15.0123     87.66  .         .      Q V.         .         .
17.417     15.5962     84.78  .         .     Q   V         .         .
17.500     16.1627     82.25  .         .     Q   V         .         .
17.583     16.7102     79.50  .         .    Q    .V        .         .
17.667     17.2359     76.34  .         .    Q    . V       .         .
17.750     17.7463     74.11  .         .   Q     . V       .         .
17.833     18.2375     71.33  .         .   Q     .  V      .         .
17.917     18.7141     69.19  .         .  Q      .   V     .         .
18.000     19.1749     66.91  .         .  Q      .   V     .         .
18.083     19.6208     64.76  .         . Q       .    V    .         .
18.167     20.0511     62.48  .         . Q       .    V    .         .
18.250     20.4648     60.07  .         . Q       .     V   .         .
18.333     20.8634     57.88  .         .Q        .     V   .         .
18.417     21.2445     55.33  .         .Q        .      V  .         .
18.500     21.6126     53.45  .         Q         .      V  .         .
18.583     21.9680     51.61  .         Q         .       V .         .
18.667     22.3116     49.89  .        Q.         .       V .         .
18.750     22.6426     48.06  .        Q.         .        V.         .
18.833     22.9616     46.32  .        Q.         .        V.         .
18.917     23.2696     44.72  .       Q .         .         V         .
19.000     23.5662     43.07  .       Q .         .         V         .
19.083     23.8520     41.49  .       Q .         .         V         .
19.167     24.1255     39.71  .      Q  .         .         .V        .
19.250     24.3892     38.29  .      Q  .         .         .V        .
19.333     24.6438     36.97  .      Q  .         .         .V        .
19.417     24.8894     35.67  .      Q  .         .         . V       .
19.500     25.1251     34.22  .     Q   .         .         . V       .
19.583     25.3510     32.80  .     Q   .         .         . V       .
19.667     25.5688     31.62  .     Q   .         .         .  V      .
19.750     25.7786     30.47  .     Q   .         .         .  V      .
19.833     25.9802     29.27  .    Q    .         .         .  V      .
```

```
  19.917     26.1722     27.88  .    Q    .         .         .  V      .
  20.000     26.3563     26.74  .    Q    .         .         .   V     .
-------------------------------------------------------------------------------
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1205.0
10%	365.0
20%	245.0
30%	185.0
40%	140.0
50%	110.0
60%	75.0
70%	50.0
80%	30.0
90%	15.0

===

END OF FLOODSCx ROUTING ANALYSIS

```
****************************************************************************

              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
         (c) Copyright 1989-2015 Advanced Engineering Software (aes)
            Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                         Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED R - EXISTING - SAUH                                            *
* 2022-09-30                                                               *
 **************************************************************************

  FILE NAME: 87_R_EX.DAT
  TIME/DATE OF STUDY: 09:13 09/30/2022


****************************************************************************
  FLOW PROCESS FROM NODE   5000.00 TO NODE   5006.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =     130.600 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.690 HOURS
```

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.590

LOW LOSS FRACTION = 0.778

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.17

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.994

30-MINUTE FACTOR = 0.994

1-HOUR FACTOR = 0.994

3-HOUR FACTOR = 0.999

6-HOUR FACTOR = 1.000

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 12.077

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UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.531	8.393
2	2.044	23.892
3	4.490	38.637
4	7.909	53.993

5	13.319	85.445
6	22.590	146.442
7	34.253	184.210
8	43.893	152.249
9	51.325	117.386
10	57.276	94.003
11	61.812	71.635
12	65.524	58.626
13	68.706	50.268
14	71.559	45.052
15	73.987	38.345
16	76.136	33.949
17	78.136	31.593
18	79.799	26.256
19	81.373	24.867
20	82.735	21.509
21	84.033	20.498
22	85.227	18.872
23	86.382	18.232
24	87.405	16.167
25	88.368	15.211
26	89.178	12.789
27	89.903	11.446
28	90.599	10.996
29	91.275	10.682
30	91.902	9.890
31	92.481	9.157
32	93.039	8.810
33	93.571	8.396
34	94.055	7.653
35	94.467	6.500
36	94.877	6.488
37	95.288	6.483
38	95.672	6.069
39	95.989	5.012
40	96.304	4.960

41	96.617	4.955
42	96.914	4.690
43	97.139	3.556
44	97.356	3.428
45	97.574	3.433
46	97.781	3.275
47	97.916	2.125
48	98.036	1.911
49	98.157	1.911
50	98.279	1.921
51	98.418	2.202
52	98.564	2.294
53	98.708	2.284
54	98.854	2.294
55	98.998	2.289
56	99.143	2.289
57	99.288	2.289
58	99.433	2.289
59	99.578	2.289
60	99.723	2.289
61	99.868	2.289
62	100.000	2.088

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UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0020	0.0006
13	0.0026	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0037	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0037	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0040	0.0031	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0069	0.0054	0.0015
146	0.0070	0.0054	0.0016
147	0.0072	0.0056	0.0016
148	0.0072	0.0056	0.0016
149	0.0074	0.0058	0.0016
150	0.0075	0.0058	0.0017
151	0.0077	0.0060	0.0017
152	0.0078	0.0061	0.0017
153	0.0080	0.0062	0.0018
154	0.0081	0.0063	0.0018
155	0.0084	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0087	0.0068	0.0019
158	0.0089	0.0069	0.0020
159	0.0091	0.0071	0.0020
160	0.0093	0.0072	0.0021
161	0.0096	0.0075	0.0021
162	0.0098	0.0076	0.0022
163	0.0101	0.0079	0.0022
164	0.0103	0.0080	0.0023
165	0.0107	0.0083	0.0024
166	0.0109	0.0085	0.0024
167	0.0114	0.0089	0.0025
168	0.0116	0.0090	0.0026
169	0.0195	0.0152	0.0043
170	0.0199	0.0155	0.0044
171	0.0207	0.0161	0.0046
172	0.0212	0.0165	0.0047
173	0.0222	0.0172	0.0049
174	0.0227	0.0177	0.0050

175	0.0239	0.0186	0.0053
176	0.0245	0.0191	0.0054
177	0.0259	0.0202	0.0058
178	0.0267	0.0208	0.0059
179	0.0285	0.0222	0.0063
180	0.0295	0.0229	0.0065
181	0.0318	0.0247	0.0071
182	0.0331	0.0257	0.0073
183	0.0362	0.0281	0.0080
184	0.0380	0.0296	0.0084
185	0.0613	0.0477	0.0136
186	0.0645	0.0492	0.0153
187	0.0723	0.0492	0.0232
188	0.0776	0.0492	0.0284
189	0.1003	0.0492	0.0512
190	0.1112	0.0492	0.0620
191	0.1500	0.0492	0.1008
192	0.1963	0.0492	0.1471
193	0.4792	0.0492	0.4300
194	0.1262	0.0492	0.0771
195	0.0838	0.0492	0.0347
196	0.0680	0.0492	0.0189
197	0.0401	0.0312	0.0089
198	0.0345	0.0269	0.0077
199	0.0306	0.0238	0.0068
200	0.0276	0.0214	0.0061
201	0.0252	0.0196	0.0056
202	0.0233	0.0181	0.0052
203	0.0217	0.0169	0.0048
204	0.0203	0.0158	0.0045
205	0.0119	0.0092	0.0026
206	0.0111	0.0087	0.0025
207	0.0105	0.0082	0.0023
208	0.0099	0.0077	0.0022
209	0.0094	0.0074	0.0021
210	0.0090	0.0070	0.0020

211	0.0086	0.0067	0.0019
212	0.0082	0.0064	0.0018
213	0.0079	0.0061	0.0018
214	0.0076	0.0059	0.0017
215	0.0073	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0040	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0039	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0031	0.0024	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0030	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0006
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0021	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.02

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.41

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 21.9712

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 15.3409

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2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0002	0.02	Q	.	.	.	.
0.250	0.0004	0.04	Q	.	.	.	.
0.333	0.0009	0.07	Q	.	.	.	.
0.417	0.0017	0.12	Q	.	.	.	.
0.500	0.0031	0.20	Q	.	.	.	.
0.583	0.0052	0.30	Q	.	.	.	.
0.667	0.0079	0.39	Q	.	.	.	.
0.750	0.0110	0.46	Q	.	.	.	.
0.833	0.0146	0.51	Q	.	.	.	.
0.917	0.0184	0.55	Q	.	.	.	.
1.000	0.0224	0.59	Q	.	.	.	.
1.083	0.0267	0.62	Q	.	.	.	.
1.167	0.0312	0.65	Q	.	.	.	.
1.250	0.0358	0.67	Q	.	.	.	.
1.333	0.0406	0.69	Q	.	.	.	.
1.417	0.0455	0.71	Q	.	.	.	.
1.500	0.0505	0.73	Q	.	.	.	.
1.583	0.0557	0.75	Q	.	.	.	.
1.667	0.0610	0.76	Q	.	.	.	.
1.750	0.0663	0.78	Q	.	.	.	.
1.833	0.0718	0.79	Q	.	.	.	.
1.917	0.0773	0.81	Q	.	.	.	.
2.000	0.0830	0.82	Q	.	.	.	.

2.083	0.0887	0.83	Q	.	.	.	.
2.167	0.0945	0.84	Q	.	.	.	.
2.250	0.1004	0.85	Q	.	.	.	.
2.333	0.1063	0.86	Q	.	.	.	.
2.417	0.1123	0.87	Q	.	.	.	.
2.500	0.1184	0.88	Q	.	.	.	.
2.583	0.1245	0.89	Q	.	.	.	.
2.667	0.1307	0.90	Q	.	.	.	.
2.750	0.1370	0.91	Q	.	.	.	.
2.833	0.1433	0.92	Q	.	.	.	.
2.917	0.1497	0.93	Q	.	.	.	.
3.000	0.1561	0.93	Q	.	.	.	.
3.083	0.1626	0.94	Q	.	.	.	.
3.167	0.1692	0.95	Q	.	.	.	.
3.250	0.1757	0.96	Q	.	.	.	.
3.333	0.1824	0.96	Q	.	.	.	.
3.417	0.1891	0.97	Q	.	.	.	.
3.500	0.1958	0.98	Q	.	.	.	.
3.583	0.2026	0.99	Q	.	.	.	.
3.667	0.2095	0.99	Q	.	.	.	.
3.750	0.2163	1.00	Q	.	.	.	.
3.833	0.2233	1.01	Q	.	.	.	.
3.917	0.2302	1.01	Q	.	.	.	.
4.000	0.2373	1.02	Q	.	.	.	.
4.083	0.2443	1.03	Q	.	.	.	.
4.167	0.2514	1.03	Q	.	.	.	.
4.250	0.2586	1.04	Q	.	.	.	.
4.333	0.2658	1.04	Q	.	.	.	.
4.417	0.2730	1.05	Q	.	.	.	.
4.500	0.2803	1.06	Q	.	.	.	.
4.583	0.2876	1.07	Q	.	.	.	.
4.667	0.2950	1.07	Q	.	.	.	.
4.750	0.3025	1.08	Q	.	.	.	.
4.833	0.3099	1.09	Q	.	.	.	.
4.917	0.3175	1.09	Q	.	.	.	.
5.000	0.3251	1.10	Q	.	.	.	.

5.083	0.3327	1.11	Q	.	.	.	.
5.167	0.3404	1.12	Q	.	.	.	.
5.250	0.3481	1.12	Q	.	.	.	.
5.333	0.3559	1.13	Q	.	.	.	.
5.417	0.3637	1.13	Q	.	.	.	.
5.500	0.3715	1.14	Q	.	.	.	.
5.583	0.3794	1.15	Q	.	.	.	.
5.667	0.3874	1.15	QV	.	.	.	.
5.750	0.3954	1.16	QV	.	.	.	.
5.833	0.4034	1.17	QV	.	.	.	.
5.917	0.4115	1.17	QV	.	.	.	.
6.000	0.4197	1.18	QV	.	.	.	.
6.083	0.4278	1.19	QV	.	.	.	.
6.167	0.4361	1.20	QV	.	.	.	.
6.250	0.4444	1.20	QV	.	.	.	.
6.333	0.4527	1.21	QV	.	.	.	.
6.417	0.4611	1.22	QV	.	.	.	.
6.500	0.4695	1.23	QV	.	.	.	.
6.583	0.4780	1.23	QV	.	.	.	.
6.667	0.4866	1.24	QV	.	.	.	.
6.750	0.4952	1.25	QV	.	.	.	.
6.833	0.5039	1.26	QV	.	.	.	.
6.917	0.5126	1.27	QV	.	.	.	.
7.000	0.5214	1.27	QV	.	.	.	.
7.083	0.5302	1.28	QV	.	.	.	.
7.167	0.5391	1.29	QV	.	.	.	.
7.250	0.5480	1.30	QV	.	.	.	.
7.333	0.5570	1.31	QV	.	.	.	.
7.417	0.5661	1.32	QV	.	.	.	.
7.500	0.5753	1.33	QV	.	.	.	.
7.583	0.5845	1.34	QV	.	.	.	.
7.667	0.5937	1.35	QV	.	.	.	.
7.750	0.6031	1.36	QV	.	.	.	.
7.833	0.6125	1.36	QV	.	.	.	.
7.917	0.6219	1.37	QV	.	.	.	.
8.000	0.6315	1.38	QV	.	.	.	.

8.083	0.6411	1.40	QV	.	.	.	.
8.167	0.6508	1.41	QV	.	.	.	.
8.250	0.6605	1.42	QV	.	.	.	.
8.333	0.6703	1.43	QV	.	.	.	.
8.417	0.6802	1.44	QV	.	.	.	.
8.500	0.6902	1.45	QV	.	.	.	.
8.583	0.7003	1.46	QV	.	.	.	.
8.667	0.7104	1.47	QV	.	.	.	.
8.750	0.7206	1.48	QV	.	.	.	.
8.833	0.7309	1.50	QV	.	.	.	.
8.917	0.7413	1.51	QV	.	.	.	.
9.000	0.7518	1.52	QV	.	.	.	.
9.083	0.7624	1.53	QV	.	.	.	.
9.167	0.7730	1.55	Q V	.	.	.	.
9.250	0.7837	1.56	Q V	.	.	.	.
9.333	0.7946	1.57	Q V	.	.	.	.
9.417	0.8055	1.59	Q V	.	.	.	.
9.500	0.8165	1.60	Q V	.	.	.	.
9.583	0.8276	1.61	Q V	.	.	.	.
9.667	0.8389	1.63	Q V	.	.	.	.
9.750	0.8502	1.64	Q V	.	.	.	.
9.833	0.8616	1.66	Q V	.	.	.	.
9.917	0.8732	1.67	Q V	.	.	.	.
10.000	0.8848	1.69	Q V	.	.	.	.
10.083	0.8966	1.71	Q V	.	.	.	.
10.167	0.9084	1.72	Q V	.	.	.	.
10.250	0.9204	1.74	Q V	.	.	.	.
10.333	0.9325	1.76	Q V	.	.	.	.
10.417	0.9447	1.78	Q V	.	.	.	.
10.500	0.9571	1.79	Q V	.	.	.	.
10.583	0.9696	1.81	Q V	.	.	.	.
10.667	0.9822	1.83	Q V	.	.	.	.
10.750	0.9949	1.85	Q V	.	.	.	.
10.833	1.0078	1.87	Q V	.	.	.	.
10.917	1.0208	1.89	Q V	.	.	.	.
11.000	1.0340	1.91	Q V	.	.	.	.

11.083	1.0473	1.93	Q V	.	.	.	.
11.167	1.0608	1.96	Q V	.	.	.	.
11.250	1.0744	1.98	Q V	.	.	.	.
11.333	1.0882	2.00	Q V	.	.	.	.
11.417	1.1021	2.03	Q V	.	.	.	.
11.500	1.1162	2.05	Q V	.	.	.	.
11.583	1.1305	2.07	Q V	.	.	.	.
11.667	1.1450	2.10	Q V	.	.	.	.
11.750	1.1597	2.13	Q V	.	.	.	.
11.833	1.1745	2.16	Q V	.	.	.	.
11.917	1.1895	2.18	Q V	.	.	.	.
12.000	1.2048	2.21	Q V	.	.	.	.
12.083	1.2202	2.24	Q V	.	.	.	.
12.167	1.2358	2.27	Q V	.	.	.	.
12.250	1.2517	2.30	Q V	.	.	.	.
12.333	1.2676	2.32	Q V	.	.	.	.
12.417	1.2838	2.34	Q V	.	.	.	.
12.500	1.3000	2.36	Q V	.	.	.	.
12.583	1.3163	2.37	Q V	.	.	.	.
12.667	1.3328	2.38	Q V	.	.	.	.
12.750	1.3493	2.41	Q V	.	.	.	.
12.833	1.3661	2.43	Q V	.	.	.	.
12.917	1.3830	2.46	Q V	.	.	.	.
13.000	1.4002	2.50	Q V	.	.	.	.
13.083	1.4177	2.53	Q V	.	.	.	.
13.167	1.4354	2.57	Q V	.	.	.	.
13.250	1.4534	2.61	Q V	.	.	.	.
13.333	1.4717	2.66	Q V	.	.	.	.
13.417	1.4903	2.71	Q V	.	.	.	.
13.500	1.5093	2.76	Q V	.	.	.	.
13.583	1.5286	2.81	Q V	.	.	.	.
13.667	1.5484	2.86	Q V	.	.	.	.
13.750	1.5685	2.92	Q V	.	.	.	.
13.833	1.5891	2.99	Q V	.	.	.	.
13.917	1.6101	3.05	Q V	.	.	.	.
14.000	1.6316	3.12	Q V	.	.	.	.

```
14.083      1.6537      3.21  Q   V     .         .         .         .
14.167      1.6766      3.33  Q   V     .         .         .         .
14.250      1.7006      3.48  Q   V     .         .         .         .
14.333      1.7258      3.66  Q   V     .         .         .         .
14.417      1.7526      3.90  Q   V     .         .         .         .
14.500      1.7818      4.24  Q   V     .         .         .         .
14.583      1.8140      4.67  Q   V     .         .         .         .
14.667      1.8488      5.05  .Q  V     .         .         .         .
14.750      1.8860      5.40  .Q  V     .         .         .         .
14.833      1.9254      5.73  .Q   V    .         .         .         .
14.917      1.9670      6.03  .Q   V    .         .         .         .
15.000      2.0106      6.34  .Q   V    .         .         .         .
15.083      2.0564      6.65  .Q   V    .         .         .         .
15.167      2.1044      6.97  .Q   V    .         .         .         .
15.250      2.1548      7.32  .Q   V    .         .         .         .
15.333      2.2078      7.69  .Q   V    .         .         .         .
15.417      2.2638      8.13  .Q   V    .         .         .         .
15.500      2.3237      8.69  .Q    V   .         .         .         .
15.583      2.3886      9.43  .Q    V   .         .         .         .
15.667      2.4607     10.46  . Q   V   .         .         .         .
15.750      2.5438     12.06  . Q   V   .         .         .         .
15.833      2.6445     14.63  . Q   V   .         .         .         .
15.917      2.7724     18.58  .  Q   V  .         .         .         .
16.000      2.9412     24.51  .   Q  V  .         .         .         .
16.083      3.1846     35.33  .      QV .         .         .         .
16.167      3.5311     50.31  .        VQ         .         .         .
16.250      3.9889     66.47  .         V  Q      .         .         .
16.333      4.5673     84.00  .         .V    Q   .         .         .
16.417      5.3030    106.82  .         .  V      .Q        .         .
16.500      6.2263    134.07  .         .     V   .     Q   .         .
16.583      7.2245    144.94  .         .       V .       Q .         .
16.667      8.0990    126.98  .         .         .V   Q    .         .
16.750      8.8230    105.12  .         .         .Q V      .         .
16.833      9.4233     87.17  .         .      Q  .   V     .         .
16.917      9.9152     71.42  .         .   Q     .    V    .         .
17.000     10.3336     60.75  .         . Q       .     V   .         .
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17.083     10.7003     53.24  .         Q         .      V  .         .
17.167     11.0283     47.63  .        Q.         .       V .         .
17.250     11.3197     42.31  .       Q .         .        V.         .
17.333     11.5824     38.16  .      Q  .         .         V         .
17.417     11.8231     34.94  .     Q   .         .         V         .
17.500     12.0369     31.05  .     Q   .         .         .V        .
17.583     12.2338     28.60  .    Q    .         .         .V        .
17.667     12.4121     25.89  .    Q    .         .         . V       .
17.750     12.5785     24.16  .   Q     .         .         . V       .
17.833     12.7329     22.42  .   Q     .         .         .  V      .
17.917     12.8778     21.04  .   Q     .         .         .  V      .
18.000     13.0107     19.29  .  Q      .         .         .  V      .
18.083     13.1339     17.90  .  Q      .         .         .   V     .
18.167     13.2454     16.19  .  Q      .         .         .   V     .
18.250     13.3486     14.99  . Q       .         .         .   V     .
18.333     13.4466     14.22  . Q       .         .         .    V    .
18.417     13.5399     13.56  . Q       .         .         .    V    .
18.500     13.6281     12.79  . Q       .         .         .    V    .
18.583     13.7113     12.08  . Q       .         .         .    V    .
18.667     13.7906     11.52  . Q       .         .         .    V    .
18.750     13.8657     10.92  . Q       .         .         .     V   .
18.833     13.9361     10.22  . Q       .         .         .     V   .
18.917     14.0013      9.46  .Q        .         .         .     V   .
19.000     14.0641      9.12  .Q        .         .         .     V   .
19.083     14.1246      8.78  .Q        .         .         .     V   .
19.167     14.1818      8.30  .Q        .         .         .     V   .
19.250     14.2344      7.64  .Q        .         .         .      V  .
19.333     14.2848      7.33  .Q        .         .         .      V  .
19.417     14.3332      7.02  .Q        .         .         .      V  .
19.500     14.3787      6.61  .Q        .         .         .      V  .
19.583     14.4196      5.94  .Q        .         .         .      V  .
19.667     14.4585      5.64  .Q        .         .         .      V  .
19.750     14.4956      5.39  .Q        .         .         .      V  .
19.833     14.5304      5.06  .Q        .         .         .      V  .
19.917     14.5612      4.47  Q         .         .         .      V  .
20.000     14.5905      4.25  Q         .         .         .       V .
```

20.083	14.6192	4.17	Q	.	.	.	V .
20.167	14.6477	4.14	Q	.	.	.	V .
20.250	14.6767	4.21	Q	.	.	.	V .
20.333	14.7056	4.21	Q	.	.	.	V .
20.417	14.7343	4.16	Q	.	.	.	V .
20.500	14.7626	4.11	Q	.	.	.	V .
20.583	14.7905	4.05	Q	.	.	.	V .
20.667	14.8179	3.98	Q	.	.	.	V .
20.750	14.8448	3.90	Q	.	.	.	V .
20.833	14.8710	3.81	Q	.	.	.	V .
20.917	14.8963	3.66	Q	.	.	.	V .
21.000	14.9203	3.49	Q	.	.	.	V .
21.083	14.9426	3.23	Q	.	.	.	V .
21.167	14.9620	2.82	Q	.	.	.	V.
21.250	14.9750	1.89	Q	.	.	.	V.
21.333	14.9867	1.70	Q	.	.	.	V.
21.417	14.9977	1.60	Q	.	.	.	V.
21.500	15.0084	1.54	Q	.	.	.	V.
21.583	15.0187	1.51	Q	.	.	.	V.
21.667	15.0289	1.47	Q	.	.	.	V.
21.750	15.0388	1.44	Q	.	.	.	V.
21.833	15.0486	1.41	Q	.	.	.	V.
21.917	15.0581	1.38	Q	.	.	.	V.
22.000	15.0674	1.36	Q	.	.	.	V.
22.083	15.0766	1.33	Q	.	.	.	V.
22.167	15.0857	1.31	Q	.	.	.	V.
22.250	15.0945	1.29	Q	.	.	.	V.
22.333	15.1033	1.27	Q	.	.	.	V.
22.417	15.1119	1.25	Q	.	.	.	V.
22.500	15.1205	1.24	Q	.	.	.	V.
22.583	15.1289	1.22	Q	.	.	.	V.
22.667	15.1372	1.21	Q	.	.	.	V.
22.750	15.1454	1.19	Q	.	.	.	V.
22.833	15.1535	1.18	Q	.	.	.	V.
22.917	15.1615	1.16	Q	.	.	.	V.
23.000	15.1694	1.15	Q	.	.	.	V.

23.083	15.1772	1.13	Q	.	.	.	V.
23.167	15.1849	1.12	Q	.	.	.	V.
23.250	15.1926	1.11	Q	.	.	.	V.
23.333	15.2001	1.10	Q	.	.	.	V.
23.417	15.2076	1.08	Q	.	.	.	V.
23.500	15.2150	1.07	Q	.	.	.	V.
23.583	15.2223	1.06	Q	.	.	.	V.
23.667	15.2295	1.05	Q	.	.	.	V.
23.750	15.2366	1.04	Q	.	.	.	V.
23.833	15.2437	1.03	Q	.	.	.	V.
23.917	15.2507	1.02	Q	.	.	.	V.
24.000	15.2576	1.01	Q	.	.	.	V.
24.083	15.2645	0.99	Q	.	.	.	V.
24.167	15.2711	0.97	Q	.	.	.	V.
24.250	15.2776	0.94	Q	.	.	.	V.
24.333	15.2838	0.90	Q	.	.	.	V.
24.417	15.2896	0.84	Q	.	.	.	V.
24.500	15.2948	0.75	Q	.	.	.	V.
24.583	15.2992	0.64	Q	.	.	.	V.
24.667	15.3030	0.55	Q	.	.	.	V.
24.750	15.3063	0.48	Q	.	.	.	V.
24.833	15.3093	0.42	Q	.	.	.	V.
24.917	15.3119	0.38	Q	.	.	.	V.
25.000	15.3142	0.34	Q	.	.	.	V.
25.083	15.3164	0.31	Q	.	.	.	V.
25.167	15.3184	0.28	Q	.	.	.	V.
25.250	15.3202	0.26	Q	.	.	.	V.
25.333	15.3218	0.24	Q	.	.	.	V.
25.417	15.3233	0.22	Q	.	.	.	V.
25.500	15.3247	0.20	Q	.	.	.	V.
25.583	15.3260	0.19	Q	.	.	.	V.
25.667	15.3272	0.17	Q	.	.	.	V.
25.750	15.3283	0.16	Q	.	.	.	V.
25.833	15.3293	0.15	Q	.	.	.	V.
25.917	15.3302	0.14	Q	.	.	.	V.
26.000	15.3311	0.13	Q	.	.	.	V.

