DOE/EA-2081

FINAL Environmental Assessment for the Proposed Construction and Operation of a Water Disinfection Facility at Lawrence Livermore National Laboratory

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U.S. Department of Energy
National Nuclear Security Administration
Livermore Field Office
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Date

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SUMMARY

This Environmental Assessment (EA) was prepared in accordance with the Council on Environmental Quality and U.S. Department of Energy (DOE) regulations for implementation of the National Environmental Policy Act. In this EA, DOE National Nuclear Security Administration (NNSA) considers the agency Proposed Action to construct and operate an onsite chloramine disinfection facility at the Lawrence Livermore National Laboratory (LLNL)-operated water tanks, located at Sandia National Laboratory, Livermore, California. The California Environmental Quality Act (CEQA) requires state and local agencies to identify and evaluate the significant environmental impacts of their actions and to avoid or mitigate those actions, if feasible. This document has been formatted and the analysis completed to incorporate elements for compliance with CEQA because the Proposed Action would be subject to permitting by the California State Water Resources Control Board, Division of Drinking Water pursuant to 22 California Code of Regulations § 64552.

The purpose of this Proposed Action is to improve the quality of water at the Livermore Site through the implementation of an onsite chloramine disinfection system located at the Sandia tanks operated by LLNL. DOE NNSA needs water from the Sandia tanks supply to meet its requirements for potable water that is also suitable for water cooling tower use. This EA evaluates the potential for significant impacts resulting from implementation of the Proposed Action, within the context of the No Action Alternative (i.e., status quo alternative). This EA also considers cumulative impacts likely to result from implementation of the Proposed Action.

Preliminary analysis indicated that implementation of the Proposed Action would not result in impacts on the following elements of the human environment: land use and aesthetic resources, prehistoric and cultural resources, socioeconomics, environmental justice, community services, noise, utilities and energy, and traffic and transportation. Therefore, these elements are dismissed from further discussion in this EA for the reasons provided in Section 4.1 of this document. The following is a summary of the resource areas considered, the types of analyses completed, and the results of those analyses:

Geology and Soils – Impacts on soils during operation would be minimized through secondary and tertiary containment of hazardous materials present within the system. Routine inspections and leak detection systems would be implemented to reduce the potential for leaks. Therefore, implementation of the Proposed Action would not result in significant impacts on geology and soils.

Ecological Resources – A qualitative comparison of the potential impacts on protected species, critical habitat, wetlands, and floodplains indicates that implementation of the Proposed Action would not result in significant adverse direct or indirect impacts on these resources over the No Action Alternative.

Air Quality – Implementation of the Proposed Action would result in a negligible increase in emissions over the No Action Alternative. Releases would be limited to refilling operations and would be below the trigger levels for Bay Area Air Quality Management District (BAAQMD) Regulation 2, Rule 5 for ammonia and would not require a permit. Under the Proposed Action, a

standby generator would be installed for use during power interruption. Depending on the final design, the standby generator operations may require a permit from the BAAQMD. Considering LLNL emission reduction policies, small amounts of pollutant emissions and regulatory oversight, the Proposed Action would have no significant impacts on air quality.

Water Resources – A qualitative comparison of the potential impacts of groundwater and surface water indicates that implementation of the Proposed Action would not result in significant adverse impacts on these resources over the No Action Alternative.

Materials and Waste Management – A combined qualitative and quantitative evaluation of materials and waste management is used in this EA. The Proposed Action would generate approximately 150 metric tons of non-hazardous waste construction debris, but is not expected to generate any additional municipal waste. Hazardous waste is not expected to be generated during construction or operation of the facility. Implementation of the Proposed Action would not result in a significant impact on LLNL material and wastes management.

Human Health and Safety – A quantitative approach is taken as part of the Air Quality analysis to determine the potential impacts on human health from air emissions under the Proposed Action. An evaluation of potential impacts on workers and the public can be found in Section 4.1.7 of this EA. Impacts on uninvolved workers would be avoided through existing controls.

Accidents and Intentional Destructive Acts – Implementation of the Proposed Action would have the potential to result in impacts on the environment, workers, or the public from accidents or intentionally destructive acts. In this EA, reasonably foreseeable accidents resulting from implementation of the Proposed Action are compared to those under the No Action Alternative. This analysis indicates that implementation of the Proposed Action would not result in significant impacts on the likelihood or outcomes of reasonably foreseeable accidents or intentionally destructive acts over the No Action Alternative.

Climate Change – This EA considers the potential for the Proposed Action to contribute to climate change along with the potential for extreme weather events to interfere with the Proposed Action. Impacts are not identified for either case.

Cumulative Impacts – The cumulative impact analysis for this EA included a review of past, present, and reasonably foreseeable actions for other federal and non-federal agencies in Alameda County. The following resource areas are analyzed in relation to cumulative impacts in this EA: air quality and climate change. Through this evaluation it is determined that aspects of the Proposed Action would have negligible contributions to cumulative impacts in the region.

NOTATION

The following is a list of acronyms, abbreviations, and units of measure used in this document.

ACRONYMS AND ABBREVIATIONS

BAAQMD	Bay Area Air Quality Management District
CCR	California Code of Regulations
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CSWRCB	California State Water Resources Control Board
DBP	Disinfection By-Product
DDW	Division of Drinking Water
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ES&H	Environmental, Safety and Health
GHG	Greenhouse Gas
IDA	Intentional Destructive Acts
LLNL	Lawrence Livermore National Laboratory
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NAL	Numeric Action Levels
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
SA	Supplement Analysis
SFPUC	San Francisco Public Utilities Commission
SNL	Sandia National Laboratories
SNL/CA	Sandia National Laboratories/California
SWEA	Site-Wide Environmental Assessment
SWEIS	Site-Wide Environmental Impact Statement
SWPPP	Storm Water Pollution Prevention Plan
TAC	Toxic Air Contaminant

UNITS OF MEASURE

dB	decibel
dBA	A-weighted decibel
dBC	C-weighted decibel
ft.	foot
gal.	gallons
gpm	gallons per minute
in.	inches
kVA	kilo-volt-ampere
lbm	pounds mass
lbs./hr.	pounds per hour
lbs./yr.	pounds per year
mtCO2e	metric tons of carbon dioxide equivalent
µm	micrometer
mg/L	milligrams per Liter
PM	particulate matter
sq ft.	square feet

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1.0 INTRODUCTION

The U.S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) prepared this Environmental Assessment (EA) in accordance with the Council on Environmental Quality's (CEQ) *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*, 40 Code of Federal Regulations (CFR), Title 4, Parts 1500-1508 (CEQ 2005), and the DOE's National Environmental Policy Act (NEPA) Implementing Procedures in 10 CFR 1021. The NEPA requires an assessment of the environmental consequences of federal actions that may affect the quality of the human environment. This EA discusses the Purpose and Need for the Proposed Action, provides a description of the Proposed Action and alternatives, and analyzes the potential environmental impacts of the Proposed Action and alternatives. Based upon the potential for impacts described in this EA, DOE NNSA would either publish a Finding of No Significant Impact or prepare an Environmental Impact Statement (EIS).

Pursuant to 22 California Code of Regulations (CCR) § 64552, a California State Water Resources Control Board (CSWRCB), Division of Drinking Water (DDW) permit must be obtained. As such, a California Environmental Quality Act (CEQA) review of the Proposed Action must also be performed in addition to this NEPA review.
This section generally describes this document, the Proposed Action, and the Purpose and Need for the agency action. The statement of Purpose and Need for the agency action reflects the goals to be achieved by DOE NNSA. NEPA regulation 40 CFR §1502.13 requires a description of the underlying Purpose and Need to which the agency is responding in considering an action (CEQ 2005).

1.1 BACKGROUND

The DOE NNSA prepared this EA to assess the potential environmental consequences of the Proposed Action to construct and operate an onsite chloramine disinfection facility at the Lawrence Livermore National Laboratory (LLNL)-operated water tanks, located at Sandia National Laboratory, Livermore, California (SNL/CA).

The LLNL Livermore Site is an experimental research site operated by the Lawrence Livermore National Security, LLC, for the DOE NNSA. The Livermore Site (Figure 1) is situated just outside the boundary of Livermore, California. It occupies a total area of approximately 1.3 square miles (821 acres) and is roughly 40 miles east of San Francisco at the southeast end of the Livermore Valley in southern Alameda County, California. The City of Livermore central business district is located about three miles to the west. Established in 1952, the Livermore Site supports LLNL's research programs which focus on defense systems, lasers, biomedical, energy, nonproliferation and arms control, and environmental programs (DOE NNSA 2011).

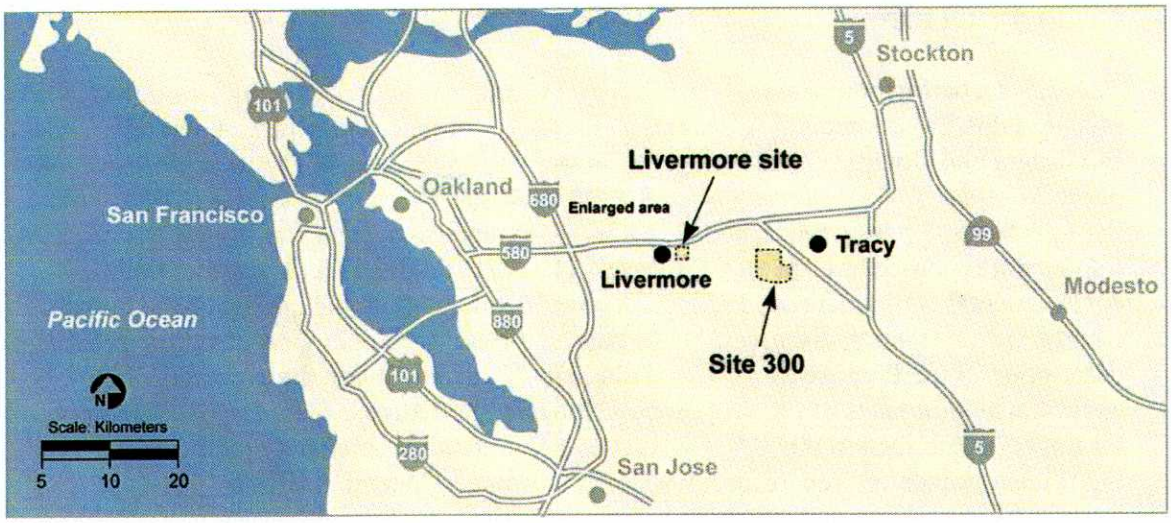

Figure 1. Location of the LLNL Livermore Site and Site 300.

