DOE/EA-1849-S-1

SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

DOE Loan Guarantee Disbursement
Tuscarora Phase II Generating Facility

Department of Energy Loan Guarantee for ORMAT LLC's Tuscarora Geothermal Power Plant, Elko County, Nevada

U.S. Department of Energy
Loan Programs Office
Washington, D.C. 20585

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Supplemental Environmental Assessment DOE/EA-1849-S-1
DOE Loan Guarantee Disbursement for Tuscarora Phase II Generating Facility

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Acronyms and Abbreviations

Acronym	Acronym Meaning
BLM	Bureau of Land Management
BMP	Best Management Plan
CAPP	Chemical Accident Prevention Plan
CO_2e	Carbon Dioxide Equivalent
dBA	A Weighted Decibels
DOE	United States Department of Energy
EA	Environmental Assessment
EPMs	Environmental Protection Measures
FONSI	Finding of No Significant Environmental Impact
MOA	Memorandum of Agreement
NAC	Nevada Administrative Code
NDEP	Nevada Division of Environmental Protection
NDOM	Nevada Division of Minerals
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
SEA	Supplemental Environmental Assessment
SHPO	State Historic Preservation Officer
USACOE	United States Army Corps of Engineers

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1.0 INTRODUCTION

1.1 Background and Proposed Action

In 2011 DOE provided a loan guarantee to John Hancock Financial Services for Ormat Nevada, Inc. (OFC 2 LLC) to develop three geothermal power production facilities in northern Nevada, including the Tuscarora Geothermal Power Plant in Elko County, Nevada, located in the Independence Valley approximately 70 miles north of the town of Elko (see Figure 1). As part of the loan process DOE completed an Environmental Assessment (Final Environmental Assessment Ormat Nevada, Northern Nevada Geothermal Power Plant Projects (DOE/EA-1849), hereafter referred to as the EA). On August 19, 2011, DOE issued a Finding of No Significant Impact (FONSI) for a DOE loan guarantee for these projects.

The DOE EA described two development phases for the Tuscarora facility. Phase I construction was initiated in 2008 with the drilling of production wells, and Ormat Nevada, Inc. through its subsidiary ORNI 42 LLC (Ormat) began full-time operations at the facility in late 2011. The EA stated that if the geothermal resource at Tuscarora were found to be sufficient, the facility would be expanded in the future to include a second phase (Phase II) similar in capacity to Phase I. Recent Ormat exploration activities indicate that additional geothermal resources exist at Tuscarora. As a result, Ormat is proposing to construct, operate and maintain the Phase II geothermal facility. DOE is considering whether or not to allow financing of the project through a disbursement from the DOE loan guarantee. On August 14, 2013, DOE made a determination to prepare a Supplemental Environmental Assessment (SEA) (DOE/EA-1849-S-1) for proposed disbursement on the Federal loan guarantee for the Phase II Tuscarora facility.

At the Phase I Tuscarora plant, geothermal fluids are produced from wells located near the power plant; heat is extracted from the fluid and then reinjected into wells located north of the power plant (see Figure 2). The Phase II expansion would include new full-size production and injection wells, a new power plant, pipelines, and ancillary facilities. The wells would primarily be completed in previously unexplored areas located south and southwest of the power plant (see Figure 3). Both the Phase I and Phase II plant and associated wells and pipelines would be on private land leased from the Ellison Ranching Company (see Figure 4).

1.2 Purpose and Need for Proposed Action

The Purpose and Need for DOE's proposed disbursement is described at 1.3.1 in the 2011 EA, which is to assist in the financing of commercial-scale energy projects that avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases.

1.3 Tribal Consultation

On August 21, 2013, DOE provided notice to the Shoshone-Paiute Tribes of the Duck Valley Reservation and the Duckwater Shoshone Tribe of its intent to prepare the SEA, and invited the Tribes to consult on a government to government basis.

In September 2013, the Duckwater Shoshone Tribe responded that since the time of their consultation on Phase I, the Duckwater Tribal Council had decided that the traditional Tribal boundaries were more to the south of Elko County; the Tuscarora plant is not in this area. No concerns were expressed by the Shoshone-Paiute Tribes of the Duck Valley Reservation.

2.0 SCOPE OF ANALYSIS

2.1 DOE 2011 EA (DOE/EA-1849) and Summary of Affected Environment

This SEA provides additional information to the 2011 EA (DOE/EA-1849). Relevant information in the 2011 EA is not repeated in this document but references are included to assist readers. The 2011 EA is available at http://lpo.energy.gov/resource-library/.

2.2 Changes in Affected Environment

The only change in the affected environment since the 2011 EA has been construction and operation of the Phase I facility that has resulted in visual impacts, increased noise levels and excavation of archaeological sites. 46.3 acres were converted from ranchland for the Phase I facility. Figure 5 is a photo showing the existing Phase I plant and the proposed West Side location for a Phase II plant.

Phase I required treatment of three NRHP eligible sites[1] in the access corridor and at the plant site. Excavation and treatment of these sites was carried out in August 2011 pursuant to a 2010 Treatment Plan and archaeological data was recovered[2].

The existing Phase I Facility uses three geothermal production wells and six injection wells. The production wells, 65A-8, 65B-8, and 65C-8, are located next to each other on the south side of the power plant (see Figure 3). Each well is approximately 5,000 feet deep. Injection wells, 53-8, 72-8, 87A-5, 66-5 and 66A-5, are located between ¼- and ¾-mile north of the production wells, while injection well 57-8 is located 0.4-miles south of the plant. Numerous other exploratory wells and temperature gradient holes have been drilled in the area by both Ormat and previous site developers.

[1]Access Corridor 26EK10619 and 26EK10625; and Plant Site 26EK12461.

[2] Treatment was carried out pursuant to a June 2011 Memorandum of Agreement (MOA) between Bureau of Land Management, Elko District Office, Tuscarora Field Office and the Nevada Historic Preservation Officer and Ormat Technologies, Inc. regarding Tuscarora Geothermal Project. DOE was a signatory to this MOA.

2.3 Resource Areas Eliminated from Detailed Analysis

Since Phase II would not affect the geology of the Tuscarora site or demographic conditions related to Environmental Justice, these areas are not discussed in this SEA.

3.0 PHASE II PROPOSED FACILITY AND OPTIONS

Information that is common to all three options is discussed below in sections 3.1 through 3.4. The discussion at 3.4 only addresses areas where there are differences between options.

3.1 Generating Facilities

The basic technology for the generating facility, injection and production wells and pipelines is described in Section 2.1 of the 2011 EA. The proposed Phase II plant will have similar output to Phase I, but will be air-cooled instead of using water cooling towers. Because air-cooling fans require more space than a water cooling tower, the Phase II plant will have a slightly larger footprint but will use less water.

For all alternatives, power plant site construction would begin with clearing, drainage, fencing and other surface improvements. Clearing would include removal of organic material, brush and slash, which would be stockpiled onsite for interim reclamation purposes throughout the proposed facility area. The power plant site would be fenced for security and safety during construction, and throughout the life of the facility.

To the extent practicable, construction and operation of Phase II facilities would utilize existing roads and previously disturbed areas. Existing disturbed areas and well pads would be temporarily devoted to equipment and materials laydown, storage, construction equipment parking, small fabrication areas, office trailers and parking. Mobile trailers or similar suitable facilities (e.g., modular offices) could be brought to the site to be used as construction offices for owner, contractor, and subcontractor personnel, and would be located within the disturbed areas associated with power plant and well pad construction areas. Parking areas at the existing power plant would be used for construction workers and visitors. Temporary utilities would be provided for the construction offices, the laydown area, and the power plant. Area lighting would be provided for safety and security. Drinking water and toilets are available at the existing facility and additional temporary facilities may be brought on site. Unless precluded by safety requirements, power plant buildings, structures, pipe, etc. would be painted to blend with the existing equipment.

3.2 New Injection and Production Wells

For all Phase II options, Ormat is proposing to drill up to 6 more production wells and 5 injection wells, primarily south and southwest of the existing plant (see Figure 3). The likely production wells will include some combination of sites 35-8, 36-8, 27-8, 28-8, 21-17 or 55-8 as shown on Figure 6. Injection wells would be located on the far south end of the well field and could include 46-17, 35-17, 43-17, and 33-17 as shown on Figure 6. One site on the far north end of the Phase I field, 64-5, may also be used for injection.

A list of all existing and proposed full-size wells is provided in Table 1 below:

Table 1: Well Locations and Status

Well	Well Type	Date Completed	Depth (feet)	Section, ¼ ¼ (T41N, R52E)
Existing Full Size Wells				
57-8	Injection	1-Oct-07	5,387	S08,SWSE
65-8	Decommissioned	10-Jun-07	4,895	S08,SWSE
65A-8	Production	1-Aug-10	4,932	S08,SWSE
65B-8	Production	25-Nov-10	4,915	S08,SWSE
65C-8	Production	26-Apr-12	4,950	S08,SWSE
66-5	Injection	29-Apr-80	5,456	S05,NWSE
66A-5	Injection	13-Sep-10	6,352	S05,NWSE
87A-5	Injection	11-1-11	3,200	S05,SESE
72-8	Injection	17-Aug-07	5,679	S08,NENE
53-8	Injection	18-Nov-07	5,711	S08,NENW
Proposed Full Size Wells				
35-8	Production			S08,NESW
36-8	Production			S08,NESW
27-8	Production			S08,SESW
28-8	Production			S08,SESW
55-8	Existing pad Production			S08,NWSE
21-17	Production			S17,NENW
33-17	Production			S17,SENW
42-17	Existing pad and conductor injection			S17,NENW
43-17	Existing pad injection			S17,SENW
35-17	Injection			S17,NESW
46-17	Injection			S17,NESW
64-5	Injection			S5,SWNE

3.3 Plant Location

Three site options have been considered, as shown on Figures 6, 7 and 8, one northeast of the existing plant, and two to the northwest. The two options located west of Hot Creek are referred to as West Side Option 1 (Square) and West Side Option 2 (Narrow); they would both be in the same location but the facility configuration would be different. Access to the moderately sloping sites would be from the existing 66-5 well pad road. The other site option that was considered is referred to as the East Side option and is located just east of the 72-8 injection well pad. Figures 9, 10 and 11 show each of the proposed Phase II options as they would appear with the existing Phase I facility.

