DRAFT **FINAL APPLICATION FOR LICENSE**
OF MAJOR UNCONSTRUCTED PROJECT

EXHIBIT F
GENERAL DESIGN DRAWINGS OF PRINCIPAL PUBLIC WORKS

LAKE ELSINORE
ADVANCED PUMPED STORAGE PROJECT
FEDERAL ENERGY REGULATORY COMMISSION
PROJECT NUMBER 14227

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EXHIBIT F

GENERAL DESIGN DRAWINGS OF PRINCIPAL PROJECT WORKS

As required under 18 CFR 4.41(g), "Exhibit F consists of general design drawings of the principal project works described under paragraph (b) of this section (Exhibit A) and supporting information used as the basis of design. If the Exhibit F submitted with the application is preliminary in nature, applicant must so state in the application. The drawings must conform to the specifications of Sec. 4.39.

(1) The drawings must show all major project structures in sufficient detail to provide a full understanding of the project, including:

   (i) Plans (overhead view);

   (ii) Elevations (front view);

   (iii) Profiles (side view); and

   (iv) Sections.

(2) The applicant may submit preliminary design drawings with the application. The final Exhibit F may be submitted during or after the licensing process and must show the precise plans and specifications for proposed structures. If the project is licensed on the basis of preliminary designs, the applicant must submit a final Exhibit F for Commission approval prior to commencement of any construction of the project.

(3) Supporting design report. The applicant must furnish, at a minimum, the following supporting information to demonstrate that existing and proposed structures are safe and adequate to fulfill their stated functions and must submit such information in a separate report at the time the application is filed. The report must include:

   (i) An assessment of the suitability of the site and the reservoir rim stability based on geological and subsurface investigations, including investigations of soils and rock borings and tests for the evaluation of all foundations and construction materials sufficient to determine the location and type of dam structure suitable for the site;

   (ii) Copies of boring logs, geology reports and laboratory test reports;

   (iii) An identification of all borrow areas and quarry sites and an estimate of required quantities of suitable construction material;

   (iv) Stability and stress analyses for all major structures and critical abutment slopes under all probable loading conditions, including seismic and hydrostatic forces induced by water loads up to the Probable Maximum Flood as appropriate; and

   (v) The bases for determination of seismic loading and the Spillway Design Flood in sufficient detail to permit independent staff evaluation.

(4) The applicant must submit two copies of the supporting design report described in paragraph (g)(3) of this section at the time preliminary and final design drawings are

submitted to the Commission for review. If the report contains preliminary drawings, it must be designated a 'Preliminary Supporting Design Report.'"

1.0 Introduction to Resubmitted Project

The proposed Lake Elsinore Advanced Pumped Storage Project (the "Proposed Project") described herein is largely identical to the project described in the Final Environmental Impact Statement prepared by the Federal Energy Regulatory Commission ("Commission") and the U.S Forest Service[1] ("FEIS") for project number P–11858. Much of the described material provided in this application has been extracted from this FEIS. The FEIS and materials submitted in docket P–11858 are incorporated by reference into this Application.

As noted in the introductory sections of the other application Exhibits, this application contains updated and enhanced information prepared to meet the needs of the State Water Resources Control Board and the requirements of the California Public Utilities Commission ("CPUC") in their role as the lead agency for the environmental review of the project as required under state environmental law. The CPUC imposes extraordinary rigorous standards on applicants to submit all relevant information required for their analysis. This included the requirement for the Company to develop a much more detailed project description and a "Proponent's Environmental Assessment" ("PEA"). The PEA serves as the basis for creation of an EIR, much like the Commission can use an environmental assessment (or applicant prepared draft EIS) as the basis for its own EIS. This link is to the CPUC's web site where Nevada Hydro's application may be found. AS a result, this application contains a significant amount of detailed information that augments what was available in the Final EIS.

The project described in the FEIS included a connection point to the Talega–Escondido 230 kV line that was within Camp Pendleton. This location and drawings thereto have been referenced in the other Exhibits, and are not included here. As noted, because of the hazards involved in locating major infrastructure within an active military exercise area, the Applicant has moved this connection point to a location to the north to a new site within the Cleveland National Forest ("Forest"), immediately adjacent to the Talega–Escondido corridor. The Forest's acknowledgement may be found in the Attachment Section to this filing (Forest Service Letter on Substation Use). Drawings associated with this new location are included in this Exhibit. This new location represents the only modification to the project described in the FEIS.