SNL is one of several national laboratories that support the DOE NNSA's statutory responsibilities for nuclear weapons research and design, development of other energy technologies, and basic scientific research. SNL/CA encompasses 410 acres owned by DOE and is bounded by the City of Livermore to the west, LLNL to the north, and privately-owned rural and agricultural land to the south and east (Figure 2) (DOE NNSA 2012).

The Livermore Site receives its primary potable water supply from the San Francisco Public Utilities Commission's (SFPUC's) Hetch Hetchy Aqueduct System via the Mocho Shaft on the Coastal Range Coast. The secondary water source is the Alameda County Flood Control and Water Conservation District, Zone 7. Zone 7 serves as a backup supply when the Hetch Hetchy supply is not available or when water quality is insufficient. The domestic water system, which provides potable water for both the Livermore Site and SNL/CA, consists of three main storage tanks located at SNL/CA that are supplied by both Hetch Hetchy's Mocho Shaft and Zone 7. These tanks have a maximum capacity of 1,500,000 gallons.

Both water sources are treated with chloramines. Chloramine is a disinfectant added to water for public health protection. A combination of chlorine and ammonia, chloramine is currently considered best technology for controlling the formation of certain regulated organic disinfection byproducts. Zone 7 supplies chloraminated groundwater directly to the Livermore Site; however, the Zone 7 water source has a much higher dissolved solids content, increasing water hardness and leading to excessive scaling. While Hetch Hetchy surface water is treated with chloramines, the water received at the Livermore Site from the Mocho Shaft is only treated with chlorine. Chlorine is added by the SFPUC to the Hetch Hetchy water supply upstream of the Livermore Site, while ammonia is added downstream. In the summer of 2016, the Livermore Site switched to Zone 7 water because the SFPUC reduced chlorine residuals in the Coast Range Tunnel to control Disinfection By-Product (DBP) formation. The lower chlorine residuals have resulted in difficulties for operators to

consistently maintain the bacteriological quality of the Livermore Site domestic water system.

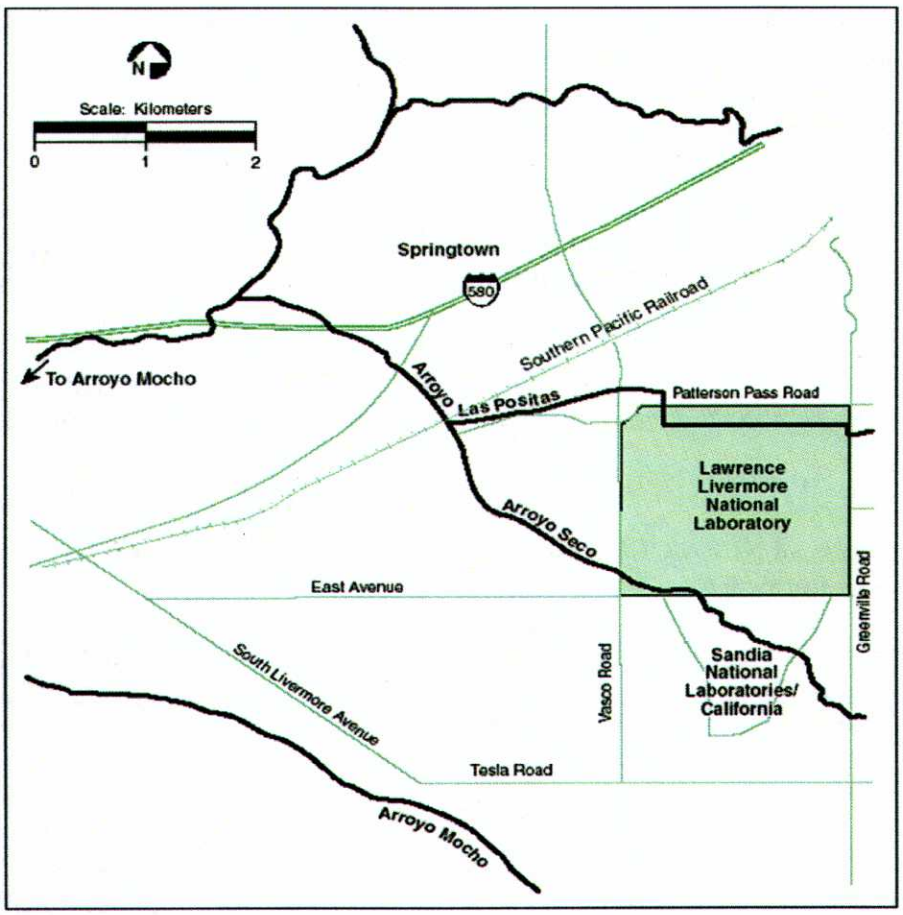

Figure 2. Proximity of SNL/CA to LLNL Livermore Site.

1.2 PURPOSE AND NEED

The purpose of this Proposed Action is to improve the quality of water at the Livermore Site through the implementation of an onsite chloramine disinfection system located at the Sandia tanks operated by LLNL. At present, the Livermore Site has an annual potable water demand of 250 million gallons, representing an average daily demand of 475 gallons per minute (gpm). The current Zone 7 water supply is not ideal for cooling tower make-up due to high mineral contents causing excessive cooling tower scaling and blow down. Because of the present inability to disinfect water onsite, the Hetch Hetchy water source is also not an ideal option. As part of the Livermore Site's Water Master Plan (Stantec 2017), chloramination was determined to be the best option for water disinfection due to the Livermore Site's higher demand and lower detention time. It was determined that systems with a water age of less than 10 days usually do not have significant problems (e.g., nitrification) when using chloramine disinfection.

The Proposed Action would enable LLNL to increase operational flexibility by allowing for the use of water available from both groundwater and surface water sources. The ability to disinfect water sources onsite would reduce overall facility water consumption by approximately 44.21 million gallons, significantly decreasing annual costs, and ensure continued compliance with drinking water standards.

1.3 Compliance with the California Environmental Quality Act

The CEQA requires state and local agencies to identify and evaluate the significant environmental impacts of their actions and to avoid or mitigate those actions, if feasible. This document has been formatted and the analysis completed to incorporate elements for compliance with CEQA.

Pursuant to 22 CCR § 64552, a CSWRCB, DDW permit must be obtained. As such, a CEQA review of the Proposed Action must also be performed in addition to this NEPA review.

Table 1. Summary of NEPA/CEQA Resource Categories and Their Applicability to the Impact Analysis in this EA

Resource Category		Applicability to Impacts Analysis*
NEPA	**CEQA**	
Land Use and Aesthetic Resources	Land Use/Planning, Aesthetics, Agriculture Resources/Recreation	Section 4.1 dismissed from further analysis
Prehistoric and Cultural Resources	Cultural Resources	Section 4.1 dismissed from further analysis
Socioeconomics and Environmental Justice	Population/Housing and Growth Inducing Impacts	Section 4.1 dismissed from further analysis
Community Services	Public Services	Section 4.1 dismissed from further analysis
Geology and Soils	Geology/Soils/Mineral Resources	Section 4.1.1
Ecological Resources	Biological Resources	Section 4.1.2
Air Quality	Air Quality	Section 4.1.3
Water Resources	Hydrology/Water Quality	Section 4.1.4
Noise	Noise	Section 4.1.5
Traffic and Transportation	Transportation/Traffic	Section 4.1 dismissed from further analysis
Utilities and Energy	Utilities/ Service Systems	Section 4.1 dismissed from further analysis
Materials and Waste Management	Hazards and Hazardous Materials	Section 4.1.6
Human Health and Safety	Human Health and Safety	Section 4.1.7
Accidents and Intentional Destructive Acts	N/A	Section 4.1.8
Climate Change	Climate Change	Section 4.1.9
Cumulative Impacts	Cumulative Impacts	Section 4.1.10

*The sections in which each category can be found in this document are noted, or if the category was not analyzed further.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

CEQ regulation 40 CFR 1508.9(b) requires that an EA include a brief discussion of alternatives to a Proposed Action (CEQ 2005). This section describes the Proposed Action, the No Action Alternative, and alternatives considered, but eliminated from further analysis.

DOE NNSA considered action alternatives for meeting its need for improving redundancy of water systems with the use of chloramines at the Livermore Site. For the action alternatives to be feasible, they must accomplish the following:

- Be constructed at the existing water tank facility operated by LLNL.
- Provide the ability to monitor, disinfect, and maintain a desired residual level of 2.5 milligrams per Liter (mg/L).
- Allow for the disinfection of both surface water and groundwater supplies to the Livermore Site.
- Minimize the formation of regulated DBP.

2.1 PROPOSED ACTION

DOE NNSA proposes to construct and operate an onsite chloramine disinfection system at the proposed project site. The Proposed Action would be subject to permitting by CSWRCB-DDW pursuant to 22 CCR § 64552 and would require the application and acquisition of the appropriate CSWRCB permit.

The Proposed Action would enable LLNL to increase operational flexibility by allowing for the use of two water sources, Zone 7 and Hetch Hetchy. The ability to disinfect water sources onsite would reduce overall facility water consumption, significantly decreasing annual costs, and ensure continued compliance with drinking water standards.