The main difference between the West Side facility options is the orientation and layout of the condenser fans. West Side Option 1 has two parallel rows of fans in a square shape, while West Side Option 2 has one longer row of fans in a narrow rectangular shape. Both West Side power plant options are shown on Figures 6 and 7. Only the square configuration as shown on Figure 8 is feasible for the East Side Option due to terrain restrictions.

All three power plant site options would be located entirely on private land near the existing Phase I plant. Access to the power plant from Elko is via State Route (SR) 225 to SR 226, and then northwest past the Spanish Ranch to the plant access road (Figure 1).

3.4 Options

3.4.1 West Side Option 1 (Square)

3.4.1.1 Plant Footprint

The West Side Option 1 (Square) plant would have a plant footprint of about 700 by 880 feet, or 14.2 acres. To fit this plant on the sloping hillside would require a relatively large cut and fill.

3.4.1.2 New Pipelines

As shown on Figures 6 and 7, pipelines to convey geothermal fluids to and from the West Side location would follow a new road that would be constructed from well 35-8, along the west side of a low ridge of hills west of Hot Creek. To access the proposed injection wells on the east side of Hot Creek, an injection pipeline would have to cross over Hot Creek. The pipeline(s) would be suspended above the creek and there would be no impacts to the creek bed.

Assuming all of the proposed production and injection wells are connected to the Phase II facility (including well 64-5 to the far north), approximately 12,000 feet of injection pipeline and 6,900 feet of production pipeline would be needed to convey geothermal fluid to and from the West Side Option 2 (Narrow) plant (18,800 feet total). The West Side Option 2 (Square) option would require an additional 1,125 feet of injection and production pipelines (21,000 feet total).

The geothermal fluid pipelines would be constructed from welded steel pipe set on aboveground supports. Pipe diameters would range from 8 inches to 24 inches.

Horizontal and/or vertical expansion loops (a square bend in the pipeline approximately 30 feet in length by 40 feet in width) would be constructed every 300 to 600 feet along the production pipelines. Expansion loops would allow the pipeline to flex as it lengthens and shortens due to heating and cooling. Fewer expansion loops would be needed along the injection pipelines, as the injection pipelines are subject to less temperature fluctuations.

Pipeline construction would begin by auguring 24-inch-diameter holes into the ground about eight to ten feet deep at approximately 30-foot intervals along the pipeline route. A steel pipe support, known as a "sleeper," is placed in the hole and concrete poured to fill the hole slightly above the ground surface. The steel pipe sleeper extends above the concrete, averaging approximately one foot above ground surface.

While the concrete is curing, the approximately 40-foot long steel pipe sections would be delivered and placed along the construction corridor. A small crane would lift the pipe sections onto the pipe supports and temporary pipe jacks so that they can be welded together into a solid pipeline. Once welded and the welds tested, the pipe would be jacketed with two to three inches of insulation followed by an aluminum sheath. Unless precluded by safety requirements, pipelines and power trays would be painted to match the existing pipelines, blend in with the surroundings, and minimize visibility, pursuant to BLM Instruction Memorandum (IM) 2007-021[3]. Electrical power and instrumentation cables for the wells would then be installed in cable trays mounted on the same pipe sleepers.

When completed, the top of the pipelines would average less than five feet above the ground surface and provide adequate clearance for high-flow events, floating debris, wildlife or livestock (Gold Book[4], Fourth Edition, Revised 2007). The top of some sections of the pipelines could be as high as seven feet above the ground surface to accommodate terrain undulations and to facilitate movement of wildlife and livestock through the well field. To facilitate livestock access to water, or at vehicle crossings, the pipelines may locally be buried. At road crossings, the pipelines would be constructed using the cut-and-fill method, where a trench would be cut through the road, a prefabricated, "U"-shaped, oversized pipe sleeve (containing the fabricated geothermal fluid pipeline with the insulation and metal cladding in place) installed in the trench, the excavated soil and rock backfilled and compacted around and above the oversize pipe sleeve, and the roadbed material repaired or replaced. Alternatively, the pipelines could be constructed across the roads on sleepers (as described above) and the roadbed run up and over the pipeline. This would entail constructing a concrete conduit over a pipeline where it crosses a road, then compacting soil on either side of the conduit sufficient to ramp the roadbed up and over the conduit to allow traffic to travel over the pipeline.

[3] Integration of Best Management Practices into Application for Permit to Drill Approvals and Associated Rights-of-Way

[4] 'Surface Operating Standards and Guidelines for Oil and Gas Development,' BLM

3.4.1.3 New Roads

New roads would have to be constructed adjacent to new pipelines for all three options. Roads with a single adjacent pipeline would have a long-term, 35-foot disturbance width, while roads with a double pipeline would have 40-foot disturbance width. The extent of new roads will depend on the selected power plant site. For both West Side options there would be between 14,000 and 15,000 linear feet of roads required, as opposed to 17,000 feet for the East Side option.

About 2,200 feet of spur roads would be needed from the ranch road to wells 33-17 and 35-17 and are included in Table 2 below. A two-track road that already exists to well 33-17 would be improved to allow full-size rig access. A new road would be built to access well 35-17.

Table 2 below summarizes the surface disturbance from pipelines and roads. This projection applies to both of the West Side configurations.

Table 2: Surface Disturbance Associated with Pipelines and Roads

Private Property	Length (feet)	Disturbance (acres)*	
		Short Term	Long Term
West of Hot Creek Plant Sites			
West Side Plant Option 1 (Square)			
Single pipeline/road	7,651	8.8	5.2
Double pipeline/road	5,188	5.9	4.8
Drill Roads only (no pipeline)	2,165	1.3	1.3
Totals	**15,004**	**16.0**	**11.3**
West Side Option 2 (Narrow) –same as Option 1, but with less pipeline disturbance			
Double pipeline/road	-1,124	-1.3	-1.1
Totals	**13,880**	**14.7**	**10.2**
East of Hot Creek Plant Site			
Single pipeline/road	9,249	10.6	6.4
Double pipeline/road	3,269	3.8	3.0
Drill Roads only (no pipeline)	4,521	2.6	2.6
Totals	**17,039**	**17.0**	**12.0**

*Road lengths and disturbance acreages are estimated from maps. Numbers may not add up due to rounding.

The figures in the table above account for all roads that would be located next to the pipelines. Some would involve new disturbance while others would include existing roads or would be on previously disturbed ground. For both the East and West Side options the 4,680 foot pipeline road from existing well 57-8 to well 46-17 would follow previously disturbed but reclaimed ground used by the makeup water pipeline. For the East Side option approximately half the length of 1,600 foot road from the plant to well 57-8 would also be along the previously disturbed pipeline route.

3.4.1.4 New Transmission Lines

No modifications will be needed to the existing 120 kV transmission line to support the additional capacity provided by Phase II. However, a short segment of new, 120 kV, overhead transmission line would be installed to connect the new Phase II facility to the existing line near the Phase I power plant. The line length would range between 2,000 and 2,700 feet, depending on the new plant's location and orientation.

3.4.2 West Side Option 2 (Narrow)

This is Ormat's preferred option for the Phase II project.

3.4.2.1 Plant Footprint

West Side Option 2 (Narrow) would have a plant footprint of 1,360 by 360 feet, or about 11.5 acres. Not only is the footprint of Option 2 less than Option 1, but this plant configuration/orientation could be fit largely within a linear bench of flat ground that exists between the creek and hillside. As a result, a much smaller amount of cut and fill grading would be required than would be needed for either Option 1 or Option 3.

3.4.2.2 New Pipelines

The discussion above at 3.4.1.2 also applies to this alternative except that this option would require about 1,125 feet less injection and production pipelines and associated roads (13,880 feet total).

3.4.2.3 New Roads

The discussion above at 3.4.1.3 also applies to this alternative.

3.4.2.4 New Transmission Lines

The discussion at 3.4.1.4 also applies to this alternative.

3.4.3 East Side Option

3.4.3.1 Plant Footprint

Because the footprint of the West Side Option 1 (Square) and the East Side Option is same, the discussion above at 3.4.1.1 for the West Side Option 1 (Square) also applies to this alternative. Because the site is located within a shallow swale, a large amount of cut and fill would be required to level the site and allow plant construction. In addition, because the site is at a higher elevation and is more exposed than either Options 1 or 2, it is assumed that noise impacts to surrounding areas would be greater.

3.4.3.2 New Pipelines

As shown on Figure 8, pipelines for the East Side Option plant would largely follow the existing roads and the makeup water pipeline route along the east side of Hot Creek. The production pipeline would have to cross Hot Creek at one location to access wells on the west side of the creek.

Assuming all of the proposed production and injection wells are connected to the Phase II facility (including well 64-5 to the far north) approximately 8,700 feet of production pipeline and 11,600 feet of injection pipeline would be needed to convey geothermal fluid to and from the East Side Option power plant (20,300 feet total).

3.4.3.3 New Roads

The East Side Option would require 17,000 feet of new roads as opposed to 14,000 to 15,000 for both West Side configurations. For the East Side option, approximately 2,400 feet of road would be constructed to access well site 35-8 on the west side of Hot Creek. Well Site 35-8 was recently the site of exploratory core drilling operations, and a two-track road exists that would be improved for full time access.

3.4.3.4 New Transmission Lines

The discussion at 3.4.1.4 also applies to this alternative, except that the estimated length of new line for this alternative is slightly less; about 1,700 linear feet.

3.5 No Action Alternative

For purposes of analysis DOE assumes that if loan guarantee funds are not disbursed to support Phase II then the Phase II expansion would not occur, although it is possible that financing could be found elsewhere. If Phase II is not built then Phase I will continue to operate as described in DOE/EA-1894 and in the Affected Environment section at 2.2 above.

4.0 ENVIRONMENTAL CONSEQUENCES RESULTING FROM FACILITY OPTIONS AND THE NO-ACTION ALTERNATIVE

Potential impacts to many resource areas would be identical or nearly identical from all options (except the No Action alternative) due to their close proximity, natural habitat, topography, and construction and best management practices. Therefore, this section will cover impacts for all options within resource subject headings rather than discussing alternatives separately.