26.083	15.3319	0.12	Q	.	.	.	V.
26.167	15.3326	0.11	Q	.	.	.	V.
26.250	15.3333	0.10	Q	.	.	.	V.
26.333	15.3339	0.09	Q	.	.	.	V.
26.417	15.3345	0.09	Q	.	.	.	V.
26.500	15.3351	0.08	Q	.	.	.	V.
26.583	15.3356	0.07	Q	.	.	.	V.
26.667	15.3361	0.07	Q	.	.	.	V.
26.750	15.3365	0.06	Q	.	.	.	V.
26.833	15.3369	0.06	Q	.	.	.	V.
26.917	15.3373	0.05	Q	.	.	.	V.
27.000	15.3376	0.05	Q	.	.	.	V.
27.083	15.3379	0.05	Q	.	.	.	V.
27.167	15.3382	0.04	Q	.	.	.	V.
27.250	15.3385	0.04	Q	.	.	.	V.
27.333	15.3387	0.04	Q	.	.	.	V.
27.417	15.3390	0.03	Q	.	.	.	V.
27.500	15.3392	0.03	Q	.	.	.	V.
27.583	15.3394	0.03	Q	.	.	.	V.
27.667	15.3395	0.03	Q	.	.	.	V.
27.750	15.3397	0.02	Q	.	.	.	V.
27.833	15.3398	0.02	Q	.	.	.	V.
27.917	15.3400	0.02	Q	.	.	.	V.
28.000	15.3401	0.02	Q	.	.	.	V.
28.083	15.3402	0.02	Q	.	.	.	V.
28.167	15.3403	0.02	Q	.	.	.	V.
28.250	15.3404	0.01	Q	.	.	.	V.
28.333	15.3405	0.01	Q	.	.	.	V.
28.417	15.3406	0.01	Q	.	.	.	V.
28.500	15.3407	0.01	Q	.	.	.	V.
28.583	15.3407	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1715.0
10%	150.0
20%	90.0
30%	65.0
40%	50.0
50%	35.0
60%	30.0
70%	25.0
80%	15.0
90%	10.0

END OF FLOODSCx ROUTING ANALYSIS

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****************************************************************************

              F L O O D   R O U T I N G   A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
         (c) Copyright 1989-2015 Advanced Engineering Software (aes)
            Ver. 22.0  Release Date: 07/01/2015  License ID 1673

                          Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* 40.087                                                                   *
* WATERSHED R - PROPOSED - UH                                              *
* 2022-10-03                                                               *
 **************************************************************************

  FILE NAME: 87_R_PR.DAT
  TIME/DATE OF STUDY: 11:25 10/03/2022



****************************************************************************
  FLOW PROCESS FROM NODE   5000.00 TO NODE   5004.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      93.600 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.530 HOURS
```

DESERT(UNDEVELOPED) S-GRAPH SELECTED

MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.504

LOW LOSS FRACTION = 0.686

HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.48

SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 1.16

SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.60

SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.24

SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.56

SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 3.43

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 0.996

30-MINUTE FACTOR = 0.996

1-HOUR FACTOR = 0.996

3-HOUR FACTOR = 0.999

6-HOUR FACTOR = 1.000

24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES

UNIT INTERVAL PERCENTAGE OF LAG-TIME = 15.723

==

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.718	8.130
2	3.068	26.598
3	7.010	44.624
4	13.799	76.854

5	26.883	148.102
6	40.804	157.581
7	51.022	115.672
8	58.556	85.278
9	63.974	61.326
10	68.294	48.907
11	71.984	41.764
12	75.020	34.376
13	77.697	30.296
14	79.919	25.155
15	81.904	22.476
16	83.620	19.417
17	85.206	17.953
18	86.682	16.715
19	87.970	14.580
20	89.095	12.732
21	90.036	10.653
22	90.931	10.125
23	91.777	9.579
24	92.535	8.583
25	93.250	8.088
26	93.917	7.552
27	94.467	6.223
28	95.001	6.052
29	95.527	5.948
30	95.960	4.900
31	96.369	4.630
32	96.775	4.598
33	97.098	3.659
34	97.381	3.203
35	97.664	3.206
36	97.882	2.464
37	98.039	1.777
38	98.196	1.780
39	98.365	1.907
40	98.553	2.129

41	98.741	2.137
42	98.930	2.135
43	99.119	2.137
44	99.307	2.135
45	99.496	2.135
46	99.685	2.135
47	99.873	2.135
48	100.000	1.436

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0017	0.0008
2	0.0025	0.0017	0.0008
3	0.0025	0.0017	0.0008
4	0.0025	0.0017	0.0008
5	0.0026	0.0018	0.0008
6	0.0026	0.0018	0.0008
7	0.0026	0.0018	0.0008
8	0.0026	0.0018	0.0008
9	0.0026	0.0018	0.0008
10	0.0026	0.0018	0.0008
11	0.0026	0.0018	0.0008
12	0.0026	0.0018	0.0008
13	0.0026	0.0018	0.0008
14	0.0027	0.0018	0.0008
15	0.0027	0.0018	0.0008
16	0.0027	0.0018	0.0008
17	0.0027	0.0018	0.0008
18	0.0027	0.0019	0.0008
19	0.0027	0.0019	0.0009
20	0.0027	0.0019	0.0009
21	0.0027	0.0019	0.0009
22	0.0028	0.0019	0.0009
23	0.0028	0.0019	0.0009
24	0.0028	0.0019	0.0009
25	0.0028	0.0019	0.0009
26	0.0028	0.0019	0.0009
27	0.0028	0.0019	0.0009
28	0.0028	0.0019	0.0009
29	0.0029	0.0020	0.0009
30	0.0029	0.0020	0.0009

31	0.0029	0.0020	0.0009
32	0.0029	0.0020	0.0009
33	0.0029	0.0020	0.0009
34	0.0029	0.0020	0.0009
35	0.0029	0.0020	0.0009
36	0.0029	0.0020	0.0009
37	0.0030	0.0020	0.0009
38	0.0030	0.0020	0.0009
39	0.0030	0.0021	0.0009
40	0.0030	0.0021	0.0009
41	0.0030	0.0021	0.0010
42	0.0030	0.0021	0.0010
43	0.0031	0.0021	0.0010
44	0.0031	0.0021	0.0010
45	0.0031	0.0021	0.0010
46	0.0031	0.0021	0.0010
47	0.0031	0.0021	0.0010
48	0.0031	0.0022	0.0010
49	0.0032	0.0022	0.0010
50	0.0032	0.0022	0.0010
51	0.0032	0.0022	0.0010
52	0.0032	0.0022	0.0010
53	0.0032	0.0022	0.0010
54	0.0032	0.0022	0.0010
55	0.0033	0.0022	0.0010
56	0.0033	0.0023	0.0010
57	0.0033	0.0023	0.0010
58	0.0033	0.0023	0.0010
59	0.0033	0.0023	0.0011
60	0.0034	0.0023	0.0011
61	0.0034	0.0023	0.0011
62	0.0034	0.0023	0.0011
63	0.0034	0.0024	0.0011
64	0.0034	0.0024	0.0011
65	0.0035	0.0024	0.0011
66	0.0035	0.0024	0.0011

67	0.0035	0.0024	0.0011
68	0.0035	0.0024	0.0011
69	0.0036	0.0024	0.0011
70	0.0036	0.0025	0.0011
71	0.0036	0.0025	0.0011
72	0.0036	0.0025	0.0011
73	0.0037	0.0025	0.0011
74	0.0037	0.0025	0.0012
75	0.0037	0.0025	0.0012
76	0.0037	0.0025	0.0012
77	0.0037	0.0026	0.0012
78	0.0038	0.0026	0.0012
79	0.0038	0.0026	0.0012
80	0.0038	0.0026	0.0012
81	0.0039	0.0026	0.0012
82	0.0039	0.0027	0.0012
83	0.0039	0.0027	0.0012
84	0.0039	0.0027	0.0012
85	0.0040	0.0027	0.0012
86	0.0040	0.0027	0.0013
87	0.0040	0.0028	0.0013
88	0.0040	0.0028	0.0013
89	0.0041	0.0028	0.0013
90	0.0041	0.0028	0.0013
91	0.0042	0.0028	0.0013
92	0.0042	0.0029	0.0013
93	0.0042	0.0029	0.0013
94	0.0042	0.0029	0.0013
95	0.0043	0.0029	0.0013
96	0.0043	0.0030	0.0014
97	0.0044	0.0030	0.0014
98	0.0044	0.0030	0.0014
99	0.0044	0.0030	0.0014
100	0.0045	0.0031	0.0014
101	0.0045	0.0031	0.0014
102	0.0045	0.0031	0.0014

103	0.0046	0.0031	0.0014
104	0.0046	0.0032	0.0014
105	0.0047	0.0032	0.0015
106	0.0047	0.0032	0.0015
107	0.0048	0.0033	0.0015
108	0.0048	0.0033	0.0015
109	0.0048	0.0033	0.0015
110	0.0049	0.0033	0.0015
111	0.0049	0.0034	0.0015
112	0.0050	0.0034	0.0016
113	0.0050	0.0035	0.0016
114	0.0051	0.0035	0.0016
115	0.0051	0.0035	0.0016
116	0.0052	0.0035	0.0016
117	0.0052	0.0036	0.0016
118	0.0053	0.0036	0.0017
119	0.0054	0.0037	0.0017
120	0.0054	0.0037	0.0017
121	0.0055	0.0038	0.0017
122	0.0055	0.0038	0.0017
123	0.0056	0.0038	0.0018
124	0.0056	0.0039	0.0018
125	0.0057	0.0039	0.0018
126	0.0058	0.0040	0.0018
127	0.0059	0.0040	0.0018
128	0.0059	0.0041	0.0019
129	0.0060	0.0041	0.0019
130	0.0061	0.0042	0.0019
131	0.0062	0.0042	0.0019
132	0.0062	0.0043	0.0020
133	0.0063	0.0043	0.0020
134	0.0064	0.0044	0.0020
135	0.0065	0.0045	0.0020
136	0.0066	0.0045	0.0021
137	0.0067	0.0046	0.0021
138	0.0067	0.0046	0.0021

139	0.0069	0.0047	0.0022
140	0.0069	0.0048	0.0022
141	0.0071	0.0049	0.0022
142	0.0072	0.0049	0.0022
143	0.0073	0.0050	0.0023
144	0.0074	0.0051	0.0023
145	0.0069	0.0047	0.0022
146	0.0070	0.0048	0.0022
147	0.0071	0.0049	0.0022
148	0.0072	0.0050	0.0023
149	0.0074	0.0051	0.0023
150	0.0075	0.0051	0.0024
151	0.0077	0.0053	0.0024
152	0.0078	0.0053	0.0024
153	0.0080	0.0055	0.0025
154	0.0081	0.0056	0.0025
155	0.0083	0.0057	0.0026
156	0.0085	0.0058	0.0027
157	0.0087	0.0060	0.0027
158	0.0089	0.0061	0.0028
159	0.0091	0.0063	0.0029
160	0.0093	0.0064	0.0029
161	0.0096	0.0066	0.0030
162	0.0098	0.0067	0.0031
163	0.0101	0.0069	0.0032
164	0.0103	0.0071	0.0032
165	0.0107	0.0073	0.0034
166	0.0109	0.0075	0.0034
167	0.0114	0.0078	0.0036
168	0.0116	0.0080	0.0036
169	0.0194	0.0133	0.0061
170	0.0198	0.0136	0.0062
171	0.0207	0.0142	0.0065
172	0.0211	0.0145	0.0066
173	0.0221	0.0151	0.0069
174	0.0226	0.0155	0.0071

175	0.0238	0.0163	0.0075
176	0.0244	0.0168	0.0077
177	0.0258	0.0177	0.0081
178	0.0266	0.0183	0.0084
179	0.0284	0.0195	0.0089
180	0.0294	0.0202	0.0092
181	0.0317	0.0217	0.0099
182	0.0330	0.0226	0.0104
183	0.0361	0.0247	0.0113
184	0.0379	0.0260	0.0119
185	0.0630	0.0420	0.0210
186	0.0662	0.0420	0.0242
187	0.0741	0.0420	0.0321
188	0.0794	0.0420	0.0374
189	0.0992	0.0420	0.0572
190	0.1099	0.0420	0.0679
191	0.1485	0.0420	0.1065
192	0.1946	0.0420	0.1526
193	0.4780	0.0420	0.4360
194	0.1249	0.0420	0.0829
195	0.0856	0.0420	0.0436
196	0.0698	0.0420	0.0278
197	0.0400	0.0274	0.0125
198	0.0344	0.0236	0.0108
199	0.0305	0.0209	0.0096
200	0.0275	0.0188	0.0086
201	0.0251	0.0172	0.0079
202	0.0232	0.0159	0.0073
203	0.0216	0.0148	0.0068
204	0.0202	0.0139	0.0064
205	0.0119	0.0081	0.0037
206	0.0111	0.0076	0.0035
207	0.0105	0.0072	0.0033
208	0.0099	0.0068	0.0031
209	0.0094	0.0065	0.0030
210	0.0090	0.0062	0.0028

211	0.0086	0.0059	0.0027
212	0.0082	0.0056	0.0026
213	0.0079	0.0054	0.0025
214	0.0076	0.0052	0.0024
215	0.0073	0.0050	0.0023
216	0.0071	0.0048	0.0022
217	0.0075	0.0051	0.0023
218	0.0072	0.0050	0.0023
219	0.0070	0.0048	0.0022
220	0.0068	0.0047	0.0021
221	0.0066	0.0045	0.0021
222	0.0064	0.0044	0.0020
223	0.0063	0.0043	0.0020
224	0.0061	0.0042	0.0019
225	0.0060	0.0041	0.0019
226	0.0058	0.0040	0.0018
227	0.0057	0.0039	0.0018
228	0.0056	0.0038	0.0017
229	0.0054	0.0037	0.0017
230	0.0053	0.0036	0.0017
231	0.0052	0.0036	0.0016
232	0.0051	0.0035	0.0016
233	0.0050	0.0034	0.0016
234	0.0049	0.0034	0.0015
235	0.0048	0.0033	0.0015
236	0.0047	0.0032	0.0015
237	0.0046	0.0032	0.0015
238	0.0046	0.0031	0.0014
239	0.0045	0.0031	0.0014
240	0.0044	0.0030	0.0014
241	0.0043	0.0030	0.0014
242	0.0043	0.0029	0.0013
243	0.0042	0.0029	0.0013
244	0.0041	0.0028	0.0013
245	0.0041	0.0028	0.0013
246	0.0040	0.0027	0.0013

247	0.0039	0.0027	0.0012
248	0.0039	0.0027	0.0012
249	0.0038	0.0026	0.0012
250	0.0038	0.0026	0.0012
251	0.0037	0.0026	0.0012
252	0.0037	0.0025	0.0012
253	0.0036	0.0025	0.0011
254	0.0036	0.0025	0.0011
255	0.0035	0.0024	0.0011
256	0.0035	0.0024	0.0011
257	0.0035	0.0024	0.0011
258	0.0034	0.0023	0.0011
259	0.0034	0.0023	0.0011
260	0.0033	0.0023	0.0010
261	0.0033	0.0023	0.0010
262	0.0033	0.0022	0.0010
263	0.0032	0.0022	0.0010
264	0.0032	0.0022	0.0010
265	0.0031	0.0022	0.0010
266	0.0031	0.0021	0.0010
267	0.0031	0.0021	0.0010
268	0.0030	0.0021	0.0010
269	0.0030	0.0021	0.0009
270	0.0030	0.0020	0.0009
271	0.0030	0.0020	0.0009
272	0.0029	0.0020	0.0009
273	0.0029	0.0020	0.0009
274	0.0029	0.0020	0.0009
275	0.0028	0.0019	0.0009
276	0.0028	0.0019	0.0009
277	0.0028	0.0019	0.0009
278	0.0028	0.0019	0.0009
279	0.0027	0.0019	0.0009
280	0.0027	0.0019	0.0009
281	0.0027	0.0018	0.0008
282	0.0027	0.0018	0.0008

283	0.0026	0.0018	0.0008
284	0.0026	0.0018	0.0008
285	0.0026	0.0018	0.0008
286	0.0026	0.0018	0.0008
287	0.0026	0.0018	0.0008
288	0.0025	0.0017	0.0008

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 1.76

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.67

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 13.7555

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 12.9868

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

```
--------------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.        50.0     100.0     150.0     200.0
--------------------------------------------------------------------------------
   0.083      0.0000      0.01  Q         .         .         .         .
   0.167      0.0002      0.03  Q         .         .         .         .
   0.250      0.0007      0.06  Q         .         .         .         .
   0.333      0.0015      0.12  Q         .         .         .         .
   0.417      0.0032      0.24  Q         .         .         .         .
   0.500      0.0057      0.37  Q         .         .         .         .
   0.583      0.0089      0.46  Q         .         .         .         .
   0.667      0.0125      0.53  Q         .         .         .         .
   0.750      0.0165      0.58  Q         .         .         .         .
   0.833      0.0208      0.62  Q         .         .         .         .
   0.917      0.0253      0.66  Q         .         .         .         .
   1.000      0.0300      0.69  Q         .         .         .         .
   1.083      0.0349      0.71  Q         .         .         .         .
   1.167      0.0400      0.74  Q         .         .         .         .
   1.250      0.0452      0.76  Q         .         .         .         .
   1.333      0.0506      0.78  Q         .         .         .         .
   1.417      0.0560      0.79  Q         .         .         .         .
   1.500      0.0616      0.81  Q         .         .         .         .
   1.583      0.0673      0.82  Q         .         .         .         .
   1.667      0.0731      0.84  Q         .         .         .         .
   1.750      0.0789      0.85  Q         .         .         .         .
   1.833      0.0849      0.86  Q         .         .         .         .
   1.917      0.0909      0.87  Q         .         .         .         .
   2.000      0.0970      0.88  Q         .         .         .         .
```

2.083	0.1031	0.89	Q	.	.	.	.
2.167	0.1094	0.90	Q	.	.	.	.
2.250	0.1156	0.91	Q	.	.	.	.
2.333	0.1220	0.92	Q	.	.	.	.
2.417	0.1284	0.93	Q	.	.	.	.
2.500	0.1349	0.94	Q	.	.	.	.
2.583	0.1414	0.95	Q	.	.	.	.
2.667	0.1480	0.96	Q	.	.	.	.
2.750	0.1546	0.96	Q	.	.	.	.
2.833	0.1613	0.97	Q	.	.	.	.
2.917	0.1681	0.98	Q	.	.	.	.
3.000	0.1748	0.98	Q	.	.	.	.
3.083	0.1817	0.99	Q	.	.	.	.
3.167	0.1885	1.00	Q	.	.	.	.
3.250	0.1954	1.00	Q	.	.	.	.
3.333	0.2024	1.01	Q	.	.	.	.
3.417	0.2094	1.02	Q	.	.	.	.
3.500	0.2164	1.02	Q	.	.	.	.
3.583	0.2235	1.03	Q	.	.	.	.
3.667	0.2306	1.04	Q	.	.	.	.
3.750	0.2378	1.04	Q	.	.	.	.
3.833	0.2451	1.05	Q	.	.	.	.
3.917	0.2523	1.06	Q	.	.	.	.
4.000	0.2597	1.06	Q	.	.	.	.
4.083	0.2670	1.07	Q	.	.	.	.
4.167	0.2744	1.08	Q	.	.	.	.
4.250	0.2819	1.08	Q	.	.	.	.
4.333	0.2894	1.09	Q	.	.	.	.
4.417	0.2969	1.09	Q	.	.	.	.
4.500	0.3045	1.10	Q	.	.	.	.
4.583	0.3121	1.10	Q	.	.	.	.
4.667	0.3197	1.11	Q	.	.	.	.
4.750	0.3274	1.12	QV	.	.	.	.
4.833	0.3351	1.12	QV	.	.	.	.
4.917	0.3429	1.13	QV	.	.	.	.
5.000	0.3507	1.13	QV	.	.	.	.

5.083	0.3585	1.14	QV	.	.	.	.
5.167	0.3665	1.15	QV	.	.	.	.
5.250	0.3744	1.15	QV	.	.	.	.
5.333	0.3824	1.16	QV	.	.	.	.
5.417	0.3904	1.17	QV	.	.	.	.
5.500	0.3985	1.17	QV	.	.	.	.
5.583	0.4066	1.18	QV	.	.	.	.
5.667	0.4148	1.19	QV	.	.	.	.
5.750	0.4231	1.19	QV	.	.	.	.
5.833	0.4313	1.20	QV	.	.	.	.
5.917	0.4397	1.21	QV	.	.	.	.
6.000	0.4480	1.22	QV	.	.	.	.
6.083	0.4565	1.22	QV	.	.	.	.
6.167	0.4650	1.23	QV	.	.	.	.
6.250	0.4735	1.24	QV	.	.	.	.
6.333	0.4821	1.25	QV	.	.	.	.
6.417	0.4907	1.26	QV	.	.	.	.
6.500	0.4994	1.26	QV	.	.	.	.
6.583	0.5082	1.27	QV	.	.	.	.
6.667	0.5170	1.28	QV	.	.	.	.
6.750	0.5259	1.29	QV	.	.	.	.
6.833	0.5348	1.30	QV	.	.	.	.
6.917	0.5438	1.30	QV	.	.	.	.
7.000	0.5528	1.31	QV	.	.	.	.
7.083	0.5619	1.32	QV	.	.	.	.
7.167	0.5711	1.33	QV	.	.	.	.
7.250	0.5803	1.34	QV	.	.	.	.
7.333	0.5896	1.35	QV	.	.	.	.
7.417	0.5990	1.36	QV	.	.	.	.
7.500	0.6084	1.37	QV	.	.	.	.
7.583	0.6179	1.38	QV	.	.	.	.
7.667	0.6275	1.39	QV	.	.	.	.
7.750	0.6371	1.40	QV	.	.	.	.
7.833	0.6468	1.41	QV	.	.	.	.
7.917	0.6566	1.42	Q V	.	.	.	.
8.000	0.6665	1.43	Q V	.	.	.	.

8.083	0.6764	1.44	Q V	.	.	.	.
8.167	0.6864	1.45	Q V	.	.	.	.
8.250	0.6965	1.46	Q V	.	.	.	.
8.333	0.7066	1.47	Q V	.	.	.	.
8.417	0.7169	1.49	Q V	.	.	.	.
8.500	0.7272	1.50	Q V	.	.	.	.
8.583	0.7376	1.51	Q V	.	.	.	.
8.667	0.7481	1.52	Q V	.	.	.	.
8.750	0.7586	1.53	Q V	.	.	.	.
8.833	0.7693	1.55	Q V	.	.	.	.
8.917	0.7800	1.56	Q V	.	.	.	.
9.000	0.7909	1.57	Q V	.	.	.	.
9.083	0.8018	1.59	Q V	.	.	.	.
9.167	0.8128	1.60	Q V	.	.	.	.
9.250	0.8239	1.61	Q V	.	.	.	.
9.333	0.8352	1.63	Q V	.	.	.	.
9.417	0.8465	1.64	Q V	.	.	.	.
9.500	0.8579	1.66	Q V	.	.	.	.
9.583	0.8694	1.67	Q V	.	.	.	.
9.667	0.8811	1.69	Q V	.	.	.	.
9.750	0.8928	1.71	Q V	.	.	.	.
9.833	0.9047	1.72	Q V	.	.	.	.
9.917	0.9166	1.74	Q V	.	.	.	.
10.000	0.9287	1.75	Q V	.	.	.	.
10.083	0.9409	1.77	Q V	.	.	.	.
10.167	0.9532	1.79	Q V	.	.	.	.
10.250	0.9657	1.81	Q V	.	.	.	.
10.333	0.9783	1.83	Q V	.	.	.	.
10.417	0.9910	1.84	Q V	.	.	.	.
10.500	1.0038	1.86	Q V	.	.	.	.
10.583	1.0168	1.88	Q V	.	.	.	.
10.667	1.0299	1.90	Q V	.	.	.	.
10.750	1.0432	1.93	Q V	.	.	.	.
10.833	1.0566	1.95	Q V	.	.	.	.
10.917	1.0701	1.97	Q V	.	.	.	.
11.000	1.0838	1.99	Q V	.	.	.	.

11.083	1.0977	2.01	Q V	.	.	.	.
11.167	1.1118	2.04	Q V	.	.	.	.
11.250	1.1260	2.06	Q V	.	.	.	.
11.333	1.1403	2.09	Q V	.	.	.	.
11.417	1.1549	2.11	Q V	.	.	.	.
11.500	1.1696	2.14	Q V	.	.	.	.
11.583	1.1845	2.17	Q V	.	.	.	.
11.667	1.1997	2.19	Q V	.	.	.	.
11.750	1.2150	2.22	Q V	.	.	.	.
11.833	1.2305	2.25	Q V	.	.	.	.
11.917	1.2462	2.28	Q V	.	.	.	.
12.000	1.2622	2.32	Q V	.	.	.	.
12.083	1.2783	2.35	Q V	.	.	.	.
12.167	1.2947	2.38	Q V	.	.	.	.
12.250	1.3112	2.40	Q V	.	.	.	.
12.333	1.3279	2.42	Q V	.	.	.	.
12.417	1.3446	2.43	Q V	.	.	.	.
12.500	1.3614	2.44	Q V	.	.	.	.
12.583	1.3783	2.45	Q V	.	.	.	.
12.667	1.3953	2.47	Q V	.	.	.	.
12.750	1.4126	2.50	Q V	.	.	.	.
12.833	1.4300	2.54	Q V	.	.	.	.
12.917	1.4477	2.57	Q V	.	.	.	.
13.000	1.4657	2.61	Q V	.	.	.	.
13.083	1.4840	2.65	Q V	.	.	.	.
13.167	1.5026	2.70	Q V	.	.	.	.
13.250	1.5215	2.75	Q V	.	.	.	.
13.333	1.5407	2.80	Q V	.	.	.	.
13.417	1.5604	2.85	Q V	.	.	.	.
13.500	1.5804	2.91	Q V	.	.	.	.
13.583	1.6008	2.97	Q V	.	.	.	.
13.667	1.6217	3.03	Q V	.	.	.	.
13.750	1.6430	3.10	Q V	.	.	.	.
13.833	1.6648	3.17	Q V	.	.	.	.
13.917	1.6871	3.24	Q V	.	.	.	.
14.000	1.7100	3.32	Q V	.	.	.	.

```
14.083      1.7336      3.42  Q    V    .         .         .         .
14.167      1.7582      3.57  Q    V    .         .         .         .
14.250      1.7842      3.77  Q    V    .         .         .         .
14.333      1.8121      4.06  Q    V    .         .         .         .
14.417      1.8432      4.51  Q    V    .         .         .         .
14.500      1.8776      5.00  .Q   V    .         .         .         .
14.583      1.9150      5.42  .Q   V    .         .         .         .
14.667      1.9548      5.78  .Q    V   .         .         .         .
14.750      1.9969      6.11  .Q    V   .         .         .         .
14.833      2.0411      6.43  .Q    V   .         .         .         .
14.917      2.0876      6.75  .Q    V   .         .         .         .
15.000      2.1363      7.07  .Q    V   .         .         .         .
15.083      2.1874      7.42  .Q    V   .         .         .         .
15.167      2.2410      7.78  .Q    V   .         .         .         .
15.250      2.2973      8.18  .Q     V  .         .         .         .
15.333      2.3566      8.60  .Q     V  .         .         .         .
15.417      2.4195      9.14  .Q     V  .         .         .         .
15.500      2.4877      9.90  .Q     V  .         .         .         .
15.583      2.5633     10.97  . Q    V  .         .         .         .
15.667      2.6497     12.56  . Q     V .         .         .         .
15.750      2.7545     15.21  .  Q    V .         .         .         .
15.833      2.8847     18.90  .  Q    V .         .         .         .
15.917      3.0484     23.77  .   Q    V.         .         .         .
16.000      3.2588     30.55  .     Q   V         .         .         .
16.083      3.5503     42.32  .       Q V         .         .         .
16.167      3.9553     58.81  .         .QV       .         .         .
16.250      4.4828     76.59  .         .  V Q    .         .         .
16.333      5.1616     98.56  .         .    V   Q.         .         .
16.417      6.0296    126.04  .         .       V .    Q    .         .
16.500      6.8934    125.42  .         .         .V   Q    .         .
16.583      7.6043    103.23  .         .         Q  V      .         .
16.667      8.1777     83.26  .         .     Q   .    V    .         .
16.750      8.6354     66.46  .         .  Q      .     V   .         .
16.833      9.0162     55.28  .         .Q        .      V  .         .
16.917      9.3447     47.70  .        Q.         .       V .         .
17.000      9.6291     41.30  .       Q .         .        V.         .
```

```
17.083      9.8820     36.72  .      Q  .         .         V         .
17.167     10.1051     32.40  .     Q   .         .         .V        .
17.250     10.3064     29.22  .    Q    .         .         .V        .
17.333     10.4874     26.28  .    Q    .         .         . V       .
17.417     10.6521     23.91  .   Q     .         .         . V       .
17.500     10.8019     21.75  .   Q     .         .         .  V      .
17.583     10.9362     19.51  .  Q      .         .         .  V      .
17.667     11.0572     17.56  .  Q      .         .         .   V     .
17.750     11.1660     15.80  .  Q      .         .         .   V     .
17.833     11.2673     14.71  . Q       .         .         .   V     .
17.917     11.3618     13.72  . Q       .         .         .   V     .
18.000     11.4492     12.69  . Q       .         .         .    V    .
18.083     11.5308     11.86  . Q       .         .         .    V    .
18.167     11.6069     11.04  . Q       .         .         .    V    .
18.250     11.6761     10.06  . Q       .         .         .    V    .
18.333     11.7416      9.51  .Q        .         .         .     V   .
18.417     11.8036      8.99  .Q        .         .         .     V   .
18.500     11.8602      8.23  .Q        .         .         .     V   .
18.583     11.9136      7.74  .Q        .         .         .     V   .
18.667     11.9639      7.31  .Q        .         .         .     V   .
18.750     12.0096      6.63  .Q        .         .         .     V   .
18.833     12.0518      6.14  .Q        .         .         .      V  .
18.917     12.0918      5.80  .Q        .         .         .      V  .
19.000     12.1280      5.26  .Q        .         .         .      V  .
19.083     12.1612      4.83  Q         .         .         .      V  .
19.167     12.1935      4.69  Q         .         .         .      V  .
19.250     12.2255      4.64  Q         .         .         .      V  .
19.333     12.2575      4.64  Q         .         .         .      V  .
19.417     12.2888      4.55  Q         .         .         .      V  .
19.500     12.3194      4.45  Q         .         .         .      V  .
19.583     12.3492      4.33  Q         .         .         .       V .
19.667     12.3780      4.18  Q         .         .         .       V .
19.750     12.4057      4.01  Q         .         .         .       V .
19.833     12.4318      3.80  Q         .         .         .       V .
19.917     12.4560      3.50  Q         .         .         .       V .
20.000     12.4763      2.95  Q         .         .         .       V .
```

20.083	12.4916	2.23	Q	.	.	.	V .
20.167	12.5058	2.05	Q	.	.	.	V .
20.250	12.5192	1.94	Q	.	.	.	V .
20.333	12.5320	1.87	Q	.	.	.	V .
20.417	12.5445	1.82	Q	.	.	.	V .
20.500	12.5567	1.77	Q	.	.	.	V .
20.583	12.5686	1.73	Q	.	.	.	V .
20.667	12.5802	1.69	Q	.	.	.	V .
20.750	12.5916	1.65	Q	.	.	.	V .
20.833	12.6027	1.61	Q	.	.	.	V .
20.917	12.6135	1.58	Q	.	.	.	V .
21.000	12.6242	1.55	Q	.	.	.	V .
21.083	12.6347	1.52	Q	.	.	.	V .
21.167	12.6449	1.49	Q	.	.	.	V .
21.250	12.6551	1.47	Q	.	.	.	V .
21.333	12.6650	1.45	Q	.	.	.	V.
21.417	12.6748	1.42	Q	.	.	.	V.
21.500	12.6845	1.40	Q	.	.	.	V.
21.583	12.6940	1.38	Q	.	.	.	V.
21.667	12.7034	1.36	Q	.	.	.	V.
21.750	12.7126	1.34	Q	.	.	.	V.
21.833	12.7218	1.32	Q	.	.	.	V.
21.917	12.7308	1.31	Q	.	.	.	V.
22.000	12.7396	1.29	Q	.	.	.	V.
22.083	12.7484	1.27	Q	.	.	.	V.
22.167	12.7570	1.26	Q	.	.	.	V.
22.250	12.7656	1.24	Q	.	.	.	V.
22.333	12.7740	1.22	Q	.	.	.	V.
22.417	12.7823	1.21	Q	.	.	.	V.
22.500	12.7905	1.19	Q	.	.	.	V.
22.583	12.7987	1.18	Q	.	.	.	V.
22.667	12.8067	1.17	Q	.	.	.	V.
22.750	12.8146	1.15	Q	.	.	.	V.
22.833	12.8224	1.14	Q	.	.	.	V.
22.917	12.8302	1.13	Q	.	.	.	V.
23.000	12.8379	1.11	Q	.	.	.	V.

23.083	12.8454	1.10	Q	.	.	.	V.
23.167	12.8529	1.09	Q	.	.	.	V.
23.250	12.8604	1.08	Q	.	.	.	V.
23.333	12.8677	1.07	Q	.	.	.	V.
23.417	12.8750	1.06	Q	.	.	.	V.
23.500	12.8822	1.04	Q	.	.	.	V.
23.583	12.8893	1.03	Q	.	.	.	V.
23.667	12.8963	1.02	Q	.	.	.	V.
23.750	12.9033	1.01	Q	.	.	.	V.
23.833	12.9102	1.00	Q	.	.	.	V.
23.917	12.9171	0.99	Q	.	.	.	V.
24.000	12.9239	0.98	Q	.	.	.	V.
24.083	12.9305	0.97	Q	.	.	.	V.
24.167	12.9370	0.94	Q	.	.	.	V.
24.250	12.9432	0.90	Q	.	.	.	V.
24.333	12.9489	0.83	Q	.	.	.	V.
24.417	12.9537	0.70	Q	.	.	.	V.
24.500	12.9577	0.57	Q	.	.	.	V.
24.583	12.9609	0.48	Q	.	.	.	V.
24.667	12.9637	0.40	Q	.	.	.	V.
24.750	12.9661	0.35	Q	.	.	.	V.
24.833	12.9683	0.31	Q	.	.	.	V.
24.917	12.9702	0.27	Q	.	.	.	V.
25.000	12.9719	0.24	Q	.	.	.	V.
25.083	12.9734	0.22	Q	.	.	.	V.
25.167	12.9747	0.20	Q	.	.	.	V.
25.250	12.9759	0.18	Q	.	.	.	V.
25.333	12.9770	0.16	Q	.	.	.	V.
25.417	12.9780	0.14	Q	.	.	.	V.
25.500	12.9789	0.13	Q	.	.	.	V.
25.583	12.9797	0.12	Q	.	.	.	V.
25.667	12.9805	0.11	Q	.	.	.	V.
25.750	12.9812	0.10	Q	.	.	.	V.
25.833	12.9818	0.09	Q	.	.	.	V.
25.917	12.9823	0.08	Q	.	.	.	V.
26.000	12.9828	0.07	Q	.	.	.	V.