The project site is located at the southern-most point of SNL/CA property. This location is where the three water tanks at SNL/CA intercept Mocho Shaft before distributing the water north to SNL/CA and the Livermore Site. Several vaults around the tanks allow access to the pipelines and valving, and have been utilized in the project design. A small support building near the tanks has been designated to store the chemical feed equipment and electrical equipment.

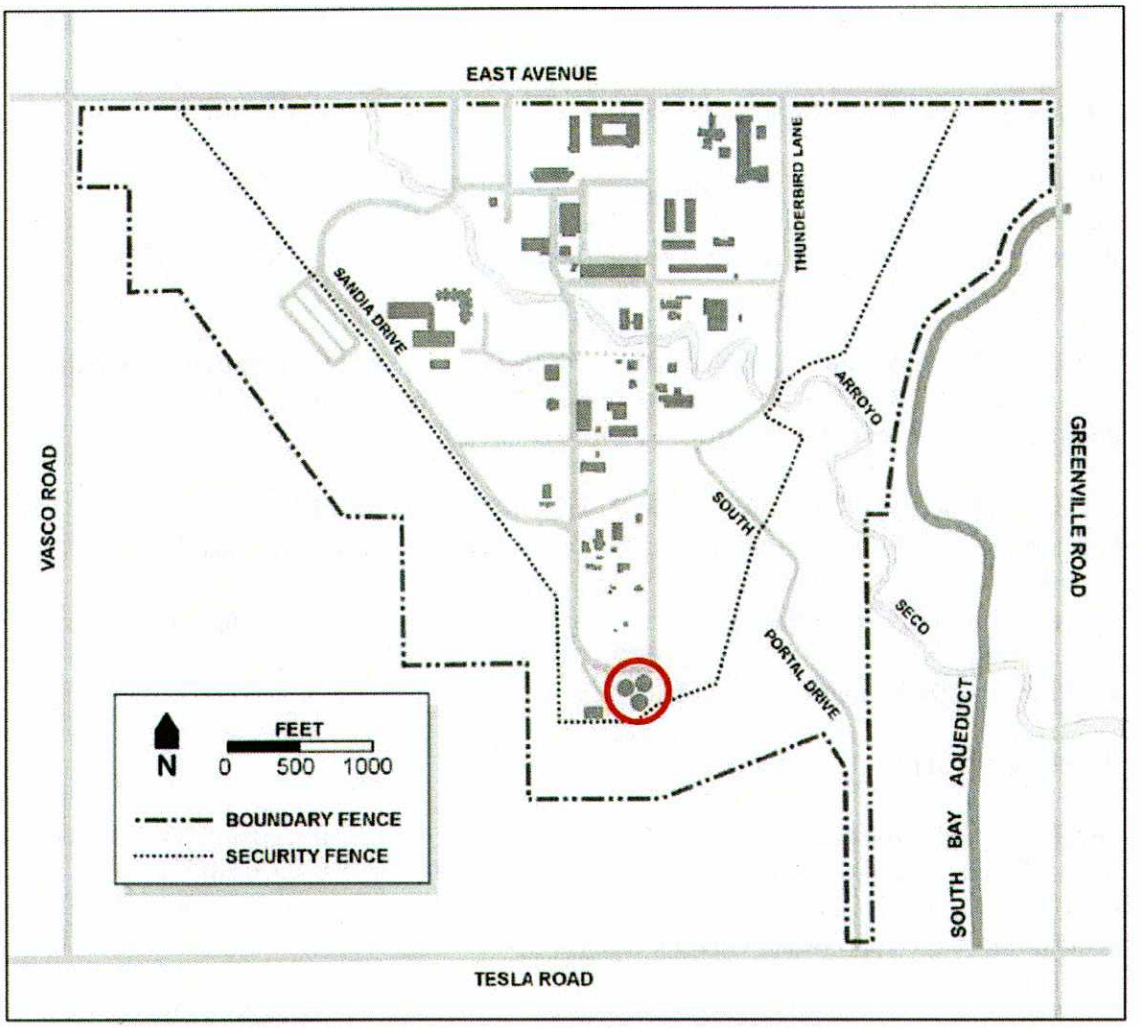

Figure 3. Location of water tanks at SNL/CA.

2.1.1 Site Preparation Activities

Safely implementing the Proposed Action would require preparing the existing water tank site and structures to facilitate the chloramination process and materials. An existing building at the project site is 22 ft. by 11 ft. 4 in. and contains two separate rooms. Each room is 10 ft. by 10 ft. interior dimensions, with the chemical room being the north room and the electrical room the south room. The chemical room would be used to house the necessary chemical feed pumps and analyzers. This building would be modified to meet building code and include a new emergency eye wash and shower station situated outside the chemical room. A tepid water heater pad would be installed outside the chemical room for the emergency eyewash and shower station. Fixed bollards would be installed near the water heater pad for safety and security.

The chemical storage tanks would be installed just outside the building. The aqua ammonia (NH_4OH) tank would have a capacity of 250 gal.; the sodium hypochlorite (NaClO) tank would have a capacity of 405 gal. Both tanks would be double walled and be situated on weigh scales to monitor supply. The tanks would be contained within a segregated containment berm. The containment berm would contain 100% of the contents for spill prevention. The double-walled tanks would be equipped with a leak detection system. Flexible lines from the chemical feed pumps, as well as the flexible lines to the analyzers, would be carried by PVC conduits and penetrate through the north wall of the building, where they would be run to the pull-boxes/vaults in a common trench.

A new vault would be installed for downstream disinfection on the north side of the tanks near the fire hydrant. This vault would house the initial free chlorine analyzer and static mixer with a chlorine feed line. The pipes used to convey hazardous materials would be double-walled and monitored with leak detection methods. A new pre-engineered building, referred to as the analyzer building, would be installed at the project site. The approximate size of the analyzer building would be approximately 100 square feet (sq. ft.) and would include exhaust fans. The analyzer building would house a 110 gal. analyzer drain water sump tank, as well as three analyzers (total chlorine and pH analyzer, and two free chlorine analyzers) and associated pumps. Fixed bollards would be installed on the north and east sides of the building for safety and security.

Site preparation activities would require minor grading and repaving for the chemical tanks and berm, placement of the analyzer building, and tepid water heater. Excavation and trenching would be necessary for placement of bollards and pipe installation. External modifications to the existing structure would be necessary to install piping from the chemical tanks to the analyzers and pumps in the chemical room. Additional site modifications may include, but are not limited to, a shade structure over the chemical tanks, and a standby generator. Implementation of the Proposed Action would not require new roads or access routes. Electrical systems and diagnostic tools necessary for monitoring pH, water quality, and chemical dosage would be updated as part of the Proposed Action.

2.1.2 Operational Activities

The Proposed Action implements a dual disinfection system; one upstream of the Sandia Tanks and one downstream of the Sandia Tanks. The downstream system would be utilized during normal operations, whereas the upstream system would be utilized during high DBP conditions.

Onsite chemical storage would be designed for a 40-day chemical supply of both sodium hypochlorite and aqua ammonia. Chemicals would be refilled by an approved contractor on a regular schedule. Coordination with Sandia Force Protection would be required for access to the water tank facility. Modifications in water quality sampling and operational controls would be required under the

Proposed Action. As a permitted action, a sampling plan would be developed to include sampling as required for total coliform bacteria, total trihalomethanes and haloacetic acids, and lead and copper.

Existing LLNL procedures and processes for managing work including materials and wastes management, and worker safety and health management would be updated under the Proposed Action. Existing procedures related to flushing and filling of the tanks would remain the same under the Proposed Action.

2.2 No Action Alternative

A No Action Alternative must be considered in all DOE NNSA EAs. The purpose of a No Action Alternative in the NEPA process is to provide a baseline against which impacts of the other analyzed alternatives can be compared. "No action" does not necessarily mean inaction. Rather, the No Action Alternative often involves maintaining or continuing the "status quo" of ongoing operations and activities.

Under the No Action Alternative for this EA, DOE NNSA would not construct a chloramination disinfection system and the Livermore Site would continue to receive water from the Zone 7 water supply or Hetch Hetchy, depending on the water quality. The No Action Alternative does not provide the Livermore Site with the redundancy needed to improve operational flexibility as it would not address the issues regarding the buildup of DBP or increased scaling which would continue to inhibit the effectiveness of the cooling towers, thereby increasing water consumption and associated costs.

The No Action Alternative would not meet the criteria to establish feasibility of action alternatives and would not support the mission needs of DOE NNSA. However, it is considered here as is required under NEPA.

2.3 Alternatives Considered but Eliminated from Further Analysis

This section describes alternative actions considered by DOE NNSA but eliminated from further analysis in this document. The alternative actions described in this section have been eliminated from further analysis because they would not be reasonable alternatives, and/or they would not support the DOE NNSA mission needs for the reasons explained below.

2.3.1 Alternate Water Treatment Strategies

Under this alternative, DOE NNSA would still implement treatment of water coming from the Sandia water tanks to ensure it meets human consumption and cooling tower scaling and blowdown standards, but using other technologies. Alternative technologies could include free chlorine disinfection, treatment to remove DBP precursors using granular activated carbon (GAC) filters, ozone/biological filtration, and nanofiltration. DOE NNSA's contractor retained expert consultants to perform a screening analysis of these alternative technologies, as well as chloramination (Stantec 2017). As part of that effort, the contractor's

consultants also conducted a water age analysis, which showed detention times (that is, time between treatment and ultimate consumption) in the LLNL water system to be generally less than four days. The contractor's consultants determined that these would be ideal conditions for successful use of chloramination. Finally, in its report, the consultants determined that alternatives to chloramination would have an increased implementation cost, but would not offer any advantage in effectiveness or safety. For these reasons, alternative technologies were removed from further consideration.