2.0 Drawings of Major Structures

A number of drawings have been prepared to show the major project structures. They are available in the Attachment Section. They include:

(i) Proposed Site Plan

(ii) Powerhouse drawings and cross–sections

[1]/ Federal Energy Regulatory Commission and United States Department of Agriculture, United States Forest Service, Trabuco Ranger District, Final Environmental Impact Statement for Hydropower License – Lake Elsinore Advanced Pumped Storage Project, FERC Project No. 11858, FERC/EIS-0191F, January 2007.

(iii) Profile of project penstock alignment

(iv) Upper reservoir site plan

(v) Enhanced and more detailed electrical and engineering drawings for substations (

(vi) Detailed maps covering the entire scope of the project, including primary transmission connections to the interconnected grid.

(vii) A detailed "workbook" prepared in cooperation with personnel of the Cleveland National Forest ("Forest") identifying and assessing all project facilities to be located on Forest land.

(viii) Fully executed agreements with area utilities which allow project power to be transmitted to the interconnected grid, including detailed description of engineering required for the project and within the interconnected grid.

A detailed project description is also available in the Attachment section

3.0 Design Drawings

Preliminary design drawings are in the process of being prepared, subject to additional geotechnical and other studies. According to the requirements of 18 CFR 4.41(g)(2), these drawings will be available no later than "during or after the licensing process" but prior to the commencement of construction.

4.0 Preliminary Supporting Design Report

A preliminary supporting design report is intended to document the geological conditions, stability calculations, supplementary data and other background information that has been developed to date. The Applicant has chosen to rely on the information contained in the FEIS to meet this Commission requirement. A final supporting design report will be provided at the conclusion of additional geotechnical and other studies, and when detailed engineering and design has been completed.

4.1 Site Suitability

Please see the FEIS and PEA for descriptions of site geological conditions at locations of the major project works. The Applicant believes that the description of the project contained in the FEIS adequately supports the suitability of the site for the proposed project

4.2 Logs and Geologic Reports

Copies of logs and reports prepared by the Applicant's geotechnical consultant, Genterra, may be found in the Attachments section of this application, under "Supporting Design Reports.

4.3 Construction Materials Sites and Estimates

This section provides material that will supplement that contained in the FEIS developed for the CPUC's use in their evaluation of the Project.

For the purposes of this discussion, the Project consists of two components: the pumped hydro component and the electrical components associated with the primary line connecting the facility to the gird. Construction activities for each would include establishment of staging areas for materials and equipment, development of access roads and spur roads to reach construction sites and development of support staging areas. All construction activity areas are designated on figures referenced individually in the following discussion.

4.3.1 General Approach to Project Construction

For the gen–ties, new tower construction would include clearing of footing locations, installation of foundations, tower assembly, and tower erection. After towers are in place, crews would proceed with stringing of conductor and overhead ground wires. Construction would be completed with clean-up of construction sites and demobilization of personnel and equipment. The exact construction methods employed and the sequence with which construction tasks occur would be dependent on final engineering, contract award, conditions of permits, and contractor preference.

For the pumped storage component, construction activities would include clearing and laydown area preparation for materials and equipment, excavation spoil temporary and permanent disposal area clearing, grading and drainage construction, upper reservoir clearing and overburden stripping for the reservoir and embankment foundations, and general construction trailer set-up with utilities, temporary fencing, and parking areas. Areas for disposal or stockpile areas for natural earth stripping materials would be identified or temporary stockpile areas would be designated in the event that the stripping materials are re-used in the construction of the dam. Tunnel spoil stockpile or disposal areas will also be cleared and graded to drain off and around the spoils.

Temporary construction support facilities such as temporary office trailers and parking areas would be established. Temporary utilities would be established near the tunnel outlet area and at the upper reservoir, with local sources of power, telephone, water, and sanitary facilities provided. If local utilities are unavailable, all power will be provided by portable generators, and all water and sanitary facilities would be supplied and serviced remotely.