Detailed noise modelling was only done for the West Side Options since the East Side Option is not the preferred option for the plant site due to site constraints, grading requirements, and assumed larger noise impacts.

4.1 Air Quality

Since Phase II will be similar in size and production to Phase I and will largely employ similar technology the additional emissions and impact are anticipated to be the same as discussed in Section 3.1.1.2 of the 2011 DOE EA. The use of air cooling in Phase II would result in fewer operational particulate emissions since a wet cooling tower, a source of particulate emissions, would not be utilized. The additional emissions are not expected to have a major adverse impact on air quality. Ormat will obtain an Air Quality Class II permit from the Nevada Division of Environmental Protection (NDEP) for fugitive emissions of pentane.

4.2 Land Use and Soils

Surface Disturbance

Surface disturbance falls into two categories: short term and long term. Short-term disturbance is temporary surface disturbance that would undergo interim reclamation once the area is no longer needed. Long-term disturbance would remain disturbed during the 35-year project life span. Areas of surface disturbance for the proposed facilities are described in the following sections. The nature and extent of the short- and long-term disturbance would be the same at each of the power plant sites.

Disturbance for the Phase II plant would depend on 1) the type and orientation of the selected plant, and 2) the topography of the site (i.e. more cut and fill, and thus more surface disturbance, could be required for some configurations). It is expected that long term disturbance for any plant type or location would be less than 15 acres.

Short term disturbance for all Phase II alternatives will be between 12 to 15 acres. The total permanent (long-term) surface disturbance for all Phase II facilities, including well pads, pipelines, roads and the plant site, will range between 53.8 and 54.5 acres. Table 3 below summarizes the acres of land disturbance associated with both Phases.

Table 3: Summary of Permanent Surface Disturbance

Description	Phase I (acres)	Phase II West Side Option 1 (Square)(acres)	Phase II West Side, Option 2 (Narrow)(acres)	Phase II East Side (acres)
Property Owner	Private	Private	Private	Private
Well Pads	19.3	27.5	27.5	27.5
Plant Site	20.0	15*	12*	15*
Roads, Pipeline/Road Construction	7.0	11.3	10.2	12.0
TOTAL	**46.3**	**53.8**	**49.7**	**54.5**

* Actual Plant site could range in size from 12 to 15 acres. The longer, narrow Option 1 plant (12 acres) would be constructed to the south, and the larger square plant (15 acres) to the north.

The impact on land use on the additional acreage from Phase II would be the same as that described at 3.1.14.1 of the 2011 DOE EA, which is conversion of grazing land to power generation facilities. The impact on soils on the additional acreage from Phase II would the same as that described at 3.1.3.2 of the 2011 DOE EA involving the impact to soil structure and compaction as a result of grading that could increase susceptibility to wind and water erosion. Based on the effects observed from Phase I, Phase II effects are not expected to be significant.

Up to 20,000 cubic yards of aggregate would be required to construct Phase II facilities. About 1,000 dump truck deliveries would be required to lay the aggregate material for construction would be obtained from private sources located on or near the Ellison Ranch. As much as possible, native materials (derived from grading to balance cut and

fill) would be used for power plant site and road building materials. Surfacing material may be needed for power plant, pipeline construction and well pads. Most gravel would be used for drill pads and roads with about 1,000 cubic yards per pad depending on soil conditions.

4.3 Water Resources

4.3.1 Water Supply

Water required for construction of the power plant and the associated pipelines (including earthwork, erosion control, concrete, finishing subgrade and aggregate base) would be obtained from the existing make-up water well field, for which Ormat has industrial-use water rights, or from other ranch sources.

Water requirements for well drilling would depend on subsurface conditions, but could range between 1,000 and 50,000 gallons per day (gpd). Additional water for dust control, construction and other operational requirements could increase this quantity depending on weather and other factors.

Ormat currently has sufficient water rights to meet both Phase I operation and Phase II construction and operation. Because Phase II would be air-cooled, no additional water supply wells will be required to operate that facility.

4.3.2 Surface Water

Impacts to surface waters are primarily associated with the potential for increased sedimentation to Hot Creek from surface disturbance adjacent to the creek. This impact would typically be controlled through implementation of best management practices (BMPs). With implementation of BMPs, sedimentation in Hot Creek would be minimized. In addition to reclamation activities described at 4.0 above, the following measures would be taken:

- Buffer zones will be established along water bodies to restrict access, thus minimizing potential impacts from erosion or other spills.
- Ormat has developed a stormwater management plan pursuant to Nevada Administrative Code (NAC) 445A.236, Stormwater General Permit NVR10000. The Stormwater General Permit covers construction and maintenance of all culverts installed on the access road, and BMPs for the drill pads and other disturbance. For Phase II development, the Stormwater Pollution Prevention Plan would be updated, as required by the permit.
- The solid contents in the sumps and reserve pits, typically consisting of non-hazardous, non-toxic drilling mud and rock cuttings, would be tested to confirm that it is not hazardous. None of the materials at existing Tuscarora drill sumps have been characterized as hazardous and it is expected that the contents from these operations will also be non-hazardous. If the test results indicate that these solids are non-hazardous, the solids will then be disposed in existing reserve pits. Ultimately, when these pits are reclaimed, the materials would dry by

evaporation, be mixed with the excavated rock and soil, and buried by backfilling the pit. Should contents be found to be hazardous they would be disposed of at an approved hazardous waste facility.

4.3.3 Geothermal Reservoir

The geothermal reservoir is not expected to be depleted by the new facility primarily because all of the geothermal fluid is reinjected back into the resource after heat extraction. The proposed plant would use a binary system, a closed system that transfers heat from the geothermal fluid to a motive fluid (n-pentane), without the geothermal fluid coming into contact with the motive fluid or the atmosphere.

The same mass quantity of fluid pumped from the geothermal aquifer is thus returned to the geothermal aquifer. There is a potential for the hot water in the geothermal reservoir and associated surface waters to cool over the life of the project. Cooling of the resource is dependent on the underground heat source, which is heating the fluid and the depth to which the cooled fluid is injected. Cooling of the geothermal resource has the potential to shorten the life of the project. Careful modeling of the geothermal reservoir will help to prevent excessive cooling through reservoir monitoring and management.

4.3.4 Groundwater

The Phase I facility is water-cooled, and uses five makeup water wells that deliver groundwater to the plant cooling towers. The Phase II facility would be air-cooled and no additional groundwater supplies would be required to operate the Phase II facility.

4.4 Vegetation and Invasive Non-native and Noxious Weeds

Operation of the Phase II plant and related ancillary facilities would result in the disturbance of approximately 43 to 46.3 acres of vegetation out of the 53.8 to 54.5 total acreage required, since 15 to 20% of this land has already been disturbed as a result of Phase I facilities. Reclamation of previously vegetated areas is discussed at 3.1.5 in the 2011 EA.

In collaboration with the Nevada Department of Wildlife (NDOW), Ormat has developed and implemented a Noxious Weed Control Plan that restricts vehicle traffic to defined roads or overland travel routes to reduce potential mechanical transport of noxious weed seeds. Ormat also uses herbicides to control weeds at Tuscarora well pads.

4.5 Wildlife

Wildlife conservation measures that would be in place for Phase II are the same as those addressed for Phase I at 2.1.7.3 and 3.1.8.2 in the 2011 EA. They include:

- Trash and other waste products would be placed in containers with covers to prevent access by wildlife. The waste will be collected by a local sanitation company and properly disposed of at the City of Elko landfill.
- A 15-mph speed limit would be maintained on the access roads leading to the drill sites.

- Employees and contractors would continue to be prohibited from carrying firearms on the job site to discourage illegal hunting and harassment of wildlife.
- An underground pipeline crossing for big game may be constructed if necessary, at a location to be determined by NDOW in consultation with ORMAT.
- ”Dark skies” lighting would be used at the facility to minimize the impact of nighttime artificial light on wildlife.

Based on these measures it is not anticipated that the Phase II will have any major impact on wildlife in the facility area (also see Sections 4.6 and 4.9).

4.6 Threatened, Endangered and Sensitive Species

Section 3.1.8.2 of the 2011 EA addressed three Threatened, Endangered and Sensitive species that have been observed within or near the Tuscarora facility. These include: Vesper Sparrow (BLM Sensitive), Sandhill Crane (BLM Sensitive) and the Greater Sage-Grouse which is the US Fish and Wildlife Service has designated as a candidate species for endangered species listing.

The 2011 EA determined that the impact from Phase I on the Vesper Sparrow would be minor and that there would be no impact on the Sandhill Crane. The same circumstances would apply for Phase II.

Measures identified in the 2011 EA to protect the greater sage grouse would also apply for Phase II since habitat for the greater sage grouse is present throughout the Tuscarora facility area. A Greater Sage Grouse Conservation Measures Implementation Plan was prepared by Ormat, BLM, NDOW and DOE and is included as Appendix A to the 2011 EA. The Plan provided a number of measures to protect sage grouse, which Ormat would abide by during Phase II. The additional surface disturbance for Phase II would require additional mitigation funding, the formula for which will follow that established for Phase I. Seeps, springs, and associated meadows on public lands surrounding the Tuscarora Facility are important sage-grouse brood rearing habitat. To reduce potential impacts, ORMAT will undertake the following measures:

- Comply with seasonal drilling restrictions, including lekking season restrictions.
- Roads and pads will be flagged to limit the areas that can be driven over.
- Drill pad sizes will be kept as small as possible to minimize surface disturbance.

As discussed at 4.9 below, measures will be implemented as a part of Phase II to control noise sources that might affect greater sage grouse leks.

4.7 Cultural Resources and Native American Religious Concerns

As part of Ormat’s Phase I implementation, field cultural surveys were completed for the area that will include the proposed Phase II project area. Phase II drill sites were selected in part to avoid identified cultural resource sites. Further, most pipeline routes east of Hot Creek will follow the existing makeup water pipeline route that was treated (artifacts

collected and documented) where it crossed through eligible sites. Several sites that were found eligible for the National Register of Historic Places were mitigated as part of the Phase I project. However, one site that was not previously treated (mitigated) would be affected by the proposed Phase II.