2.3.2 Increased onsite quantity and concentration of water treatment chemicals

Under this alternative, DOE NNSA would still propose to construct an onsite water treatment facility at the Sandia water tanks capable of storing up to a six-month supply of sodium hypochlorite and ammonia for water treatment and disinfection. The existing facility footprint would not be increased to accommodate the storage of additional water disinfecting agents.

Through facility upgrades, the site would contain up to 500 gal. of sodium hypochlorite at 12.5% concentration and up to 220 gal. of ammonia at 19% concentration. Because the concentration and quantity of both sodium hypochlorite and ammonia to be stored onsite would exceed existing site safety guidelines and requirements, this alternative would be infeasible and was dismissed from further analysis in this document.

2.3.3 Reduced onsite quantity and concentration of water treatment chemicals

Under this alternative, DOE NNSA would still propose to construct an onsite water treatment facility at the Sandia water tanks capable of storing up to a 20-day supply of sodium hypochlorite and ammonia for water treatment and disinfection. The existing facility footprint would not be increased to accommodate the storage of additional water disinfecting agents.

Through facility upgrades, the site would contain up to 250 gal. of sodium hypochlorite at 12.5% concentration and up to 110 gal. of ammonia at 10% concentration. The concentration and quantity of both sodium hypochlorite and ammonia to be stored onsite would meet existing site safety guidelines and requirements; however, the frequency at which refills would be required would be considered costly and time consuming. Therefore, this alternative would be infeasible and was dismissed from further analysis in this document.

3.0 DESCRIPTION OF THE EXISTING SETTING

This section contains a description of the area potentially impacted by the Proposed Action as required by CEQ regulations. The extent of the affected environment may not be the same for all potentially affected resource areas. A detailed description of all elements of the existing setting at the Livermore Site and SNL/CA can be found in the 2005 Site-Wide

Environmental Impact Statement (SWEIS) for LLNL (DOE/EIS-0348) and the 2003 Site-Wide Environmental Assessment (SWEA) for SNL/CA (DOE/EA-1422).

Discussion of the existing setting in this document is limited to existing environmental information that directly relates to the location and scope of the Proposed Action and alternatives analyzed. Table 1 shows the resources categories for NEPA and CEQA, whether they are applicable to this analysis and in what section they are discussed.

The LLNL water tanks are located within the SNL/CA fence line. The water tank facility is located on a hill in the southeast quadrant of the SNL/CA site and houses three 500,000 gal. epoxy-lined steel water storage tanks and an approximately 250 sq. ft. support structure containing two rooms; a chemical room and an electrical room. The water tank facility is surrounded by the installation fence line, immediately adjacent to undeveloped natural landscape.

Impacts from ongoing activities at the Livermore Site and SNL/CA were previously reviewed in the 2011 LLNL SWEIS Supplemental Analysis (SA) and the 2012 SNL/CA SWEA (DOE/EA-1422-SA-01).

3.1 Land Use and Aesthetic Resources

This section describes the land use designations of the proposed project area at SNL/CA and its surroundings, as well as any natural or man-made aesthetic features that give a landscape its character and value. The proposed project site is mostly flat terrain and is surrounded by residential areas to the west, and farmland, including Unique and Prime Farmland, to the south, east and southeast, which is mostly managed as vineyards. This area also contains grazing land.

The City of Livermore designates SNL/CA as Education and Institutions, which includes offices, laboratory buildings, support facilities, storage, infrastructure, and open space. The proposed project is located at the southern edge of the 410-acre SNL/CA site, adjacent to the security buffer area, which surrounds the western, southern, and eastern edges of the site and ranges in width from 600 to 1200 ft. The water tanks are obscured from view on the western and southern borders of the site, and mostly obscured from the eastern section, by a low hilly area.

Neither land use designations nor the visual characteristics of this site would be altered by implementation of the Proposed Action. Prime and Unique Farmland, as designated by the California Department of Conservation under the Farmland Protection Policy Act, is located near the project site.

3.2 Prehistoric and Cultural Resources

Because the proposed project is located at SNL/CA, only prehistoric and cultural resources at SNL/CA are addressed. A background literature search indicates that there is no evidence of prehistoric or historic archeological sites at SNL/CA. None of the SNL/CA buildings are historically significant and they have been determined to not be eligible for

the National Register (SNL 2002). The project area does not contain any known historical or archeological resources. There are no resources listed by the National Register of Historical Places, or in local registries as provided for by Public Resource Code 5020.1(k) or 5024.1(g).

While no recorded prehistoric, historic or paleontological resources have been identified in the Project area, soils disturbing activities such as grading have the potential to unearth unknown paleontological resources. Existing LLNL procedures dictate that in the event buried paleontological resources are encountered during project trenching, grading, site preparation, and/or construction; construction and/or grading activities within 100 ft. of the find shall be temporarily halted until a qualified archaeologist can assess the significance of the find and provide proper management recommendations. Paleontological resources include, but are not limited to, fossils and material remains.

3.3 Socioeconomics, Environmental Justice, and Community Services

3.3.1 Socioeconomics

This section describes the demographic and economic variables associated with community growth and development that have the potential to be directly or indirectly affected by the proposed project.

The workforce at SNL/CA comprises 1,266 employees and contracted staff; LLNL comprises 6,360 employees and contracted staff. Many of these personnel live within Alameda, Contra Costa, and San Joaquin Counties, with a combined population of approximately 3.3 million people. During 2016, SNL/CA and LLNL's total annual payroll was $124 million and $787 million, respectively. This amount represents roughly 1.3 percent of the total combined payroll generated by all business establishments in Alameda, Contra Costa, and San Joaquin Counties (about $69 billion).

Current unemployment rates in these three counties are as follows: 3.7%, Alameda; 3.9%, Contra Costa; and 6.6%, San Joaquin. The proposed project would add approximately ten temporary construction workers during the three-month construction period.

3.3.2 Environmental Justice

In accordance with the presidential Executive Order (EO) 12898, dated February 11, 1994, DOE has proposed to establish procedures for identifying and addressing disproportionate adverse human health and environmental effects of their programs, policies, and activities on minority populations, low-income populations, Native American tribes, and populations of non-English-speaking residents (EO 1994). The Livermore region, on average within a 50-mile radius, does not have minority or low-income populations higher than the state average (DOE NNSA 2011; DOE 1999).

3.3.3 Community Services

This section describes the community services, including demand for fire protection and emergency services, police protection and security services, and school services, surrounding the proposed project area.

SNL/CA and LLNL obtain fire protection services through Alameda County Fire Department Station #20, located in Building 323 at the Livermore Site. This station houses three crews of six firefighters, three engines and three patrol vehicles, plus a hazardous materials unit and two ambulances (LLNL 2017).

Security services at the proposed project site are provided by SNL/CA's onsite security force, who are responsible for badging and visitor clearances, securing the site and adjacent areas, responding to security threats, supporting building emergency teams, and assisting in site evacuation. Security services are coordinated with the LLNL Protective Force, the Alameda County Sheriff's Department, and the Livermore Police Department when necessary.

The Livermore Valley Joint Unified School District is the local school district; it serves over 13,500 students and includes schools from transitional kindergarten through high school. It is estimated that less than two percent of SNL/CA and LLNL employee's children attend the local district. Local community colleges/universities include Las Positas College (enrolling about 8,500 students), and the University of Phoenix, Livermore Learning Center.

3.4 Geology and Soils

This section describes the geology and soils surrounding the proposed project site at SNL/CA.

SNL/CA is located in the California Coast ranges geologic province and consists of relatively flat foothills with low relief and slope gently northwest and north (DOE NNSA 2003a). At SNL/CA, the slopes vary from one to three degrees. The SNL/CA property ranges in elevation from 849 ft. above Mean Sea Level (MSL) at the south end of the SNL/CA ridge top to 615 ft. MSL at the northwest corner of the site. The southern area of SNL/CA is situated on the north side of a ridge (the Altamont Hills) approximately 150 ft. above the surrounding land.

Surface soils and arroyo sediments cover the site with subsurface soils having formed primarily upon sediments deposited by local streams. Most of the deposits in the eastern part of the valley are relatively young, and thus soils are only moderately developed. These soils (generally loam) have minimal horizon, or development of layers, and can be several meters thick locally. Three soils cover most of SNL/CA: Rincon clay loam, Positas gravelly loam, and Livermore gravelly loam (DOE NNSA 2003a).

The regional northwest-southeast trending Greenville and Tesla-Ortigalita fault zones are the closest to the SNL/CA site. To the west, the Sam Ramon Valley fault is located

approximately 10 miles from the SNL/CA site. The South Branch Las Positas fault traverses the southernmost section of SNL/CA and the North Branch Las Positas fault cuts through the center of the site (see Fig. 4-4, DOE NNSA 2003a).

The water tanks and the proposed project site are located on the south side of the SNL/CA site and cover approximately a 200 ft. by 240 ft. area on top of a hill. There is no known history of soil contamination in the proposed project area. The proposed project area is not part of the SNL/CA environmental restoration program (DOE NNSA 2003a).

3.5 Ecological Resources

This section describes the ecological resources, including plants, wildlife, and floodplains and wetlands, surrounding the proposed project area.

Extensive surveys were performed at SNL/CA and the results were summarized in the 2003 SNL/CA SWEA (DOE/EA-1422). These surveys assessed the presence of species listed as threatened or endangered under the federal Endangered Species Act (ESA) or the California Endangered Species Act. These surveys also noted the presence of native species of plants, amphibians, reptiles, and mammals with other special status such as California species of special concern. This section summarizes the existing ecological resources found in the Proposed Action area.

3.5.1 Plants

There are three landscape features at the SNL/CA site: grassland, coyote brush scrub, and riparian woodland. Non-native grasslands represent much of the undeveloped land at SNL/CA. Although native plant species are present within grasslands at SNL/CA, no federal- or state-listed plant species are known to occur at the site (DOE NNSA 2003).