```
   26.083     12.9833      0.07  Q          .          .          .         V.
   26.167     12.9837      0.06  Q          .          .          .         V.
   26.250     12.9840      0.05  Q          .          .          .         V.
   26.333     12.9844      0.05  Q          .          .          .         V.
   26.417     12.9847      0.04  Q          .          .          .         V.
   26.500     12.9849      0.04  Q          .          .          .         V.
   26.583     12.9852      0.03  Q          .          .          .         V.
   26.667     12.9854      0.03  Q          .          .          .         V.
   26.750     12.9856      0.03  Q          .          .          .         V.
   26.833     12.9857      0.02  Q          .          .          .         V.
   26.917     12.9859      0.02  Q          .          .          .         V.
   27.000     12.9860      0.02  Q          .          .          .         V.
   27.083     12.9862      0.02  Q          .          .          .         V.
   27.167     12.9863      0.02  Q          .          .          .         V.
   27.250     12.9864      0.02  Q          .          .          .         V.
   27.333     12.9865      0.01  Q          .          .          .         V.
   27.417     12.9865      0.01  Q          .          .          .         V.
   27.500     12.9866      0.01  Q          .          .          .         V.
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                Duration
        Peak Flow Rate                     (minutes)
    =======================                =========
              0%                             1650.0
             10%                              140.0
             20%                               85.0
             30%                               60.0
             40%                               45.0
             50%                               35.0
             60%                               30.0
             70%                               20.0
             80%                               15.0
             90%                               10.0
```

```
****************************************************************************
  FLOW PROCESS FROM NODE   5004.00 TO NODE   5004.00 IS CODE = 3.1
----------------------------------------------------------------------------
  >>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<
============================================================================

                     INFLOW
                   (STREAM 1)
                        |
                        |
                        V                __effective depth
                    -----------          |   (and volume)
                   |           |    |    |
                   |           |    |....V........
                   | detention |<-->|           outflow
                   |   basin   |    |.........________
                    -----------     |    ^    |  \
                        |           |  dead   |   basin outlet
                        V           | storage |
                     OUTFLOW         ---------
                   (STREAM 1)



          ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
          THROUGH A FLOW-THROUGH DETENTION BASIN
          SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
            DEAD STORAGE(AF) =      0.000
            SPECIFIED DEAD STORAGE(AF) FILLED =      0.000
            SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET =      0.000
            DETENTION BASIN CONSTANT LOSS RATE(CFS) =    0.00


          BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:
```

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	31.00	3.000
3	2.00	62.00	6.000
4	3.00	93.00	9.000
5	4.00	127.00	14.000

===

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):

(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;

MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
14.083	0.000	3.42	0.00	0.09	2.7	0.266
14.167	0.000	3.57	0.00	0.09	2.8	0.271
14.250	0.000	3.77	0.00	0.09	2.8	0.278
14.333	0.000	4.06	0.00	0.10	2.9	0.286
14.417	0.000	4.51	0.00	0.10	3.0	0.296
14.500	0.000	5.00	0.00	0.10	3.1	0.309
14.583	0.000	5.42	0.00	0.11	3.3	0.324
14.667	0.000	5.78	0.00	0.11	3.4	0.340
14.750	0.000	6.11	0.00	0.12	3.6	0.357
14.833	0.000	6.43	0.00	0.13	3.8	0.375
14.917	0.000	6.75	0.00	0.13	4.0	0.394
15.000	0.000	7.07	0.00	0.14	4.2	0.414
15.083	0.000	7.42	0.00	0.15	4.4	0.435
15.167	0.000	7.78	0.00	0.15	4.6	0.457
15.250	0.000	8.18	0.00	0.16	4.8	0.480
15.333	0.000	8.60	0.00	0.17	5.1	0.504
15.417	0.000	9.14	0.00	0.18	5.3	0.530

15.500	0.000	9.90	0.00	0.19	5.6	0.560
15.583	0.000	10.97	0.00	0.20	6.0	0.594
15.667	0.000	12.56	0.00	0.21	6.4	0.637
15.750	0.000	15.21	0.00	0.23	6.9	0.694
15.833	0.000	18.90	0.00	0.26	7.6	0.772
15.917	0.000	23.77	0.00	0.29	8.5	0.877
16.000	0.000	30.55	0.00	0.34	9.8	1.020
16.083	0.000	42.32	0.00	0.41	11.6	1.232
16.167	0.000	58.81	0.00	0.51	14.3	1.538
16.250	0.000	76.59	0.00	0.65	18.0	1.942
16.333	0.000	98.56	0.00	0.82	22.8	2.464
16.417	0.000	126.04	0.00	1.04	28.9	3.133
16.500	0.000	125.42	0.00	1.25	35.6	3.751
16.583	0.000	103.23	0.00	1.39	41.0	4.180
16.667	0.000	83.26	0.00	1.48	44.6	4.447
16.750	0.000	66.46	0.00	1.53	46.7	4.583
16.833	0.000	55.28	0.00	1.55	47.6	4.636
16.917	0.000	47.70	0.00	1.54	47.9	4.634
17.000	0.000	41.30	0.00	1.53	47.7	4.591
17.083	0.000	36.72	0.00	1.51	47.1	4.519
17.167	0.000	32.40	0.00	1.47	46.2	4.424
17.250	0.000	29.22	0.00	1.44	45.2	4.315
17.333	0.000	26.28	0.00	1.40	44.0	4.193
17.417	0.000	23.91	0.00	1.35	42.7	4.064
17.500	0.000	21.75	0.00	1.31	41.3	3.929
17.583	0.000	19.51	0.00	1.26	39.9	3.789
17.667	0.000	17.56	0.00	1.22	38.4	3.645
17.750	0.000	15.80	0.00	1.17	36.9	3.500
17.833	0.000	14.71	0.00	1.12	35.4	3.357
17.917	0.000	13.72	0.00	1.07	34.0	3.218
18.000	0.000	12.69	0.00	1.03	32.5	3.081
18.083	0.000	11.86	0.00	0.98	31.1	2.948
18.167	0.000	11.04	0.00	0.94	29.8	2.819
18.250	0.000	10.06	0.00	0.90	28.5	2.692
18.333	0.000	9.51	0.00	0.86	27.2	2.570
18.417	0.000	8.99	0.00	0.82	26.0	2.453

18.500	0.000	8.23	0.00	0.78	24.8	2.340
18.583	0.000	7.74	0.00	0.74	23.6	2.230
18.667	0.000	7.31	0.00	0.71	22.5	2.126
18.750	0.000	6.63	0.00	0.67	21.4	2.024
18.833	0.000	6.14	0.00	0.64	20.4	1.925
18.917	0.000	5.80	0.00	0.61	19.4	1.832
19.000	0.000	5.26	0.00	0.58	18.5	1.741
19.083	0.000	4.83	0.00	0.55	17.5	1.653
19.167	0.000	4.69	0.00	0.52	16.7	1.571
19.250	0.000	4.64	0.00	0.50	15.8	1.494
19.333	0.000	4.64	0.00	0.47	15.1	1.422
19.417	0.000	4.55	0.00	0.45	14.3	1.354
19.500	0.000	4.45	0.00	0.43	13.7	1.291
19.583	0.000	4.33	0.00	0.41	13.0	1.231
19.667	0.000	4.18	0.00	0.39	12.4	1.174
19.750	0.000	4.01	0.00	0.37	11.9	1.120
19.833	0.000	3.80	0.00	0.36	11.3	1.069
19.917	0.000	3.50	0.00	0.34	10.8	1.018

PROCESS SUMMARY OF STORAGE:

INFLOW VOLUME = 12.987 AF

BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)

OUTFLOW VOLUME = 12.987 AF

LOSS VOLUME = 0.000 AF

****

FLOW PROCESS FROM NODE 5004.00 TO NODE 5005.00 IS CODE = 5.1

>>>>>MODEL CHANNEL ROUTING OF STREAM #1 BY THE TRANSLATION METHOD<<<<<

==

THE TRANSLATION MODEL NEGLECTS ALL STORAGE ATTENUATION EFFECTS,

AND MOVES THE STREAM 1 RUNOFF HYDROGRAPH FORWARD IN TIME.

ASSUMED REGULAR CHANNEL INFORMATION:

BASEWIDTH(FT) = 100.00 CHANNEL Z = 5.00

UPSTREAM ELEVATION(FT) = 419.94

DOWNSTREAM ELEVATION(FT) = 367.45

CHANNEL LENGTH(FT) = 1419.32 MANNING'S FACTOR = 0.050

CONSTANT LOSS RATE(CFS) = 0.00

MEAN-FLOW RATE NORMAL-DEPTH FLOW VELOCITIES(FPS) ARE AS FOLLOWS:

(FLOW RATE (CFS)) [FLOW VELOCITY (FPS)]

AVERAGED PEAK 5-MINUTE: (47.9).......[2.14]

AVERAGED PEAK 15-MINUTE: (47.7).......[2.13]

AVERAGED PEAK 30-MINUTE: (47.2).......[2.11]

AVERAGED PEAK 1-HOUR: (45.1).......[2.02]

AVERAGED PEAK 3-HOUR: (33.1).......[1.87]

AVERAGED PEAK 6-HOUR: (21.0).......[1.44]

AVERAGED PEAK 24-HOUR: (6.5).......[0.94]

USER-SPECIFIED CHANNEL AVERAGE FLOW VELOCITY(FPS) = 3.090

HYDROGRAPH TRANSLATION TIME

= (CHANNEL LENGTH)/(AVERAGE FLOW VELOCITY)

= (1419.32)/(3.090) = 0.128 HRS

TRANSLATION METHOD CHANNEL ROUTING RESULTS:

MODEL TIME (HRS)	INFLOW (STREAM 1) (CFS)	ROUTED FLOW (CFS)	OUTFLOW LESS LOSS (STREAM 1) (CFS)
14.000	2.67	2.61	2.61
14.083	2.72	2.65	2.65
14.167	2.77	2.70	2.70
14.250	2.84	2.75	2.75
14.333	2.91	2.80	2.80
14.417	3.00	2.87	2.87
14.500	3.13	2.95	2.95
14.583	3.27	3.06	3.06
14.667	3.43	3.19	3.19
14.750	3.60	3.34	3.34
14.833	3.79	3.51	3.51

14.917	3.98	3.69	3.69
15.000	4.18	3.88	3.88
15.083	4.39	4.07	4.07
15.167	4.61	4.28	4.28
15.250	4.84	4.49	4.49
15.333	5.09	4.72	4.72
15.417	5.35	4.96	4.96
15.500	5.63	5.21	5.21
15.583	5.96	5.48	5.48
15.667	6.36	5.79	5.79
15.750	6.88	6.15	6.15
15.833	7.58	6.60	6.60
15.917	8.52	7.21	7.21
16.000	9.80	8.02	8.02
16.083	11.63	9.12	9.12
16.167	14.31	10.66	10.66
16.250	17.98	12.89	12.89
16.333	22.76	16.03	16.03
16.417	28.91	20.22	20.22
16.500	35.57	25.65	25.65
16.583	40.98	32.03	32.03
16.667	44.57	38.11	38.11
16.750	46.65	42.66	42.66
16.833	47.63	45.55	45.55
16.917	47.90	47.11	47.11
17.000	47.66	47.75	47.75
17.083	47.07	47.79	47.79
17.167	46.21	47.38	47.38
17.250	45.15	46.66	46.66
17.333	43.95	45.71	45.71
17.417	42.66	44.59	44.59
17.500	41.30	43.35	43.35
17.583	39.88	42.02	42.02
17.667	38.41	40.63	40.63
17.750	36.92	39.19	39.19
17.833	35.43	37.71	37.71

17.917	33.97	36.22	36.22
18.000	32.54	34.74	34.74
18.083	31.15	33.30	33.30
18.167	29.80	31.89	31.89
18.250	28.47	30.51	30.51
18.333	27.19	29.18	29.18
18.417	25.96	27.87	27.87
18.500	24.76	26.61	26.61
18.583	23.61	25.40	25.40
18.667	22.51	24.22	24.22
18.750	21.44	23.09	23.09
18.833	20.40	22.01	22.01
18.917	19.41	20.95	20.95
19.000	18.46	19.94	19.94
19.083	17.54	18.96	18.96
19.167	16.66	18.03	18.03
19.250	15.83	17.12	17.12
19.333	15.06	16.27	16.27
19.417	14.34	15.47	15.47
19.500	13.67	14.73	14.73
19.583	13.03	14.03	14.03
19.667	12.43	13.37	13.37
19.750	11.85	12.75	12.75
19.833	11.31	12.16	12.16
19.917	10.78	11.60	11.60
20.000	10.26	11.06	11.06

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PROCESS SUMMARY OF STORAGE:

INFLOW VOLUME = 12.987 AF

OUTFLOW VOLUME = 12.987 AF

LOSS VOLUME = 0.000 AF

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FLOW PROCESS FROM NODE 5005.00 TO NODE 5005.00 IS CODE = 1

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  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
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      (UNIT-HYDROGRAPH ADDED TO STREAM #2)

         WATERSHED AREA =      37.330 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.560 HOURS
         DESERT(UNDEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.590
         LOW LOSS FRACTION = 0.778
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.48
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  1.16
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.60
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  2.24
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.56
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  3.43

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.998
          30-MINUTE FACTOR = 0.998
           1-HOUR FACTOR = 0.998
           3-HOUR FACTOR = 1.000
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000

         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  14.881



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                      UNIT HYDROGRAPH DETERMINATION
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INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.670	3.025
2	2.811	9.666
3	6.377	16.099
4	12.126	25.956
5	23.186	49.928
6	37.134	62.973
7	47.835	48.308
8	55.840	36.140
9	61.679	26.360
10	66.201	20.416
11	69.997	17.138
12	73.216	14.532
13	75.929	12.246
14	78.366	11.004
15	80.382	9.102
16	82.208	8.244
17	83.814	7.251
18	85.300	6.708
19	86.696	6.303
20	87.914	5.499
21	89.000	4.900
22	89.896	4.045
23	90.750	3.857
24	91.570	3.700
25	92.300	3.297
26	92.995	3.139
27	93.650	2.957
28	94.214	2.544
29	94.720	2.285
30	95.226	2.284
31	95.697	2.129
32	96.088	1.763

33	96.474	1.746
34	96.852	1.704
35	97.141	1.307
36	97.409	1.209
37	97.677	1.209
38	97.880	0.920
39	98.029	0.672
40	98.178	0.672
41	98.334	0.703
42	98.511	0.800
43	98.690	0.806
44	98.868	0.806
45	99.047	0.806
46	99.225	0.806
47	99.403	0.806
48	99.582	0.806
49	99.760	0.806
50	99.939	0.806
51	100.000	0.275

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UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0025	0.0020	0.0006
2	0.0025	0.0020	0.0006
3	0.0025	0.0020	0.0006
4	0.0025	0.0020	0.0006
5	0.0026	0.0020	0.0006
6	0.0026	0.0020	0.0006
7	0.0026	0.0020	0.0006
8	0.0026	0.0020	0.0006
9	0.0026	0.0020	0.0006
10	0.0026	0.0020	0.0006
11	0.0026	0.0020	0.0006
12	0.0026	0.0020	0.0006
13	0.0026	0.0021	0.0006
14	0.0027	0.0021	0.0006
15	0.0027	0.0021	0.0006
16	0.0027	0.0021	0.0006
17	0.0027	0.0021	0.0006
18	0.0027	0.0021	0.0006
19	0.0027	0.0021	0.0006
20	0.0027	0.0021	0.0006
21	0.0027	0.0021	0.0006
22	0.0028	0.0021	0.0006
23	0.0028	0.0022	0.0006
24	0.0028	0.0022	0.0006
25	0.0028	0.0022	0.0006
26	0.0028	0.0022	0.0006
27	0.0028	0.0022	0.0006
28	0.0028	0.0022	0.0006
29	0.0029	0.0022	0.0006
30	0.0029	0.0022	0.0006

31	0.0029	0.0022	0.0006
32	0.0029	0.0022	0.0006
33	0.0029	0.0023	0.0006
34	0.0029	0.0023	0.0006
35	0.0029	0.0023	0.0007
36	0.0029	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0030	0.0023	0.0007
40	0.0030	0.0023	0.0007
41	0.0030	0.0024	0.0007
42	0.0030	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0031	0.0024	0.0007
47	0.0031	0.0024	0.0007
48	0.0031	0.0024	0.0007
49	0.0032	0.0025	0.0007
50	0.0032	0.0025	0.0007
51	0.0032	0.0025	0.0007
52	0.0032	0.0025	0.0007
53	0.0032	0.0025	0.0007
54	0.0032	0.0025	0.0007
55	0.0033	0.0025	0.0007
56	0.0033	0.0026	0.0007
57	0.0033	0.0026	0.0007
58	0.0033	0.0026	0.0007
59	0.0033	0.0026	0.0007
60	0.0034	0.0026	0.0007
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0027	0.0008
64	0.0034	0.0027	0.0008
65	0.0035	0.0027	0.0008
66	0.0035	0.0027	0.0008

67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0036	0.0028	0.0008
70	0.0036	0.0028	0.0008
71	0.0036	0.0028	0.0008
72	0.0036	0.0028	0.0008
73	0.0036	0.0028	0.0008
74	0.0037	0.0029	0.0008
75	0.0037	0.0029	0.0008
76	0.0037	0.0029	0.0008
77	0.0037	0.0029	0.0008
78	0.0038	0.0029	0.0008
79	0.0038	0.0030	0.0008
80	0.0038	0.0030	0.0008
81	0.0039	0.0030	0.0009
82	0.0039	0.0030	0.0009
83	0.0039	0.0030	0.0009
84	0.0039	0.0031	0.0009
85	0.0040	0.0031	0.0009
86	0.0040	0.0031	0.0009
87	0.0040	0.0031	0.0009
88	0.0040	0.0031	0.0009
89	0.0041	0.0032	0.0009
90	0.0041	0.0032	0.0009
91	0.0042	0.0032	0.0009
92	0.0042	0.0032	0.0009
93	0.0042	0.0033	0.0009
94	0.0042	0.0033	0.0009
95	0.0043	0.0033	0.0010
96	0.0043	0.0034	0.0010
97	0.0044	0.0034	0.0010
98	0.0044	0.0034	0.0010
99	0.0044	0.0034	0.0010
100	0.0045	0.0035	0.0010
101	0.0045	0.0035	0.0010
102	0.0045	0.0035	0.0010

103	0.0046	0.0036	0.0010
104	0.0046	0.0036	0.0010
105	0.0047	0.0036	0.0010
106	0.0047	0.0037	0.0010
107	0.0048	0.0037	0.0011
108	0.0048	0.0037	0.0011
109	0.0048	0.0038	0.0011
110	0.0049	0.0038	0.0011
111	0.0049	0.0038	0.0011
112	0.0050	0.0039	0.0011
113	0.0050	0.0039	0.0011
114	0.0051	0.0039	0.0011
115	0.0051	0.0040	0.0011
116	0.0052	0.0040	0.0011
117	0.0052	0.0041	0.0012
118	0.0053	0.0041	0.0012
119	0.0054	0.0042	0.0012
120	0.0054	0.0042	0.0012
121	0.0055	0.0043	0.0012
122	0.0055	0.0043	0.0012
123	0.0056	0.0044	0.0012
124	0.0056	0.0044	0.0013
125	0.0057	0.0045	0.0013
126	0.0058	0.0045	0.0013
127	0.0059	0.0046	0.0013
128	0.0059	0.0046	0.0013
129	0.0060	0.0047	0.0013
130	0.0061	0.0047	0.0013
131	0.0062	0.0048	0.0014
132	0.0062	0.0048	0.0014
133	0.0063	0.0049	0.0014
134	0.0064	0.0050	0.0014
135	0.0065	0.0051	0.0014
136	0.0066	0.0051	0.0015
137	0.0067	0.0052	0.0015
138	0.0067	0.0052	0.0015

139	0.0069	0.0053	0.0015
140	0.0069	0.0054	0.0015
141	0.0071	0.0055	0.0016
142	0.0072	0.0056	0.0016
143	0.0073	0.0057	0.0016
144	0.0074	0.0057	0.0016
145	0.0069	0.0054	0.0015
146	0.0070	0.0054	0.0015
147	0.0071	0.0056	0.0016
148	0.0072	0.0056	0.0016
149	0.0074	0.0058	0.0016
150	0.0075	0.0058	0.0017
151	0.0077	0.0060	0.0017
152	0.0078	0.0061	0.0017
153	0.0080	0.0062	0.0018
154	0.0081	0.0063	0.0018
155	0.0083	0.0065	0.0019
156	0.0085	0.0066	0.0019
157	0.0087	0.0068	0.0019
158	0.0088	0.0069	0.0020
159	0.0091	0.0071	0.0020
160	0.0093	0.0072	0.0021
161	0.0096	0.0075	0.0021
162	0.0098	0.0076	0.0022
163	0.0101	0.0079	0.0022
164	0.0103	0.0080	0.0023
165	0.0107	0.0083	0.0024
166	0.0109	0.0085	0.0024
167	0.0114	0.0088	0.0025
168	0.0116	0.0090	0.0026
169	0.0193	0.0150	0.0043
170	0.0197	0.0153	0.0044
171	0.0205	0.0160	0.0046
172	0.0210	0.0163	0.0047
173	0.0220	0.0171	0.0049
174	0.0225	0.0175	0.0050

175	0.0237	0.0184	0.0053
176	0.0243	0.0189	0.0054
177	0.0257	0.0200	0.0057
178	0.0265	0.0206	0.0059
179	0.0283	0.0220	0.0063
180	0.0293	0.0228	0.0065
181	0.0315	0.0245	0.0070
182	0.0328	0.0256	0.0073
183	0.0359	0.0279	0.0080
184	0.0377	0.0294	0.0084
185	0.0632	0.0491	0.0140
186	0.0664	0.0492	0.0172
187	0.0743	0.0492	0.0251
188	0.0796	0.0492	0.0304
189	0.0994	0.0492	0.0503
190	0.1102	0.0492	0.0610
191	0.1489	0.0492	0.0997
192	0.1951	0.0492	0.1459
193	0.4792	0.0492	0.4300
194	0.1252	0.0492	0.0761
195	0.0858	0.0492	0.0367
196	0.0700	0.0492	0.0208
197	0.0398	0.0310	0.0088
198	0.0343	0.0267	0.0076
199	0.0303	0.0236	0.0067
200	0.0273	0.0213	0.0061
201	0.0250	0.0194	0.0055
202	0.0231	0.0179	0.0051
203	0.0215	0.0167	0.0048
204	0.0201	0.0156	0.0045
205	0.0119	0.0092	0.0026
206	0.0111	0.0087	0.0025
207	0.0105	0.0082	0.0023
208	0.0099	0.0077	0.0022
209	0.0094	0.0073	0.0021
210	0.0090	0.0070	0.0020

211	0.0086	0.0067	0.0019
212	0.0082	0.0064	0.0018
213	0.0079	0.0061	0.0018
214	0.0076	0.0059	0.0017
215	0.0073	0.0057	0.0016
216	0.0071	0.0055	0.0016
217	0.0075	0.0058	0.0017
218	0.0072	0.0056	0.0016
219	0.0070	0.0055	0.0016
220	0.0068	0.0053	0.0015
221	0.0066	0.0051	0.0015
222	0.0064	0.0050	0.0014
223	0.0063	0.0049	0.0014
224	0.0061	0.0048	0.0014
225	0.0060	0.0046	0.0013
226	0.0058	0.0045	0.0013
227	0.0057	0.0044	0.0013
228	0.0056	0.0043	0.0012
229	0.0054	0.0042	0.0012
230	0.0053	0.0041	0.0012
231	0.0052	0.0040	0.0012
232	0.0051	0.0040	0.0011
233	0.0050	0.0039	0.0011
234	0.0049	0.0038	0.0011
235	0.0048	0.0037	0.0011
236	0.0047	0.0037	0.0010
237	0.0046	0.0036	0.0010
238	0.0046	0.0035	0.0010
239	0.0045	0.0035	0.0010
240	0.0044	0.0034	0.0010
241	0.0043	0.0034	0.0010
242	0.0043	0.0033	0.0009
243	0.0042	0.0033	0.0009
244	0.0041	0.0032	0.0009
245	0.0041	0.0032	0.0009
246	0.0040	0.0031	0.0009

247	0.0039	0.0031	0.0009
248	0.0039	0.0030	0.0009
249	0.0038	0.0030	0.0009
250	0.0038	0.0029	0.0008
251	0.0037	0.0029	0.0008
252	0.0037	0.0029	0.0008
253	0.0036	0.0028	0.0008
254	0.0036	0.0028	0.0008
255	0.0035	0.0028	0.0008
256	0.0035	0.0027	0.0008
257	0.0035	0.0027	0.0008
258	0.0034	0.0027	0.0008
259	0.0034	0.0026	0.0007
260	0.0033	0.0026	0.0007
261	0.0033	0.0026	0.0007
262	0.0033	0.0025	0.0007
263	0.0032	0.0025	0.0007
264	0.0032	0.0025	0.0007
265	0.0031	0.0024	0.0007
266	0.0031	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0030	0.0024	0.0007
269	0.0030	0.0023	0.0007
270	0.0030	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0029	0.0023	0.0006
273	0.0029	0.0023	0.0006
274	0.0029	0.0022	0.0006
275	0.0028	0.0022	0.0006
276	0.0028	0.0022	0.0006
277	0.0028	0.0022	0.0006
278	0.0028	0.0021	0.0006
279	0.0027	0.0021	0.0006
280	0.0027	0.0021	0.0006
281	0.0027	0.0021	0.0006
282	0.0027	0.0021	0.0006

283	0.0026	0.0021	0.0006
284	0.0026	0.0020	0.0006
285	0.0026	0.0020	0.0006
286	0.0026	0.0020	0.0006
287	0.0026	0.0020	0.0006
288	0.0025	0.0020	0.0006

TOTAL STORM RAINFALL(INCHES) = 3.43

TOTAL SOIL-LOSS(INCHES) = 2.02

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.41

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 6.2702

TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 4.3969

==

2 4 - H O U R   S T O R M

R U N O F F   H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	12.5	25.0	37.5	50.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0001	0.01	Q	.	.	.	.
0.250	0.0002	0.02	Q	.	.	.	.
0.333	0.0004	0.03	Q	.	.	.	.
0.417	0.0008	0.06	Q	.	.	.	.
0.500	0.0014	0.09	Q	.	.	.	.
0.583	0.0023	0.12	Q	.	.	.	.
0.667	0.0033	0.14	Q	.	.	.	.
0.750	0.0043	0.16	Q	.	.	.	.
0.833	0.0055	0.17	Q	.	.	.	.
0.917	0.0067	0.18	Q	.	.	.	.
1.000	0.0080	0.19	Q	.	.	.	.
1.083	0.0094	0.20	Q	.	.	.	.
1.167	0.0108	0.20	Q	.	.	.	.
1.250	0.0122	0.21	Q	.	.	.	.
1.333	0.0137	0.21	Q	.	.	.	.
1.417	0.0152	0.22	Q	.	.	.	.
1.500	0.0168	0.22	Q	.	.	.	.
1.583	0.0183	0.23	Q	.	.	.	.
1.667	0.0200	0.23	Q	.	.	.	.
1.750	0.0216	0.24	Q	.	.	.	.
1.833	0.0232	0.24	Q	.	.	.	.
1.917	0.0249	0.24	Q	.	.	.	.
2.000	0.0266	0.25	Q	.	.	.	.

2.083	0.0283	0.25	Q	.	.	.	.
2.167	0.0301	0.25	Q	.	.	.	.
2.250	0.0318	0.26	Q	.	.	.	.
2.333	0.0336	0.26	Q	.	.	.	.
2.417	0.0354	0.26	Q	.	.	.	.
2.500	0.0372	0.26	Q	.	.	.	.
2.583	0.0390	0.27	Q	.	.	.	.
2.667	0.0409	0.27	Q	.	.	.	.
2.750	0.0427	0.27	Q	.	.	.	.
2.833	0.0446	0.27	Q	.	.	.	.
2.917	0.0465	0.27	Q	.	.	.	.
3.000	0.0484	0.28	Q	.	.	.	.
3.083	0.0503	0.28	Q	.	.	.	.
3.167	0.0522	0.28	Q	.	.	.	.
3.250	0.0541	0.28	Q	.	.	.	.
3.333	0.0561	0.28	Q	.	.	.	.
3.417	0.0581	0.28	Q	.	.	.	.
3.500	0.0600	0.29	Q	.	.	.	.
3.583	0.0620	0.29	Q	.	.	.	.
3.667	0.0640	0.29	Q	.	.	.	.
3.750	0.0660	0.29	Q	.	.	.	.
3.833	0.0681	0.29	Q	.	.	.	.
3.917	0.0701	0.30	Q	.	.	.	.
4.000	0.0722	0.30	Q	.	.	.	.
4.083	0.0742	0.30	Q	.	.	.	.
4.167	0.0763	0.30	Q	.	.	.	.
4.250	0.0784	0.30	Q	.	.	.	.
4.333	0.0805	0.31	Q	.	.	.	.
4.417	0.0826	0.31	Q	.	.	.	.
4.500	0.0847	0.31	Q	.	.	.	.
4.583	0.0869	0.31	Q	.	.	.	.
4.667	0.0890	0.31	Q	.	.	.	.
4.750	0.0912	0.31	Q	.	.	.	.
4.833	0.0934	0.32	Q	.	.	.	.
4.917	0.0955	0.32	Q	.	.	.	.
5.000	0.0977	0.32	Q	.	.	.	.

5.083	0.0999	0.32	Q	.	.	.	.
5.167	0.1022	0.32	Q	.	.	.	.
5.250	0.1044	0.32	Q	.	.	.	.
5.333	0.1067	0.33	Q	.	.	.	.
5.417	0.1089	0.33	Q	.	.	.	.
5.500	0.1112	0.33	QV	.	.	.	.
5.583	0.1135	0.33	QV	.	.	.	.
5.667	0.1158	0.33	QV	.	.	.	.
5.750	0.1181	0.34	QV	.	.	.	.
5.833	0.1204	0.34	QV	.	.	.	.
5.917	0.1228	0.34	QV	.	.	.	.
6.000	0.1251	0.34	QV	.	.	.	.
6.083	0.1275	0.34	QV	.	.	.	.
6.167	0.1299	0.35	QV	.	.	.	.
6.250	0.1323	0.35	QV	.	.	.	.
6.333	0.1347	0.35	QV	.	.	.	.
6.417	0.1371	0.35	QV	.	.	.	.
6.500	0.1395	0.36	QV	.	.	.	.
6.583	0.1420	0.36	QV	.	.	.	.
6.667	0.1445	0.36	QV	.	.	.	.
6.750	0.1470	0.36	QV	.	.	.	.
6.833	0.1495	0.36	QV	.	.	.	.
6.917	0.1520	0.37	QV	.	.	.	.
7.000	0.1546	0.37	QV	.	.	.	.
7.083	0.1571	0.37	QV	.	.	.	.
7.167	0.1597	0.37	QV	.	.	.	.
7.250	0.1623	0.38	QV	.	.	.	.
7.333	0.1649	0.38	QV	.	.	.	.
7.417	0.1675	0.38	QV	.	.	.	.
7.500	0.1702	0.38	QV	.	.	.	.
7.583	0.1728	0.39	QV	.	.	.	.
7.667	0.1755	0.39	QV	.	.	.	.
7.750	0.1782	0.39	QV	.	.	.	.
7.833	0.1810	0.40	QV	.	.	.	.
7.917	0.1837	0.40	QV	.	.	.	.
8.000	0.1865	0.40	QV	.	.	.	.

8.083	0.1893	0.40	QV	.	.	.	.
8.167	0.1921	0.41	QV	.	.	.	.
8.250	0.1949	0.41	QV	.	.	.	.
8.333	0.1978	0.41	QV	.	.	.	.
8.417	0.2006	0.42	QV	.	.	.	.
8.500	0.2035	0.42	QV	.	.	.	.
8.583	0.2065	0.42	QV	.	.	.	.
8.667	0.2094	0.43	QV	.	.	.	.
8.750	0.2124	0.43	QV	.	.	.	.
8.833	0.2154	0.43	QV	.	.	.	.
8.917	0.2184	0.44	QV	.	.	.	.
9.000	0.2214	0.44	Q V	.	.	.	.
9.083	0.2245	0.45	Q V	.	.	.	.
9.167	0.2276	0.45	Q V	.	.	.	.
9.250	0.2307	0.45	Q V	.	.	.	.
9.333	0.2339	0.46	Q V	.	.	.	.
9.417	0.2370	0.46	Q V	.	.	.	.
9.500	0.2403	0.47	Q V	.	.	.	.
9.583	0.2435	0.47	Q V	.	.	.	.
9.667	0.2468	0.47	Q V	.	.	.	.
9.750	0.2501	0.48	Q V	.	.	.	.
9.833	0.2534	0.48	Q V	.	.	.	.
9.917	0.2567	0.49	Q V	.	.	.	.
10.000	0.2601	0.49	Q V	.	.	.	.
10.083	0.2636	0.50	Q V	.	.	.	.
10.167	0.2670	0.50	Q V	.	.	.	.
10.250	0.2705	0.51	Q V	.	.	.	.
10.333	0.2740	0.51	Q V	.	.	.	.
10.417	0.2776	0.52	Q V	.	.	.	.
10.500	0.2812	0.52	Q V	.	.	.	.
10.583	0.2848	0.53	Q V	.	.	.	.
10.667	0.2885	0.53	Q V	.	.	.	.
10.750	0.2922	0.54	Q V	.	.	.	.
10.833	0.2960	0.55	Q V	.	.	.	.
10.917	0.2998	0.55	Q V	.	.	.	.
11.000	0.3037	0.56	Q V	.	.	.	.

11.083	0.3075	0.56	Q	V	.	.	.	.
11.167	0.3115	0.57	Q	V	.	.	.	.
11.250	0.3155	0.58	Q	V	.	.	.	.
11.333	0.3195	0.59	Q	V	.	.	.	.
11.417	0.3236	0.59	Q	V	.	.	.	.
11.500	0.3277	0.60	Q	V	.	.	.	.
11.583	0.3319	0.61	Q	V	.	.	.	.
11.667	0.3361	0.62	Q	V	.	.	.	.
11.750	0.3404	0.62	Q	V	.	.	.	.
11.833	0.3448	0.63	Q	V	.	.	.	.
11.917	0.3492	0.64	Q	V	.	.	.	.
12.000	0.3536	0.65	Q	V	.	.	.	.
12.083	0.3582	0.66	Q	V	.	.	.	.
12.167	0.3628	0.67	Q	V	.	.	.	.
12.250	0.3674	0.67	Q	V	.	.	.	.
12.333	0.3721	0.68	Q	V	.	.	.	.
12.417	0.3768	0.68	Q	V	.	.	.	.
12.500	0.3815	0.68	Q	V	.	.	.	.
12.583	0.3862	0.69	Q	V	.	.	.	.
12.667	0.3910	0.69	Q	V	.	.	.	.
12.750	0.3958	0.70	Q	V	.	.	.	.
12.833	0.4007	0.71	Q	V	.	.	.	.
12.917	0.4057	0.72	Q	V	.	.	.	.
13.000	0.4107	0.73	Q	V	.	.	.	.
13.083	0.4158	0.74	Q	V	.	.	.	.
13.167	0.4210	0.75	Q	V	.	.	.	.
13.250	0.4263	0.77	Q	V	.	.	.	.
13.333	0.4317	0.78	Q	V	.	.	.	.
13.417	0.4372	0.80	Q	V	.	.	.	.
13.500	0.4428	0.81	Q	V	.	.	.	.
13.583	0.4485	0.83	Q	V	.	.	.	.
13.667	0.4543	0.85	Q	V	.	.	.	.
13.750	0.4603	0.86	Q	V	.	.	.	.
13.833	0.4664	0.88	Q	V	.	.	.	.
13.917	0.4726	0.90	Q	V	.	.	.	.
14.000	0.4790	0.93	Q	V	.	.	.	.

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14.083      0.4855      0.95  Q   V     .         .         .         .
14.167      0.4924      0.99  Q   V     .         .         .         .
14.250      0.4996      1.05  Q   V     .         .         .         .
14.333      0.5073      1.12  Q   V     .         .         .         .
14.417      0.5158      1.23  Q   V     .         .         .         .
14.500      0.5252      1.37  .Q  V     .         .         .         .
14.583      0.5354      1.48  .Q  V     .         .         .         .
14.667      0.5463      1.59  .Q  V     .         .         .         .
14.750      0.5579      1.68  .Q   V    .         .         .         .
14.833      0.5701      1.77  .Q   V    .         .         .         .
14.917      0.5828      1.86  .Q   V    .         .         .         .
15.000      0.5963      1.95  .Q   V    .         .         .         .
15.083      0.6103      2.04  .Q   V    .         .         .         .
15.167      0.6251      2.14  .Q   V    .         .         .         .
15.250      0.6406      2.25  .Q   V    .         .         .         .
15.333      0.6569      2.37  .Q   V    .         .         .         .
15.417      0.6742      2.51  . Q   V   .         .         .         .
15.500      0.6928      2.71  . Q   V   .         .         .         .
15.583      0.7135      2.99  . Q   V   .         .         .         .
15.667      0.7370      3.42  . Q   V   .         .         .         .
15.750      0.7656      4.15  .  Q  V   .         .         .         .
15.833      0.8019      5.27  .   Q  V  .         .         .         .
15.917      0.8494      6.89  .    Q V  .         .         .         .
16.000      0.9133      9.28  .      QV .         .         .         .
16.083      1.0063     13.51  .        VQ         .         .         .
16.167      1.1407     19.51  .         V    Q    .         .         .
16.250      1.3192     25.91  .         . V       Q         .         .
16.333      1.5507     33.62  .         .   V     .     Q   .         .
16.417      1.8528     43.87  .         .     V   .         .    Q    .
16.500      2.1789     47.35  .         .        V.         .      Q  .
16.583      2.4525     39.73  .         .         . V       .Q        .
16.667      2.6730     32.02  .         .         .   VQ    .         .
16.750      2.8479     25.39  .         .         Q    V    .         .
16.833      2.9905     20.71  .         .     Q   .      V  .         .
16.917      3.1119     17.63  .         .   Q     .       V .         .
17.000      3.2171     15.28  .         . Q       .        V.         .
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17.083      3.3091     13.36  .         Q         .         V         .
17.167      3.3914     11.95  .        Q.         .         V         .
17.250      3.4639     10.52  .       Q .         .         .V        .
17.333      3.5295      9.53  .      Q  .         .         . V       .
17.417      3.5886      8.58  .     Q   .         .         . V       .
17.500      3.6425      7.82  .     Q   .         .         .  V      .
17.583      3.6919      7.18  .    Q    .         .         .  V      .
17.667      3.7363      6.45  .    Q    .         .         .  V      .
17.750      3.7765      5.83  .   Q     .         .         .   V     .
17.833      3.8124      5.22  .   Q     .         .         .   V     .
17.917      3.8460      4.88  .  Q      .         .         .   V     .
18.000      3.8775      4.58  .  Q      .         .         .    V    .
18.083      3.9066      4.23  .  Q      .         .         .    V    .
18.167      3.9340      3.97  .  Q      .         .         .    V    .
18.250      3.9596      3.71  . Q       .         .         .     V   .
18.333      3.9830      3.40  . Q       .         .         .     V   .
18.417      4.0047      3.16  . Q       .         .         .     V   .
18.500      4.0255      3.02  . Q       .         .         .     V   .
18.583      4.0450      2.82  . Q       .         .         .     V   .
18.667      4.0627      2.58  . Q       .         .         .     V   .
18.750      4.0796      2.45  .Q        .         .         .      V  .
18.833      4.0954      2.30  .Q        .         .         .      V  .
18.917      4.1095      2.05  .Q        .         .         .      V  .
19.000      4.1227      1.91  .Q        .         .         .      V  .
19.083      4.1351      1.80  .Q        .         .         .      V  .
19.167      4.1462      1.62  .Q        .         .         .      V  .
19.250      4.1564      1.47  .Q        .         .         .      V  .
19.333      4.1663      1.43  .Q        .         .         .      V  .
19.417      4.1761      1.42  .Q        .         .         .      V  .
19.500      4.1860      1.44  .Q        .         .         .       V .
19.583      4.1958      1.42  .Q        .         .         .       V .
19.667      4.2054      1.40  .Q        .         .         .       V .
19.750      4.2149      1.37  .Q        .         .         .       V .
19.833      4.2241      1.33  .Q        .         .         .       V .
19.917      4.2329      1.29  .Q        .         .         .       V .
20.000      4.2414      1.23  Q         .         .         .       V .
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20.083	4.2494	1.15	Q	.	.	.	V .
20.167	4.2565	1.04	Q	.	.	.	V .
20.250	4.2618	0.76	Q	.	.	.	V .
20.333	4.2659	0.60	Q	.	.	.	V .
20.417	4.2697	0.55	Q	.	.	.	V .
20.500	4.2732	0.52	Q	.	.	.	V .
20.583	4.2767	0.50	Q	.	.	.	V .
20.667	4.2801	0.49	Q	.	.	.	V .
20.750	4.2834	0.48	Q	.	.	.	V .
20.833	4.2866	0.47	Q	.	.	.	V .
20.917	4.2897	0.46	Q	.	.	.	V.
21.000	4.2928	0.45	Q	.	.	.	V.
21.083	4.2958	0.44	Q	.	.	.	V.
21.167	4.2987	0.43	Q	.	.	.	V.
21.250	4.3016	0.42	Q	.	.	.	V.
21.333	4.3045	0.41	Q	.	.	.	V.
21.417	4.3073	0.41	Q	.	.	.	V.
21.500	4.3100	0.40	Q	.	.	.	V.
21.583	4.3127	0.39	Q	.	.	.	V.
21.667	4.3154	0.39	Q	.	.	.	V.
21.750	4.3180	0.38	Q	.	.	.	V.
21.833	4.3206	0.38	Q	.	.	.	V.
21.917	4.3232	0.37	Q	.	.	.	V.
22.000	4.3257	0.37	Q	.	.	.	V.
22.083	4.3282	0.36	Q	.	.	.	V.
22.167	4.3307	0.36	Q	.	.	.	V.
22.250	4.3331	0.35	Q	.	.	.	V.
22.333	4.3355	0.35	Q	.	.	.	V.
22.417	4.3379	0.34	Q	.	.	.	V.
22.500	4.3402	0.34	Q	.	.	.	V.
22.583	4.3425	0.34	Q	.	.	.	V.
22.667	4.3448	0.33	Q	.	.	.	V.
22.750	4.3470	0.33	Q	.	.	.	V.
22.833	4.3493	0.32	Q	.	.	.	V.
22.917	4.3515	0.32	Q	.	.	.	V.
23.000	4.3537	0.32	Q	.	.	.	V.

23.083	4.3558	0.31	Q	.	.	.	V.
23.167	4.3579	0.31	Q	.	.	.	V.
23.250	4.3600	0.31	Q	.	.	.	V.
23.333	4.3621	0.30	Q	.	.	.	V.
23.417	4.3642	0.30	Q	.	.	.	V.
23.500	4.3662	0.30	Q	.	.	.	V.
23.583	4.3683	0.29	Q	.	.	.	V.
23.667	4.3703	0.29	Q	.	.	.	V.
23.750	4.3722	0.29	Q	.	.	.	V.
23.833	4.3742	0.28	Q	.	.	.	V.
23.917	4.3761	0.28	Q	.	.	.	V.
24.000	4.3781	0.28	Q	.	.	.	V.
24.083	4.3800	0.28	Q	.	.	.	V.
24.167	4.3818	0.27	Q	.	.	.	V.
24.250	4.3836	0.26	Q	.	.	.	V.
24.333	4.3852	0.24	Q	.	.	.	V.
24.417	4.3866	0.21	Q	.	.	.	V.
24.500	4.3878	0.17	Q	.	.	.	V.
24.583	4.3888	0.14	Q	.	.	.	V.
24.667	4.3897	0.12	Q	.	.	.	V.
24.750	4.3904	0.11	Q	.	.	.	V.
24.833	4.3910	0.09	Q	.	.	.	V.
24.917	4.3916	0.08	Q	.	.	.	V.
25.000	4.3921	0.07	Q	.	.	.	V.
25.083	4.3926	0.07	Q	.	.	.	V.
25.167	4.3930	0.06	Q	.	.	.	V.
25.250	4.3934	0.05	Q	.	.	.	V.
25.333	4.3937	0.05	Q	.	.	.	V.
25.417	4.3940	0.04	Q	.	.	.	V.
25.500	4.3943	0.04	Q	.	.	.	V.
25.583	4.3946	0.04	Q	.	.	.	V.
25.667	4.3948	0.03	Q	.	.	.	V.
25.750	4.3950	0.03	Q	.	.	.	V.
25.833	4.3952	0.03	Q	.	.	.	V.
25.917	4.3954	0.03	Q	.	.	.	V.
26.000	4.3955	0.02	Q	.	.	.	V.