Accordingly, to address this previously untreated site, in 2013 DOE initiated a second Amendment to the Memorandum of Agreement (the MOA) between the Bureau of Land Management, Elko District Office, Tuscarora Field Office (BLM), DOE, the U.S. Army Corps of Engineers, Sacramento District (USACE), the Nevada State Historic Preservation Officer (SHPO) and Ormat Technologies, Inc. (Ormat) regarding the Tuscarora Geothermal Project Phase II. The Amendment was subsequently signed by BLM, DOE, USACE and the SHPO and filed with the Advisory Council on Historic Preservation made final on June 9, 2014.

The MOA Amendment 2 adds additional measures related to Phase II expansion at Tuscarora. These measures will avoid or mitigate adverse effects to a National Register eligible property identified as 26EK9860. This site straddles the private land / BLM land boundary and contains Native American artifacts. The private land portion would d be unavoidably damaged by Phase II pipeline construction, but there would no impacts to the BLM portion of the site. Accordingly, the new MOA Section X, Conditions of the Loan Disbursement for Tuscarora Phase II, requires that Ormat engage a cultural resource management firm to complete the recordation and recovery of historic artifacts as outlined in a Historic Preservation Treatment Plan[5] that has been accepted by DOE and BLM in consultation with the SHPO. Under the terms of the MOA this Plan includes, but is not limited to, mitigation of archaeological sites, artifact processing, writing summary and final reports of findings, and curation of artifacts. No collection, excavation, or other treatment activity will take place on the BLM portion of site 26EK9860. The BLM portion of the site will continue to be recorded as an eligible site.

In addition to the requirements of the MOA for Ormat Phase II, Ormat would do the following in carrying out Phase II:

- Survey the property boundary and secure or modify the existing fence between the private land portion of site 26EK9860 and the BLM property. The BLM section would not be affected by construction or treatment plan activities and this would protect the remaining eligible site.
- Avoid identified eligible and potentially eligible cultural resource sites that have been identified in site surveys whenever possible during design, construction, and operation of the Project.

[5] Ormat contracted with P-III Associates, Inc. to produce the 'Mitigation Plan for Site 26EK9860, Independence Valley, Elko County, Nevada which was completed in August 2014 and accepted by the SHPO September 22, 2014. In order to protect information on site-specific locations the Plan is not included in this SEA.

- A flagged buffer zone of approximately 30 meters would be established around all eligible cultural resource sites during construction only. Project equipment and facilities would not encroach into the buffer zone.
- For sites where impacts cannot be avoided, a mitigation plan would be developed and implemented to meet the requirements of the State Historic Preservation Office and the BLM.
- Erosion control methods would be employed to prevent run-off that could affect nearby cultural sites.
- ORMAT would limit vehicle and equipment travel to established access routes and construction areas.
- Any unplanned discovery of cultural resources, items of cultural patrimony, sacred objects or funerary items would require that all activity at the find cease, and the appropriate contact at the State Historic Preservation Office and Advisory Council on Historic Preservation be notified immediately by phone with written confirmation to follow. The location of the find would not be publicly disclosed. Any human remains would be secured and preserved in place until the SHPO issues a Notice to Proceed.
- All eligible and potentially eligible sites would be protected from entry during operations.

Prior to conducting field work on the Tuscarora Geothermal Project in 2011, the BLM consulted with American Indian tribes to identify any concerns with the proposed undertaking. No concerns were expressed. In August 2013, the DOE contacted the Duckwater Shoshone Tribe and the Shoshone-Paiute Tribes of the Duck Valley Reservation regarding plans for Phase II. In September 2013, the Duckwater Shoshone Tribe responded that since the time of their consultation on Phase I, the Duckwater Tribal Council had decided that the traditional Tribal boundaries were more to the south of Elko County; the Tuscarora plant is not in this area. No concerns were expressed by the Shoshone-Paiute Tribes of the Duck Valley Reservation. The site also is not known to have long-term preservation value, such as a traditional cultural property of cultural or religious importance to an Indian tribe based on the consultation efforts of the concerned federal agencies. There were no historical associations or groups identified that would be interested in the project. No interested parties have been identified except Ormat, DOE, BLM, USACE and the SHPO.

4.8 Waste and Hazardous Materials

Section 2.1.7.6 of the 2011 EA addressed risks from the use of pentane as the working fluid in the generation cycle. The EA explained that due to the flammability of pentane and the quantity on-site, Ormat is required to comply with Nevada Chemical Accident Prevention Program (CAPP) permitting requirements. Phase II will double the use of pentane over that currently used in Phase I. Ormat will continue to comply with CAPP requirements for both facilities; these requirements are summarized below:

- Through the accident prevention program, facilities are required to evaluate and mitigate hazards, understand the design parameters of their processes and operate within the appropriate design limits, prepare comprehensive operating procedures, thoroughly train operators in those procedures and maintain the facility equipment and instruments to prevent failure.
- Through the emergency response program, facilities are required to develop an action plan for dealing with potential emergency situations and they are further required to coordinate emergency response activities with local responders, to ensure that the responders are prepared to deal with the emergencies appropriately.

Section 2.1.7.6 also addresses emergence response and capability to handle hazardous materials required for a Permit to Construct. These requirements will also apply for Phase II construction.

4.9 Noise

At Section 3.1.12 of the 2011 EA, projected noise levels from the operation of Phase I facilities and equipment were analyzed and predicted for the potential impacts on 10 Sage Grouse lek sites in the Hot Springs Complex. It was found that the Phase I facility would have a noise impact greater than 10 decibels (dBA) above background on five (5) of the sites. Accordingly, environmental protection measures (EPMs) were set out in Appendix A of the EA to manage noise levels over time so that levels would be at or below 35 dBA (ambient 25 dBA plus 10 dBA) at active leks during the lekking period (March 15 – May 15, from 1 hour before sunrise to 10 am). If monitoring determined that noise levels at the monitored leks would be greater than 35 dBA during the period from 12 am to 5 am, and that exceedances were due to power plant operations rather than natural conditions such as wind or weather, one or more of several contingent conservation measures would be implemented. These measures are set out in detail at Appendix A of the 2011 EA, Greater Sage-Grouse Conservation Measures Implementation Plan.

Lek monitoring over the past year has shown only rare occurrences when noise exceeded the 10 dBA-above-background threshold at two of the monitored leks. The events were determined to be the result of unusual atmospheric conditions comprised of very cold temperatures and no wind. This combination allowed certain sound frequencies to travel greater than normal distances.

The noise originated from the three production well pump motors, and Ormat is investigating methods to reduce their noise output (barriers, etc.). As of the date of this SEA, Ormat has sought and received building permits to install sound barriers around the pump motors. The sound barriers will be constructed during the third quarter of 2014 and subsequent sound monitoring will determine their effectiveness.

Sound model projections were made in March 2014 by JBR Environmental Consultants to estimate potential impacts from West Side Option 2 (Narrow), which is the preferred option. The sound levels shown in Table 4 below include both Phase I and Phase II sources. Noise sources added to the model included 135 cooling tower fans, four pentane turbines, two generators, and six production wells (35-8, 36-8, 27-8, 55-8, and 21-7).

The receptors include known active and inactive sage-grouse leks located up to two miles from these noise-generating components.

Table 4 shows results both with and without noise controls that were already incorporated into planned project design. The results in Table 4 are presented as Ldn and Leq for A-weighted sound. The Ldn is the A-weighted equivalent sound level for a 24-hour period where an additional 10 dB is imposed on the equivalent sound levels for night time hours. The Leq is a single value of sound level for any desired duration. For this project, the Leq is the more important of these two metrics because lek activity for greater sage-grouse occurs during the daylight hours. A-weighting takes into account the human ear's sensitivity to certain frequencies.

As can be seen for three leks (HS-Hot Springs, HS16 and HS9) the expected noise levels of Phase II and Phase I are projected to result in an increase of more than 10 dBA even with noise controls on production wells, and therefore additional noise reduction measures will have to be implemented. The largest single noise source is the Phase I cooling towers. To reduce the overall sound impacts from adding Phase II to the Tuscarora facility, Ormat will develop barriers to reduce noise generated by the cooling towers, which should reduce noise levels from the combined Phase I/Phase II facility to levels called for in the Sage Grouse Conservation Plan.

Table 4: Modeled Noise Impacts to Lek Sites

Receptor Name	Terrain Height (meters)	Distance (feet)[1]	Ambient (12am-5am)	Phase II Without Noise Control				Phase II with Noise Controls on Production Wells				Difference with Noise Control
				Predicted Sound Level	Day Night Level	Predicted and Ambient	Overall Change	Predicted Sound Level	Day Night Level	Predicted and Ambient	Overall Change	
			L90 dBA	Leq[2] dBA	Ldn[3] dBA	Leq dBA	dBA	Leq[2] dBA	Ldn[3] dBA	Leq dBA	dBA	dBA
Control	1,845	9,100	25	23.7	30.1	27.4	2.4	23.6	30.0	27.4	2.4	0.0
HC Harrington Creek	1,862	10,500	25	23.5	29.9	27.3	2.3	23.4	29.8	27.3	2.3	0.0
HS Hot Springs	1,774	4,150	25	40.6	47.0	40.7	**15.7**	37.4	43.8	37.6	**12.6**	3.1
HS16 Hot Springs 16	1,788	2,400	25	41.8	48.2	41.9	**16.9**	40.8	47.2	40.9	**15.9**	1.0
HS18 Hot Springs 18	1,785	7,250	25	31.2	37.7	32.1	7.1	30.6	37.0	31.7	6.7	0.4
HS9 Hot Springs 9	1,797	3,900	25	35.1	41.5	35.5	**10.5**	35.0	41.4	35.4	**10.4**	0.1

[1]Distance from the center of the geothermal plant (x = 571,030; y = 4,590,750).
[2]Average Energy Equivalent Sound Pressure Level (dBA).
[3]Day Night Level (24 hour level, 10 dB penalty for night time period 10 pm - 7 am) (dBA).