The water tank facility area is a developed area consisting primarily of structures and asphalt. Previously disturbed, low quality non-native grassland occurs immediately adjacent to the area. Several mature trees line the existing fence and retaining wall to the west and south of the project area.

3.5.2 Wildlife

Common amphibians and reptiles such as the western toad (*Bufo boreas*), Pacific chorus frog (*Pseudacris regilla*), western fence lizard (*Scleroporus occidentalis*), and gopher snake (*Pituophis melanoleucus*) occur at SNL/CA. Common mammals that occur at SNL/CA include the fox squirrel (*Sciurus niger*), California ground squirrel (*Spermophilus beecheyii*), desert cottontail rabbit (*Sylvilagus audubonii*), black-tailed jack rabbit (*Lepus californicus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), and opossum (*Didephis virgiana*).

No protected invertebrate species or reptile species occur at SNL/CA. Two amphibian species known to occur at SNL/CA are state species of special concern and listed as threatened under the ESA: the California red-legged frog (*Rana aurora draytonii*) and California tiger salamander (*Ambystoma californiense*). The upland grassland habitat at SNL/CA is within the dispersal distance for California red-legged frogs and California tiger salamanders. No breeding pools are present within the footprint or immediate area of the Proposed Action. The nearest pond habitat with the potential to support breeding amphibians is offsite over 2,000 ft. to the northeast. The Arroyo Seco is the nearest riparian habitat with potential to support breeding amphibians, approximately 1,500 ft. to the east of the Proposed Action area. SNL/CA performs ongoing activities in a manner consistent with protective measures specified in the Biological Opinion issued by the U.S. Fish and Wildlife Service.

Birds are the most abundant group of vertebrates present at SNL/CA. Species commonly observed include the mallard (*Anas platyrhynchos*), American coot (*Fulica americana*), turkey vulture (*Cathartes aura*), American kestrel (*Falco sparverius*), mourning dove (*Zenaida macroura*), northern flicker (*Colaptes auratus*), American crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), red-winged blackbird (*Agelaius phoeniceus*), brown-headed cowbird (*Molothrus ater*), Brewer's blackbird (*Euphagus cyanocephalus*), white-crowned sparrow (*Zonotrichia lecophyrs*), song sparrow (*Melospiza melodia*), house finch (*Carpodacus mexicanus*), lesser goldfinch (*Carduelis psaltria*), and European starling (*Sturnus vulgaris*). None of the observed species have protection under the ESA, although the majority of birds onsite are protected under the Migratory Bird Treaty Act (DOE NNSA 2003).

One special protected mammal, the mountain lion (*Felis concolor californica*), has also been observed onsite (DOE NNSA 2003).

3.5.3 Floodplains and Wetlands

All of SNL/CA drains to the Arroyo Seco. During the rainy season, from October to April, the arroyo is a potential source of flooding onsite. It has a drainage length of approximately 12 miles and a watershed area of approximately 8,960 acres upstream of SNL/CA. Floodplain maps indicate that along most of the channel on SNL/CA property, the entire 100-year discharge is contained within the existing channel (DOE NNSA 2003). Within the riparian woodland habitat are 0.44 acres of seasonal wetlands associated with Arroyo Seco, almost entirely in the east buffer zone. No wetlands occur within the water tank facility area.

3.6 Air Quality

SNL/CA and LLNL activities are subject to regulations and standards under the Clean Air Act, rules and regulations of the State of California Bay Area Air Quality Management District (BAAQMD), DOE requirements, and SNL/CA and LLNL policies. SNL/CA and

LLNL evaluate activities with potential emissions to determine the need for permits and conditions for compliant operations.

The Environmental Protection Agency (EPA) has set primary and secondary National Ambient Air Quality Standards (NAAQS) for several criteria pollutants to protect human health (40 CFR Part 50). These pollutants include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate pollution less than 10 micrometers (μm) in diameter (PM10 and PM2.5), and sulfur dioxide (SO_2). The State of California has devised a State Implementation Plan to attain and maintain the primary and secondary NAAQS. The State of California also has its own set of standards for the pollutants mentioned above.

The EPA has established conformity rules to ensure that a proposed federal action would not negatively impact the state's efforts in achieving and maintaining attainment with NAAQS. The Bay Area is currently in attainment in all categories except for ozone (California and EPA standards), PM10 (California standard), and PM2.5 (California standards).

3. 7 WATER RESOURCES

The SNL/CA site is located at the eastern end of the Livermore Valley groundwater basin. Recharge to the basin is largely from arroyos originating in the foothills, including Arroyo Seco and Arroyo Las Positas.

3.7.1 Groundwater

Groundwater at SNL/CA occurs within saturated unconsolidated geologic material, including permeable sediments separated by low-permeability silt and clay layers. The depth to groundwater ranges from less than 20 ft. on the eastern portion of the site to 126 ft. on the northeast corner of the site (SNL 2003a). Groundwater near SNL/CA is generally suitable for use as domestic, municipal, agricultural and industrial supply, but shallow groundwater may be of marginal quality.
There are seven groundwater monitoring wells at SNL/CA—three in former restoration areas and four along Arroyo Seco.

3.7.2 Surface Water

The major surface drainages in the Livermore Valley are the Arroyo Valle, Arroyo Las Positas, Arroyo Mocho, Arroyo Seco, Cottonwood Creek, and Tassajara Creek. These surface streams are all intermittent and flow generally to the west. Arroyo Seco, an ephemeral and intermittent stream, crosses SNL/CA diagonally from southeast to northwest. The arroyo typically flows only in very wet years, and for short periods during heavy storms. A seasonal wetland that is wet well into June, and sometimes July, is located in the streambed along the eastern part of the arroyo. Storm water runoff at SNL/CA is conveyed into Arroyo Seco through a system of storm drains and channels. Arroyo Seco discharges into Alameda Creek and eventually to the San Francisco Bay.

Storm water runoff is regulated under the *State of California National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharge Associated with Industrial Activities* (2014 Industrial General Permit). Storm water samples collected during the 2015/2016 reporting year were averaged and compared to Numeric Action Levels (NAL). SNL/CA exceeded the NALs for iron, aluminum, and zinc. To support minimizing pollution in the runoff, SNL/CA personnel inspect and clean debris from the storm water drainage system, as well as conduct street sweeping on the site. Other best management practices are implemented as necessary and in accordance with the SNL/CA Storm Water Pollution Prevention Plan (SWPPP) (SNL 2017).

3.8 NOISE

This section describes the existing conditions at SNL/CA as they relate to noise and vibrations.

The noise generated at SNL/CA is typical of a research and development facility. Ambient noise sources include onsite vehicle traffic, pumps, motors, and equipment. The contribution of these onsite activities to ambient noise levels offsite is small. These activities are not in conflict with land use compatibility guidelines.

3.9 TRAFFIC AND TRANSPORTATION

Regional access to SNL/CA is from Interstate 580, exiting onto Vasco Road or Greenville Road. An emergency access road connects the site to Tesla Road to the south. All entrances to SNL/CA are situated along East Avenue. The primary routes to East Avenue are Vasco Road and Greenville Road.

Onsite (excluding parking areas) vehicular traffic consists of General Services Administration vehicles, such as cars, light trucks, gasoline and electric carts, medium duty trucks, forklifts, cranes, and other equipment. Delivery trucks are generally routed only to shipping and receiving facilities. Vehicles owned by organizations performing work (such as construction) for SNL/CA are permitted around the site when necessary for the performance of the work.

3.10 UTILITIES AND ENERGY

The Pacific Gas and Electric Company and Western Area Power Administration supply primary electrical power to both SNL/CA and the Livermore Site. Electricity consumption at SNL/CA has been relatively stable since 2002. SNL/CA uses between 35 and 38 million kilowatt-hours/year. In 2016, SNL/CA consumed 35.9 million kilowatt-hours (SNL 2017).

Drinking water at SNL/CA is purchased through LLNL and obtained from the SFPUC or Zone 7. LLNL maintains the primary drinking water distribution system that feeds to SNL/CA and screens for water quality (SNL/CA 2002). Water use at SNL/CA is metered by LLNL as it enters the site. For both SNL/CA and LLNL, yearly water consumption has been below the 2003 SNL/CA SWEA and 2005 LLNL SWEIS projections. In 2015,

SNL/CA and LLNL consumed approximately 250 million gallons combined (SNL 2017; LLNL 2016).

3.11 Materials and Waste Management

3.11.1 Materials

SNL/CA and LLNL utilize both hazardous and non-hazardous materials. LLNL currently handles sodium hypochlorite and ammonia in operations and research activities; these materials would also be used during operation of the Proposed Action. Materials handling at LLNL occurs in accordance with well-established Environment, Safety and Health (ES&H) processes and procedures.

3.11.2 Waste Management

Currently, wastes generated at SNL/CA and LLNL include municipal solid wastes, wastewaters, industrial, hazardous and radioactive wastes. Hazardous wastes include Resource Conservation and Recovery Act, state wastes, Toxic Substances Control Act (primarily asbestos and polychlorinated biphenyls), medical, and universal wastes.

Waste management activities at SNL/CA and LLNL consist of managing, storing, and preparing for offsite disposal of all wastes in accordance with applicable federal and state regulations, permits obtained under these regulations, and DOE orders. The SNL/CA and the Livermore Site each operate hazardous and mixed waste storage and treatment facilities under a Hazardous Waste Facility Permit issued by the Department of Toxic Substances Control. SNL/CA and LLNL implement robust recycling programs aimed at diverting much of the waste that would otherwise be disposed of in landfills. In 2016, LLNL recycled approximately 70% of its municipal waste.

3.12 Human Health and Safety

It is the policy of DOE NNSA to operate in a manner that protects the health and safety of employees and the public, preserves the quality of the environment, and prevents property damage. SNL/CA and LLNL comply with applicable ES&H laws, regulations, and requirements. SNL/CA and LLNL also comply with directives promulgated by DOE regarding occupational safety and health. Through the Integrated Safety Management System, SNL/CA and LLNL systematically integrate safety into all work practices.