In general, construction efforts would occur in accordance with accepted construction industry standards. Construction activities above ground generally would be scheduled during daylight hours (7:00 A.M. to 5:00 P.M.), Monday through Saturday. Underground construction may proceed round-the-clock, Monday through Saturday or under an alternate extended schedule, if permitted. When different hours or days are necessary, the Applicant would obtain variances, as necessary, from the jurisdiction in which the work would take place. All materials associated with construction efforts would be delivered by truck or helicopter to established staging and material laydown areas. Delivery activities requiring major street use such as Grand Avenue or Ortega Highway would be scheduled to occur during off-peak traffic hours.

Previously disturbed areas would be used during construction wherever possible. Once sites for construction areas are proposed, biological and cultural resource reviews would be conducted before final site selection. The size of individual construction areas would vary from a fraction of an acre to up to as much as 10 acres, depending on its purpose for construction. In addition to construction materials and equipment, these areas may contain trash and recycle bins. Preparation of the construction areas will including site clearing and grubbing, site grading and drainage preparation, and in all cases, the implementation of Storm Water Pollution Prevention Plan (SWPPP) best management practices.

The following sections provide more detailed information about the construction tasks that would be associated with the overall Project.

4.3.1.1 Primary Staging Areas

Primary staging areas would be used to stage equipment and materials during the gen–ties construction activities. Materials and equipment typically staged at these staging areas would include, but would not be limited to, tower steel bundles, tubular steel poles, spur angles, palletized bolts, rebar, wire reels, insulators and hardware, heavy equipment, light trucks, construction trailers, and portable sanitation facilities. Also, material that would be removed from existing transmission lines during work associated with the Talega Escondido reconductoring efforts and new steel pole construction for the relocation of the 69 kV line will require staging areas. Dismantled construction materials such as conductor, steel, concrete, and other debris would be temporarily stored in designated areas as it awaits salvage, recycling, or disposal or directly loaded into transport to selected permitted facilities. All effort will be made to ensure that salvageable or recyclable materials will be recovered in accordance with state waste management guidelines.

The gen–ties would include several staging yards that would be selected based on accessibility to construction locations and proximity to transmission line and substation access roads.

Where possible, previously disturbed areas would be used. An area up to 5-10 acres in size and within 5 or less air miles of the tower locations is required for each primary staging area. In addition to construction materials and equipment, these staging areas may contain trash and recycle bins. Preparation of the primary staging areas would include the application of road base, installation of perimeter fencing, and implementation of SWPPP best management practices.

In addition to the primary staging areas, secondary staging areas would be established for short-term utilization near construction sites. Where possible, the secondary staging areas would be sited in areas of previous disturbance along the construction corridors. Final siting of these staging areas would depend upon availability of appropriately zoned property that is suitable for this purpose. The number and size of the secondary staging areas would be dependent upon a detailed ROW inspection and would take into account, where practical, suggestions by the successful bidder for the work. Typically, an area approximately 1 to 3 acres would be required. Once sites for secondary staging areas are proposed, biological and cultural resource reviews would be conducted before final site selection. Preparation of the secondary staging areas would include installation of perimeter fencing, and implementation of SWPPP best management practices. Application of road base may also occur, depending on existing ground conditions at the yard site.

4.3.1.2 Work Areas

Working areas for foundation, erection and string works will be established on the tower locations, and will be re-instated once the construction works are completed..

4.3.1.3 Access Roads and Spur Roads

Transmission line roads are classified into two groups: access roads and spur roads. Access roads are through roads that run between tower sites along an ROW and serve as the main transportation route along line ROWs. Spur roads are roads that lead from line access roads and terminate at one or more tower sites.

The gen–ties will require approximately 75 new spur and access roads. The majority of these features can be classified as spur roads, since they consist of short sections of new or improved road that branch off existing roads and do not follow the transmission line right-of-way. The locations of all spur and access roads are also shown on figures in the Attachment section to this Application.

This project includes construction on both existing ROW and new ROW. Where construction would take place on existing ROW, it is assumed that most of the existing access roads as well as spur roads would be used. However, it is also assumed that rehabilitation work would be necessary in some locations for existing roads to accommodate construction activities. This work may include:

Existing access and spur roads may be re-graded and repaired. These roads would be cleared of vegetation, blade-graded to remove potholes, ruts, and other surface irregularities, and re-compacted to provide a smooth and dense riding surface capable of supporting heavy construction equipment. The graded road would have a minimum drivable width of 12 feet and preferably a shoulder width of an additional 2 feet.