4.10 Socioeconomic Resources

Project construction could require up to 65 workers, although substantially fewer would be on site most of the time during construction, as the construction activities would be staged. Construction of the power plant and well field facilities would take approximately 12 to 24 months to complete once all permits are obtained and equipment orders are scheduled. It is anticipated that the construction workers would reside in Elko, or at local RV Parks**.**

Drill rigs will operate 24-hours a day, except during seasonal restrictions. Depending on the rig and well type, between 8 and 18 drillers/workers would be on location at any given time. The drilling crews would likely stay in local RV parks or Elko hotels, but may live in self-contained portable trailers on the private property. The drilling supervisor typically sleeps in a trailer on the active drill site. It is anticipated that 2 new permanent employees would be required for operation, with additional staff brought in during maintenance activities.

The increase in employment as a result of Phase II would not result in major regional socioeconomic change, but there will be some benefit to Elko businesses and to Elko County as a result of increased tax revenue.

4.11 Human Health and Safety

As discussed in the 2011 EA at section 3.1.17, the primary health and safety concerns would be work related accidents and fire risk, particularly related to the use of pentane as a working fluid. As with Phase I, Ormat would take the following measures to minimize the likelihood and impact of fire:

- All construction and operating equipment will be equipped with applicable exhaust spark arresters.
- Fire extinguishers will be available on-site. Water for drilling and dust control will be available for firefighting.
- Personnel will smoke only in designated areas, and will be required to follow Ormat policy regarding smoking.
- The BLM Elko District Office (775-753-0200) will be notified of any wildland fire, even if the available personnel can handle the situation or the fire poses no threat to the surrounding area. Additionally, the Elko Interagency Dispatch Center will be notified (775-748-4000).
- A list of emergency phone numbers will be available on-site.
- All vehicles will carry a shovel and a conventional fire extinguisher.
- Adequate fire-fighting equipment (diesel motorized fire pump and dedicated fire water system approved by the Elko County Fire Marshall, a shovel, a Pulaski, standard fire extinguisher(s), and an ample water supply) will be kept readily available at a minimum of five locations at the facility.
- Vehicle catalytic converters (on vehicles that enter and leave the site on a regular basis) will be inspected often and cleaned of all flammable debris.

- All cutting/welding torch use, electric-arc welding, and grinding operations will be conducted in an area free, or mostly free, from vegetation. Fire extinguishers, an ample water supply, and shovels will be on hand to extinguish any fires created from sparks. At least one person in addition to the cutter/welder/grinder will be at the work site to promptly detect fires created by sparks.

4.12 Transportation

As mentioned above, the Phase II facility would require up to 65 workers to enter and exit the site during construction, and 2 employees during operation. Truck deliveries of construction materials and equipment would also have to enter and exit the site via existing roads. Construction and upgrades of well pad and pipeline access roads has been discussed earlier. The existing public and facility access road system would be more than adequate to handle the projected increase in traffic.

4.13 Visual Resources

Phase II would not alter the existing visual quality of the Tuscarora site. The site contains the existing power plant, wells, and pipelines. Figures 9 through 11 show each of the Phase II facilities as they would appear along with the existing Phase I facility**.**

4.14 Climate Change

Greenhouse gases (GHGs) are chemical compounds in the earth's atmosphere that trap heat. GHGs allow sunlight to enter the atmosphere freely, but limit the amount of infrared radiation (heat) that bounces back into space after striking the earth's surface. Most studies indicate that the earth's climate has warmed over the past century due to increased emissions of GHGs, and that human activities affecting emissions to the atmosphere are likely an important contributing factor. Computer-based modeling suggests that rising GHG concentrations generally produce an increase in the average temperature of the Earth, which may produce changes in sea levels, rainfall patterns, and intensity and frequency of extreme weather events. Collectively, these effects are referred to as climate change (National Energy Information Center 2008). The Intergovernmental Panel on Climate Change (IPCC), in its Fourth Assessment Report, stated that warming of the earth's climate system is unequivocal and that warming is very likely due to anthropogenic GHG concentrations (IPCC 2007). DOE is not aware of any methods to correlate exclusively the CO2 emissions resulting from the proposed action to any specific impact to global warming. ; however, studies such as those performed by IPCC support the premise that CO2 emissions from the Ormat Tuscarora facility, together with global GHG emissions, would likely result in a cumulative impact to global warming.

Section 3.1.1.2 of the 2011 EA concluded that small quantities of naturally occurring non condensable gases (carbon dioxide (CO2), hydrogen sulfide (H2S), nitrogen (N_2) and methane (CH_4)) would be emitted as a result of the Tuscarora facility. Carbon dioxide, nitrous oxide, and methane are greenhouse gases. However the EA concluded that such emissions would be extremely small relative to state, national, and global greenhouse gas emissions and that any resultant effects would also be extremely small and could not be reliably estimated. Phase II would only marginally increase these emissions and the conclusion above would also apply to the combined Phase I/Phase II project. As discussed below, the combined project would also

reduce greenhouse gas emissions since the facility will allow utilities to fulfill mandatory state renewable energy requirements and assist in meeting any growth in demand for electricity with far fewer GHG emissions than an equivalent capacity fossil fuel-fired generator.

The 16 MW (net) Phase II facility is expected to produce approximately 140,000 gross megawatt hours per year (MW-hrs/year). The GHG emissions decrease that would result from the expected 25-year operation of this proposed renewable energy project has been estimated using the eGRID estimate (EPA 2012) of CO_2e (carbon dioxide equivalent)[6] emissions per megawatt hour (MWh). For a binary geothermal plant, such as at Tuscarora, there are essentially no CO_2, SO_2, or NOx emissions, although a small amount may be released from the geothermal reservoir itself (see Table 5). A coal-fired power plant, emits approximately 2,095 pounds/MW-hr.

Table 5: Estimated CO_2 and Greenhouse Gas Emissions

Table 1. Comparison of Geothermal and Fossil Fuel CO2 Emissions. *

	Geothermal	Coal	Petroleum	Natural Gas
Emissions (lbs. CO2/kW-hr)	0.20	2.095	1.969	1.321

Table 2. Geothermal "Greenhouse Gas" Emissions

	CO2	H2S	CH4	NH3
Emissions (lbs./kW-hr)	0.20	1.87E-04	1.66E-03	1.39E-04

* Weighted average for all types of geothermal power plants. Actual CO_2 emissions from a closed-loop binary plant would be significantly less than shown above. At Tuscarora, CO_2 would only be emitted from the geothermal resource during well testing.

Source: Bloomfield, K. Kit, Joseph N. Moore EGI, and Robert M. Neilson Jr. "Emissions from Geothermal Energy Facilities are Insignificant Compared to Power Plants Burning Fossil Fuels." in Geothermal Resources Council Bulletin, March/April 2003 Issue.

Using the factors shown in Table 5, which are average values for all types of geothermal power plants and which overestimate the emissions from binary plants, the project's emissions would be an estimated 12,700 metric tons per year of CO_2e emissions and 318,000 metric tons of CO_2e emissions over the plant lifetime. A coal-fired plant of the same capacity would emit 133,076 metric tons CO_2 annually.

Assuming that the capacity of the Phase II Project displaces electricity produced by conventional fossil-fueled power plants, the potential estimated project-related reduction is about 120,372 metric tons of GHG emissions annually or an estimated total displacement of more than 3 million metric tons of GHG over the 25-year life of the project.

[6] A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the global warming potential associated with the gas.

There would also be GHGs emitted as a result of construction and transportation activities related to the facility. The GHG emissions generated by construction activities would be short-term (over the construction period of 1 year). Based on studies previously completed for the Wister Geothermal Project in Imperial County, California, the total GHG emissions that would be generated from construction of the Phase II project are estimated at 7,790 metric tons of CO_2e[7]. Annualized over the life of the project, the GHG emissions generated from Phase II construction activities would be equivalent to approximately 312 metric tons of CO_2e per year.

A potential impact to the proposed project from increased temperatures related to climate change would be the need for additional cooling capacity in order for the project to operate at maximum efficiency because the facility will be air-cooled. Another impact related to expected increases in temperature and drier conditions is the potential increase in brush fires. Though brush fires have occurred in the vicinity of the project, and could have serious consequences to plant operation, they have never directly threatened the facility. However, notwithstanding unforeseen, catastrophic events, the expected effects of climate change would likely have minimal impacts on the project during its 25-year expected lifetime.

4.15 Intentionally Destructive Acts

As explained at 2.1.7.7 of the 2011 EA, DOE believes that the Tuscarora facility is an unlikely target for intentionally destructive acts and would have an extremely low probability of being attacked. Since the proposed Phase II facility will be on the same remote site as the Phase I facility and the same protective measures would apply, it is anticipated that Phase II would not raise the likelihood of an intentionally destructive act.

4.16 Seismic Impacts

The 2011 EA at 3.1.2.2 explained that the Phase I facility was not expected to induce seismic events because the project was designed to balance geothermal reservoir pressures, not increase them or induce rock fracture as is the case with some other geothermal projects. To date there have been no seismic events associated with the Phase I Tuscarora facility. Phase II would involve the same geothermal technology as Phase I and therefore would not be likely to induce seismic events.

4.17 Cumulative Impacts

Section 4.0 of the 2011 EA addressed the cumulative impacts of the Phase I Tuscarora plant and related facilities, including an 18 mile transmission line, access roads, and wells. Possible expansion of the Tuscarora facility was also mentioned. The discussion of activities discussed in the 2011 EA Section 4.2.1, Past, Present and Reasonably Foreseeable Future Activities, has

[7] ORNI 21 LLC Geothermal Project, Draft Environmental Impact Report. Prepared by Ecology and Environment Inc. for County of Imperial, California, Department of Planning and Development Services. Attachment C-6, Assessment of Greenhouse Gas Emissions

not been affected by any events since 2011. Nor would construction and operation of Phase II create any major change in the projected cumulative impacts as summarized in Section 4.

4.18 No Action Alternative

If Phase II is not built then Phase I will continue to operate as described in DOE/EA-1849 and there would be no additional impacts beyond those described in DOE/EA-1849. Greenhouse gas reductions described at 4.14 above would not occur.

5.0 RECLAMATION

All disturbed areas resulting from Phase II will be reclaimed in accordance with the requirements of BLM Geothermal Resource Regulations at 43 CFR 320. Interim reclamation will be carried out throughout the life of the facility to the extent practicable. Final reclamation, which will occur at the time of facility decommissioning after the projected 35 year lifespan of the facility, will involve plugging and abandonment of the wells, and removal of all associated equipment. Ormat has an irrevocable letter of credit reclamation bond with the BLM and a separate bond with the Nevada Division of Minerals (NDOM) to ensure decommissioning and reclamation are carried out. Ormat currently meets all State and Federal bonding requirements.