```
  26.083      4.3957      0.02  Q         .         .         .        V.
  26.167      4.3958      0.02  Q         .         .         .        V.
  26.250      4.3959      0.02  Q         .         .         .        V.
  26.333      4.3960      0.02  Q         .         .         .        V.
  26.417      4.3961      0.01  Q         .         .         .        V.
  26.500      4.3962      0.01  Q         .         .         .        V.
  26.583      4.3963      0.01  Q         .         .         .        V.
  26.667      4.3964      0.01  Q         .         .         .        V.
  26.750      4.3964      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                Duration
       Peak Flow Rate                     (minutes)
   =======================                =========
             0%                            1605.0
            10%                             130.0
            20%                              80.0
            30%                              55.0
            40%                              45.0
            50%                              35.0
            60%                              25.0
            70%                              20.0
            80%                              15.0
            90%                              10.0


 ****************************************************************************
  FLOW PROCESS FROM NODE   5005.00 TO NODE   5005.00 IS CODE =   7
 ----------------------------------------------------------------------------
  >>>>>STREAM NUMBER 1 ADDED TO STREAM NUMBER 2<<<<<
 ============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE   5005.00 TO NODE   5005.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>VIEW STREAM NUMBER 2 HYDROGRAPH<<<<<
============================================================================

            STREAM HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       20.0      40.0      60.0      80.0
----------------------------------------------------------------------------
  14.000      1.9000      3.53  .Q  V     .         .         .         .
  14.083      1.9248      3.60  .Q  V     .         .         .         .
  14.167      1.9503      3.69  .Q  V     .         .         .         .
  14.250      1.9764      3.79  .Q  V     .         .         .         .
  14.333      2.0034      3.92  .Q  V     .         .         .         .
  14.417      2.0316      4.10  . Q V     .         .         .         .
  14.500      2.0614      4.32  . Q V     .         .         .         .
  14.583      2.0927      4.54  . Q V     .         .         .         .
  14.667      2.1256      4.78  . Q V     .         .         .         .
  14.750      2.1602      5.02  . Q V     .         .         .         .
  14.833      2.1965      5.28  . Q  V    .         .         .         .
  14.917      2.2347      5.54  . Q  V    .         .         .         .
  15.000      2.2748      5.82  . Q  V    .         .         .         .
  15.083      2.3169      6.11  .  Q V    .         .         .         .
  15.167      2.3611      6.42  .  Q V    .         .         .         .
  15.250      2.4076      6.74  .  Q V    .         .         .         .
  15.333      2.4564      7.09  .  Q V    .         .         .         .
  15.417      2.5078      7.47  .  Q V    .         .         .         .
  15.500      2.5624      7.92  .  Q V    .         .         .         .
  15.583      2.6207      8.48  .   Q V   .         .         .         .
  15.667      2.6842      9.21  .   Q V   .         .         .         .
  15.750      2.7551     10.30  .    QV   .         .         .         .
  15.833      2.8369     11.88  .    QV   .         .         .         .
  15.917      2.9340     14.10  .     VQ  .         .         .         .
  16.000      3.0531     17.30  .      VQ .         .         .         .
```

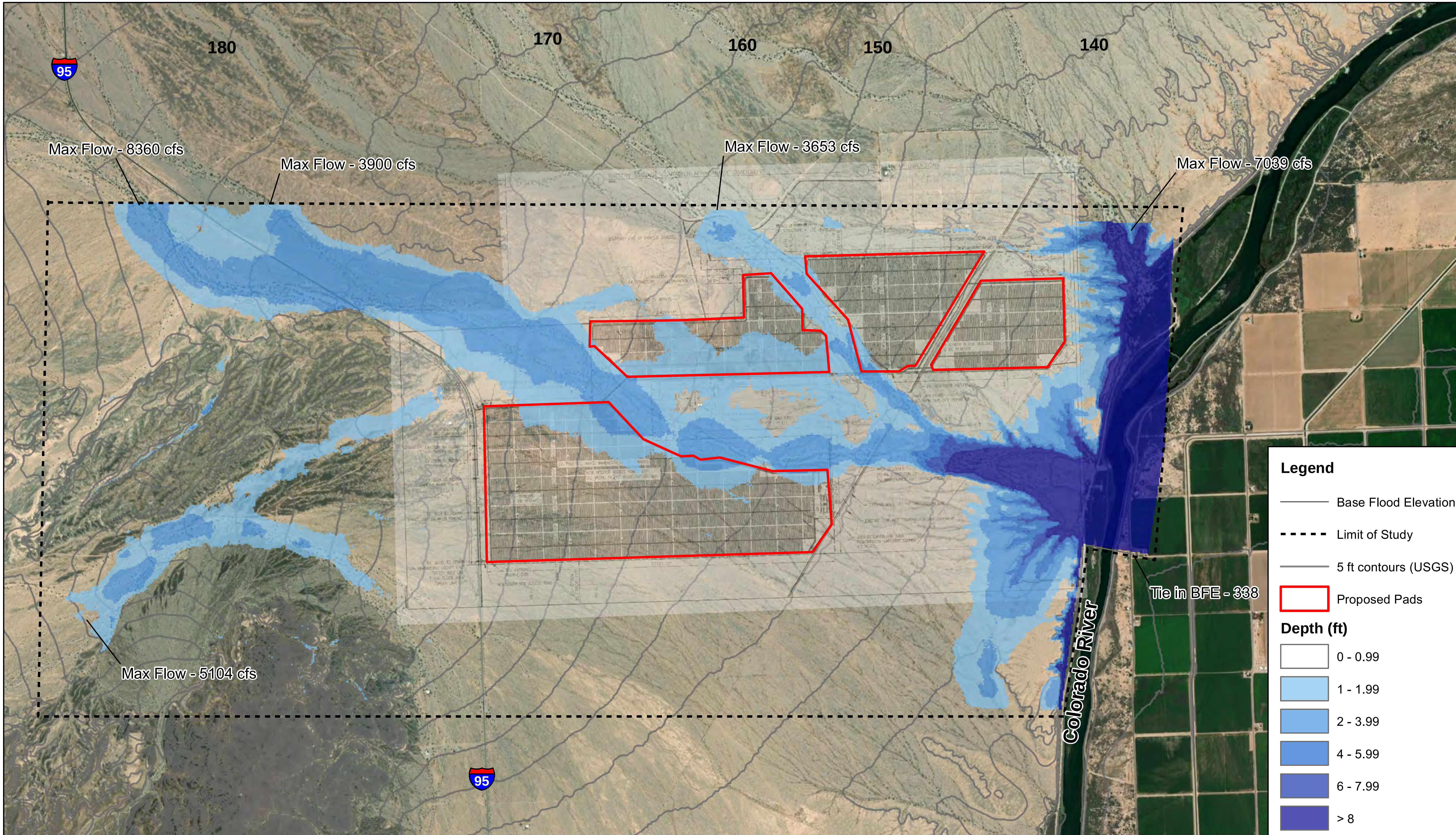
```
16.083      3.2090     22.63  .      V  .Q        .         .         .
16.167      3.4168     30.17  .      V  .    Q    .         .         .
16.250      3.6841     38.80  .       V .        Q.         .         .
16.333      4.0260     49.65  .        V.         .   Q     .         .
16.417      4.4674     64.09  .         V         .         . Q       .
16.500      4.9701     72.99  .         .V        .         .     Q   .
16.583      5.4643     71.77  .         . V       .         .    Q    .
16.667      5.9473     70.12  .         .  V      .         .    Q    .
16.750      6.4160     68.05  .         .   V     .         .   Q     .
16.833      6.8723     66.26  .         .    V    .         .  Q      .
16.917      7.3181     64.74  .         .     V   .         . Q       .
17.000      7.7522     63.03  .         .      V  .         .Q        .
17.083      8.1733     61.14  .         .       V .         Q         .
17.167      8.5820     59.34  .         .        V.        Q.         .
17.250      8.9758     57.18  .         .         V       Q .         .
17.333      9.3563     55.24  .         .         .V     Q  .         .
17.417      9.7224     53.17  .         .         . V   Q   .         .
17.500     10.0749     51.17  .         .         .  V Q    .         .
17.583     10.4137     49.20  .         .         .  VQ     .         .
17.667     10.7379     47.08  .         .         .  QV     .         .
17.750     11.0480     45.02  .         .         . Q  V    .         .
17.833     11.3436     42.93  .         .         .Q    V   .         .
17.917     11.6266     41.09  .         .         Q     V   .         .
18.000     11.8974     39.32  .         .        Q.      V  .         .
18.083     12.1559     37.53  .         .       Q .      V  .         .
18.167     12.4029     35.86  .         .      Q  .       V .         .
18.250     12.6386     34.23  .         .      Q  .        V.         .
18.333     12.8629     32.57  .         .     Q   .        V.         .
18.417     13.0766     31.03  .         .    Q    .         V         .
18.500     13.2807     29.63  .         .   Q     .         V         .
18.583     13.4751     28.22  .         .   Q     .         .V        .
18.667     13.6596     26.80  .         .  Q      .         .V        .
18.750     13.8355     25.54  .         . Q       .         .V        .
18.833     14.0029     24.30  .         . Q       .         . V       .
18.917     14.1613     23.00  .         .Q        .         . V       .
19.000     14.3118     21.85  .         Q         .         . V       .
```

```
   19.083     14.4548     20.77  .         Q         .         .  V      .
   19.167     14.5901     19.64  .        Q.         .         .  V      .
   19.250     14.7182     18.60  .        Q.         .         .  V      .
   19.333     14.8401     17.70  .       Q .         .         .   V     .
   19.417     14.9565     16.90  .       Q .         .         .   V     .
   19.500     15.0678     16.17  .       Q .         .         .   V     .
   19.583     15.1742     15.45  .      Q  .         .         .   V     .
   19.667     15.2760     14.77  .      Q  .         .         .    V    .
   19.750     15.3732     14.12  .      Q  .         .         .    V    .
   19.833     15.4661     13.49  .     Q   .         .         .    V    .
   19.917     15.5549     12.89  .     Q   .         .         .    V    .
   20.000     15.6396     12.29  .     Q   .         .         .    V    .
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                Duration
        Peak Flow Rate                     (minutes)
    =======================                =========
               0%                           1205.0
              10%                            325.0
              20%                            225.0
              30%                            175.0
              40%                            145.0
              50%                            115.0
              60%                             90.0
              70%                             70.0
              80%                             50.0
              90%                             25.0
 ============================================================================