Drainage structures such as wet crossings, water bars, overside drains and pipe culverts would be installed to allow for construction traffic usage, as well as prevent road damage due to uncontrolled water flow. Slides, washouts, and other slope failures would be repaired and stabilized by installing retaining walls or other means necessary to prevent future failures. The type of structure to be used would be based on specific site conditions.

Where construction would take place in new ROW, which is particularly applicable to the gen–ties, new access and spur roads would be necessary to access the transmission line structure locations, unless these sites are initially designated as helicopter-access only sites. All proposed access roads will require review and approval by the Forest Service prior to construction. Biological and cultural surveys have been performed for all the proposed access roads as part of this PEA effort. Specific detailed environmental conditions are presented in Attachment 4.

Similar to rehabilitation of existing roads, all new road alignments would first be cleared and grubbed of vegetation. Roads would be blade-graded to remove potholes, ruts, and other surface irregularities, and re-compacted to provide a smooth and dense riding surface capable of supporting heavy construction equipment. The graded road would have a minimum drivable width of 12 feet (preferably with 2 feet of shoulder on either side). In addition, drainage structures (e.g., wet crossings, water bars, overside drains, pipe culverts, and energy dissipaters would be installed along spur and access roads to allow for construction equipment usage as well as to prevent erosion from uncontrolled water flow. Landslides, washouts, and other slope failures would be repaired and stabilized along the roads by installing retaining walls or other means necessary to prevent future failures. The type of mechanically stabilized earth-retaining structure to be used would be based on site-specific conditions.

It is anticipated that most of the roads constructed to accommodate new construction would be left in place to facilitate future access for operations and maintenance purposes. Gates would be installed where required at fenced property lines to restrict general and recreational vehicular access to road ROWs.

Construction roads across areas that are not required for future maintenance access would be removed and restored after construction is completed. An example of this type of road would be a road constructed to provide access to a splice location during wire-stringing operations. Splice locations are used to remove temporary pulling splices and install permanent splices once the conductor is strung through the stringing travelers located on transmission structures. Access roads to splice locations are sometimes required when a splice location is not accessible from an access or spur road.

4.3.1.4 Helicopter Use

In the event that there are no existing access roads, contractors would hike in or be shuttled to the tower locations by helicopter. Helicopters would be used to transport equipment to tower sites. Segments of LST towers will be preassembled in the staging areas and will be airlifted to the tower location, and erected on to the already prepared foundations. It is estimated that the helicopter would generally operate up to 8 hours per day, Monday through Friday. The operating area of the helicopters would be limited to helicopter staging areas, material and equipment staging areas, and positions along the utility corridors that have previously been used for this purpose and are safe locations for landing.

Use of helicopters for installation eliminates land disturbance associated with crane pads, structure laydown areas, and the trucks and tractors used for steel delivery to structure sites. Figures in the Attachment section to this Application show designated tower sites anticipated for helicopter-only construction. All construction work in remote work sites would be completed by hand with the assistance of portable compressors, portable hydraulic accumulators, and portable concrete mixers that would be flown into the tower sites. The use of helicopters for the erection of LSTs would be in accordance with the construction specifications and would be similar to methods detailed in IEEE 951-1966, Guide to the Assembly and Erection of Metal Transmission Structures, Section 9, Helicopter Methods of Construction. During helicopter operations, public access to defined areas would be restricted. Temporary road closures, traffic detours, and posted notices and signs would be used to restrict public access to construction areas.

Final siting of staging areas for the gen–ties would be conducted with the input of the helicopter contractor, and affected private landowners and land management agencies. The size of each staging area would be dependent upon the size and number of towers to be installed. Staging areas would likely change as work progresses.

Helicopter fueling would occur at staging areas or at local airports using the helicopter contractor's fuel truck, would be supervised by the helicopter fuel service provider, and SWPPP measures would be followed, as applicable. The helicopter and fuel truck would stay overnight at a local airport or at a staging area if adequate security is in place.

4.3.1.5 Vegetation Clearance

Minimal vegetation clearing will be performed as required for construction of the project components. Care will be taken to minimize soil disturbance during construction and restoration, plus for temporary construction disturbance, areas will be developed with agency concurrence as part of the design and mitigation process.