At the end of project operations, all aboveground facilities and areas of surface disturbance associated with geothermal development would be removed and reclaimed. Ormat would implement a site reclamation plan that addresses restoration of surface grades, surface drainage, and revegetation of cleared areas. Stormwater diversion would remain in place until successful revegetation is attained.

The power plants and all other above-ground facilities and areas of surface disturbance associated with geothermal development would be removed and reclaimed. Any stormwater diversion would remain in place until successful revegetation is attained.

Reclamation of roads would include recontouring to the original contour, seeding and controlling noxious weeds. Reclamation may include other techniques to improve reclamation success, such as ripping, scarifying, replacing topsoil, pitting and mulching.

Portions of cleared well sites not needed for operational and safety purposes would be recontoured to a final or intermediate contour that would blend with the surrounding topography as much as possible. Areas able to be reclaimed would be ripped, tilled, or disked on contour as necessary. Any stockpiled topsoil and organic materials would be spread on the area to aid in revegetation, and the area reseeded with the appropriate seed mix. Following the abandonment of a well, access roads and well pads would be reclaimed. Each well pad and road would be disked and graded, if necessary, to decompact the soil, turn under any applied gravel, and restore grade.

At the end of facility operations, wells would be plugged to ensure that fluids would not move into different aquifers and then abandoned. The well head (and any other equipment) would then be removed, the casing cut off below ground surface and the hole backfilled to the surface.

The solid contents remaining in each of the reserve pits from earlier well drilling, typically consisting of non-hazardous, non-toxic drilling mud and rock cuttings, would be tested for pH, metals, and total petroleum hydrocarbon or oil and grease concentrations to confirm that they are

not hazardous. If the test results indicate that these solids are non-hazardous, the solids would then be mixed with the excavated rock and soil and buried by backfilling the reserve pit. The stockpiled topsoil will be smoothed over the back-filled basin and reseeded. Wells that are found to have no commercial potential may continue to be monitored over the life of the facility, but would eventually be plugged and abandoned in conformance with the well abandonment requirements of BLM and Nevada Division of Minerals.

6.0 CONSULTATION AND COORDINATION

This Supplemental EA was prepared by the DOE as NEPA Lead Agency in consultation with the BLM Tuscarora Field Office, Elko, Nevada. Information and analysis in this SEA is based on review of Ormat files, existing published information, computer modeling, field reconnaissance, field surveys and technical input from Ormat staff.

6.1 Preparers

United States Department of Energy

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Mark Hanneman	Environmental/Regulatory Affairs Administrator