   END OF FLOODSCx ROUTING ANALYSIS
```

APPENDIX D

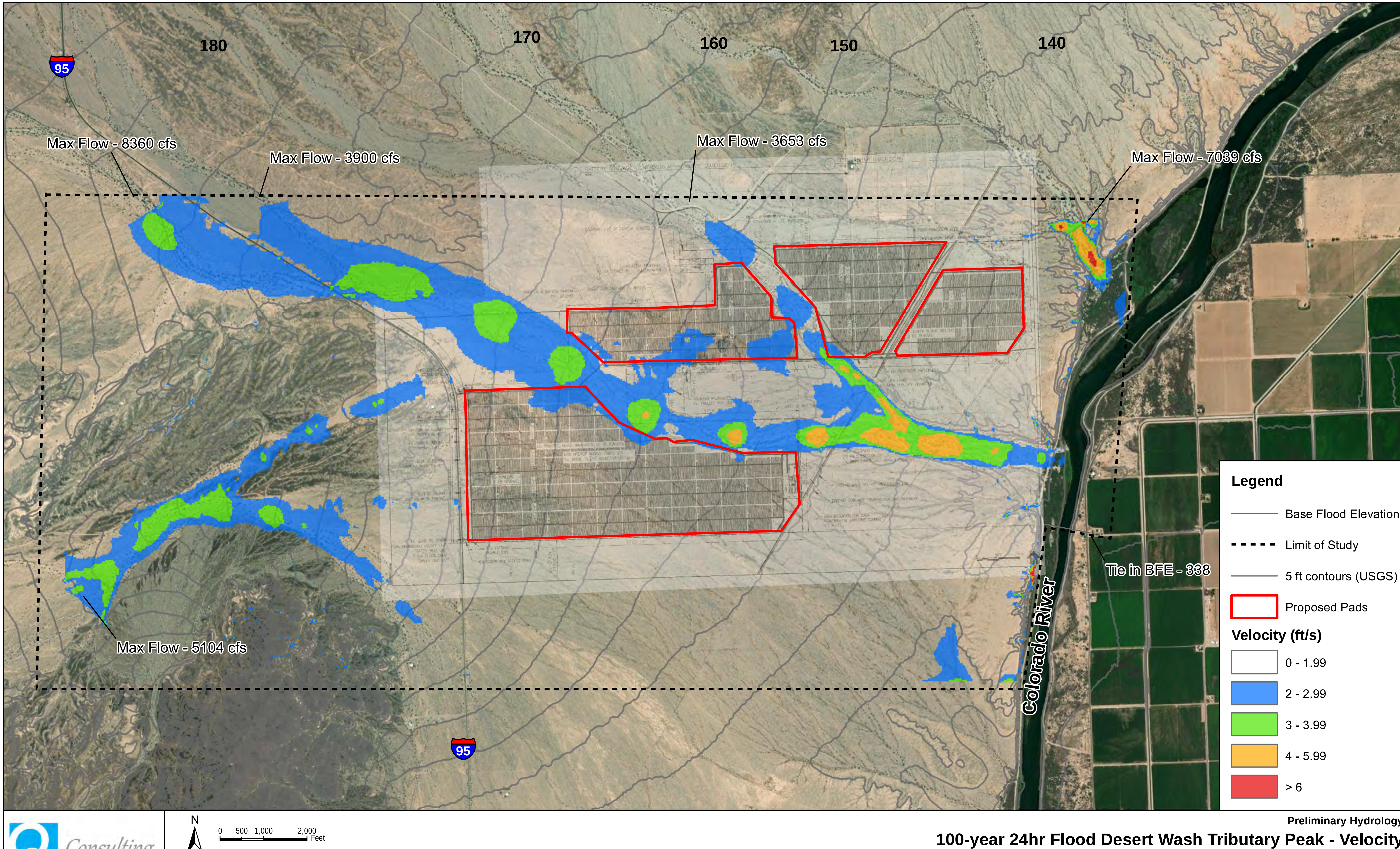


Q3 Consulting

Preliminary Hydrology

100-year 24hr Flood Desert Wash Tributary Peak - Depth

County of San Bernardino, California

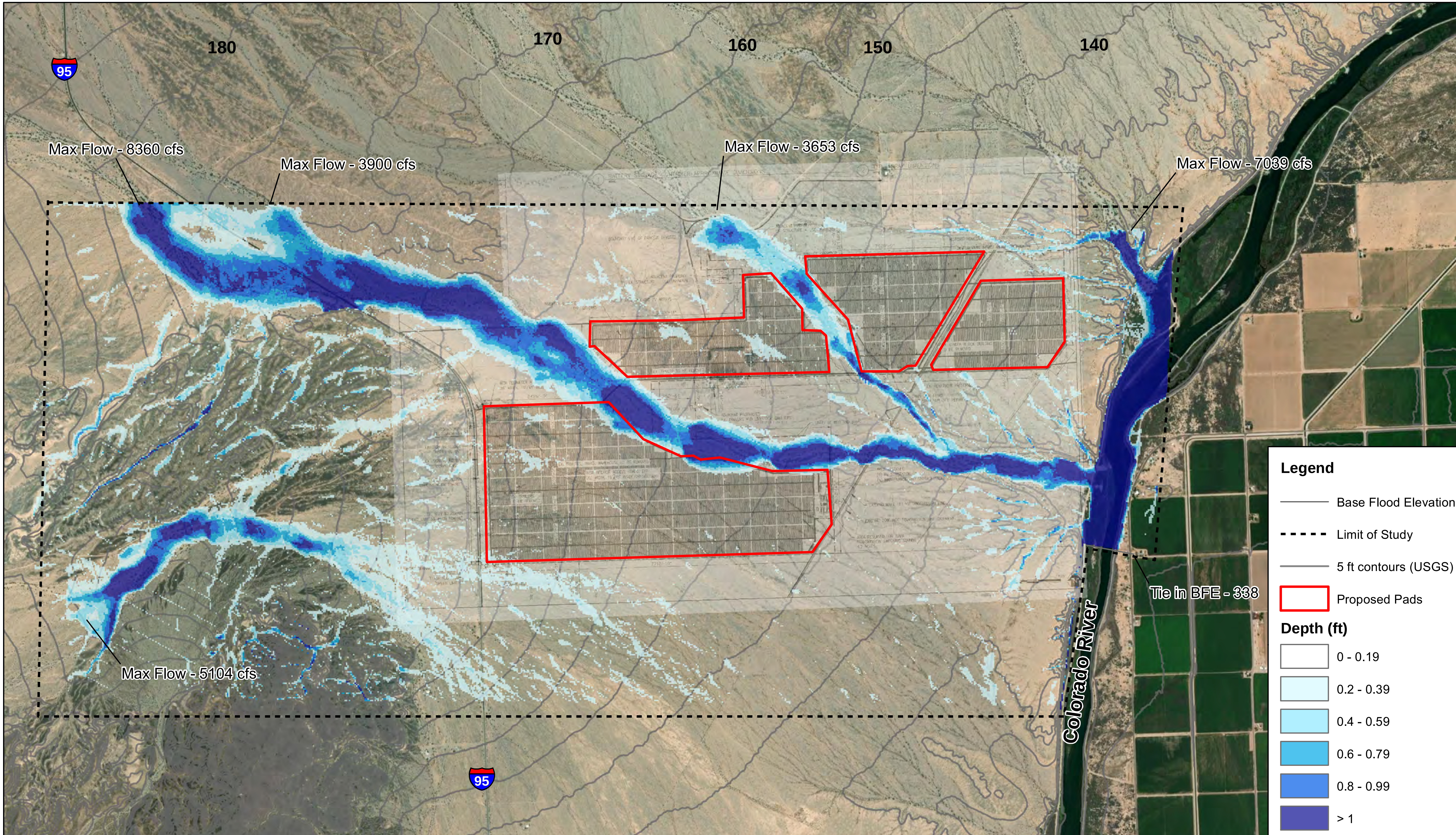


Q3 Consulting

Preliminary Hydrology

100-year 24hr Flood Desert Wash Tributary Peak - Velocity

County of San Bernardino, California

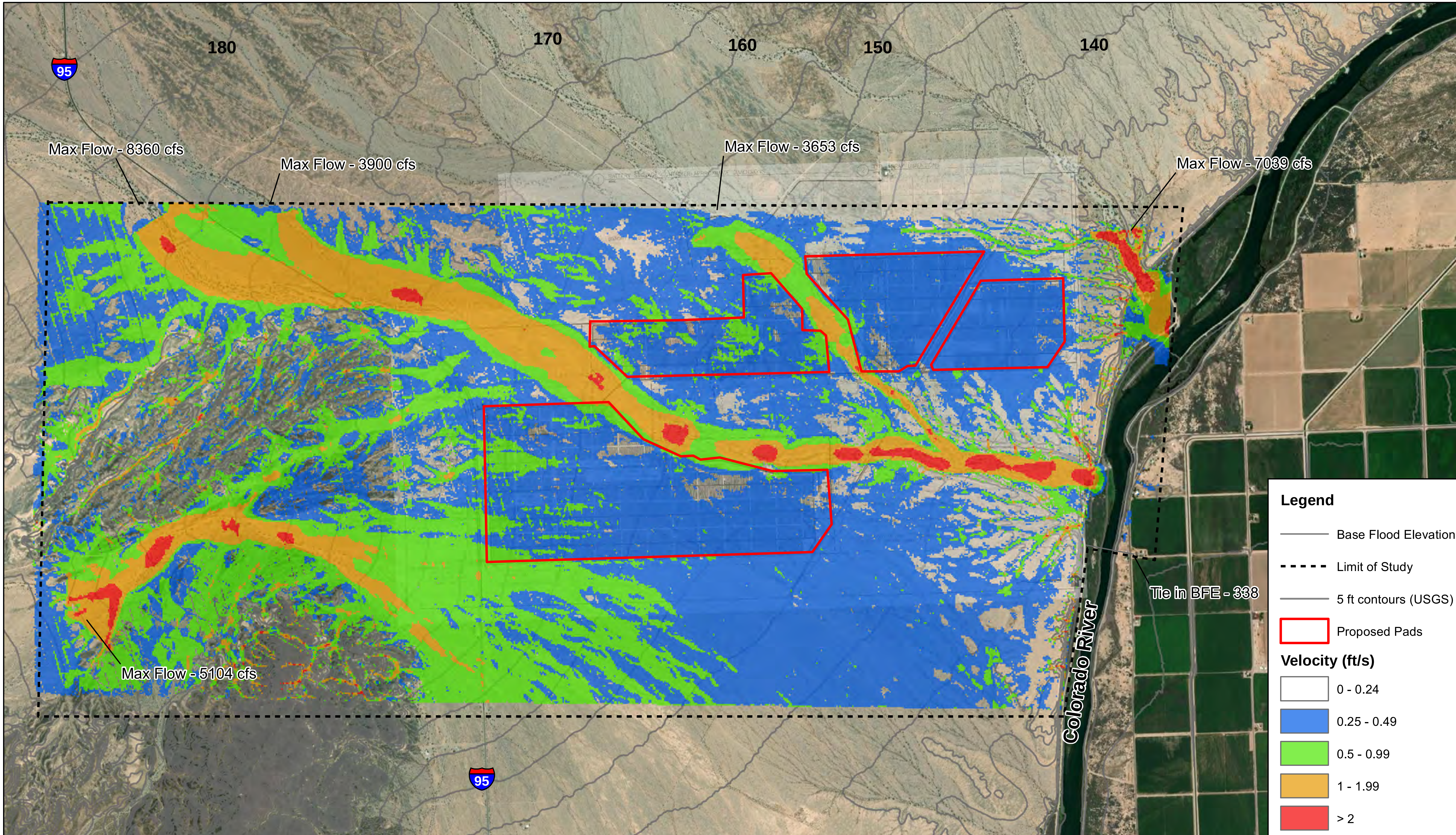


Q3 Consulting

County of San Bernardino, California

Preliminary Hydrology

100-year 24hr Flood Rain on Grid Peak - Depth



Q3 Consulting

Preliminary Hydrology

100-year 24hr Flood Rain on Grid Peak - Velocity

County of San Bernardino, California

APPENDIX E

NRCS				Saxton and Rawls (2006)				Rawls et a	
survey	MUSYM	soil capacity, in *feet*	soil RTIMP	pervious XKSAT, in *in/h*	PSIF, in *inches*	dry moisture deficit	normal moisture deficit	pervious XKSAT, in *in/h*	PSIF, in *inches*
AZ656	1A	11.40	0	0.548	3.475	0.350	0.263	0.120	6.530
AZ656	2	11.40	0	1.782	2.076	0.350	0.320	0.386	4.049
AZ656	8	11.40	0	0.153	5.949	0.398	0.250	0.035	9.786
AZ656	8A	11.40	0	0.201	5.329	0.370	0.250	0.035	9.786
AZ656	8B	11.40	0	0.201	5.329	0.370	0.250	0.035	9.786
AZ656	11	11.40	0	0.548	3.475	0.350	0.263	0.120	6.530
AZ656	12	11.40	0	0.548	3.475	0.350	0.263	0.120	6.530
AZ656	13	11.40	0	0.153	5.949	0.398	0.250	0.035	9.786
AZ656	14	11.40	0	0.201	5.329	0.370	0.250	0.035	9.786
AZ656	14A	11.40	0	0.201	5.329	0.370	0.250	0.035	9.786
AZ656	15	11.40	0	0.571	3.413	0.350	0.265	0.227	5.075
AZ656	21	11.40	0	3.425	1.584	0.350	0.357	1.059	2.601
AZ656	22	11.40	0	3.425	1.584	0.350	0.357	1.059	2.601
AZ656	30	11.40	0	0.571	3.413	0.350	0.265	0.227	5.075
AZ656	30A	11.40	0	0.571	3.413	0.350	0.265	0.227	5.075
AZ656	30B	12.67	0	0.170	5.705	0.387	0.250	0.039	9.503
AZ656	31	11.40	0	1.782	2.076	0.350	0.320	0.386	4.049
AZ656	38	12.00	0	0.571	3.413	0.350	0.265	0.227	5.075
AZ656	42	11.40	0	0.041	9.422	0.247	0.150	0.011	12.410
AZ656	44	0.00	0	0.000	12.493	0.050	0.050	0.000	12.493
CA	s275	8.92	0	0.926	2.760	0.350	0.287	0.214	5.201
CA	s1126	0.50	55	1.613	2.167	0.350	0.315	0.378	4.084
CA	s1140	0.26	0	1.078	2.582	0.350	0.295	0.229	5.058

al. (1983)				HSG breakdown					composition	
dry moisture deficit	normal moisture deficit	porosity	HSG	A	B	C	D	NRCS soil index	X {%}	X-RTIMP {%}
0.366	0.190	0.460	B		1			AZ6561A	100.0	100.0
0.350	0.250	0.451	B		1			AZ6562	100.0	100.0
0.235	0.140	0.461	C			1		AZ6568	100.0	100.0
0.235	0.140	0.468	C			1		AZ6568A	100.0	100.0
0.235	0.140	0.468	C			1		AZ6568B	100.0	100.0
0.366	0.190	0.460	B		1			AZ65611	100.0	100.0
0.366	0.190	0.460	B		1			AZ65612	100.0	100.0
0.235	0.140	0.461	C			1		AZ65613	100.0	100.0
0.235	0.140	0.468	C			1		AZ65614	100.0	100.0
0.235	0.140	0.468	C			1		AZ65614A	100.0	100.0
0.359	0.250	0.495	B		1			AZ65615	100.0	100.0
0.350	0.294	0.437	A	1				AZ65621	100.0	100.0
0.350	0.294	0.437	A/D	0.5			0.5	AZ65622	100.0	100.0
0.359	0.250	0.495	A	1				AZ65630	100.0	100.0
0.359	0.250	0.495	A	1				AZ65630A	100.0	100.0
0.244	0.149	0.464	C			1		AZ65630B	100.0	100.0
0.350	0.250	0.451	A	1				AZ65631	100.0	100.0
0.359	0.250	0.495	B		1			AZ65638	100.0	100.0
0.152	0.053	0.471	C			1		AZ65642	100.0	100.0
0.050	0.050	0.437	D				1	AZ65644	100.0	100.0
0.365	0.250	0.469	B				1	CAs275	100.0	100.0
0.350	0.250	0.447	D				1	CAs1126	100.0	45.0
0.358	0.250	0.446	B				1	CAs1140	100.0	100.0

Green-Ampt Infiltration Parameters from Soils Data

By Walter J. Rawls,[1] M. ASCE, Donald L. Brakensiek,[2] and Norman Miller[3]

Abstract: The analysis of approx 5,000 soil horizons indicated that Green and Ampt parameters (effective porosity, wetting front capillary pressure, and hydraulic conductivity) could not be developed based on phases of soil order or suborder. However, sets of average parameters are developed based on soil horizon or soil texture class, or both. A procedure for determining the Green and Ampt parameters based on soil properties utilizing the full spectrum of soil survey information is outlined.

Introduction

If physically based infiltration models are to be used in operational hydrology, procedures for estimating infiltration model parameters based on soil properties must be developed. Not only are improved procedures needed for estimating point soil parameters, but also methods are needed for quantifying the areal and temporal variation of the soil parameters (14).

The Green and Ampt infiltration model has been found to have wide applicability for modeling the infiltration process (10,15). The Green and Ampt rate equation is written as

$$f = K\left(1 + \frac{n\,\psi_f}{F}\right) \qquad (1)$$

and its integrated form is

$$F - n\,\psi_f \ln\left(1 + \frac{F}{n\,\psi_f}\right) = Kt \qquad (2)$$

in which K = hydraulic conductivity, in centimeters per hour; ψ_f = wetting front capillary pressure head, in centimeters; and n = available porosity which is calculated as the effective porosity, θ_e (total porosity, ϕ, minus residual saturation, θ_r), minus initial soil water content. Equation

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[3]Hydr. Engr., U.S. Dept. of Agr., SCS, Lanham, Md.

Note.—Discussion open until June 1, 1983. To extend the closing date one month, a written request must be filed with the ASCE Manager of Technical and Professional Publications. The manuscript for this paper was submitted for review and possible publication on September 16, 1981. This paper is part of the Journal of Hydraulic Engineering, Vol. 109, No. 1, January, 1983. ©ASCE, Proc. No. 17613.

variables are f = infiltration rate, in centimeters per hour; F = infiltration amount, in centimeters; and t = time, in hours.

Application of the Green and Ampt infiltration model requires estimates of the hydraulic conductivity, K; effective porosity, θ_e; and wetting front capillary pressure head, ψ_f. Pioneering work on evaluating the Green and Ampt parameters was first reported by Bouwer (1). Additional work, relating the parameters to soil texture, has been reported by Clapp and Hornberger (7), Brakensiek, et al. (3), and McCuen, et al. (9). Since past work has used only a small portion of the available soil survey information, specifically soil texture, it is the purpose of this study to report on predicting the Green and Ampt parameters (K, θ_e, ψ_f) from soil properties utilizing the full spectrum of soil survey information.

The National Cooperative Soil Survey (a joint effort by cooperating Federal agencies, land grant universities, and other state and local agencies), uses a national system of soil classification (11,16). This system is based primarily on soil properties that can be observed in the field (e.g., texture) or inferred from other properties observable in the field (e.g., clay mineralogy). The differentiating soil properties are those that mainly affect plant growth and engineering use of the soil, such as particle size distribution, clay mineralogy, organic matter, soil temperature regime, soil moisture regime, carbonate content, and salt content.

Soil taxonomy is a hierarchy of six categories and each category includes a set of classes that are defined at about the same level. The most general definitions, with the fewest differentiating properties, are in the highest category, which consists of 10 orders. The most specific definitions, with the most differentiating properties, are in the lowest category, which is the soil series. There are more than 12,000 series. Soil series are the classes most commonly used to define and name map units in soil surveys, but classes in other categories are also used. The system is designed to facilitate both the interpretation of the soil data for practical application, and because it is national—the transfer of soil information from one location to another. A soil survey for an individual area is designed to meet certain objectives and satisfy the needs identified by local users and cooperating agencies. The distinguishing characteristics of soil surveys are summarized in Table 1.

A map unit delineated on a soil map is a unique soil area recognized in a particular soil survey area. Map units are named for the dominant soil or soils in the unit. The named soil can be at any of the categoric levels in the soil classification system. The more general the soil resource information needed, the higher the category used for the reference name.

Map unit delineations contain inclusions not identified in the map unit name. These units are named and identified by the taxonomic class they represent. Soils are natural bodies, and their properties have a characteristic natural scatter or variability. Because of this variability, certain properties may fall outside the precise limits defined for the named taxonomic class. Also, the map scale may be too small for precise mapping of a small area of these included soils. Map units are designed so that no more than about 15% of the unit consists of inclusions dissimilar enough that their use and management differ, and these inclusions are described in map unit descriptions. Generally, map units of soil surveys made in the U.S. are named for soil series. These units will provide the most precise soil-hydrologic data.

For order 5 soil surveys, the most distinguishable soil property is the taxonomic unit, specifically the soil order or suborder. For orders 2–4 soil surveys, the soil textures at various levels of detail are the most distinguishable soil properties. Also, for orders 2–4, information on horizon identification and depth and on mineralogy might be available. In addition to the information available for the higher order soil surveys, orders 1–2 soil surveys might have more specific information, such as

TABLE 1.—Criteria for Identifying Kinds of Soil Surveys[a]

Kinds of soil survey (1)	Kinds of map units (2)	Kinds of components (3)	Field procedures (4)	Appropriate scales for field mapping and published maps (5)	Minimum size delineation (6)
First order	mainly consociations and some complexes	phases of soil series	the soils in each delineation are identified by transection and traversing. Soil boundaries are observed throughout their length; air photo used to aid boundary delineation	1:12,000	1.5 acres
Second order	consociations, associations, and complexes	phases of soil series	the soils in each delineation are identified by transection and traversing; soil boundaries are plotted by observation and interpretation of remotely sensed data; boundaries are verified at closely spaced intervals	1:12,000–1:31,680	1.5 acres–10 acres
Third order	associations and some consociations and complexes	phases of soil series and soil families	the soils in each delineation are identified by transecting, traversing, and some observation and interpretation by remotely sensed data and verified with some observations	1:24,000–1:250,000	6 acres–640 acres
Fourth order	associations with some consociations	phases of soil families and subgroups	the soils of delineation representative of each map unit are identified and their patterns and composition determined by transecting; subsequent delineations are mapped by some traversing, by some observation, and by interpretation of remotely sensed data verified by occasional observations; boundaries are plotted by air photo interpretations	1:100,000–1:300,000	100 acres–1,000 acres
Fifth order	associations	phases of subgroups, great groups, suborders, and orders	the soils, their patterns, and their compositions for each map unit are identified through mapping selected areas (15 sq mile–25 sq mile) with first or second order surveys, or alternatively, by transection;	1:250,000–1:1,000,000	640 acres–10,000 acres

TABLE 1.—*Continued*

(1)	(2)	(3)	(4)	(5)	(6)
			subsequently, mapping is by widely spaced observations, or by interpretation of remotely sensed data with occasional verification by observation or traversing		

[a]Soil surveys of all orders require maintenance of a soil handbook (legend, mapping unit descriptions, taxonomic unit descriptions, field notes, and interpretations) and review by correlation procedures of the National Cooperative Soil Survey. Work plans for many survey areas list more than 1 order; the part to which each is applicable is delineated on a small scale map of the survey area.

Note: Undifferentiated groups may be used in any order with possible exception of first order. This is about the minimum size delineation for readable soil maps (i.e., 1/4 × 1/4 area)—see Table 2. In practice, the minimum size delineations are generally larger than the minimum shown. First order soil surveys are made for purposes that require appraisal of the soil resources of areas as small as experimental plots and building sites. Mapping scale could conceivably be as large as 1:1.

measured particle size information, measured soil water retention values, organic matter percentage, bulk density, and saturated hydraulic conductivity. Such detailed information might be available for higher order soil surveys; however, because of the large map scale, their usefulness might be extremely limited.

Sources of detailed soils information are the SCS Technical Service Center, the SCS National Soil Survey Laboratory, the state SCS offices, state universities (usually the soil science or agricultural engineering departments), and publications, such as Ref. 13.

Data Base

The data used in this study were from a comprehensive compilation of published soil water characteristic data, as of 1978, for approx 1,200 soils (5,000 horizons) covering 34 states (13). The distribution of the soils is shown in Fig. 1. Each soil set included at most: (1) Detailed profile descriptions; (2) particle size distribution; (3) bulk density; (4) total porosity; (5) clay mineralogy; (6) chemical data; and (7) five to 10 water retention valves covering a range of matric potentials from 160–15,300 cm.

The basic data covered most agricultural soils with the physical properties including a wide range of sand content (mean 56%, range 0.1%–99%), silt content (mean 26%, range 0.1%–93%), clay content (mean 18%, range 0.1%–94%), organic matter content (mean 0.66, range 0.1%–12.5%), and bulk density (mean 1.42 gm/cm^3, range 0.6–2.09). The soils included also both expanding (montmorillonite) and nonexpanding (kaolinite, illite, chlorite, and vermiculite) type clay minerals.

Analysis

It has been shown that the Green and Ampt parameters can be estimated from soil water data using the Brooks-Corey equation (Ref. 3). The Brooks and Corey equation (Ref. 4) is written as

$$S_e = \left(\frac{\psi_b}{\psi}\right)^{\lambda} \quad \text{in which} \quad S_e \text{ (effective saturation)} = \frac{\theta - \theta_r}{\phi - \theta_r} \qquad (3)$$

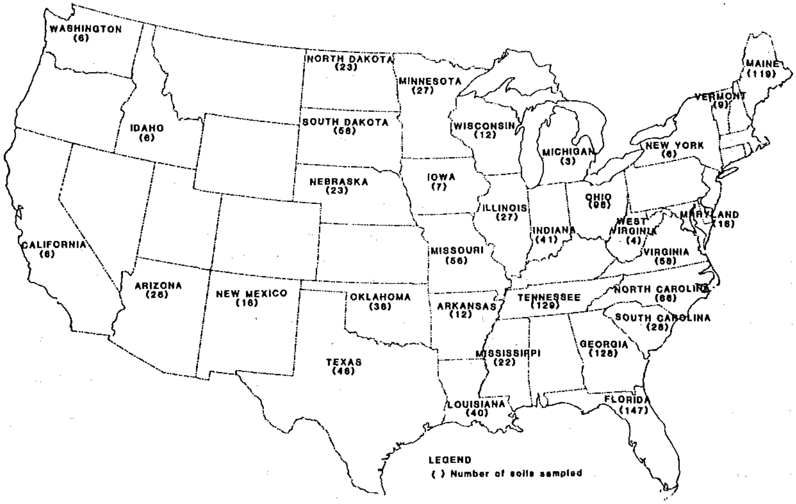

FIG. 1.—Distribution of Soils

in which θ = soil water content, in cubic centimeters per cubic centimeter; θ_r = residual saturation, in cubic centimeters per cubic centimeter; ϕ = total porosity, in cubic centimeters per cubic centimeter; ψ_b = bubbling pressure, in centimeters; ψ = capillary pressure, in centimeters; and λ = the pore-size distribution index.

The Green and Ampt parameters can be calculated from the estimated Brooks and Corey constants as follows: The wetting front capillary pressure term, ψ_f, is calculated by (2)

$$\psi_f = \frac{2\lambda + 3}{2\lambda + 2}\left(\frac{\psi_b}{2}\right) \quad \text{(4)}$$

The effective porosity, θ_e, is calculated as

$$\theta_e = \phi - \theta_r \quad \text{(5)}$$

in which ϕ = the total porosity, in cubic centimeters per cubic centimeter, and is calculated from bulk density and particle density; and θ_r = the residual soil-water content, in cubic centimeters per cubic centimeter. The Green and Ampt hydraulic conductivity, K, based on Bouwer's (4) findings that it is one-half the saturated hydraulic conductivity, is calculated as

$$K = \frac{K_s}{2} \quad \text{(6)}$$

in which the saturated conductivity, K_s, is calculated by an equation (Ref. 5) derived by substituting the Brooks and Corey equation into the Childs, Collis-George permeability integral (6) given by

$$K_s = a\,\frac{\phi_e^2}{\psi_b^2}\left[\frac{\lambda^2}{(\lambda + 1)(\lambda + 2)}\right] \quad \text{(7)}$$

in which a = a constant representing the effects of various fluid con-

TABLE 2.—Green and Ampt Parameters According to Soil Texture Classes and Horizons

Soil texture class (1)	Horizon (2)	Sample size (3)	Total porosity, ϕ, in cubic centimeters per cubic centimeters (4)	Effective porosity, θ_e, in cubic centimeters per cubic centimeters (5)	Wetted front capillary pressure, ψ_f,[a] in centimeters (6)	Hydraulic conductivity, K,[b] in centimeters per hour (7)
Sand[c]		762	0.437 0.374–0.500[d]	0.417 (0.354–0.480)	4.95 (0.97–25.36)	11.78
	A	370	0.452 (0.396–0.508)	0.431 (0.375–0.487)	5.34 (1.24–23.06)	
	B	185	0.440 (0.385–0.495)	0.421 (0.365–0.477)	6.38 (1.31–31.06)	
	C	127	0.424 (0.385–0.463)	0.408 (0.365–0.451)	2.07 (0.32–13.26)	
Loamy sand		338	0.437 (0.363–0.506)	0.401 (0.329–0.473)	6.13 (1.35–27.94)	2.99
	A	110	0.457 (0.385–0.529)	0.424 (0.347–0.501)	6.01 (1.58–22.87)	
	B	49	0.447 (0.379–0.515)	0.412 (0.334–0.490)	4.21 (1.03–17.24)	
	C	36	0.424 (0.372–0.476)	0.385 (0.323–0.447)	5.16 (0.76–34.85)	
Sandy loam		666	0.453 (0.351–0.555)	0.412 (0.283–0.541)	11.01 (2.67–45.47)	1.09
	A	119	0.505 (0.399–0.611)	0.469 (0.330–0.608)	15.24 (5.56–41.76)	
	B	219	0.466 (0.352–0.580)	0.428 (0.271–0.585)	8.89 (2.02–39.06)	
	C	66	0.418 (0.352–0.484)	0.389 (0.310–0.468)	6.79 (1.16–39.65)	
Loam		383	0.463 (0.375–0.551)	0.434 (0.334–0.534)	8.89 (1.33–59.38)	0.34
	A	76	0.512 (0.427–0.597)	0.476 (0.376–0.576)	10.01 (2.14–46.81)	
	B	67	0.512 (0.408–0.616)	0.498 (0.382–0.614)	6.40 (1.01–40.49)	
	C	47	0.412 (0.350–0.474)	0.382 (0.305–0.459)	9.27 (0.87–99.29)	
Silt loam		1,206	0.501 (0.420–0.582)	0.486 (0.394–0.578)	16.68 (2.92–95.39)	0.65
	A	361	0.527 (0.444–0.610)	0.514 (0.425–0.603)	10.91 (1.89–63.05)	
	B	267	0.533 (0.430–0.636)	0.515 (0.387–0.643)	7.21 (0.86–60.82)	
	C	73	0.470 (0.409–0.531)	0.460 (0.396–0.524)	12.62 (3.94–40.45)	
Sandy clay loam		498	0.398 (0.332–0.464)	0.330 (0.235–0.425)	21.85 (4.42–108.0)	0.15
	A	—[e]	— —	— —	— —	
	B	198	0.393 (0.310–0.476)	0.330 (0.223–0.437)	26.10 (4.79–142.30)	
	C	32	0.407 (0.359–0.455)	0.332 (0.251–0.413)	23.90 (5.51–103.75)	
Clay loam		366	0.464 (0.409–0.519)	0.309 (0.279–0.501)	20.88 (4.79–91.10)	0.10
	A	28	0.497 (0.434–0.560)	0.430 (0.328–0.532)	27.00 (6.13–118.9)	
	B	99	0.451 (0.401–0.501)	0.397 (0.228–0.530)	18.52 (4.36–78.73)	
	C	55	0.452 (0.412–0.492)	0.400 (0.320–0.480)	15.21 (3.79–61.01)	
Silty clay loam		689	0.471 (0.418–0.524)	0.432 (0.347–0.517)	27.30 (5.67–131.50)	0.10
	A	65	0.509 (0.449–0.569)	0.477 (0.410–0.544)	13.97 (4.20–46.53)	
	B	191	0.469 (0.423–0.515)	0.441 (0.374–0.508)	18.56 (4.08–84.44)	
	C	39	0.475 (0.436–0.514)	0.451 (0.386–0.516)	21.54 (4.56–101.7)	
Sandy clay		45	0.430 (0.370–0.490)	0.321 (0.207–0.435)	23.90 (4.08–140.2)	0.06
	A	—	— —	— —	— —	
	B	23	0.435 (0.371–0.499)	0.335 (0.220–0.450)	36.74 (8.33–162.1)	
	C	—	— —	— —	— —	
Silty clay		127	0.479 (0.425–0.533)	0.423 (0.334–0.512)	29.22 (6.13–139.4)	0.05
	A	—	— —	— —	— —	
	B	38	0.476 (0.445–0.507)	0.424 (0.345–0.503)	30.66 (7.15–131.5)	
	C	21	0.464 (0.430–0.498)	0.416 (0.346–0.486)	45.65 (18.27–114.1)	
Clay		291	0.475 (0.427–0.523)	0.385 (0.269–0.501)	31.63 (6.39–156.5)	0.03
	A	—	— —	— —	— —	
	B	70	0.470 (0.426–0.514)	0.412 (0.309–0.515)	27.72 (6.21–123.7)	
	C	23	0.483 (0.441–0.525)	0.419 (0.294–0.544)	54.65 (10.59–282.0)	

[a]Antilog of the log mean and standard deviation.
[b]Values for Rawls, et al. (13).
[c]Values for the texture class.
[d]Numbers in ( ) ± one standard deviation.
[e]Insufficient sample to determine parameters.

stants and gravity. The constant a equals 270 cm^3/sec according to Brutsaert (5).

The Brooks and Corey equation was fitted to the water retention data using pattern search optimization. Only the optimizations which produced a correlation coefficient significant at the 95% level were used. The Green and Ampt parameters were calculated from the Brooks and Corey parameters using Eqs. 4–7. Checking the saturated hydraulic conductivities derived from Eq. 7 with those reported in Rawls, et al. (13), we find that Eq. 7 produced saturated hydraulic conductivities that were approximately one order of magnitude too high; therefore, we calibrated the constant in Eq. 7 to the Rawls, et al. (13) 11 soil textures. This fitting produced a value of the a constant equal to 21.0 cm^3/sec.

The data included six of the 10 soil orders and 17 of the 49 soil suborders. Analysis of the data indicated that mean Green and Ampt parameter values were not significantly different for soil orders and suborders, thus we concluded that use of the Green and Ampt infiltration model is inappropriate for the Order 5 soil surveys.

Analysis of the data according to soil texture classes, horizon, and clay mineralogy indicated that soil texture classes were the most significant discriminators of the Green and Ampt parameters. Also, a further division according to major horizons (A, B, C) yielded further classification accuracy. Clay mineralogy was not found to be significant. The mean parameter values and standard deviations are summarized in Table 2 for the 11 USDA soil texture classifications and major horizons. The values given in Table 2 can be used when applying the Green and Ampt infiltration model using orders 2–4 soil surveys.

We considered using more detailed soil information, such as particle size distribution, organic matter, bulk density, and 1/3 and 15 bar moisture retention values, to make better estimates of the Green and Ampt parameters (ψ_f, θ_e, K) than just average values according to soil texture class and horizon. First, we attempted to relate the Green and Ampt parameters to the particle size distribution, organic matter, and bulk density using regression analysis; however, these relationships yielded correlation coefficients of approx 0.6–0.75, which we felt were not adequate for predictive purposes. Therefore, we used the approach presented by Gupta and Larson (8), and Rawls, et al. (12,13) in which the soil water retention values for −0.1, −0.2, −0.33, −0.60, −1.0, −2.0, −4.0, −10.0, and −15.0 bar matric potentials were related to the particle size, percentages, organic matter, bulk density, and measured soil water content at specific matric potentials. Depending upon which parameters were included in the relationship, this approach predicted soil water retention at specific matric potential with a correlation coefficient ranging between 0.80 and 0.98. A sensitivity test on clay, sandy loam, and silt loam textures was performed utilizing various combinations of the 10 water retention matric potential values. We concluded that for the purpose of determining the Green and Ampt parameters, only six points on the water retention matric potential curve are needed. The best combination of points is the 0.1, 0.33, 1, 4, 10, and 15 bar water retentions.

Conclusion

Appropriate procedures for determining Green and Ampt infiltration parameters (effective porosity, wetting front capillary pressure, and hydraulic conductivity) could not be developed for order 5 soil surveys. However, for orders 1–4 soil surveys, the methods for determining the Green and Ampt parameters, ranked according to accuracy, are:

1. Fit the Brooks and Corey equation to measured water retention matric potential data and determine the Green and Ampt parameters from the Brooks and Corey parameters. This probably is the most expensive and time-consuming approach.
2. Fit the Brooks and Corey equation to published water retention matric potential data obtained form literature sources, such as Rawls, et al. (13), and determine the Green and Ampt parameters from the Brooks and Corey parameters.
3. Predict the moisture tension curve based on particle size distribution, organic matter, bulk density, and either 1/3 or 15 bar water content, or both, using appropriate set of equations given in Rawls, et al. (13), or Gupta and Larson (8) for the 0.1, 0.33, 1, 4, 10, and 15 bar moisture values. Fit the Brooks and Corey equation to the water retention matric potential curve and then predict the Green and Ampt parameters from the Brooks and Corey parameters.
4. Estimate the parameters based on profile horizon and soil texture classes (Table 2).
5. Estimate the parameters based on soil texture classes (Table 2).

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APPENDIX H – Applicable Regulations

Air Quality Applicable Regulations, Plans, and Standards

Federal

National Ambient Air Quality Standards (NAAQS) are set by the Environmental Protection Agency (EPA) Office of Air Quality Planning and Standards, as required by the federal Clean Air Act (CAA). Ambient air quality standards define the allowable concentrations of criteria pollutants in ambient air. There are NAAQS in place for seven “criteria” pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particle pollution—further defined as particles having diameters equal to or less than 10 micrometers (PM_{10}) and particles having diameters equal to or less than 2.5 micrometers ($PM_{2.5}$)—and sulfur dioxide (Table 5). Standards are classified as primary and secondary. Primary standards are designed to protect public health, including sensitive individuals, such as children and the elderly, whereas secondary standards are designed to protect public welfare, such as visibility and crop or material damage. The EPA sets the NAAQS based on a process that involves science policy workshops, a risk/exposure assessment (REA) that draws on the information and conclusions of the science policy workshops to development quantitative characterizations of exposures and associated risks to human health or the environment, and a policy assessment by EPA staff that bridges the gap between agency scientific assessments and the judgments required of the EPA administrator, who then takes the proposed standards through the federal rulemaking process.

The Clean Air Act requires the EPA to routinely review and update the NAAQS in accordance with the latest available scientific evidence. For example, the EPA revoked the annual PM10 standard in 2006 due to a lack of evidence linking health problems to long-term exposure to PM10 emissions. The 1-hour standard for O3 was revoked in 2005 in favor of a new 8-hour standard that is intended to better protect public health.

CAA Section 182(e)(5) allows the EPA administrator to approve provisions of an attainment strategy in an extreme area that anticipates development of new control techniques or improvement of existing control technologies if the state has submitted enforceable commitments to develop and adopt contingency measures to be implemented if the anticipated technologies do not achieve planned reductions.

Nonattainment areas that are classified as “serious” or “worse” are required to revise their air quality management plans to include specific emission reduction strategies to meet interim milestones in implementing emission controls and improving air quality. The EPA can withhold certain transportation funds from states that fail to comply with the planning requirements of the act. If a state fails to correct these planning deficiencies within two years of federal notification, the EPA is required to develop a Federal Implementation Plan for the identified nonattainment area or areas.

State

The California Clean Air Act of 1988 requires all air pollution control districts in the state to aim to achieve and maintain state ambient air quality standards for O_3, CO, and NO_2 by the earliest practical date and to develop plans and regulations specifying how the districts will meet this goal. There are no planning requirements for the state PM_{10} standard. California Air Resources Board (CARB), which became part of the California Environmental Protection Agency in 1991, is responsible for meeting state requirements of the federal Clean Air Act, administrating the California Clean Air Act, and establishing the California Ambient Air Quality Standards (CAAQS). The California Clean Air Act, amended in 1992, requires all air districts in the state to endeavor to achieve and maintain the CAAQS. The CAAQS are generally stricter than national standards for the same pollutants, but there is no penalty for nonattainment. Similar to the federal process, the standards for the CAAQS are adopted after review by CARB staff of the scientific literature produced by agencies such as the Office of Environmental Health Hazard Assessment (OEHHA), the Air Quality Advisory Committee, which is comprised of experts in health sciences, exposure assessment, monitoring methods, and atmospheric sciences appointed by the Office of the President of the University of California, and public review and comment.

An important component of the MDAQMD's air quality planning strategy is contained in the State Implementation Plan (SIP) for the State of California. The federal Clean Air Act requires all states to submit a SIP to the EPA. This statewide SIP is often referred to as an "infrastructure" SIP. Infrastructure SIPs are administrative in nature and describe the authorities, resources, and programs a state has in place to implement, maintain, and enforce the federal standards. It does not contain any proposals for emission control measures.

In addition to infrastructure SIPs, the Clean Air Act requires submissions of SIPs for areas that are out of compliance with the NAAQS. These area attainment SIPs are comprehensive plans that describe how an out-of-compliance area will attain and maintain the particular NAAQS standard(s) it does not conform to. Once an out-of-compliance area has attained the standard in question, a maintenance SIP is required for a period of time to ensure the area will continue to meet the standard.

State Implementation Plans are not single documents. They are a compilation of new and previously submitted plans, programs (such as monitoring, modeling, permitting, etc.), district rules, state regulations, and federal controls. Many of California's SIPs rely on the same core set of control strategies, including emission standards for cars and heavy trucks, fuel regulations, and limits on emissions from consumer products. State law makes CARB the lead agency for all purposes related to SIPs. Local air districts and other agencies prepare SIP elements and submit them to CARB for review and approval. CARB forwards those revisions to the EPA for approval and publication in the CFR.

Table 5 compares the state and federal criteria pollutant standards while also discussing the relevant effects of pollutants on persons.

The MDAB is designated as either in attainment or unclassified for all federal air quality standards, and all state air quality standards with the exceptions of Ozone and PM_{10} (CARB 2020). Section 176(c) of the Clean Air Act (42 U.S.C. 7401 et seq.) requires federal agencies to comply with the General Conformity Regulations and demonstrate conformity for the projects in nonattainment areas; otherwise, the projects cannot proceed.

Biological Resources-Vegetation Applicable Regulations, Plans, and Standards

Federal

Federal Endangered Species Act of 1973

When a private Project that has no federal funding and for which no federal action is required may affect a listed species, the private applicant may receive authorization for incidental take of species listed under the Federal Endangered Species Act (FESA). In these situations, Section 10 of the FESA provides for issuance of incidental take permits (ITPs) to private entities with the development of a Habitat Conservation Plan (HCP). An ITP allows take of the species that is incidental to another authorized activity.

State

California Desert Native Plants Act

The California Desert Native Plants Act, Division 23 of the California Food and Agriculture Code, is intended to "protect California desert native plants from unlawful harvesting on both public and privately owned lands." The Act regulates the harvesting, transport, and sale of specific species of native plants in California