3.13 Accident Scenarios and Intentional Destructive Acts

An accident is a sequence of one or more unplanned events with potential outcomes that endanger the health and safety of workers and the public. An evaluation of reasonably foreseeable accidents for LLNL was described in the 2005 SWEIS. The bounding chemical accident as described in the 2005 SWEIS is a chlorine release from Building 332. This accident would result in concentrations existing as far out as 1.7 kilometers from

Building 332, which would extend about 750 meters beyond the site boundary (the largest distance of any of the facility accident scenarios). At the site boundary, members of the public exposed to this concentration could experience irreversible or other serious health effects or symptoms that could impair their ability to take protective action. At the noninvolved worker location, individuals exposed to this concentration could experience or develop life-threatening health effects. The workers inside the facility would be protected by the intact building structure and safety systems and thus would be unaffected by this incident.

Other accidents analyzed in the 2005 SWEIS include chemical dispersion, and material spills and releases. All accidents involving chemicals could result in severe or fatal injury to personnel if they are present. As of 2017, no severe or fatal injuries have resulted from accidental chemical releases at the Livermore Site.

The 2003 SNL/CA SWEA considered three general areas of accident analysis: natural phenomena, material accidents, and operational accidents. The SNL/CA SWEA selected two accident scenarios for detailed analysis: 1) a major earthquake, and 2) an unspecified accident resulting in the explosion of a refueling tanker truck. The analysis of the earthquake scenario concluded that the most likely result would be damage to unsecured equipment that might impact hazardous chemical containers or a fire resulting from damage to electrical equipment or the rupture of onsite gas lines. Typical emergency response actions would be taken, including inspection and damage assessment of facilities, gas lines, water lines, fire alarms, and building areas. Explosion of a refueling tanker truck carrying 40,000 cubic feet of hydrogen would result in potential physical harm to individuals, including injury from flying debris, eardrum rupture, or death, at distances up to 500 ft. from the site of the explosion.

The 2003 SNL/CA SWEA nor the 2005 LLNL SWEIS discussed the potential environmental impacts of intentionally destructive acts, as this approach was consistent with the DOE policy and requirements in effect at that time. Since publication of the 2003 SNL/CA SWEA, DOE and SNL/CA have analyzed intentional destructive acts involving release of materials and theft of radiological and energetic materials as bounding scenarios. DOE and LLNL have analyzed intentional destructive acts involving biological agents and nuclear materials as bounding scenarios since the publication of the 2005 SWEIS. The DOE NNSA continues to identify and implement measures designed to defend against and deter attacks at its facilities.

3.14 Climate Change

Since completion of the 2003 SNL/CA SWEA and 2005 LLNL SWEIS, several EOs relating to Greenhouse Gas (GHG) emissions and climate change were issued and revoked, including EO 13423, "Strengthening Federal Environmental, Energy, and Transportation Management," signed in 2007, and EO 13514 "Federal Leadership in Environmental, Energy, and Economic Performance," signed in 2009. In 2015, the CEQ published Implementing Instructions for EO 13693, "Planning for Federal Sustainability in the Next Decade." The Order included requirements for federal agencies to support preparations for the impacts of climate change, including climate change preparedness and resilience

planning which considers the effects of climate change on the agency's operations and programs.

For GHG emissions, SNL/CA and LLNL have not been required to report under the EPA's regulations because both sites carbon-dioxide-equivalent emissions have remained below the regulatory threshold of 25,000 metric tons/year. Both SNL/CA and LLNL continue to implement reductions and controls, such as using electricity generated by solar energy and improving ventilation systems to reduce electricity use that should reduce GHG emissions in future years.

California also has regulations pertaining to sulfur hexafluoride, because of its high GHG emissions potential. SNL/CA and LLNL have reduced the amount of sulfur hexafluoride in the inventory and use alternative gases, as practical, in switchgear and non-electric and non-semiconductor applications to reduce emissions. SNL/CA and LLNL must also report the amount of sulfur hexafluoride contained in electrical switchgear, and the amount that leaks from that switchgear.

SNL/CA and LLNL have operational goals relating to climate change resiliency detailed in their Site Sustainability Plans. SNL/CA and LLNL operations generate GHG emissions that contribute to local, regional, and global climate change. Regional climate change projections, including prolonged drought and temperature-rise, have the potential to impact operations through decreased water availability, increased risk of wildfires, and increased electricity demand for facility cooling.

4.0 POTENTIAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

This section evaluates the potential impacts of the Proposed Action and No Action Alternative. Alternatives considered but eliminated from further analysis are discussed in Section 2.3 of this document.

The CEQ regulations for implementing NEPA require that the environmental consequences discussion shall address both direct and indirect effects and their significance (40 CFR §1502.16). Direct effects are caused by the action and occur at the same time and place (40 CFR §1508.8). Indirect effects are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable (40 CFR §1508.8). This section provides an analysis of potential direct and indirect environmental impacts resulting from implementation of the Proposed Action, as well as potential cumulative impacts.

4.1 PROPOSED ACTION

Preliminary analysis indicated that implementation of the Proposed Action would not result in impacts on the following elements of the human environment: land use and aesthetic resources, prehistoric and cultural resources, socioeconomics, environmental justice, community services, noise and traffic, and transportation. Therefore, these elements are not further analyzed in this EA for the reasons provided in the following paragraphs:
Land Use and Aesthetic Resources – Implementation of the Proposed Action would not introduce a new land use at SNL/CA. Activities associated with the Proposed Action

would be consistent with permitted land uses for SNL/CA. Even though Prime and unique Farmland, as designated by the California Department of Conservation under the Farmland Protection Policy Act, is located near the project site, it would not be impacted by the proposed action. The water tanks are obscured from view on the western and southern borders of the site, and mostly obscured from the eastern section, by a low, hilly area. Implementation of the Proposed Action would not degrade the existing visual character or quality of the site and its surroundings. Therefore, the Proposed Action would not impact land use or aesthetic resources.

Prehistoric and Cultural Resources – Excavations would be required for construction of the Proposed Action. While there is no evidence of prehistoric or historic archeological sites at SNL/CA, in the event that currently unknown subsurface archaeological or paleontological resources (such as bones, fossils, or artifacts) are encountered during excavation, work would be suspended in the area and a qualified archaeologist would assess the find. No impacts on paleontological, archaeological, or historical resources are anticipated.

Socioeconomics – Five to ten permanent employees would be added due to the Proposed Action. Implementation of the proposed project would not impact the demographic or economic variables of the surrounding communities. The temporary construction period would add several jobs to the local communities, but these construction positions would be short-lived and would not substantially alter the community. Therefore, implementation of the Proposed Action would not result in impacts on socioeconomics.

Environmental Justice – The Livermore's site region, on average within a 50-mile radius, does not have more minority or low-income populations than the state average (DOE NNSA 2011; DOE 2005). Therefore, there would be no disproportionately high or adverse human health or environmental effects on minority or low-income populations as a result of construction or operation of the Proposed Action.

Community Services – Because ongoing operations would not change under the Proposed Action, and because the types and quantities of materials proposed for use are presently available at SNL/CA and LLNL, existing fire protection and emergency services would be sufficient to accommodate the Proposed Action. Non-hazardous solid waste would be generated from the Proposed Action, in types and amounts consistent with current ongoing activities. Given the temporary employment during construction activities and the five to ten additional permanent employees, the Proposed Action would not significantly impact fire protection and emergency services, police protection and security services, or school services in the surrounding community areas.

Traffic and Transportation – Implementation of the Proposed Action would require one to two additional chemical shipments to SNL/CA each month occurring on a scheduled basis coordinated with LLNL and SNL/CA. Monthly site visits would be required for sampling and system maintenance. The Proposed Action is consistent with ongoing activities at SNL/CA. Onsite vehicle use would continue to be restricted to government vehicles and contractor's company vehicles. There would be no change in parking demand or onsite road use under the Proposed Action. All SNL/CA shipment operations would continue to

be conducted within established DOE safety requirements and in accordance with U.S. Department of Transportation (DOT) regulations. No impacts on traffic and transportation are anticipated.

Utilities and Energy – Implementation of the Proposed Action would not introduce a new demand on water consumption or sewer discharges. Under the Proposed Action, the existing electrical components would be upgraded to accommodate up to 15 kilo-volt-ampere (kVA). This would increase the electrical energy consumption by approximately 45,000 kilowatt-hours/year. The Proposed Action would not result in a significant increase over electrical energy consumption trends and would remain in bounds with both the 2003 SNL/CA SWEA and the 2005 LLNL SWEIS projections. Natural gas would not be required for this Proposed Action. Existing procedures related to flushing and filling of the tanks would remain the same under the Proposed Action. However, implementation of the Proposed Action with the use of the Hetch Hetchy water supply would result in a reduction of approximately 44 million gallons per year at LLNL. No significant impacts on utilities and energy have been identified.

Discussion and analysis are provided in the following sections for Geology and Soils, Ecological Resources, Air Quality, Water Resources, Noise, Materials and Waste Management, Human Health and Safety, Accidents, Intentionally Destructive Acts, and Climate Change.

4.1.1 Geology and Soils

The potential for soil contamination during operations would be minimized because hazardous materials storage and conveying systems would be secondarily and tertiarily contained. Hazardous materials would be stored in double-walled tanks that would be situated in tertiary containment structures. The secondary and tertiary containment systems would be able to contain 100% of the tank contents. The double-walled tanks would be equipped with a leak detection system. The pipes used to convey hazardous materials would be double-walled and monitored with leak detection methods. Routine inspections would also be implemented to reduce the potential for leaks within the system. The primary concern of seismic activities would be release of hazardous materials to the immediate surroundings. The project would be designed and constructed in accordance with the latest standards and codes. No significant impacts to soils have been identified.