6.2 Persons, Groups, or Agencies Contacted

Ormat

Nevada State Historic Preservation Office

BLM

Shoshone-Paiute Tribes of the Duck Valley Reservation

Duckwater Shoshone Tribe

FIGURE 1: GENERAL LOCATION MAP

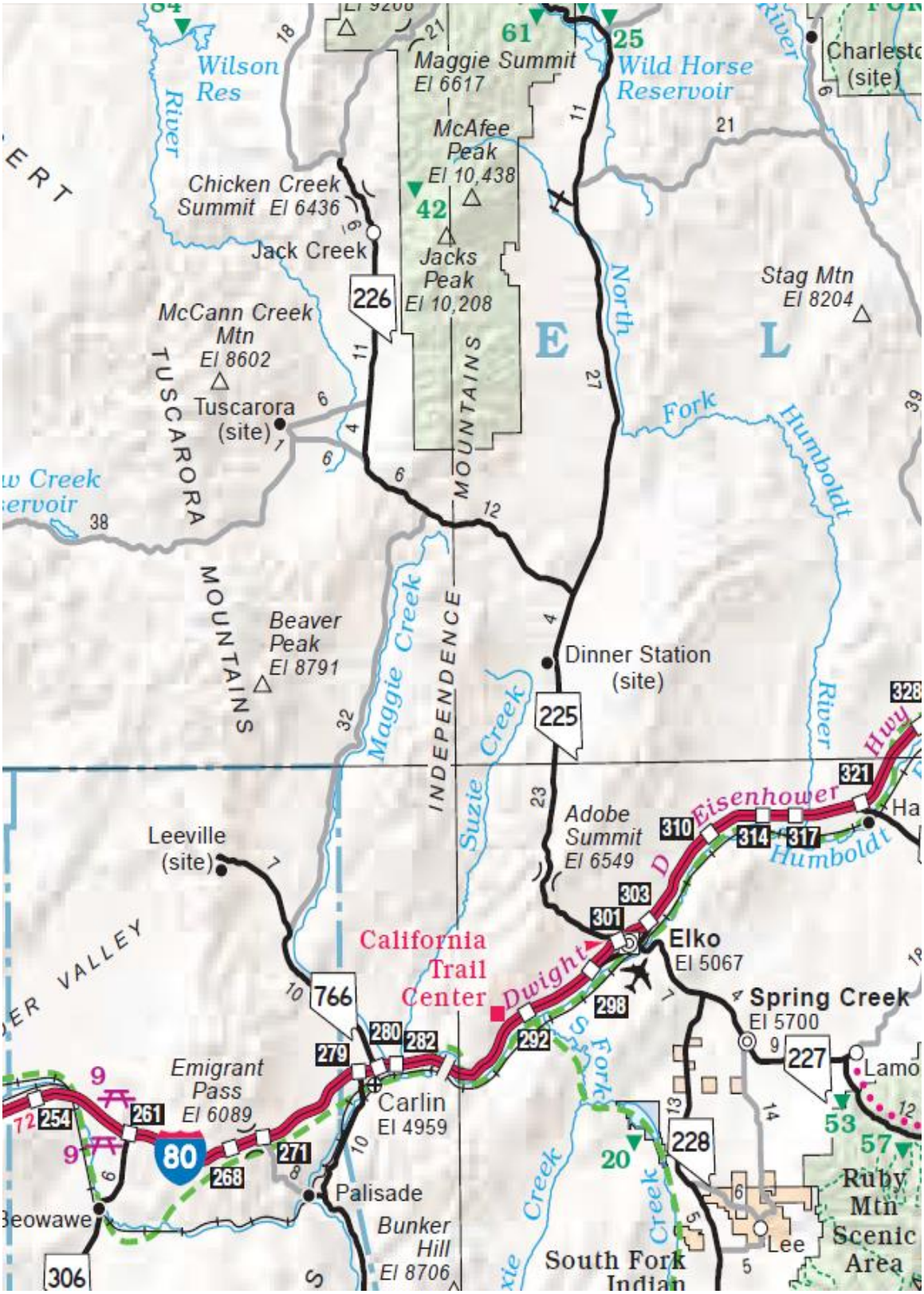

FIGURE 2: EXISTING WELL MAP

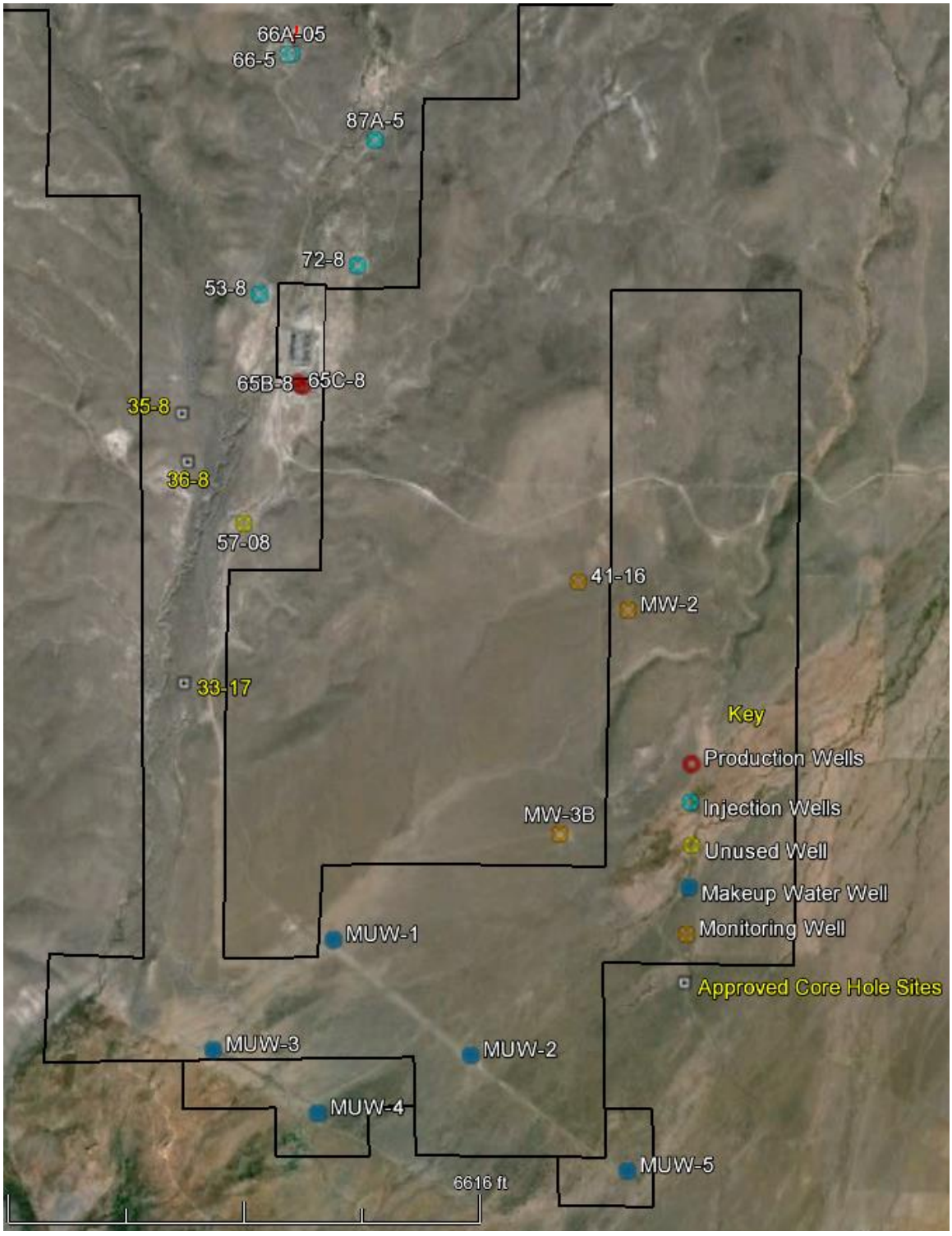

FIGURE 3: PHASE II AND EXISTING WELLS

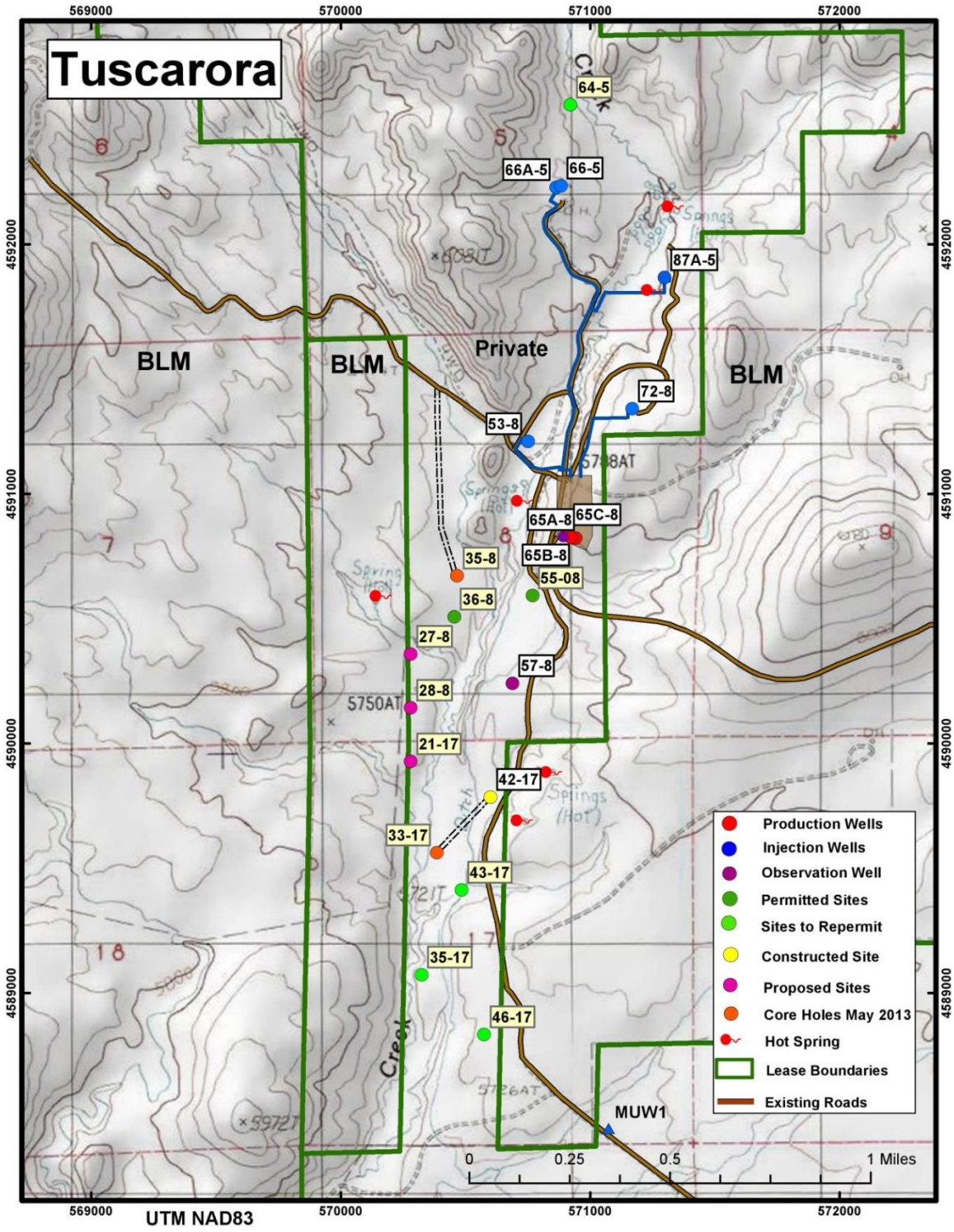

FIGURE 4: PROPERTY MAP

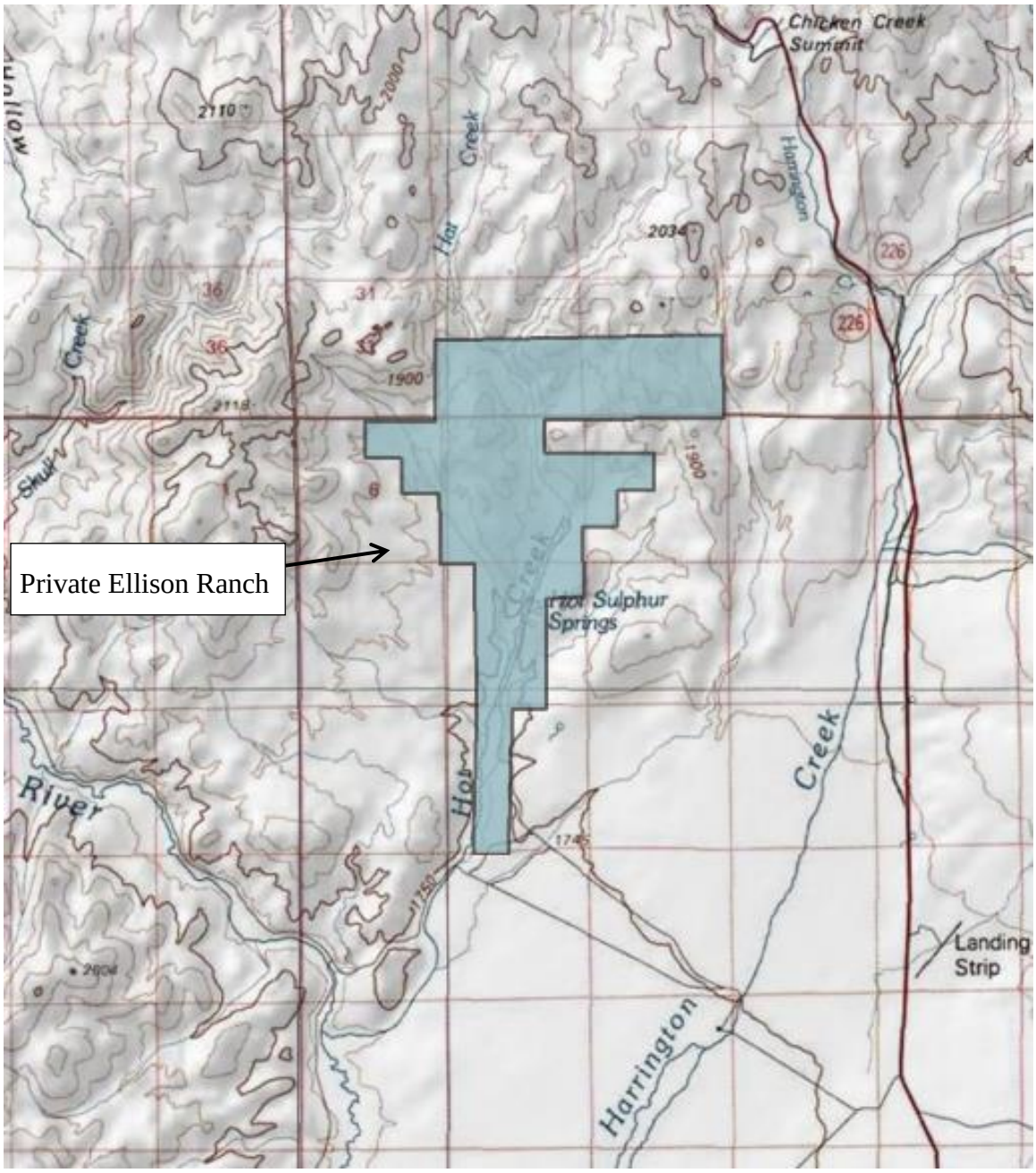

FIGURE 5: EXISTING PHASE I PLANT AND LOCATION WEST SIDE, PHASE II OPTION