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California Native Plant Protection Act

The Native Plant Protection Act (NPPA) of 1977 (Fish and Wildlife Code Sections 1900-1913) directs the CDFW to "preserve, protect and enhance rare and endangered plants in this State." The NPPA gives the California Fish and Wildlife Commission the power to designate native plants as "endangered" or "rare" and protected endangered and rare plants from take.

Desert Renewable Energy Conservation Plan

The Desert Renewable Energy Conservation Plan (DRECP) is a multi-agency plan formed by the Renewable Energy Action Team composed of the California Energy Commission, CDFW, USFWS, and the Bureau of Land Management with the goal of facilitating the development and minimizing the environmental impact of the development of renewable energy resources within the desert regions of California. The plan consists of multiple components targeting varying aspects of development, including but not limited to the following: General Conservation Plan (GCP) and a NCCP. The overall goal is to conserve biological, physical, cultural, social, and scenic resources within the plan area. As this applies to biological resources, the plan intends to achieve six primary objectives: (1) Locate renewable energy development to disturbed lands or those with low biological conflict; (2) Identify plan-wide biological goals and objectives; (3) identify a DRECP Plan-Wide Reserve Design Envelope for each alternative; (4) contribute to the long-term conservation and management of covered species and natural communities; (5) preserve, restore, and enhance natural communities and ecosystems; and (6) identify and incorporate climate change adaption research and management objectives and/or policies (Renewable Energy Action Team 2016).

Local

County of San Bernardino General Plan

The San Bernardino County Countywide Plan describes the following policies regarding biological resources:

Policy NR-5.1 Coordinated habitat planning. We participate in landscape-scale habitat conservation planning and coordinate with existing or proposed habitat conservation and natural resource management plans for private and public lands to increase certainty for both the conservation of species, habitats, wildlife corridors, and other important biological resources and functions and for land development and infrastructure permitting.

Policy NR-5.2 Capacity for resource protection and management. We coordinate with public and nongovernmental agencies to seek funding and other resources to protect, restore, and maintain open space, habitat, and wildlife corridors for threatened, endangered, and other sensitive species.

Policy NR-5.3 Multiple-resource benefits. We prioritize conservation actions that demonstrate multiple resource preservation benefits, such as biology, climate change adaptation and resiliency, hydrology, cultural, scenic, and community character.

Policy NR-5.6 Mitigation banking. We support the proactive assemblage of lands to protect biological resources and facilitate development through private or public mitigation banking. We require public and private conservation lands or mitigation banks to ensure that easement and fee title agreements provide funding methods sufficient to manage the land in perpetuity.

Policy NR-5.7 Development review, entitlement, and mitigation. We comply with state and federal regulations regarding protected species of animals and vegetation through the development review, entitlement, and environmental clearance processes.

Policy NR-5.8 Invasive species. We require the use of non-invasive plant species with new development and encourage the management of existing invasive plant species that degrade ecological function.

San Bernardino County Development Code

Desert Native Plant Protection (88.01.060). This Section provides regulations for the removal or harvesting of specified desert native plants in order to preserve and protect the plants and to provide for the conservation and wise use of desert resources. The provisions are intended to augment and coordinate with the Desert Native Plants Act (Food and Agricultural Code Section 80001 et seq.) and the efforts of the State Department of Food and Agriculture to implement and enforce the Act.

The following desert native plants or any part of them, except the fruit, shall not be removed except under a Tree or Plant Removal Permit in compliance with Section 88.01.050 (Tree or Plant Removal Permits). In all cases the botanical names shall govern the interpretation of this Section. (1) The following desert native plants with stems 2 inches or greater in diameter or 6 feet or greater in height: Dalea spinosa (smoke tree), all species of the genus Prosopis (mesquites). (2) All species of the family Agavaceae (century plants, nolinas, yuccas). (3) Creosote Rings, 10 feet or greater in diameter. (4) All Joshua trees. (5) Any part of any of the following species, whether living or dead: Olneya tesota (desert ironwood), all species of the genus Prosopis (mesquites), all species of the genus Cercidium (synonym: Parkinsonia, palo verde).

County of San Bernardino General Plan – Renewable Energy and Conservation

The County of San Bernardino General Plan Renewable Energy Conservation Element describes the following policies regarding Environmental Compatibility:

> RE Policy 4.7: RE Project site selection and site design shall be guided by the following priorities relative to habitat conservation and mitigation:
>
> - avoid sensitive habitat, including wildlife corridors, during site selection and Project design.
> - where necessary and feasible, conduct mitigation on-site.
> - when on-site habitat mitigation is not possible or adequate, establish mitigation off-site in an area designated for habitat conservation.

Biological Resources- Wildlife Applicable Regulations, Plans, and Standards

Federal

Federal Endangered Species Act of 1973

When a private project that has no federal funding and for which no federal action is required may affect a listed species, the private applicant may receive authorization for incidental take of species listed under the FESA. In these situations, Section 10 of the FESA provides for issuance of incidental take permits (ITPs) to private entities with the development of a Habitat Conservation Plan (HCP). An ITP allows take of the species that is incidental to another authorized activity.

Bald and Golden Eagle Protection Act of 1940

The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668[c]) was enacted in 1940 (and amended several times since) and prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald or golden eagles, including their parts (including feathers), nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part (including feathers), nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." Regulations further define "disturb" as “to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior" (50 CFR 22.6). The U.S. Fish and Wildlife Service issues and maintains permits for eagle “take.”

Migratory Bird Treaty Act, as Amended

The Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 United States Code [USC] 703-711), provides legal protection for almost all bird species occurring in, migrating through, or spending a portion of their life cycle in North America by restricting the killing, taking, collecting, and selling or purchasing of native bird species or their parts, nests, or eggs. The United States Fish and Wildlife Service (USFWS) determined it was illegal under the MBTA to directly kill or destroy an active nest (nest with eggs or nestlings) of nearly any bird species (with the exception of non-native species) through the MBTA Reform Act of 2004. Certain game bird species are allowed to be hunted for specific periods determined by federal and state governments. The intent of the MBTA is to eliminate any commercial market for migratory birds, feathers, or bird parts, especially for eagles and other birds of prey. As authorized by the MBTA, the USFWS issues permits to qualified applicants for the following types of activities:

- falconry
- raptor propagation
- scientific collecting
- special purposes, such as rehabilitation, education, migratory game bird propagation, and salvage
- take of depredating birds, taxidermy, and waterfowl sale and disposal

The regulations governing migratory bird permits can be found in Title 50, Part 13 (General Permit Procedures) and Part 21 (Migratory Bird Permits) of the CFR.

State

California Endangered Species Act

The California Endangered Species Act (CESA; California Fish and Wildlife Code Sections 2050-2116) parallels the FESA. As a responsible agency, the California Department of Fish and Wildlife (CDFW) has regulatory authority over species state listed as endangered and threatened. The State Legislature encourages cooperative and simultaneous findings between state and federal agencies. Consultation with CDFW is required for projects with the potential to affect listed or candidate species. CDFW would determine whether a reasonable alternative would be required for the conservation of the species. CESA prohibits the “take” of these species unless an ITP is granted. Under California Fish and Wildlife Code Section 2081 (ITP), CDFW can authorize the “take” of a listed species (with exception to fully protected species) if the “take” of the listed species is incidental to carrying out an otherwise lawful project that has been approved under the California Environmental Quality Act (CEQA). Section 2080.1 allows for “take” once an applicant obtains a federal ITP which can be approved (Consistency Determination letter) within 30 days by the CDFW Director. If the federal Incidental Take Statement is determined not to be consistent with CESA, then application for a State ITP (2081) is required.

The California Fish and Wildlife Code outlines protection for fully protected species of mammals, birds, reptiles, amphibians, and fish. Species that are “fully protected” may not be taken or possessed at any time. CDFW has designated certain species native to California as Species of Special Concern to “focus attention on wildlife at conservation risk by the Department, other State, Local and Federal governmental entities, regulators, land managers, planners, consulting biologists, and others; stimulate research on poorly known species; achieve conservation and recovery of wildlife before they meet CESA criteria for listing as threatened or endangered."

State Fully Protected Species

The State of California designated species as Fully Protected (FP) prior to the creation of CESA and FESA. Lists of FP species were initially developed to provide protection to species that were rare or faced possible extinction/extirpation. Most FP species have since been state listed as threatened or endangered species. Under California Fish and Wildlife Code Section 4700, FP species may not be taken or possessed at any time.

In September 2011, the California Legislature sent the Governor legislation authorizing CDFW to permit the incidental take of 36 FP species pursuant to a Natural Community Conservation Plan (NCCP) approved by CDFW (Senate Bill 618 [Wolk]). The legislation gives FP species the same level of protection as provided under the NCCP Act for endangered and threatened species (California Fish and Wildlife Code Section 2835). The NCCP Act, enacted in the 1990s, authorizes the incidental take of species "whose conservation and management" is provided for in a conservation plan approved by CDFW.

Sections 1600-1602 of the California Fish and Wildlife Code

Pursuant to Division 2, Chapter 6, Sections 1600-1602 of the California Fish and Wildlife Code, CDFW regulates all diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake, which supports fish or wildlife. CDFW defines a "stream" (including creeks and rivers) as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having surface or subsurface flow that supports or has supported riparian vegetation." CDFW's definition of "lake" includes "natural lakes or man-made reservoirs." CDFW limits of jurisdiction include the maximum extent of the uppermost bank-to-bank distance or riparian vegetation dripline.

California State Fish and Game Code Sections 3503, 3503.5, 3513, and 3800

California Fish and Game Code Section 3503 states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird. California Fish and Game Code Section 3800 affords protection to all nongame birds, which are all birds occurring naturally in California that are not resident game birds, migratory game birds, or fully protected birds. California Fish and Game Code Section 3513 upholds the MBTA by prohibiting any take or possession of birds that are designated by the MBTA as migratory nongame birds except as allowed by federal rules and regulations promulgated pursuant to the MBTA.

Desert Renewable Energy Conservation Plan

The Desert Renewable Energy Conservation Plan (DRECP) is a multi-agency plan formed by the Renewable Energy Action Team composed of the California Energy Commission, CDFW, USFWS, and BLM with the goal of facilitating the development and minimizing the environmental impact of the development of renewable energy resources within the desert regions of California. The plan consists of multiple components targeting varying aspects of development, including but not limited to the following: General Conservation Plan (GCP) and a NCCP. The overall goal is to conserve biological, physical, cultural, social, and scenic resources within the plan area. As this applies to biological resources, the plan intends to achieve six primary objectives: (1) Locate renewable energy development to disturbed lands or those with low biological conflict; (2) Identify plan-wide biological goals and objectives; (3) identify a DRECP Plan-Wide Reserve Design Envelope for each alternative; (4) contribute to the long-term conservation and management of covered species and natural communities; (5) preserve, restore, and enhance natural communities and ecosystems; and (6) identify and incorporate climate change adaption research and management objectives and/or policies (Renewable Energy Action Team 2016).

Local

San Bernardino County Countywide Plan - Biological Resources

The San Bernardino County Countywide Plan describes the following policies regarding biological resources:

Policy NR-5.1 Coordinated habitat planning. We participate in landscape-scale habitat conservation planning and coordinate with existing or proposed habitat conservation and natural resource management plans for private and public lands to increase certainty for both the conservation of species, habitats, wildlife corridors, and other important biological resources and functions and for land development and infrastructure permitting.

Policy NR-5.2 Capacity for resource protection and management. We coordinate with public and nongovernmental agencies to seek funding and other resources to protect, restore, and maintain open space, habitat, and wildlife corridors for threatened, endangered, and other sensitive species.

Policy NR-5.3 Multiple-resource benefits. We prioritize conservation actions that demonstrate multiple resource preservation benefits, such as biology, climate change adaptation and resiliency, hydrology, cultural, scenic, and community character.

Policy NR-5.6 Mitigation banking. We support the proactive assemblage of lands to protect biological resources and facilitate development through private or public mitigation banking. We require public and private conservation lands or mitigation banks to ensure that easement and fee title agreements provide funding methods sufficient to manage the land in perpetuity.

Policy NR-5.7 Development review, entitlement, and mitigation. We comply with state and federal regulations regarding protected species of animals and vegetation through the development review, entitlement, and environmental clearance processes.

Policy NR-5.8 Invasive species. We require the use of non-invasive plant species with new development

County of San Bernardino General Plan – Renewable Energy and Conservation

The County of San Bernardino General Plan Renewable Energy Conservation Element describes the following policies regarding Environmental Compatibility:

RE Policy 4.7: RE project site selection and site design shall be guided by the following priorities relative to habitat conservation and mitigation:

- avoid sensitive habitat, including wildlife corridors, during site selection and project design.
- where necessary and feasible, conduct mitigation on-site.
- when on-site habitat mitigation is not possible or adequate, establish mitigation off-site in an area designated for habitat conservation.

Cultural Resources Applicable Regulations, Plans, and Standards

Federal

National Historic Preservation Act of 1966

Enacted in 1966, the NHPA (16 U.S.C §§ 470 et seq.) declared a national policy of historic preservation and instituted a multifaceted program, administered by the Secretary of the Interior, to encourage the achievement of preservation goals at the federal, state, and local levels. The NHPA authorized the expansion and maintenance of the National Register of Historic Places (NRHP), established the position of State Historic Preservation Officer (SHPO), provided for the designation of State Review Boards, set up a mechanism to certify local governments to carry out the purposes of the NHPA, assist Native American tribes in preserving their cultural heritage, and created the Advisory Council on Historic Preservation (ACHP).

The NHPA establishes the nation's policy for historic preservation and sets in place a program for the preservation of historic properties by requiring federal agencies to consider effects to significant cultural resources (i.e., historic properties) prior to undertakings.

Section 106 of the National Historic Preservation Act

Section 106 of the NHPA states that federal agencies with direct or indirect jurisdiction over federally funded, assisted, or licensed undertakings must take into account the effect of the undertaking on any historic property that is included in, or eligible for inclusion in, the NRHP and that the ACHP and SHPO must be afforded an opportunity to comment, through a process outlined in the ACHP regulations at 36 Code of Federal Regulations (CFR) Part 800, on such undertakings.

National Register of Historic Places

The NRHP was established by the NHPA of 1966 as "an authoritative guide to be used by federal, state, and local governments, private groups, and citizens to identify the Nation's cultural resources and to indicate what properties should be considered for protection from destruction or impairment." The NRHP recognizes properties that are significant at the national, state, and local levels. To be eligible for listing in the NRHP, a resource must be significant in American history, architecture, archaeology, engineering, or culture. Districts, sites, buildings, structures, and objects of potential significance must also possess integrity of location, design, setting, materials, workmanship, feeling, or association. A property is eligible for the NRHP if it is significant under one or more of the following criteria:

- Criterion A: It is associated with events that have made a significant contribution to the broad patterns of our history.
- Criterion B: It is associated with the lives of persons who are significant in our past.
- Criterion C: It embodies the distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic values; or represents a significant and distinguishable entity whose components may lack individual distinction.
- Criterion D: It has yielded, or may be likely to yield, information important in prehistory or history.

Notwithstanding Criteria Considerations, in general cemeteries, birthplaces, or graves of historic figures; properties owned by religious institutions or used for religious purposes; structures that have been moved from their original locations; reconstructed historic buildings; and properties that are primarily commemorative in nature are not considered eligible for the NRHP unless they satisfy certain conditions. In general, a resource must be at least 50 years of age to be considered for the NRHP, unless it satisfies a standard of exceptional importance.

In addition to the four National Register Criteria noted above, qualifying resources must maintain elements of integrity. Integrity is the ability of a property to convey its significance. "The evaluation of integrity is sometimes a subjective judgment, but it must always be grounded in an understanding of a property's physical features and how they relate to its significance" (NPS 1997:44). The National Register Bulletin (NPS 1990, revised 1997) identifies seven aspects of integrity that a property should retain, and include: Location, Design, Setting, Materials, Workmanship, Feeling, and Association. While maintenance of all aspects of integrity is not required, a property should possess most of the aspects that are integral to its ability to convey its significance. Understandably, not all aspects of integrity are applicable across the range of buildings, structure, objects, or sites under evaluation. Aspects such as design or feeling likely would not be integral to understanding the significance of an archaeological deposit, whereas these would be essential in understanding a significant building, or landscape.

The Bulletin further exemplifies how to broadly assess the integrity of eligible resources when applying the qualifying National Register Criteria. Under Criteria A and B, a property that is significant for its historic association is eligible if it retains the essential physical features that made up its character or appearance during the period of its association with the important event, historical pattern, or person(s). If the property is a site (such as a treaty site) where there are no material cultural remains, the setting must be intact. Eligible archaeological sites must be in overall good condition with excellent preservation of features, artifacts, and spatial relationships to the extent that these remains are able to convey important associations with events or persons.

Under Criterion C, a property important for illustrating a particular architectural style or construction technique must retain most of the physical features that constitute that style or technique. A property that has lost some historic materials or details can be eligible if it retains most of the features that illustrate its style in terms of the massing, spatial relationships, proportion, pattern of windows and doors, texture of materials, and ornamentation. The property is not eligible, however, if it retains some basic features conveying massing but has lost the majority of the features that once characterized its style. Eligible archaeological sites must be in overall good condition with excellent preservation of features, artifacts, and spatial relationships to the extent that these remains are able to illustrate a site type, time period, method of construction, or work of a master.

Properties eligible under Criterion D, including archaeological sites and standing structures studied for their information potential, less attention is given to their overall condition, than if they were being considered under Criteria A, B, or C. Archaeological sites do not exist today exactly as they were formed. There are numerous cultural and natural processes that may have altered the deposited materials and their spatial relationships. For properties eligible under Criterion D, integrity is based upon the property's potential to yield specific data that addresses important research questions, such as those identified in the historic context documentation, or in the research design, for projects meeting the Secretary of the Interior's Standards for Archeological Documentation (NPS 1997:46).

Native American Graves Protection and Repatriation Act of 1990

The NAGPRA of 1990 sets provisions for the intentional removal and inadvertent discovery of human remains and other cultural items from federal and tribal lands. It clarifies the ownership of human remains and sets forth a process for repatriation of human remains and associated funerary objects and sacred religious objects to the Native American groups claiming to be lineal descendants or culturally affiliated with the remains or objects. It requires any federally funded institution housing Native American remains or artifacts to compile an inventory of all cultural items within the museum or with its agency and to provide a summary to any Native American tribe claiming affiliation.

State

Assembly Bill 4239

AB 4239 established the Native American Heritage Commission (NAHC) as the primary government agency responsible for identifying and cataloging Native American cultural resources. The bill authorized the NAHC to act in order to prevent damage to and insure Native American access to sacred sites and authorized the NAHC to prepare an inventory of Native American sacred sites located on public lands.

Public Resources Code 5097.97

No public agency and no private party using or occupying public property or operating on public property under a public license, permit, grant, lease, or contract made on or after July 1, 1977, shall in any manner whatsoever interfere with the free expression or exercise of Native American religion as provided in the United States Constitution and the California Constitution; nor shall any such agency or party cause severe or irreparable damage to any Native American sanctified cemetery, place of worship, religious or ceremonial site, or sacred shrine located on public property, except on a clear and convincing showing that the public interest and necessity so require.

Public Resources Code 5097.98 (b) and (e)

Public Resources Code (PRC) 5097.98 (b) and (e) require a landowner on whose property Native American human remains are found to limit further development activity in the vicinity until he/she confers with the NAHC-identified Most Likely Descendants (MLDs) to consider treatment options. In the absence of MLDs or of a treatment acceptable to all parties, the landowner is required to reinter the remains elsewhere on the property in a location not subject to further disturbance.

California Health and Safety Code, Section 7050.5

California Health and Safety Code, Section 7050.5 makes it a misdemeanor to disturb or remove human remains found outside a cemetery. This code also requires a project owner to halt construction if human remains are discovered and to contact the county coroner.

Local

San Bernardino County Development Code

Development Code Chapter 82.12, Cultural Resources Preservation (CP) Overlay, includes regulations pertaining to the identification and preservation of important archaeological and historical resources. The chapter outlines application requirements for a project proposed within a CP Overlay, as well as development standards and an explanation of the need for a Native American monitor. The Development Code states that the CP Overlay may be applied to areas where archaeological and historic sites that warrant preservation are known or are likely to be present. Specific identification of known cultural resources is indicated by listing in one or more of the following inventories: California Archaeological Inventory, California Historic Resources Inventory, California Historical Landmarks, California Points of Historic Interest, and/or National Register of Historic Places.

County of San Bernardino Countywide Plan

The Countywide Plan is organized around two main documents, (1) the Policy Plan, and (2) the Business Plan. The Policy Plan serves as the County's general plan – a blueprint for meeting the County's long-term vision for the future – but in a much more comprehensive way. The Cultural Resources Element of the Policy Plan establishes direction on notification, coordination, and partnerships to preserve and conserve cultural resources; provides guidance on how new development can avoid or minimize impacts on cultural resources; and provides direction on increasing public awareness and education efforts about cultural resources. The Proposed Action and proposed Project are consistent with all applicable policies and goals in the Cultural Resources Element of the County of San Bernardino Countywide Plan.

Visual ResourcesApplicable Regulations, Plans, and Standards

State

Senate Bill 1467

Senate Bill 1467 established the Scenic Highway Program. SB 1467 declares: "The development of scenic highways will not only add to the pleasure of the residents of this state but will also play an important role in encouraging the growth of the recreation and tourism industries upon which the economy of many users of this State depends".

According to Section 263.1 of the Streets and Highways Code, U.S. 62 from I-10 in White Water to the Arizona state line is included in the State Scenic Highway System as an eligible state scenic highway(Caltrans 2019).

County of San Bernardino General Plan

The Countywide Plan is organized around two main documents, (1) the Policy Plan, and (2) the Business Plan. The Policy Plan serves as the County's general plan – a blueprint for meeting the County's long-term vision for the future – but in a much more comprehensive way. The Natural Resources Element, Land Use Element, and Renewable Energy & Conservation Element of the Countywide Policy Plan provide specific goals and objectives for maintaining and protecting the aesthetic character of the region. Table 13 analyzes the consistency of the Project with specific policies contained in the Policy Plan associated with aesthetics.

County of San Bernardino Development Code

Section 83.07.040, Glare and Outdoor Lighting – Mountain and Desert Regions

Section 83.07.040 establishes standards for outdoor lighting in the County's Mountain and Desert Regions (the proposed Project site is located in the Desert Region). This section requires new permitted lighting for construction and operational lighting to be fully shielded to preclude light pollution or light trespass on adjacent property, other property within the line of sight (direct or reflected) of the light source, or members of the public who may be traveling on adjacent roadways or rights-of-way.

Section 84.29.035, Required Findings for Approval of a Commercial Solar Energy Facility

Section 84.29.035 includes the following provisions:

a) In order to approve a commercial solar energy generation facility, the Planning Commission shall, in addition to making the findings required under Section 85.06.040(a) of the San Bernardino County Development Code, determine that the location of the proposed commercial solar energy facility is appropriate in relation to the desirability and future development of communities, neighborhoods, and rural residential uses, and will not lead to loss of the scenic desert qualities that are key to maintaining a vibrant desert tourist economy by making each of the findings of fact in subdivision (C).

b) In making these findings of fact, the Planning Commission shall consider:

1. The characteristics of the commercial solar energy facility development site and its physical and environmental setting, as well as the physical layout and design of the proposed development in relation to nearby communities, neighborhoods, and rural residential uses; and

2. The location of other commercial solar energy generation facilities that have been constructed, approved, or applied for in the vicinity, whether within a city of unincorporated territory, or on state or federal land.

c) The finding of fact shall include the following:

1. The proposed commercial solar energy generation facility is either:

A. Sufficiently separated from existing communities and existing/developing rural residential areas so as to avoid adverse effects, or

B. Of a sufficiently small size, provided with adequate setbacks, designed to be lower profile than otherwise permitted, and sufficiently screened from public view so as to not adversely affect the desirability and future development of communities, neighborhoods, and rural residential use.

2. Proposed fencing, walls, landscaping, and other perimeter features of the proposed commercial solar energy generation facility will minimize the visual impact of the Project so as to blend with and be subordinate to the environment and character of the area where the facility is to be located.

3. The siting and design of the proposed commercial solar energy generation facility will be either:

A. Unobtrusive and not detract from the natural features, open space and visual qualities of the area as viewed from communities, rural residential uses, and major roadways and highways, or

B. Located in such proximity to already disturbed lands, such as electrical substations, surface mining operations, landfills, wastewater treatment facilities, etc., that it will not further detract from the natural features, open space and visual qualities of the area as viewed from communities, rural residential uses, and major roadways and highways.

4. The siting and design of Project site access and maintenance roads have been incorporated in the visual analysis for the Project and shall minimize visibility from public view points while providing needed access to the development site.

5. The proposed commercial solar energy generation facility will avoid modification of scenic natural formations.

Section 84.29.040, Solar Energy Development Standards

Section 84.29.040 includes the following standards applicable to the proposed Project:

b) Glare. Solar energy facilities shall be designed to preclude daytime glare on any abutting residential land use zoning district, residential parcel, or public right-of-way.

c) Night Lighting. Outdoor lighting within a commercial solar energy generation facility shall comply with the provisions of Chapter 83.07 of the Development Code.

San Bernardino County Ordinance No. 3900

Because desert and mountain residents value the night sky conditions, the County adopted Ordinance No. 3900, also known as the Night Sky Ordinance. This ordinance outlines specific standards relating to glare and outdoor lighting. These standards are included in the sections of the Development Code described previously.

APPENDIX I – CONSERVATION MEASURES

IMPACT AVOIDANCE, REDUCTION, AND CONSERVATION MEASURES

The following sections identify design elements that would be implemented to avoid or reduce impacts to sensitive resources, best management practices to reduce impacts, and conservation measures for unavoidable impacts. These measures would be implemented for both WAPA's Proposed Action and the Vidal Energy Project. WAPA's Construction Standards would also be implemented as part of the Proposed Action (WAPA 2021).

Soil/Erosion

- Grading would be minimized to only those areas where necessary to meet the construction and operational requirements.
- Construction and operational activities would be conducted in compliance with a Storm Water Pollution Prevention Plan (SWPPP) that would include Best Management Practices (BMPs) and other erosion-control measures designed to minimize soil erosion and limit sheet flow and downstream sedimentation. The SWPPP would also incorporate adaptive management actions if erosion and sedimentation control measures are found to be insufficient to control surface water at the site.
- To minimize wind erosion, all construction activities shall comply with a Fugitive Dust Control Plan that would be developed and implemented for the projects.
- A Site Restoration Plan would be implemented as needed to restore impacts to temporary disturbance areas as much as practicable.
- Soil-disturbing activities on wet soils would be minimized, except when implemented as a component of the Fugitive Dust Control Plan.
- Temporary disturbance areas that are no longer needed would be recontoured and revegetated in order to increase infiltration and reduce soil compaction.
- Routine site inspections would be performed to assess the effectiveness of maintenance efforts for erosion and sediment control systems. Roadway ditches, and culverts would be regularly maintained.

Hydrology/Water Quality

- The projects would be designed to maintain existing drainage patterns and control the rate and amount of surface water runoff.
- The site would be graded so that downstream flows would not be adversely impacted as a result of proposed changes to natural washes from grading or drainage management measures.
- The number of drainage crossings would be minimized to the extent possible and each would be designed to accommodate adequate flow.
- All large ancillary facilities (e.g., switchyard and substation) would be located outside of the 100-year floodplain. Some PV supports could be placed within drainages where technically feasible and in accordance with permit requirements for state-jurisdictional waters.
- A Spill Prevention and Emergency Response Plan would be developed and implemented during construction and the O&M phases if a sufficient quantity of regulated substances were to be stored on-site. Adequately sized secondary spill containment would be incorporated around the transformers at the on-site substation to ensure proper capture and control measures for

potential spills. The Spill Prevention and Emergency Response Plan would also provide for hazardous material spill prevention and cleanup measures, were a spill to occur.

- No federally jurisdictional waters have been identified within the areas proposed to be disturbed by the projects, although construction would adhere to requirements of a General Construction Permit to be pursued under the National Pollutant Discharge Elimination System (NPDES) as well as any necessary State of California permits (e.g. Streambed Alteration Agreement and Waste Discharge Requirements).

Air Quality

- The area of grading and vegetation removal would be limited to only that area required for construction and operation.
- Ground disturbing activities would be undertaken in accordance with a Fugitive Dust Control Plan to minimize the amount of time areas would be exposed to wind erosion.
- Vehicular speeds on unpaved roads would be limited to 25 miles per hour (MPH).
- Grading operations would be phased, where appropriate, to limit the amount of disturbance at any one time, and water or other appropriate chemical suppressant/tackifiers would be used for stabilization of disturbed surfaces under windy conditions.
- Water or an appropriate chemical suppressant/tackifier would be applied to disturbed areas to control dust and facilitate soil compaction, where necessary. If water were to be used, it would be applied using water trucks and application rates would be monitored to prevent runoff and ponding. Alternatively, dust palliatives would be used to control dust and applied per manufacturer's specifications.
- Exposed material stockpile areas would be covered when not in use, and excavation and grading would be suspended during windy conditions (forecast or actual wind conditions of approximately 25 MPH or greater).
- All trucks hauling soil and other loose material would be covered or at least 2 feet of freeboard would be maintained.
- All paved roads would be kept clean of objectionable amounts of mud, dirt, or debris, as necessary. Gravel or other material would be used where unpaved access roads intersect paved roadways to prevent mud and dirt track-out.
- Unnecessary idling of equipment would be limited.
- A Valley Fever Management Plan (VFMP), including a Valley Fever training program, will be implemented during construction to minimize the potential for unsafe dust exposure during construction. The VFMP will identify best management practices including:
    - Development of an educational Valley Fever Training Handout for distribution to onsite workers, which should include general information about the causes, symptoms, and treatment instructions regarding Valley Fever, including contact information of local health departments and clinics knowledgeable about Valley Fever.
    - Conducting Valley Fever training sessions to educate all Project construction workers regarding appropriate dust management and safety procedures, symptoms of Valley Fever, testing, and treatment options. This training will be completed by all workers and visitors (expected to be on-site for more than 2 days) prior to participating in or working

in proximity to any ground disturbing activities. Signed documentation of successful completion of the training is to be kept on-site for the duration of construction.

- Developing a job-specific Job Hazard Analyses (JHA), in accordance with the California Division of Occupational Safety and Health (Cal/OSHA) regulations, to analyze the risk of worker exposure to dust, and maintain and manage safety supplies identified by the JHA.
- Provide and/or require, if determined to be needed based on the applicable JHA, OSHA-approved half-face respirators equipped with a minimum N-95 protection factor for use during worker collocation with surface disturbance activities, following completion of medical evaluations, fit-testing, and proper training on use of respirators.

Biological Resources

- A biological monitor will be present prior to initiation of ground disturbing activities to demark limit of disturbance boundaries. Flagging and/or staking shall be used to clearly define the work area boundaries and avoid impacts to sensitive species with the potential to occur near the projects. The biological monitor will be present to conduct pre-construction sweeps and inspect compliance with project protection measures.
- Desert riparian vegetation shall be avoided to the greatest extent possible within the drainages containing Blue Palo Verde-Ironwood woodland to preserve habitat for the sensitive species with potential to nest and forage in these areas.
- An environmental training program shall be developed and presented to all crew members prior to the beginning of construction. The training shall describe special-status wildlife species and sensitive habitats that could occur within project work areas, protection afforded to these species and habitats, and avoidance and minimization measures required to avoid and/or minimize impacts. The training shall include a discussion on the reduction of trash and the elimination of any food and standing water originating from a human source that may attract wildlife, including ravens, to the site. The training program will be approved by a qualified biologist. Records of training will be kept on-site.
- Vegetation trimming/crushing shall take place outside the general bird breeding season (February 15 to September 1), to the maximum extent practical. Regardless of the time of year, prior to ground-disturbing activities, a qualified biologist shall conduct a nesting bird survey to comply with CDFW Code 3503 and 3503.5 and the Migratory Bird Treaty Act. The survey shall occur no more than three (3) days prior to initiation of construction and shall include any potential nesting habitat (including trees, shrubs, the ground, or nearby structures). Any occupied passerine and/or raptor nests shall be delineated and a no-disturbance buffer zone (as determined by the avian biologist) shall be established and maintained during construction. The buffer zone shall be sufficient in size to prevent impacts to the nest. A qualified biologist shall monitor active nests to determine whether construction activities are disturbing nesting birds or nestlings. If a nest shows signs of disturbance as determined by a qualified biologist, adaptive management methods may be used to ensure that the buffer distances are effective and no nests are disturbed. Once nesting has ceased and the fledglings are no longer using the nest area as confirmed by a qualified biologist, the buffer may be removed. A nesting bird survey report shall be provided to the County of San Bernardino and CDFW. If an active nest is encountered during construction, construction shall stop immediately until a qualified biologist can determine the status of the nest, avoidance buffer and when work can proceed without risking violation to State or federal laws.

- If a sensitive species is found, the species shall be relocated out of harm's way according to an approved capture/relocation plan. Any mortalities shall be reported to the agencies and County of San Bernardino. A final monitoring report will be submitted to CDFW and County of San Bernardino. The annual report shall include a summary of pre-construction surveys, biological monitoring, avoidance measures implemented, and whether the avoidance measures were effective.
- A Burrowing Owl Mitigation and Monitoring Plan shall be developed and submitted to CDFW for review 60 days prior to the start of ground disturbing activities. No less than 14 days prior to any ground disturbance activities, a burrowing owl (*Athene cunicularia*) Take Avoidance Survey shall be conducted by a qualified biologist according to methods outlined in the CDFW's 2012 (or most recent) Staff Report on Burrowing Owl Mitigation (CDFG 2012). If burrowing owls are determined to be present where Project activities will occur site-specific non-disturbance buffer zones shall be established by the qualified biologist. If it is not possible to avoid active burrows during the nonbreeding season, passive relocation shall be implemented once approved through coordination with CDFW.
- A Desert Kit Fox Monitoring and Mitigation Plan shall be prepared and submitted to CDFW for review 60 days prior to the start of ground disturbing activities. Prior to commencing ground-disturbing activities, a qualified biologist shall conduct a focused survey for desert kit fox (*Vulpes macrotis*), including assessment of all burrows in the Proposed Action and Vidal Energy Projects areas. If potential burrows are located in the Proposed Action and/or Vidal Energy Project areas, they shall be monitored by the qualified biologist. If any burrow/burrow complex is determined to house desert kit fox and the burrow/burrow complex is unavoidable, exclusionary devices (e.g., one-way doors) shall be fitted on the active burrow openings, and once the burrow has been confirmed vacant as determined by the qualified biologist and in consultation with CDFW, the burrow shall be carefully excavated to prevent re-entry/re-use of the burrow. These exclusion/excavation activities shall only occur during the non-breeding season (July 2 to January 15). If construction will occur during the breeding season, any active burrow/burrow complex that is unavoidable shall be provided a 500-foot no work buffer until the end of breeding season (July 1) or until the burrow has been determined to be inactive (and does not contain pups) by the qualified biologist.
- Temporary and permanent impacts to all state waters shall be compensated through a combination of habitat creation (i.e., establishment), enhancement, preservation, and/or and restoration at a minimum of a 1:1 ratio or as required by a Streambed Alteration Agreement and/or Waste Discharge Requirement. Any creation, enhancement, preservation, and/or restoration effort shall be implemented pursuant to a Habitat Restoration Plan, which shall include success criteria and monitoring specifications, and shall be approved by the permitting agencies and County of San Bernardino. A habitat restoration specialist will be designated and approved by the permitting agencies and will determine the most appropriate method of restoration.
- Temporarily impacted drainage features shall be recontoured to pre-construction conditions. Temporary impacts shall be restored sufficient to compensate for the impact to the satisfaction of the permitting agencies (depending on the location of the impact). If restoration of temporary impact areas is not possible to the satisfaction of the appropriate agency, the temporary impact shall be considered a permanent impact and compensated accordingly.

- A biological monitor shall be present prior to initiation of ground disturbing activities to demark limit of disturbance boundaries. Flagging and/or staking will be used to clearly define the work area boundaries and avoid impacts to adjacent drainage features.

- Graded areas shall be stabilized to promote infiltration and reduce run-off potential.

- Pre-construction surveys for desert tortoise (*Gopherus agassizii*) shall be conducted by a qualified biologist no more than 30 days prior to construction activities. If desert tortoise are observed within the Project Site, the Applicant shall consult with CDFW and US Fish and Wildlife Service (USFWS) to determine compliance with State (CESA) and federal (FESA) law. Additionally, if desert tortoise are determined to be present, a Raven Management Plan shall be prepared, approved by CDFW and USFWS, and implemented to offset potential predatorial impacts to tortoises.
- Transmission lines, poles, and associated structures:
    - As recommended by Avian Power Line Interaction Committee (APLIC 2006), any new overhead transmission lines will have at least 60 inches of horizontal separation and a vertical separation of 40 inches between phase conductors, which is greater than the physical dimensions of all large birds and bats that could potentially use the structures for perching.
    - In situations where particular hardware would present an electrocution risk (e.g., jumpers, cutouts, arrestors, transformers, etc.), perch guards and/or insulators would be installed per APLIC (2006) guidelines to minimize electrocution risk.
    - Line marking devices would be installed if any areas are identified as high risk for avian collisions (APLIC 2012).
- Vegetation:
    - Desert trees and shrubs should be avoided to the greatest extent possible including: Dalea spinosa (smoke tree), all species of the genus Prosopis (mesquites) with stems greater than 2 inches in diameter or greater than 6 feet in height; Creosote Rings, 10 feet or greater in diameter; Any part of any of the following species, whether living or dead: *Olneya tesota* (desert ironwood), all species of the genus Prosopis (mesquites), all species of the genus Cercidium (synonym: Parkinsonia, palo verde). If any of the preceding plants will be unavoidable during construction a permit for removal from the County of San Bernardino shall be obtained prior to removal.
    - Herbicides and pesticides may be used, as needed, to control invasive/noxious weeds and/or pests on site. Only EPA-registered pesticides and/or herbicides that also comply with State and local regulations would be used. Herbicide and pesticide use shall be limited to non-persistent immobile herbicides/pesticides and shall only be applied in accordance with label and application permit directions and stipulations for terrestrial applications.
    - WAPA and the Proponent would implement controls at entry locations to facilitate weed management and invasive species control and to minimize infestation of disturbed areas from outside sources. A controlled inspection and cleaning area would be established to visually inspect construction equipment arriving at the construction area and to remove and collect seeds that may be adhering to tires and other equipment surfaces.

- Restoration:
  - Prior to construction, a qualified restoration specialist should evaluate the habitats within the areas to be temporarily disturbed/impacted to determine if habitat restoration is possible. Habitat restoration may not be possible given prevailing winds and the potential inoculation of additional invasive species from adjacent areas. If the specialist determines restoration is possible, then a Habitat Restoration Plan (HRP) for the temporarily impacted area should be prepared. The plan should include sufficient detail to address all aspects of the restoration effort (further site evaluation, site preparation, planting, maintenance, and monitoring to determine success (i.e., plant survival, etc.) and additional maintenance needs. In general restoration of temporarily impacted areas involves recontouring the land, decompaction, replacing the topsoil (if collected), planting seed and/or container stock, maintaining (i.e., weeding, replacement planting, supplemental watering, etc.). Monitoring the restored area for a period of up to 5 years and/or until year 5 success criteria are met is normally what is required by the regulatory agency(ies). The Habitat Restoration Plan that shall be subject to approval by the CDFW and County of San Bernardino.
  - If restoration and/or enhancement of the Vidal Energy Project Area is not feasible, enhancement of habitat within the Vidal Energy Project Area (i.e., removal of exotic plant species within Drainages 5 and 6 and within the Vidal Energy Project area (Tamarisk Thickets, Disturbed habitat, exotics within native communities) may be considered suitable on-site, but out-of-kind conservation. Another conservation option would be off-site acquisition and preservation of the vegetation communities. Conservation ratios shall be developed through consultation with CDFW and County of San Bernardino.
  - A biological monitor shall be present prior to initiation of ground disturbing activities to demark limit of disturbance boundaries. Flagging and/or staking will be used to clearly define the work area boundaries and avoid impacts to adjacent native communities.
  - A biological monitor will be present prior to initiation of ground disturbing activities to demark limit of disturbance boundaries. Flagging and/or staking will be used to clearly define the work area boundaries and avoid impacts to sensitive plant species with the potential to occur near the proposed Project boundaries.
- Lighting:
  - Lighting shall comply with Table 83-7 “Shielding Requirements for Outdoor Lighting in the Mountain Region and Desert Region” (County Development Code, 2007) (i.e. “Dark Sky” requirements). All lighting shall be limited to that necessary for maintenance activities and security purposes. This is to allow minimum obstruction of night sky remote area views. No light shall project onto adjacent roadways in a manner that interferes with on-coming traffic. All signs proposed shall only be lit by steady, stationary, shielded light directed at the sign, by light inside the sign, by direct stationary neon lighting or in the case of an approved electronic message center sign, an alternating message no more than once every five seconds.
  - Lighting shall be shielded away from adjacent sensitive uses, including the adjacent residential development, to minimize light spillover. The glare from any luminous source, including on-site lighting, shall not exceed 0.5 foot-candle at the property line.

- Any lights used to illuminate the site shall include appropriate fixture lamp types as listed in San Bernardino County Development Code Table 83-7 and be hooded and designed so as to reflect away from adjoining properties and public thoroughfares and in compliance with San Bernardino County Development Code Chapter 83.07, “Glare and Outdoor Lighting” (i.e. “Dark Sky Ordinance).

Cultural Resources

- Prior to the initiation of ground-disturbing activities, a Worker Education Awareness Program (WEAP) will be conducted to alert field personnel to the possibility of buried prehistoric or historic cultural deposits. Development of the WEAP will include consultation with a Qualified Archaeologist meeting the Secretary of the Interior standards and approved by the CRIT. The WEAP will provide an overview of potential significant archaeological resources that could be encountered during ground disturbing activities, including how to identify prehistoric or historic cultural deposits, to facilitate worker recognition, avoidance, and subsequent immediate notification to the Qualified Archaeologist.
- Prior to the start of ground-disturbing activities, a Monitoring and Treatment Plan (MTP) will be created by a Qualified Archaeologist meeting the Secretary of the Interior standards in coordination with the CRIT that outlines process for identification and treatment of inadvertently discovered cultural resources.
- An archaeological monitor will be present for all ground-disturbing activity. In the event that new unevaluated cultural resources are discovered, all work within 60 feet of the find will cease, and a Qualified Archaeologist meeting the Secretary of the Interior standards shall assess the find. The Qualified Archaeologist shall have the authority to stop or divert construction as necessary. Work outside of the buffered area may continue during this assessment period. The CRIT would be contacted regarding any pre-contact and/or historic-era finds and be provided information after the Qualified Archaeologist makes their initial assessment of the nature of the find, so as to provide Tribal input with regard to significance and treatment. A research design will be implemented that includes a plan to evaluate the find’s eligibility for listing in the NRHP, in consultation with WAPA, County of San Bernardino, California State Historic Preservation Office (SHPO), and CRIT, as appropriate. Work must not resume in this area without approval of WAPA. Following the completion of evaluation efforts, all parties shall confer regarding the resource's archaeological significance, its potential as a Tribal Cultural Resource (TCR), and avoidance (or other appropriate treatment) of the discovered resource. Should any significant resource and/or TCR not be a candidate for avoidance or preservation in place, and the removal of the resource(s) is necessary to lessen impacts, the research design shall include a comprehensive discussion of sampling strategies, resource processing, analysis, and reporting protocols. Removal of any cultural resource(s) shall be conducted with the presence of a Tribal monitor representing the CRIT unless otherwise decided by the CRIT. The CRIT shall indicate if it is their preference that removed cultural material be reburied as close to the original find location as possible. However, should reburial within/near the original find location not be feasible, then a reburial location shall be decided upon in consultation with CRIT. All reburials are subject to a reburial agreement that shall be developed between the landowner and the CRIT outlining the determined reburial process/location and shall include measures and provisions to protect the reburial area from any future impacts.
- A Tribal monitor representing the CRIT will be offered the opportunity to be present for all ground-disturbing activity conducted during construction. The CRIT shall be contacted if any pre-contact

and/or historic-era cultural resources are discovered during construction and be provided information regarding the nature of the find so as to provide Tribal input with regards to significance and treatment. The Native American monitor will follow the processes outlined in the Monitoring and Treatment Plan (MTP) drafted by a Qualified Archaeologist in coordination with the CRIT.

- All draft records/reports containing the significance and treatment findings and data recovery results shall be prepared by the qualified archaeologist and submitted to the CRIT and WAPA, concurrently, for their review and comment. After approval from all parties, the final reports and site/isolate records are to be submitted to the local CHRIS Information Center and the CRIT.
- Any WAPA vehicular travel outside the Vidal Energy Project boundary will be restricted to existing access roads and overland travel within the existing transmission line ROW.
- Project-related vehicular traffic within NRHP-eligible, recommended-eligible, or indeterminate archaeological site boundaries will be restricted to established access roads, a 5 MPH speed limit, and only during dry conditions.
- Any work done by WAPA outside the Vidal Energy Project boundary, but within WAPA's existing HDR-BLY transmission right of way, would include flagging site boundaries of NRHP-eligible or indeterminate sites prior to any construction-related activities. Site boundaries will be flagged only where they intersect the transmission line ROW. Flagged lath would be staked along the edge of the ROW approximately every 80 feet (25 m), more or less, depending on conditions affecting visibility of the demarcation. Flagging would buffer the resource boundary approximately 65 feet (20 m) from the edge of the site boundary where the ROW transects the resource. Where work areas have previously encroached on resources, and continued work is permitted, flagged lath shall be installed at intervals to adequately demarcate limits of work.
- During the required WEAP training it shall be explained to work crews that the flagged lath denotes the limited work area(s) near or within Environmentally Sensitive Areas (ESA).
- If human remains are encountered during ground-disturbing activities, all work must immediately cease within 100 feet (30m) of the discovery. The County, WAPA, SHPO, and appropriate Tribes must be notified of the discovery within 24 hours (following County and/or WAPA protocol). All discoveries will be treated in accordance with Native American Graves Protection and Repatriation Act ([NAGPRA] Public Law 101-601; 25 United States Code [U.S.C.] 3001-3013) and California State laws, as appropriate, and work must not resume in this area without proper authorization.
- Any historic properties that cannot be avoided should be subjected to appropriate treatment, conservation measures, or data recovery, or if unevaluated, subjected to an archaeological testing program to determine potential listing in the California Register of Historic Resources (CRHR) and/or the NRHP.

Geology

- WAPA and the Proponent shall retain a California registered and licensed engineer to design facilities in agreement with geologic conditions identified at the site. A Final Geotechnical Report shall be produced to account for variations likely occurring in the subgrade which were not detected in the preliminary boring program. All grading and construction shall adhere to the specifications, procedures, and site conditions contained in the final design plans, which shall be fully compliant with the recommendations of the California-registered and licensed professional engineer and consistent with the recommendations in the Preliminary Geotechnical Engineering Report prepared by Terracon Consultants, Inc. in 2022.

- In areas of documented or inferred paleontological resource presence, WAPA and the Proponent shall consult with a qualified paleontologist meeting the standards of the Society for Vertebrate Paleontology (SVP). The initial consultation may be provided by a qualified paleontologist on staff at the County Museum. The qualified paleontologist will determine the degree of paleontological resource sensitivity, as outlined below, and will recommend a paleontological resource monitoring and mitigation plan (PRMMP). This plan will address specifics of monitoring and conservation measures, and will take into account updated geologic mapping, geotechnical data, updated paleontological records searches, and any changes to the regulatory framework. The PRMMP will also account for construction methods and their levels of disturbance. For example, solar PV racks are often driven directly into the ground with no excavation occurring. Construction activities such as these for which there is no opportunity to physically inspect subsurface conditions would not require monitoring. This PRMMP would meet the standards of the SVP. The following provisions would be typical for units mapped with the different levels of paleontological sensitivity:
    - High (SVP)/Class 4–5 (BLM)—All activities involving the exposure of sediments mapped as having high paleontological sensitivity will be monitored by a qualified paleontological monitor (BLM, 2009; SVP, 2010) on a full-time basis under the supervision of the Qualified Paleontologist. Undisturbed sediments may be present at the surface, or present in the subsurface, beneath earlier developments. This monitoring will include inspection of exposed sedimentary units during active excavations within sensitive geologic sediments. The monitor will have authority to temporarily divert activity away from exposed fossils to evaluate the significance of the find and, should the fossils be determined to be significant, professionally and efficiently recover the fossil specimens and collect associated data. Paleontological monitors will use field data forms to record pertinent location and geologic data, will measure stratigraphic sections (if applicable) and collect appropriate sediment samples from any fossil localities.
    - Low to High (SVP)/Class 2 to Class 4–5 (BLM)—All activities involving the exposure of sediments mapped as having low-to-high paleontological sensitivity will only require monitoring if construction activity will exceed the depth of the low sensitivity surficial sediments. The underlying sediments may have high paleontological sensitivity, and therefore work in those units might require paleontological monitoring, as designated by the Qualified Paleontologist in the PRMMP. When determining the depth at which the transition to high sensitivity occurs and monitoring becomes necessary, the Qualified Paleontologist should take into account:
        - the most recent local geologic mapping,
        - depths at which fossils have been found in the vicinity of the project area, as revealed by the museum records search, and
        - geotechnical studies of the project area, if available.
    - Low (SVP)/Class 2–3 (BLM)—All activities involving ground the exposure of sediments mapped as having low paleontological sensitivity should incorporate worker training to make construction workers aware that while paleontological sensitivity is low, fossils might still be encountered. The Qualified Paleontologist should oversee this training as well as remain on-call in the event fossils are found.

Paleontological monitoring is usually not required for sediments with low (Low / Class 2-–3) paleontological sensitivity.

  - None (SVP)/Class 1 (BLM)—Activities determined by the Qualified Paleontologist to involve ground-disturbing activities in areas mapped as having no paleontological sensitivity (i.e., plutonic igneous or high-grade metamorphic rocks) will not require further paleontological conservation measures.

- In the event of any fossil discovery, regardless of depth or geologic formation, construction work will halt within a 50-ft radius of the find until its significance can be determined by a Qualified Paleontologist. Significant fossils will be recovered, prepared to the point of curation, identified by qualified experts, listed in a database to facilitate analysis, and deposited in a designated paleontological curation facility in accordance with the standards of the SVP (2010) and BLM (2009). A repository will be identified, and a curatorial arrangement will be signed prior to collection of the fossils. Although the San Bernardino County Museum is specified as the repository for fossils found in the county in the current General Plan, the museum may not always be available as a repository. Therefore, any accredited institution may serve as a repository.

Transportation

- Deliveries of materials would be scheduled for off-peak hours, when practical, to reduce effects during periods of peak traffic.
- Truck traffic would be phased throughout construction, as much as practical.
- Carpooling or mass transportation options for construction workers would be encouraged.
- The Proponent and WAPA would obtain the applicable permits needed to transport equipment and materials (e.g., oversized transformers, lightning protection pole) and coordinate closely with the California Department of Transportation (Caltrans) and other State transportation departments, as appropriate.

Public Health and Safety

- The projects would be designed in accordance with all applicable Federal and industrial standards including the American Society of Mechanical Engineers, National Engineering Services Corporation, International Energy Conservation Code, International Building Code, Uniform Plumbing Code, Uniform Mechanical Code, National Fire Protection Association, and Occupational Safety and Health Administration regulations.

- The Proponent and WAPA would develop and maintain a Spill Prevention and Emergency Response Plan. A copy of the plan would be kept onsite at all times and facility staff would be trained on the procedures outlined in the plan.

Wastes and Hazardous Materials

- The Proponent and WAPA would design and operate systems containing hazardous materials in a manner that limits the potential for their release.

- Vehicles and equipment would be kept in proper working condition to reduce the potential for leaks of motor oil, antifreeze, hydraulic fluid, grease, or other hazardous materials.

- The containment and disposal of hazardous waste would be outlined in a Spill Prevention and Emergency Response Plan developed by the construction contractor to reduce the likelihood of substantial spills.

Visual Resources

- Areas of surface disturbance would be minimized, controlling erosion, using dust suppression techniques, and, if applicable, restoring exposed soils as closely as possible to their original contour and vegetation.

- Solar energy facilities shall be designed to preclude daytime glare on any abutting residential land use zoning district, residential parcel, or public right-of-way by using darkly colored matte PV solar panels featuring an anti-reflective coating. The solar panels will also be designed to track the sun to maximize panel exposure to the sun, which would direct the majority of any small amount of reflected light back toward the sun in a skyward direction.

APPENDIX J – EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

E.S.1 PROJECT DESCRIPTION AND LOCATION

The Western Area Power Administration's (WAPA's) Proposed Action consists of responding to CDH Vidal, LLC's (Proponent's) request for a large generator interconnection agreement and includes constructing interconnection facilities to be located within the boundaries of Proponent's Vidal Energy Project (Project). The Project is a solar photovoltaic (PV) electricity generation and battery energy storage facility that would produce up to 160 megawatts (MW) nameplate capacity of solar power and include up to 640 megawatt hours (MWh) of energy storage capacity rate in a battery energy storage system (BESS) on up to approximately 1,090 acres of land. The Vidal Energy Project is proposed to interconnect to the existing, adjacent Western Area Power Administration (WAPA) 161-kilovolt (kV) overhead transmission line. The Vidal Energy Project is a privately owned project that has been issued a conditional use permit by San Bernardino County and evaluated under an Environmental Impact Report (EIR) prepared pursuant to the California Environmental Quality Act (CEQA). The Vidal Energy Project is located near the town of Vidal in San Bernardino County, California on privately owned lands.

The Vidal Energy Project would include the construction of on-site substation facilities, which would collect and convert the power generated on-site for transmission to a new WAPA interconnection switchyard. The Vidal Energy Project's permanent facilities would include PV panels, BESS, fencing, service roads, a power collection system, communication cables, a project substation, and operations and maintenance (O&M) facilities.

WAPA's Proposed Action would include new overhead and underground transmission lines and an electrical interconnection switchyards.

E.S.2 PROJECT PARTICIPANTS AND BACKGROUND

Western Area Power Administration (WAPA), a federal power marketing agency within the U.S. Department of Energy (DOE), is the lead federal agency for purposes of National Environmental Policy Act (NEPA) review. The Proponent of the Vidal Energy Project is a private solar development company. WAPA is responding to Proponent's request to interconnect the Vidal Energy Project, a proposed photovoltaic (PV) solar plant, to its electrical transmission system. The nearest transmission line to the Vidal Energy Project is the Headgate Rock-Blythe 161-kilovolt (kV) Transmission Line, which is owned and operated by WAPA. Crossing within the southeastern portion of the Vidal Energy Project area, the transmission line runs approximately northeast–southwest. Although the Vidal Energy Project is not part of WAPA's Proposed Action, its potential impacts are presented alongside that of the Proposed Action as part of a comprehensive analysis in this Environmental Assessment (EA).

E.S.3 PUBLIC AND TRIBAL PARTICIPATION

Public scoping to gather input on both the Proposed Action and Vidal Energy Project was initiated on January 12, 2022. WAPA held a 30-day scoping period that ended on February 17, 2022. Scoping letters were mailed to interested parties and adjacent landowners to inform them of the Proposed Action and Vidal Energy Project, notify them of the scoping period timeframe and open house, and request input on topics to be evaluated in this Environmental Assessment. Letters were also sent to the following five federally recognized tribes: Chemehuevi Indian Tribe, Colorado River Indian Tribes, Fort Mojave Indian Tribe, Quechan Tribe of the Fort Yuma Reservation, and Twenty-Nine Palms Band of Mission Indians.

WAPA accepted scoping comments via telephone, email, and U.S. mail. WAPA received a total of 12 submittals, some of which included multiple comments on environmental resources or topics for analysis.

Submittals were received from 11 individuals, and one tribe (Colorado River Indian Tribes). In total, 15 specific comments were identified from the 12 submittals. Seven comments were of a general nature, including questions about purchasing nearby property. Two comments requested additional information which was provided in the form of a map, and one expressed general support for the Proposed Action and Vidal Energy Project. The remaining comments requested that the EA address identification and avoidance of Native American sites and cultural resources, socioeconomics, and the NEPA process.

Due to revisions to the Vidal Energy Project, a revised scope for the Proposed Action was submitted to WAPA on September 14, 2023. The revised scope replaced the installation of fiber optic cable along the entirety of WAPA's Headgate Rock-Blythe transmission line with wireless communication infrastructure, thus avoiding ground-disturbing activities outside of the Vidal Energy Project footprint. Since the revised scope reduced the originally anticipated footprint for the Proposed Action, WAPA accepted the revised scope and determined that re-initiation of the public scoping process was not required.

E.S.4 PURPOSE AND NEED

WAPA

WAPA operates and maintains transmission lines and associated facilities in accordance with the Federal Power Act and its Open Access Transmission Service Tariff (OATT). WAPA's purpose and need is to respond to Proponent's interconnection request in accordance with the Federal Power Act and its OATT.

Proponent

The primary purpose of the Vidal Energy Project is to utilize property within the County to site solar power-generating facilities and energy storage near existing infrastructure to provide renewable electricity to the California Independent System Operator (CAISO) grid and WAPA and support the state of California's greenhouse gas reduction goals and renewable energy standards.

E.S.5 PROPOSED ACTION

WAPA's Proposed Action consists of approving an interconnection request, entering into an interconnection agreement, and implementing three types (i.e., installation, maintenance, and decommissioning) of project-related transmission system upgrades. WAPA would install, maintain, and decommission a tap on the existing Headgate Rock-Blythe 161 kV transmission line that would lead into a new switchyard that would occupy up to five acres. The interconnection tap would be located entirely within the existing WAPA right-of-way (ROW) and Vidal Energy Project footprint. The tap would consist of approximately 3 to 5 new transmission pole structures connecting the new switchyard to the existing transmission line, all located within the existing ROW and Vidal Solar Project. Underground fiber would be installed along this same path to the take-off structure. Optical Ground Wire (OPGW) would be installed from the take-off structure, along the new overhead approach spans, then coiled up at an existing structure. Additionally, an existing transmission pole closest to the Point of Interconnection (POI) would be replaced with a new tower.

E.S.5 VIDAL ENERGY PROJECT

The Proponent plans to construct, operate, and decommission a 1,090-acre PV and battery energy storage system (BESS) facility to generate renewable energy (Vidal Energy Project). The Vidal Energy Project will provide up to 160 megawatts of alternating current (MW-AC) nameplate capacity renewable energy and would be supported by the existing, adjacent WAPA 161 kV overhead transmission line. The Vidal Energy Project would include the construction of one onsite substation (Project substation) that would collect and convert the power generated onsite for transmission in an overhead or underground line to the WAPA transmission system and interconnection location. The Vidal Energy Project's permanent facilities would include PV panels, a BESS, fencing, service roads, a power collection system, communication cables, electrical switchyards, a substation that would “step up” the electricity voltage prior to connecting to WAPA’s switchyard (the “project substation”), operations and maintenance facilities, and an aerial connection from the new transmission line pole structures and into the new WAPA switchyard to be constructed as part of the Proposed Action. San Bernardino County completed an Environmental Impact Report (EIR) pursuant to the California Environmental Quality Act (CEQA) evaluating environmental impacts from the construction, operation, and decommissioning of the Vidal Energy Project and issued a conditional use permit. Although the Vidal Energy Project is not part of the Proposed Action, its impacts will be presented alongside those of the Proposed Action as part of a comprehensive analysis in this EA.

E.S.6 ALTERNATIVES

A No Action Alternative was evaluated to provide a baseline against which the impacts of the Proposed Action can be compared. Under the No Action Alternative, WAPA would not approve an interconnection request, would not enter into an interconnection agreement, and would not implement any project-related transmission system upgrades, additions, or configurations, and Proponent would pursue other interconnection opportunities for the Vidal Energy Project.

E.S.7 SUMMARY OF THE PROPOSED ACTION’S ENVIRONMENTAL CONSEQUENCES

Five resources were evaluated and carried forward for further analysis in Chapter 3: air quality, biological resources, cultural resources, socioeconomic, and visual resources. Additional resources were evaluated for which effects were determined to be negligible, as further described in Section 3.3. Given all environmental studies and impact analyses presented in San Bernardino County’s EIR included work to be completed under both Proponent’s Vidal Energy Project and WAPA’s Proposed Action, unless otherwise noted this EA presents impacts for the entirety of the Vidal Energy Project and the Proposed Action.

Air Quality

This EA collectively evaluates air quality impacts from construction of both the Vidal Energy Project and the Proposed Action and concludes that there would not be a cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable Federal or State ambient air quality standard. Construction of the Vidal Energy Project and the Proposed Action would result in the temporary addition of pollutants to the local air basin caused by on-site sources (e.g., off-road construction equipment, soil disturbance, and volatile organic compound off-gassing) and off-site sources (e.g., on-road haul trucks, vendor trucks, and worker vehicle trips) and operations would generate emissions from mobile sources, including vehicle trips from employees commuting to work and maintenance and inspection vehicles. Emissions from this construction period would be temporary and transient in nature and would have negligible impacts on air quality. Emissions from construction, operations and maintenance, and decommissioning of both the Vidal Energy Project and Proposed Action would increase San Bernardino County’s annual emissions inventory by less than 0.01% for each pollutant of concern. Given that the Proposed Action represents only a very small portion the activities evaluated, the Proposed Action’s contribution to the County’s annual emission inventory would be negligible.

None of the analyzed criteria pollutants emissions would exceed the Mojave Desert Air Quality Management District (MDAQMD) annual emissions thresholds during operation of the Vidal Energy Project or the Proposed Action. Decommissioning activities would have similar impacts to construction and are expected to be temporary. The conservation measures proposed in Appendix I would further reduce air quality impacts. The Air Quality Impact Analysis is located in Appendix C.

Biological Resources - Vegetation

During focused plant surveys (details provided in Appendix D), a solitary Utah vine milkweed (California rare plant) was observed in the northwestern portion of the Vidal Energy Project, but outside the area to be disturbed by WAPA's Proposed Action. No other sensitive plant species or sensitive vegetation communities were observed during the survey efforts. WAPA's Proposed Action would contribute up to five acres of permanent ground disturbance within the total 1,090-acre footprint analyzed and authorized by San Bernardino County. Activities associated with operations and maintenance (O&M) of the Proposed Action and Vidal Energy Project would be infrequent and may cause limited ground disturbance or vegetation removal. Decommissioning would be confined to areas already disturbed during construction and would not lead to any additional ground disturbance. Temporary impacts to native and non-native vegetation are anticipated. Minimal impacts to sensitive plant species would occur with implementation of the conservation measures described in Appendix I.

Biological Resources – Wildlife

During focused surveys no federally or state listed threatened or endangered species were identified, nine sensitive species were determined to have moderate potential for occurrence, and three sensitive species were identified within the Vidal Energy Project site (Appendix D). There would be negligible minor, localized, short- and long-term, direct and indirect, adverse impacts to general and special status terrestrial, avian, and bat species due to construction, O&M, and decommissioning.

There would be a loss of habitat within the Vidal Energy Project area, although the highest quality desert wash habitat (Blue Palo Verde - Ironwood Woodland) would be preserved as described in Appendix I. The loss of wildlife habitat would result in the potential localized loss of shelter, nesting habitat, and forage, and would result in general and special status terrestrial species having to rely on habitat outside of the impacted areas until decommissioning and restoration has been completed. WAPA's Proposed Action would contribute a permanent loss of up to five acres of wildlife habitat within the total 1,090-acre Vidal Energy Project footprint. The Biological Report is located in Appendix D. A Supplemental Wetland Delineation and Joshua Tree inventory Study Report is located in Appendix E.

The combined Vidal Energy Project and Proposed Action impacts to general and special status terrestrial, avian, and bat species will be minimized due to implementation of the measures identified in Appendix I.

Cultural Resources

Ground disturbance activities associated with construction of the WAPA Proposed Action would be limited to permanent disturbance of up to five acres for the proposed switchyard. No ground disturbance from the Proposed Action would occur within the site boundary or within 65 feet of known National Register of Historic Places (NRHP) eligible, recommended-eligible, or indeterminate sites unless conservation measures were implemented as described in Appendix I. No additional impacts on cultural resources are expected from O&M or decommissioning activities.

Within the proposed Vidal Energy Project footprint, which includes the Proposed Action site, 64 cultural sites were recorded. Twenty-one sites are identified as historic-period resources, and 32 are prehistoric resources. These sites were evaluated for eligibility for listing on the NRHP and none were recommended eligible or potentially eligible (Cultural Resources Report, Appendix F). However, regardless of NRHP eligibility, cultural resources important to consulted Native American Tribes could be impacted by the Proposed Action and Vidal Energy Project. The combined Vidal Energy Project and Proposed Action impacts to cultural resources will be minimized with an Archaeological Monitoring and Treatment Plan prepared for tribal and agency review and approval as described further in Appendix I.

Visual Resources

There would be approximately 1,090 acres of impacted lands within the Vidal Energy Project, of which the WAPA Proposed Action would contribute up to five acres of impacted landscape that would introduce a slight visual impact with new galvanized steel three-pole structures. The magnitude of change in landscape associated with WAPA's Proposed Action would be minimal due to the proximity of the Proposed Action to existing regional transmission lines supported by H-frame wood pole structures. The scale of the existing WAPA wood pole structures in the area make these features the most visible features throughout the landscape. The WAPA Proposed Action would be visible from Highway 95. Therefore, there would be short- and long-term, minor impacts on the viewshed within 5 miles of WAPA's Proposed Action.

There would be approximately 1,090 acres of impacted lands under the Vidal Energy Project that would reduce the quality visual resources or visual character of the existing environment associated with modification to the existing landscape by the proposed solar facility and ancillary components. The magnitude of change in landscape character associated with the Vidal Energy Project would be minor to moderate due to the scale of the PV solar panel array in comparison to the surrounding landscape, low vegetation, and nearby and adjacent built structures. Although the Vidal Energy Project would alter the existing character of the area, the introduction of project components would not substantially obstruct or interrupt views of surrounding mountainous terrain. All occupied residences, as well as U.S. Highway 95, are located west of the project between the mountain foothills and the project. Additionally, the project site is adjacent to regional transmission lines supported by H-frame wood pole structures. Therefore, the proposed project is consistent with existing views in the surrounding area. Compliance with Renewable Energy & Conservation Element Policies RE-4.1 and RE-4.4 and implementation of the design elements, BMPs, and conservation measures described in Appendix I would minimize the combined Vidal Energy Project and Proposed Action impacts to visual resources during construction, O&M, and decommissioning of the proposed Vidal Energy Project.

Environmental Justice

Low-income and minority populations are present within the vicinity of the Proposed Action and Vidal Energy Project area; however, according to census information for the State of California, the proportion of the population representing a minority community in San Bernardino County and the Colorado River Indian Tribe's (CRIT's) reservation area is within the median range of minority populations for the broader State. Therefore, development within this area would not have the potential to pose an undue burden to minority populations.

Segments of the population within the vicinity of the Proposed Action and Vidal Energy Project are below median income, particularly on the CRIT land, however, any development in this area would be limited to replacement or upgrade of infrastructure which would ensure long term security and functionality of the lines and further protect adjacent populations from outages or other reliability events. Additionally, WAPA would employ six- to nine-person crews to make repairs, as needed, to maintain the reliability and safety of the bulk electric system. Further, implementation of the Project would not restrict the CRIT or other potential proponents from developing projects in the future. Neither low-income nor minority populations would be disproportionately impacted by the Proposed Action or Vidal Energy Project.

Resources Considered But Not Further Evaluated

Resource issues dismissed from further evaluation — either because they are not present in the affected area or because only negligible impacts would occur — are discussed in Section 3.3 and comprise the following categories:

- Agriculture / Prime and Unique Farmlands
- Climate Change
- Fire and Fuels Management
- Geology and Mineral Resources
- Indian Trust Assets
- Intentional Destructive Acts
- Invasive and Noxious Weeds
- Land Use
- Livestock Grazing / Rangeland Health / Wild Horses and Burros
- Military and Civilian Aviation
- Noise
- Public Health and Safety
- Recreation
- Soils
- Special Management Areas, including Wilderness and Areas of Critical Environmental Concern
- Surface Waters, including floodplains and wetlands
- Transportation

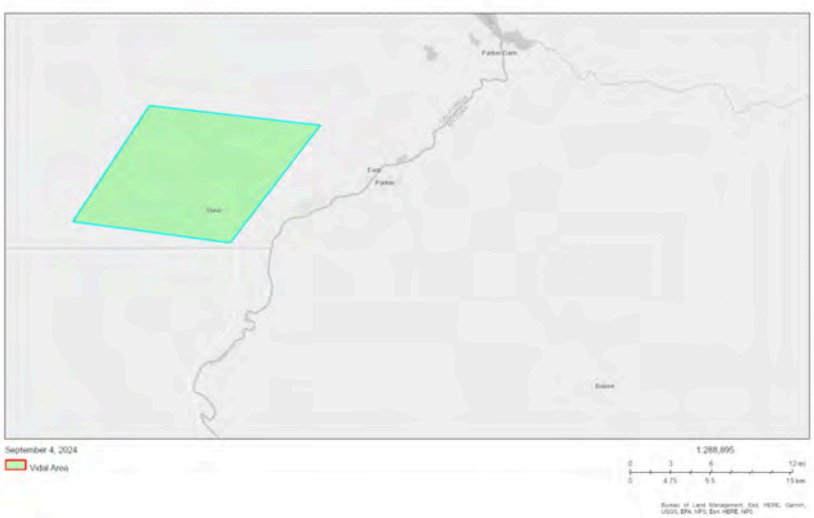
APPENDIX K – EJSCREEN COMMUNITY REPORT

EJScreen Community Report

This report provides environmental and socioeconomic information for user-defined areas, and combines that data into environmental justice and supplemental indexes.

Vidal Area

the User Specified Area
Population: 21
Area in square miles: 113.62



COMMUNITY INFORMATION

- Low income: 44 percent
- People of color: 50 percent
- Less than high school education: 19 percent
- Limited English households: 0 percent
- Unemployment: 25 percent
- Persons with disabilities: 28 percent
- Male: 51 percent
- Female: 49 percent
- 75 years — Average life expectancy
- $27,596 — Per capita income
- Number of households: 3
- Owner occupied: 67 percent

BREAKDOWN BY RACE

- White: 50%
- Black: 0%
- American Indian: 26%
- Asian: 0%
- Hawaiian/Pacific Islander: 0%
- Other race: 0%
- Two or more races: 4%
- Hispanic: 20%

BREAKDOWN BY AGE

From Ages 1 to 4	3%
From Ages 1 to 18	18%
From Ages 18 and up	82%
From Ages 65 and up	33%

LIMITED ENGLISH SPEAKING BREAKDOWN

Speak Spanish	0%
Speak Other Indo-European Languages	0%
Speak Asian-Pacific Island Languages	0%
Speak Other Languages	0%

Notes: Numbers may not sum to totals due to rounding. Hispanic population can be of any race. Source: U.S. Census Bureau, American Community Survey (ACS) 2018-2022. Life expectancy data comes from the Centers for Disease Control.

LANGUAGES SPOKEN AT HOME

LANGUAGE	PERCENT
No language data available.	

Report for the User Specified Area

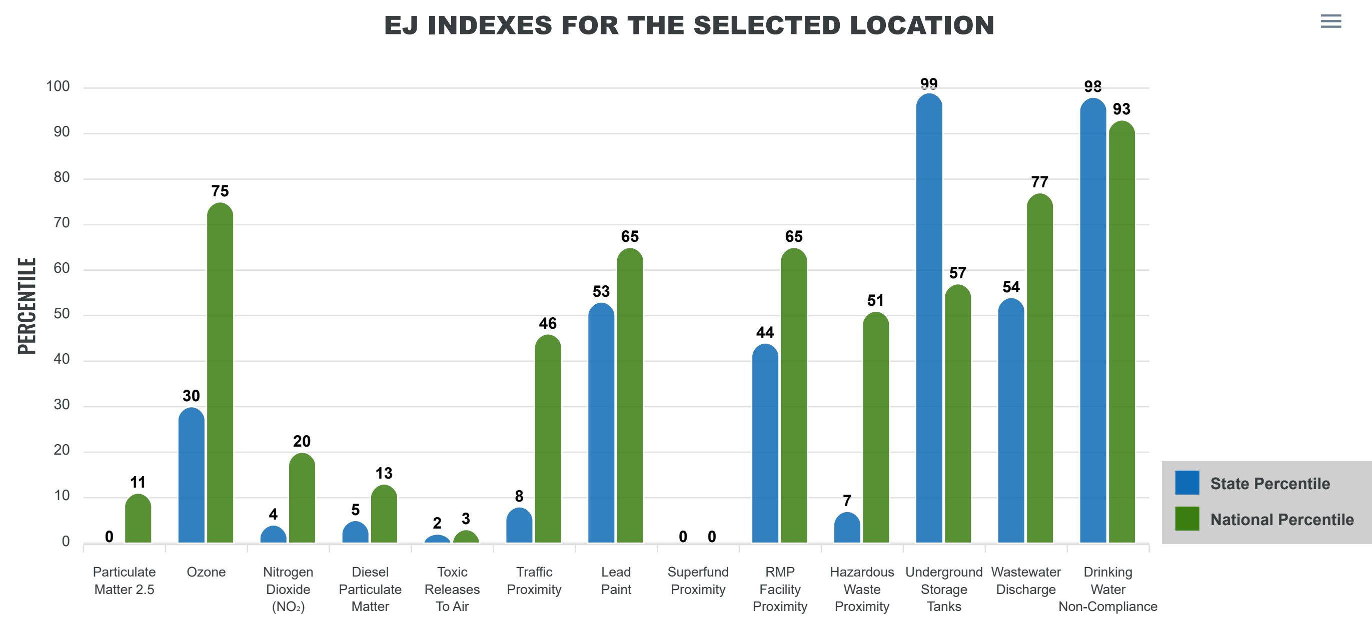
Report produced September 4, 2024 using EJScreen Version 2.3

Environmental Justice & Supplemental Indexes

The environmental justice and supplemental indexes are a combination of environmental and socioeconomic information. There are thirteen EJ indexes and supplemental indexes in EJScreen reflecting the 13 environmental indicators. The indexes for a selected area are compared to those for all other locations in the state or nation. For more information and calculation details on the EJ and supplemental indexes, please visit the EJScreen website.

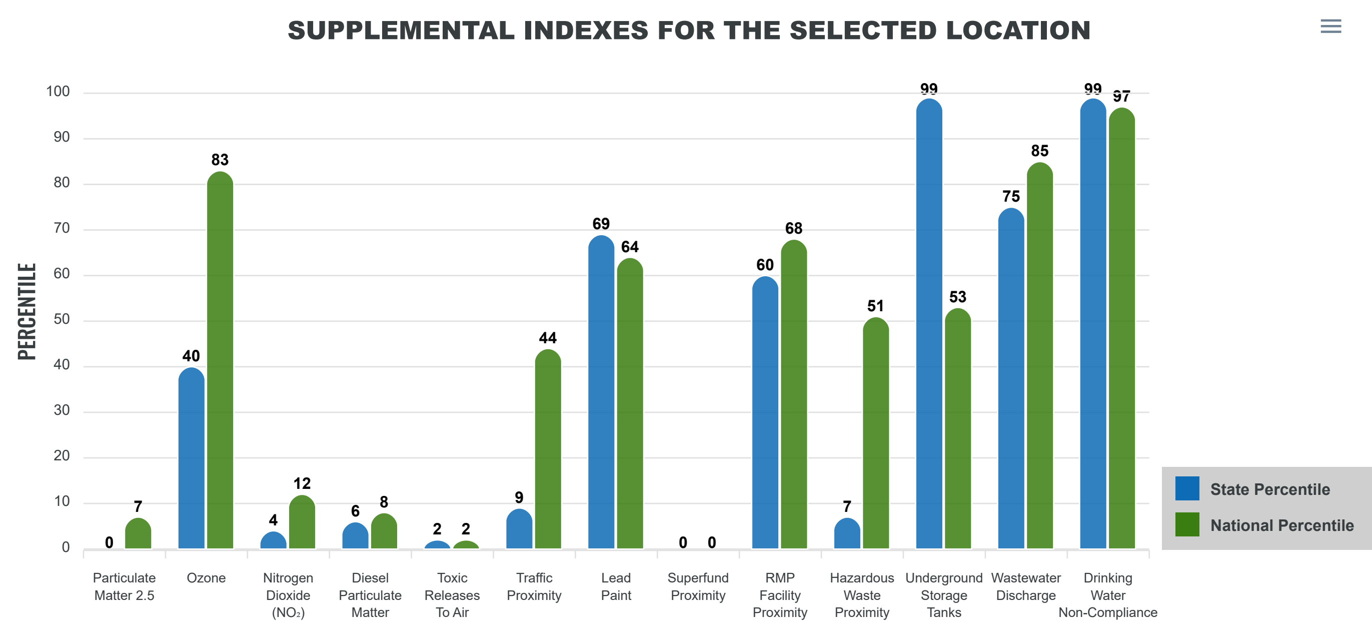
EJ INDEXES

The EJ indexes help users screen for potential EJ concerns. To do this, the EJ index combines data on low income and people of color populations with a single environmental indicator.



SUPPLEMENTAL INDEXES

The supplemental indexes offer a different perspective on community-level vulnerability. They combine data on percent low income, percent persons with disabilities, percent less than high school education, percent limited English speaking, and percent low life expectancy with a single environmental indicator.



Report for the User Specified Area

Report produced September 4, 2024 using EJScreen Version 2.3

EJScreen Environmental and Socioeconomic Indicators Data

SELECTED VARIABLES	VALUE	STATE AVERAGE	PERCENTILE IN STATE	USA AVERAGE	PERCENTILE IN USA
ENVIRONMENTAL BURDEN INDICATORS					
Particulate Matter 2.5 ($\mu g/m^3$)	5.81	12.3	0	8.45	4
Ozone (ppb)	61.3	74.2	19	61.8	54
Nitrogen Dioxide (NO_2) (ppbv)	3.1	9.1	1	7.8	7
Diesel Particulate Matter ($\mu g/m^3$)	0.0418	0.286	3	0.191	5
Toxic Releases to Air (toxicity-weighted concentration)	0.001	780	1	4,600	1
Traffic Proximity (daily traffic count/distance to road)	180,000	4,000,000	5	1,700,000	23
Lead Paint (% Pre-1960 Housing)	0.12	0.31	39	0.3	39
Superfund Proximity (site count/km distance)	0	0.68	0	0.39	0
RMP Facility Proximity (facility count/km distance)	0.17	0.83	32	0.57	41
Hazardous Waste Proximity (facility count/km distance)	0.32	11	4	3.5	28
Underground Storage Tanks (count/km^2)	0.041	0.00036	99	3.6	30
Wastewater Discharge (toxicity-weighted concentration/m distance)	160	11000	42	700000	59
Drinking Water Non-Compliance (points)	13	0.5	99	2.2	97
SOCIOECONOMIC INDICATORS					
Demographic Index USA	1.83	N/A	N/A	1.34	73
Supplemental Demographic Index USA	2.49	N/A	N/A	1.64	89
Demographic Index State	2.04	1.83	60	N/A	N/A
Supplemental Demographic Index State	2.57	1.49	92	N/A	N/A
People of Color	50%	62%	36	40%	66
Low Income	44%	28%	79	30%	75
Unemployment Rate	24%	6%	98	6%	97
Limited English Speaking Households	0%	8%	0	5%	0
Less Than High School Education	19%	16%	68	11%	81
Under Age 5	3%	5%	33	5%	35
Over Age 64	33%	16%	92	18%	91

*Diesel particulate matter index is from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

Sites reporting to EPA within defined area:

Superfund 0
Hazardous Waste, Treatment, Storage, and Disposal Facilities 0
Water Dischargers 0
Air Pollution 0
Brownfields 0
Toxic Release Inventory 0

Other community features within defined area:

Schools 0
Hospitals 0
Places of Worship 0

Other environmental data:

Air Non-attainment .... Yes
Impaired Waters .... No

Selected location contains American Indian Reservation Lands* .... No
Selected location contains a "Justice40 (CEJST)" disadvantaged community .... Yes
Selected location contains an EPA IRA disadvantaged community .... Yes

Report for the User Specified Area

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EJScreen Environmental and Socioeconomic Indicators Data

HEALTH INDICATORS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Low Life Expectancy	23%	18%	95	20%	83
Heart Disease	10.8	4.8	99	5.8	98
Asthma	11.5	9.6	94	10.3	81
Cancer	8.9	5.6	95	6.4	93
Persons with Disabilities	28.3%	11.3%	99	13.7%	97

CLIMATE INDICATORS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Flood Risk	7%	13%	55	12%	53
Wildfire Risk	23%	30%	66	14%	83

CRITICAL SERVICE GAPS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Broadband Internet	22%	9%	91	13%	81
Lack of Health Insurance	14%	7%	88	9%	81
Housing Burden	No	N/A	N/A	N/A	N/A
Transportation Access Burden	Yes	N/A	N/A	N/A	N/A
Food Desert	No	N/A	N/A	N/A	N/A

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