It is estimated that approximately 65 cubic yards of soil would be disturbed. Because there is no history of contamination or hazardous industrial activities at the project site, any excess soil would be reused onsite at SNL/CA.

The new construction for the project would take place adjacent to the existing water tanks and within the currently developed area. Because of the project location and relative small size, no geologic resources would be impacted. The project site is not Prime Farmland.

4.1.2 Ecological Resources

This section reviews the changes resulting from the Proposed Action that would affect or have the potential to affect biological and wetland resources. For the purposes of this EA, direct impacts on biological resources are defined as mortality of individuals of a species or of a population, resulting from implementation of the Proposed Action. Indirect impacts are defined as changing conditions such that over time individuals or populations significantly decline. Cumulative impacts are considered in Section 4.1.8 of this document.

Construction of the proposed project would occur within a previously disturbed area within the boundaries of the existing water tank facility area. Site preparation activities and modification of existing structures would require grading, trenching, use of heavy equipment, and other general construction activities within the water tank facility area that would have the potential to result in impacts on natural resources. Installation of PVC conduit and pull boxes near the water tank facility area would also have the potential to result in impacts on natural resources. This potential is analyzed below.

The operational aspects of the Proposed Action with the potential to impact ecological resources is the flushing and draining of the tanks, pumps and transmission pipes. This discharged water would then be released onto a concrete apron and slowly drained to Arroyo Seco.

Plants

Implementation of the proposed project would not result in direct impacts on protected plants because no federal- or state-listed special-status plant species occur at the project site. Because the project area is predominantly asphalt, most of the construction activities would not disturb vegetation. Trenching activities and installation of PVC conduit and pull boxes may disturb non-native grassland immediately adjacent to the existing asphalt area. However, because a native hydroseed mix would be used to restore all excavated or graded areas, there would be a small net increase in native plant grasslands on the site. Construction and operations of the facility would be restricted to previously disturbed and developed areas. Construction and operations would be performed in accordance with construction SWPPP requirements thus avoiding erosion and other depositional impacts on plants. Dust control requirements would be implemented as necessary, and dust generating activities would occur within one growing season, thus impacts on plant growth from dust deposition would be avoided. Therefore, implementation of the Proposed Action would not result in direct or indirect impacts on plant resources.

Wildlife

Under the Proposed Action, impacts on California red-legged frogs and California tiger salamanders from construction activities would be avoided and minimized by

implementing the requirements specified in an existing Biological Opinion issued by the U.S. Fish and Wildlife Service. Construction of the Proposed Action would not substantially alter or reduce upland or wetland habitat for either species.

Implementation of the Proposed Action would result in a change in operational activities over the No Action Alternative. The frequency of personnel and vehicles accessing the location would increase incrementally over the No Action Alternative.

The frequency and amount of water discharge from the tanks would not change over the No Action Alternative. Under the Proposed Action, the constituents of the tank releases from any source of water would be the same as releases under the No Action Alternative. Zone 7 water is chloraminated; therefore, potential impacts resulting from releases of Zone 7 water and releases of the chloraminated Hetch Hetchy water after implementing the Proposed Action would be the same.

During a release, water would be treated with a soluble de-chlorination product to neutralize chlorine. Therefore, potential direct impacts on amphibians from exposure to chlorine would be avoided. However, ammonia, which is present in chloraminated water, would not be neutralized by the de-chlorination product. If amphibians come into direct contact with a high concentration of ammonia, direct impacts can result. Under the Proposed Action, the concentration of ammonia (10%) would not be high enough to cause concern for amphibians. Further, releases would be planned to occur during the day when nocturnal amphibians are not likely to be present at the release point. Additionally, the rate of water released from the tanks would be controlled, to provide time for the water to absorb into the ground, thus avoiding discharge into the arroyo where amphibians may be present. Therefore, because releases would be planned, controlled, de-chlorinated, and would contain low concentrations of ammonia, impacts on amphibians would be avoided. As practicable, the LLNL biologist may monitor water releases to ensure that impacts on amphibians are avoided.

Floodplains and Wetlands

Because releases would be de-chlorinated, would contain low concentrations of ammonia and would be controlled to avoid discharge to surface waters, direct and indirect impacts on floodplains and wetlands would be avoided.

4.1.3 Air Quality

Activities associated with the Proposed Action would produce air emissions from several sources, including dust from construction, criteria pollutants from delivery trucks, operation of heavy equipment, and implementation of a standby generator. Ammonia would be emitted during tank refilling operations.

The construction phase would last approximately six months and include approximately ten truck trips for material delivery, and an average of about two personal vehicle trips per day over the six months. Dust generation would be

minimized by planned dust suppression activities. SNL/CA and LLNL would also follow BAAQMD and California Air Resources Board requirements to reduce dust and criteria pollutants from construction and equipment usage.

Under the Proposed Action, a standby generator would be installed for use during power interruption. While the final design for the standby generator is not available, based on 50 hours of operations per year at 100% load, emissions from a typical standby generator for the Proposed Action would produce approximately 0.5 lbs./yr. of hydrocarbons, 4 lbs./yr. of carbon monoxide, 0.4 lbs./yr. of particulate matter, 12.5 lbs./yr. of nitrogen oxides and 0.03 lbs./yr. of sulfur oxides. Depending on the final design, the standby generator operations may require a permit from the BAAQMD.

During aqua ammonia tank (250 gal. capacity) refilling operations, air quality may be impacted through release of ammonia gas. Ammonia has been classified as a Toxic Air Contaminant (TAC) by the BAAQMD (2010) (Reg 2, Rule 5, Table 2-5-1). The trigger levels for BAAQMD Regulation 2, Rule 5 for ammonia are 7.1 lbs./hr. and 7,700 lbs./yr. Since the aqua ammonia tank would be equipped with a conservation vent, ammonia evaporation losses would occur during tank refilling operations only. The Proposed Action would utilize Aqua Ammonia at 10% concentration by weight and would emit ammonia at a rate of approximately 0.3 pounds mass (lbm) per tank refill event. It is estimated that the ammonia tank would be filled approximately nine times per year which would release approximately 3 lbm of ammonia per year. Per BAAQMD (2009) Regulation 2, Rule 1, Section 2-1-123.1, storage tanks with a capacity less than 260 gallons and with air emissions less than the TAC trigger levels do not need a BAAQMD permit. Considering LLNL emission reduction policies, small amounts of pollutant emissions and regulatory oversight, the Proposed Action would have no significant impacts on air quality.

4.1.4 Water Resources

Groundwater

The proposed project does not involve discharging to groundwater resources. Any spills or leaks would be contained by containment berms, which would be designed to hold 100% of chemical container. The closest groundwater monitoring well (approximately 400 ft. to the north/northeast) has a depth of 110 ft. This monitoring well would continue to be sampled according to existing protocols. SNL/CA would continue to comply with NPDES requirements as necessary. Because of the depth to groundwater at this location, the low permeability layers of soil, and the established procedures and best management practices, impacts to groundwater are not anticipated.

Surface Water

The proposed chloramine disinfection system involves modification of the existing water tanks area at SNL/CA. Construction activities would take place in previously developed and paved areas. There would be no loss of undisturbed open areas at SNL/CA. The SWPPP would be followed during construction activities. The proposed project would also follow the requirements of the Energy Independence and Security Act, which maintains the pre-development hydrological characteristics of the site (EPA 2009). During operations, the proposed project would involve the use of chloramination chemicals—aqua ammonia and sodium hypochlorite, which would be stored and used in compliance with SPCC regulations. Full secondary containment would be provided for these two new storage tanks.

Water releases are discussed in Section 4.1.2 as related to impacts to wildlife. During a release, water would be treated with a soluble de-chlorination product to neutralize chlorine. The rate of water released from the tanks would be controlled, to provide time for the water to absorb into the ground thus avoiding discharge into the arroyo. Therefore, because releases would be planned, controlled, de-chlorinated, and would contain low concentrations of ammonia, impacts to surface water would be avoided. The proposed project would have no significant impacts to surface water.

4.1.5 Noise

The onsite and offsite acoustical environments may be impacted during construction of the disinfection system because of its proximity to the site boundary. Construction activities would generate noise produced by heavy construction equipment, trucks, and power and percussion tools. In addition, construction-related traffic would increase along regional transportation routes. Relatively continuous levels of noise would be produced by heavy equipment operations during the site preparation phase of construction. Construction related noise would occur during normal site working hours and may be noticeable offsite due to the proximity of the project site to the fence line. Average maximum noise levels (L_{max}) at 50 ft. from heavy equipment range from about 73 to 101 dBA (US DOT/FHWA 2006). The noise from trucks, power tools, and percussion would be sustained through most of the site construction and equipment installation activities. Construction noise levels would gradually decrease to the ambient background noise levels as construction neared completion, after which ambient background noise levels would return to preconstruction levels (55 to 65 dBA) (DOE NNSA 2003a). Operational noise would not change from the No Action Alternative.

The Occupational Safety and Health Administration (OSHA) sets the legal limits for workers' exposure to noise in the workplace. SNL/CA and LLNL implement practices to reduce noise and protect workers who may be exposed to excessive noise levels in compliance with OSHA standards.

4.1.6 Materials and Waste Management

LLNL would handle all wastes related to the construction and operation of the Proposed Action. During the construction phase, common construction materials, such as wood, metal, concrete, pipes, etc. would be utilized. During construction, the proposed project would generate approximately 150 metric tons of non-hazardous waste construction debris. The solid waste would be characterized according to established LLNL procedures before disposal in the local landfill. Hazardous waste is not expected to be generated.

During facility operation, approximately nine deliveries per year of 250 gal. of 10% Aqua Ammonia and 405 gal. of 12.5% of sodium hypochlorite would occur. The project is not expected to generate any additional municipal waste than what is currently generated in the No Action Alternative. The project may generate small amounts of non-recyclable hazardous or industrial wastes consisting of empty containers, etc. All wastes would be handled in accordance with established LLNL procedures and policies.