FIGURE 6: WEST SIDE OPTION 1 (SQUARE) & PIPELINE CORRIDORS

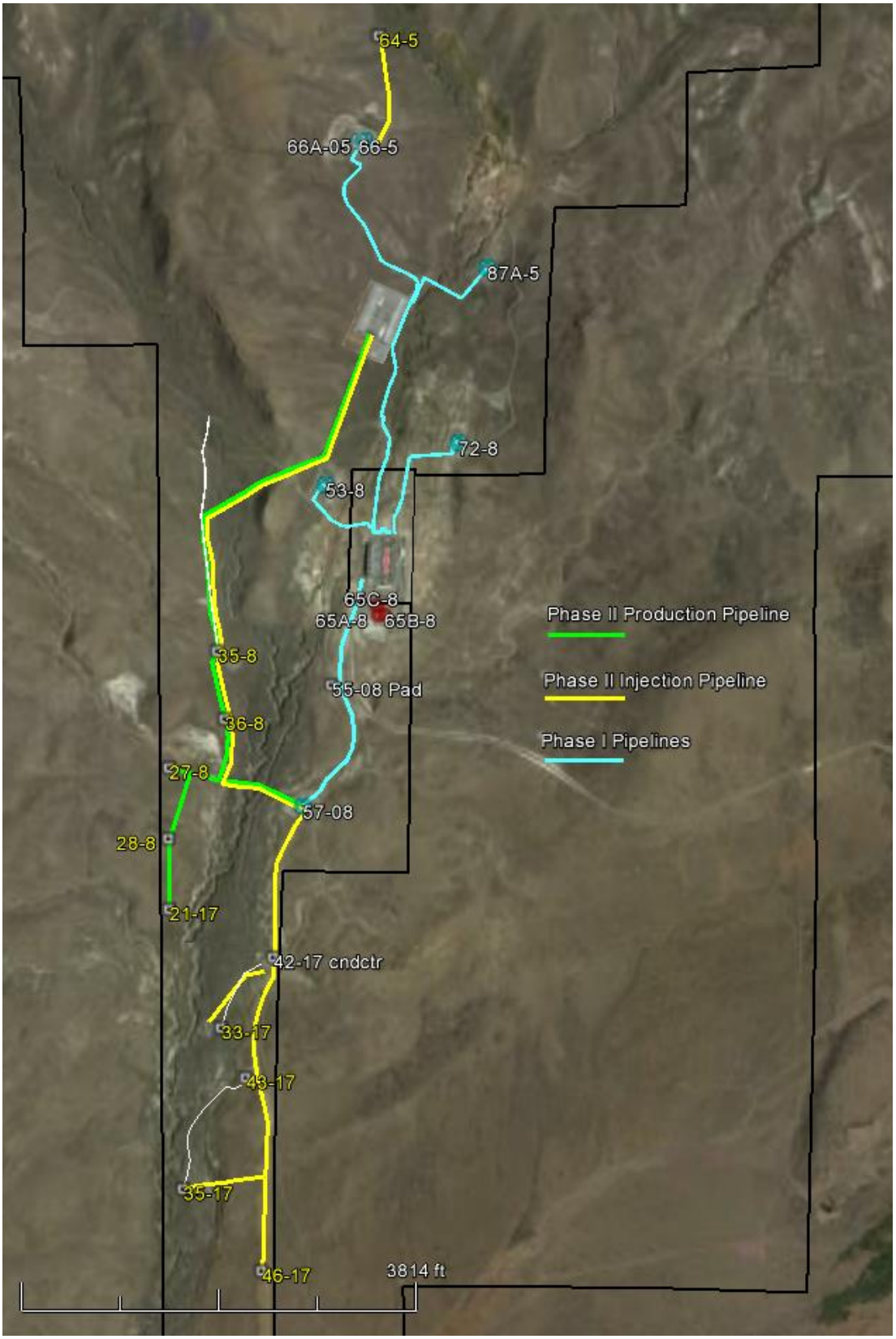

FIGURE 7: WEST SIDE OPTION 2 (NARROW) & PIPELINE CORRIDORS

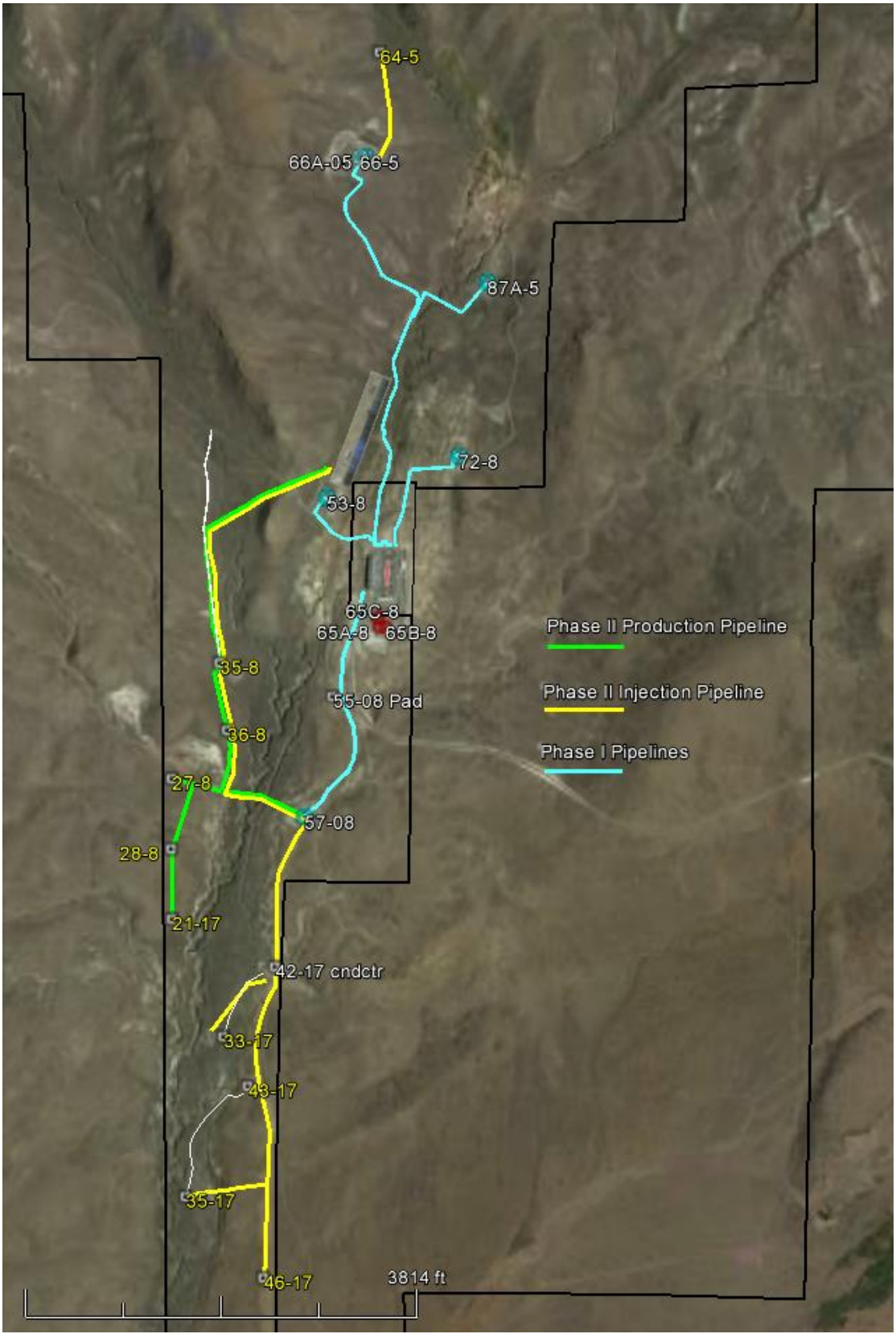

FIGURE 8: EAST SIDE POWER PLANT & PIPELINE CORRIDORS

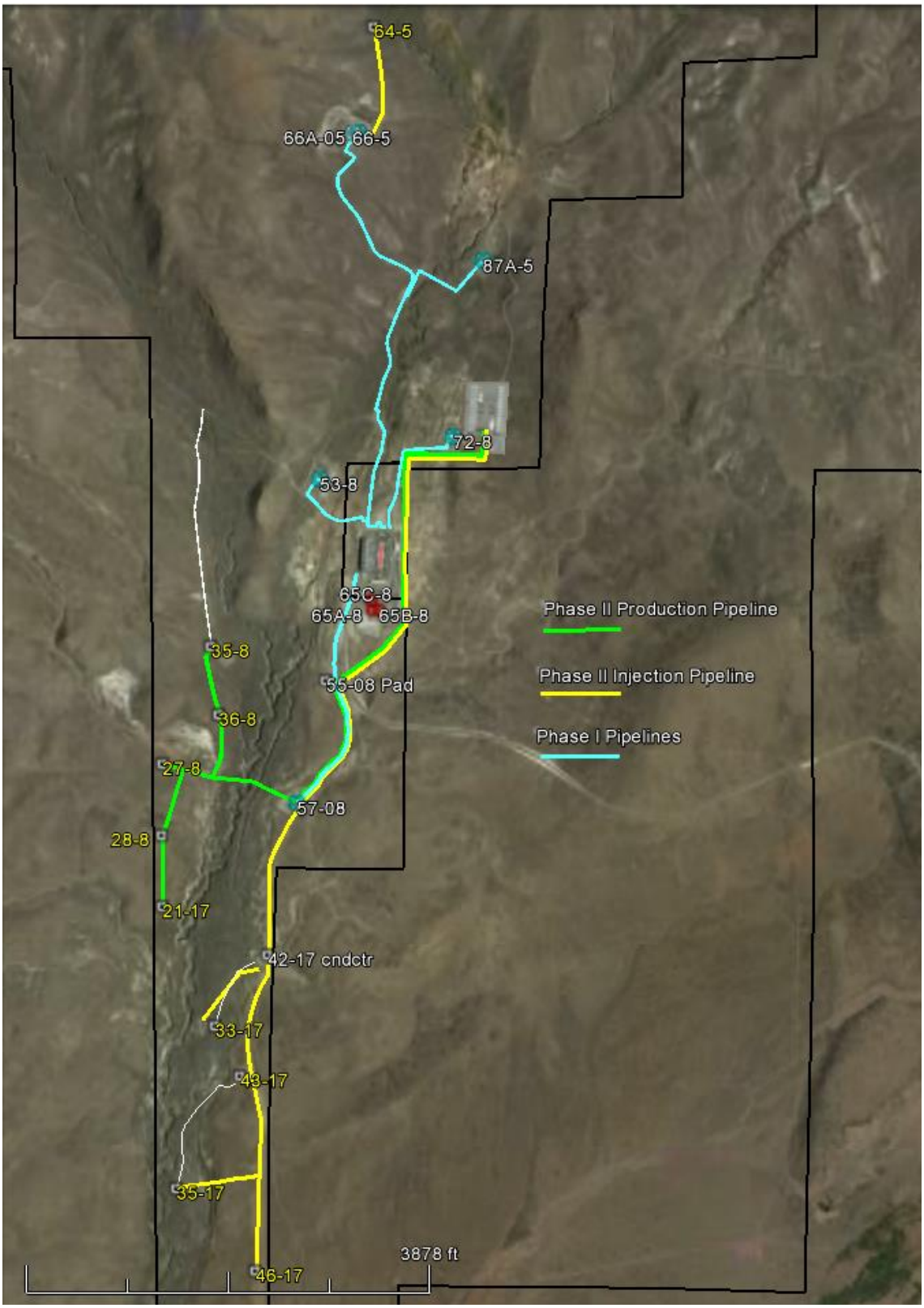

FIGURE 9: WEST SIDE OPTION 1 (SQUARE) WITH EXISTING PHASE I FACILITY

FIGURE 10: WEST SIDE OPTION 2 (NARROW) WITH EXISTING PHASE I FACILITY

FIGURE 11: EAST SIDE OPTION WITH EXISTING PHASE I FACILITY