Considering the relatively small amounts of waste that would be generated and material needs, the project would not have a significant impact on LLNL material and waste management above the No Action Alternative.

4.1.7 Human Health and Safety

Implementation of the Proposed Action would not result in significant impacts on worker safety and health relating to the handling of hazardous materials and water quality above the No Action Alternative. LLNL would continue to implement procedures to manage worker safety and health. The water disinfection facility and chemical storage would continue to be regularly inspected by drinking water treatment and distribution system operators under the Proposed Action. Hearing protection programs and personal protective equipment would continue to be used for involved workers under the Proposed Action.

An evaluation of impacts on human health and safety resulting from reasonably foreseeable accidents is included in Section 4.1.8 of this EA.

4.1.8 Accident Scenarios and Intentional Destructive Acts

Implementation of the Proposed Action would have the potential to result in impacts on the environment, workers, or the public from accidents or intentionally destructive acts. Reasonably foreseeable accidents resulting from implementation of the Proposed Action could involve an accidental chemical release resulting from tank failure or refilling operations.

LLNL and SNL/CA use operational and engineering controls to limit the probability of an accident occurring. Implementation of the Proposed Action would

require the storage of hazardous materials onsite; however, quantities would be limited to 40-day supplies with reduced concentrations. Engineering controls to include double-walled tanks and piping and spill containment would reduce the potential for chemical release accidents. The aqua ammonia tank would be equipped with a conservation vent which would limit ammonia evaporation to only during refilling operations. Therefore, under the Proposed Action, the potential for and extent of tank failure accidents would not increase over the No Action Alternative.

Under the No Action Alternative, transportation of hazardous materials on roadways within SNL/CA is controlled through existing work planning and control requirements and hazardous materials safety requirements. The types of equipment used, vehicles driven, roadways used, and distances traveled onsite would be the same under the Proposed Action and No Action alternatives. Requirements for safe onsite transportation of hazardous materials would not change with implementation of the Proposed Action.

Intentional Destructive Acts (IDAs) are malevolent or malicious acts, and their assessments consider the potential impacts of terrorist acts derived from the Proposed Action, or that could occur with significantly greater probability as a result of the Proposed Action.

IDAs do not lend themselves to probability analysis. Likelihood of occurrence for IDAs vary over time by target type and region. Therefore, probability data for IDAs is generally unavailable. DOE estimates security risk as the product of vulnerability and consequence of asset loss, assuming the attempt to commit the IDA will occur. Vulnerability is the probability that an IDA would succeed against the array of protective measures around a given asset.

This analysis considered a broad range of IDAs. Malevolent acts targeting the facility could be perpetrated by a terrorist who has no other intent and no legitimate connection to the facility, but also by other individuals, including a knowledgeable insider. One could postulate that catastrophic damage or sabotage to the facility could be accomplished either by air or ground attack or by an individual gaining direct access to the facility. Scenarios involving abrupt or covert theft were excluded from consideration because the asset does not lend itself to such. Two types of threats were considered:

1) Facility damage or destruction from direct attacks resulting in chemical release.

2) Use of the facility as a point of entry to introduce contaminants to the water supply.

Each of these scenarios were evaluated against facility design and protection systems currently in place. Potential impacts from potential successful attacks were also evaluated. Given the low target attractiveness and physical protection

measures around the facility, no additional risks of IDAs were estimated resulting from the Proposed Action.

DOE NNSA also maintains the capability for timely and adequate response to an attack as well as to other emergency situations. Under the Proposed Action the comprehensive emergency management system would not change. Planning and preparing to respond to a variety of emergency situations would continue at SNL/CA under the Proposed Action.

Implementation of the Proposed Action would not result in significant impacts on the likelihood or outcomes of reasonably foreseeable accidents or intentionally destructive acts over the No Action Alternative.

4.1.9 Climate Change

Based on the anticipated increase in electrical use and vehicle trips, implementation of the Proposed Action would result in a negligible increase in the direct emissions of GHG from operations as described in Section 4.1.3 of this EA. However, the Proposed Action would not result in a significant contribution to GHG emissions in the region, as described in Section 4.1.10, *Cumulative Impacts*.

DOE NNSA has considered the immediate impacts on mission, workers, and physical property projected to result from climate change. DOE currently incorporates into its emergency response program a broad range of hazards and environmental aspects, potential consequences and lessons learned from simulated and actual emergencies. Existing procedures would be adequate to protect workers from potential extreme weather events including lightning events and extreme heat days. Implementation of the Proposed Action would not result in demands on facilities above the No Action Alternative. Therefore, ongoing maintenance and work involving routine upgrades would serve to protect existing assets against current extreme weather events, and begin to prepare for climate-related changes that may stress aging facilities.

Increases in air temperature may lead to changes in precipitation patterns, runoff timing and volume, sea level rise, and changes in the amount of irrigation water needed due to modified evapotranspiration rates. These changes may lead to impacts to California's water resources and project operations. While there is general consensus in their trend, the magnitudes and onset-timing of impacts are uncertain and are scenario-dependent (Anderson et al. 2008).

4.1.10 Cumulative Impacts

In accordance with the CEQ regulations, a cumulative impact is defined as 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 undertakes such other actions. Cumulative impacts can result from

individually minor, but collectively significant, actions taking place over a period of time (40 CFR Part 1508.7).

The cumulative impact analysis for this EA included a review of past, present, and reasonably foreseeable actions for other federal and non-federal agencies in Alameda county. Air quality and climate change are analyzed in relation to cumulative impacts in this EA. Past, present, and probable future projects considered in these cumulative impacts analysis include residential and industrial developments. Geographic areas considered are local and regional for air quality and climate change respectively.

Air Quality

Reasonably foreseeable actions in the region that would contribute to air quality issues include increased urban and residential development, increased traffic congestion, and increased industrial activities. Implementation of the Proposed Action would result in increased emissions of air pollutants above the No Action Alternative. These emissions would contribute to air emissions in the region. The Proposed Action would result in an increase in workers at LLNL above the No Action Alternative. Five to ten permanent employees would be added due to the Proposed Action. However, due to SNL/CA and LLNL's proximity to Interstate 580, a major commuter route within the East Bay, emissions from five to ten additional commuting vehicles would be negligible.

The Proposed Action would result in increased emissions from ammonia tank refilling operations. However, the approximate ammonia emissions resulting from implementation of the Proposed Action would be well below BAAQMD trigger levels. As described in Section 4.1.3, the standby generator would generate relatively small amounts of emissions and would operate within BAAQMD rules and regulations. As described in Section 4.1 Proposed Action, implementation of the Proposed Action would not result in impacts on socioeconomics or community services. Therefore, increases in air emissions from the Proposed Action would not result in disproportionate impacts on minority or low-income populations.

Climate Change

Reasonably foreseeable actions in the region that would contribute to impacts on climate change include increases in electrical power and direct fossil fuel use for residential development, and industry, and traffic. The Proposed Action would contribute to emission of GHGs by using electricity, and through operation of vehicles and a standby generator.

Implementation of the Proposed Action would result in a negligible increase in LLNL's GHG emissions over the No Action Alternative. In typical years under the No Action Alternative, LLNL's GHG emissions are approximately 130,000 metric tons of carbon dioxide equivalent (mtCO2e) annually. The Proposed Action would use an additional 130,000 Kilowatt-hours per year of energy, emitting

approximately 213,000 pounds of CO_2 per year (EPA 2017). Based on the assumption that one gallon of diesel would produce 22.4 pounds of CO_2, the typical standby generator for the project would emit approximately 2,700 pounds CO_2 per year for an estimated 50 hours per year of operations. Therefore, implementation of the Proposed Action would not substantially change LLNL's contribution to regional climate change over the No Action Alternative.

Reasonably foreseeable impacts on LLNL operations from projected changes in regional weather patterns and extreme weather events from climate change include stress on ageing facilities, and decreased reliability on regional water supplies. Implementation of the Proposed Action would introduce a modern facility with the purpose of maintaining drinking water quality despite regional stressors. Therefore, the Proposed Action would result in a beneficial impact on water resources over the No Action Alternative.

4.2 No Action Alternative

A No Action Alternative must be considered in all DOE NNSA EAs. The purpose of a No Action Alternative in the NEPA process is to provide a baseline against which impacts of the other analyzed alternatives can be compared. For the purposes of this EA, the No Action Alternative would continue current use of water received onsite at the SNL/CA water tanks from either the SFPUC's Hetch Hetchy Aqueduct System or Alameda County Flood Control and Water Conservation District Zone 7. No onsite water disinfection practices would occur.

The No Action Alternative would not result in impacts on the human environment outside of those previously analyzed under NEPA as described in the 2003 SNL/CA SWEA (DOE/EA-1422), the 2005 LLNL SWEIS (DOE/EIS-0348), the 2008 LLNL Complex Transformation SPEIS (DOE/EIS-0236-S3), the 2011 LLNL SA (DOE/EIS-0348-SA-03), and the 2012 SNL/CA SA (DOE/EA-1422-SA-01).

The No Action Alternative would not meet the necessary criteria, nor would it support the mission needs of DOE NNSA.

5.0 LIST OF AGENCIES AND PERSONS CONSULTED

In the process of preparing material for this EA, DOE NNSA had discussions with organizations and federal agencies including SNL/CA and LLNL.

No project-specific consultation with the U.S. Fish and Wildlife Service was conducted in compliance with the *Endangered Species Act* (ESA), as the Proposed Action and alternatives would not be expected to affect either individuals of threatened or endangered species or their critical habitat.

No consultation with the State Historic Preservation Office was conducted in compliance with the *National Historic Preservation Act* (NHPA) (16 U.S.C. § 470, 36 CFR 800.5), as the Proposed Action and alternatives would not be expected to affect any cultural resource.

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