4.3.1.6 Erosion and Sediment Control and Pollution Prevention during Construction

In compliance with the CWA, site construction activities would be consistent with National Pollutant Discharge Elimination System (NPDES) program requirements, which would include development of an SWPPP for the site before construction commences. The SWPPP would focus on implementation of Best Management Practices and other actions during construction to protect the quality of waters near the construction site.

Construction of new substations and associated access roads would require earthwork activities. Construction sites would first be cleared of vegetation and loose rock and then graded to provide a near-level surface with site slope designed to collect and control drainage that minimizes surface erosion. Sites would be graded such that water would run toward the direction of the natural drainage. In addition, drainage would be designed to prevent ponding and erosive water flows that could cause damage to the tower footings.

Soils generated from the grading activities would be tested to determine if environmental contamination is present before soil removal for disposal. During grading operations, dust would be controlled by measures outlined in the SWPPP.

Construction debris from activities at each substation site would be placed in appropriate onsite containers and periodically disposed of per applicable regulations.

4.3.2 The Pumped Hydro Component

LEAPS will have an installed generating capacity of 500 MW and pumping capacity of 600 MW, provided by two single-stage reversible Francis-type pump turbine units operating under an average net head of approximately 1,500 feet. The facility will firm up and store renewable energy, primarily wind energy[2], and will be one of the most efficient storage facilities in the world, rated at approximately 83.3% net at the 500 kV primary levels.

[2]/ Pumped storage can minimize the system impact of integrating large volumes of intermittent wind resources into the power grid by absorbing electricity generation during high-wind periods that would otherwise cause operational problems for system operators. Pumped storage can be used in tandem with wind resources to shift delivery of wind energy from off-peak to on-peak period during the day and smooth out production spikes (Source: California Energy Commission, Integrated Energy Policy Report, CEC-100-2-5-007CMF, November 2005, p. 146).

Modern pumped storage units produce all five ancillary services. In addition, the unit and regulator designs provide fast response dynamics, tied directly to the intermittency of renewable products. Grid operations and protection designs must take in to account these grid-enhancing products, and make sure they are properly integrated into the CAISO controlled grid. Some ancillary products can be provided simultaneously, and regulation is provided both directions, (in generation and pumping modes).

The facility currently consists of two 250 MW Voith Siemens Hydro Power Generation synchronous generators, 600 MW of pump load, step-up transformers, and appurtenant facilities. This federal hydroelectric project is being licensed by FERC[3] (FERC P-14227) under the provision of the FPA and is being permitted by the Forest Service under the provisions of the National Forest Management Act (NFMA). Section 15(e) of the FPA (16 U.S.C. 808[e]) specifies that any license issued by FERC shall be for a term that FERC determines to be in the public interest but not less than 30 years nor more than 50 years from the date of issuance. A 50 year federal hydropower license, with the potential for subsequent relicensing for an extended term beyond 50 years, has been assumed herein.

The LEAPS facility will conform to and comply with FERC's "Engineering Guidelines for the Evaluation of Hydroelectric Projects."[4] As stipulated in Part 12 (Safety of Water Power Projects and Project Works) therein, the licensee must use sound and prudent engineering practices in any action relating to the design, construction, operation, maintenance, use, repair, or modification of a water power project or project works (Section 12.5). Requirements include the preparation of an "emergency action plan" (EAP) developed in consultation and cooperation with appropriate federal, State, and local agencies responsible for public health and safety and designed to provide early warning to upstream and downstream inhabitants, property owners, operators of water-related facilities, recreational users, and other persons in the vicinity who might be affected by a project emergency (Section 12.20). The EAP shall conform to FERC guidelines (Section 12.22) and must be filed no later than 60 days before the initial filling of the upper reservoir begins (Section 12.23).

Because the proposed upper reservoir's impoundment would be classified as a "high hazard dam" or "high hazard potential structure,"[5] the EAP will be developed in accordance with FERC[6]

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[3]/ FERC's authority to license hydropower projects is found in Part 1 of the FPA. Section 4(e) of the FPA (16 U.S.C. 797[e]) empowers FERC to issue licenses for projects that: (1) are located on navigable waters; (2) located on non-navigable waters over which Congress has Commerce Clause jurisdiction, were constructed after 1935, and affect the interests of interstate or foreign commerce; (3) located on public lands or reservations of the United States (excluding national parks); and/or (4) using surplus water or water power from a federal dam. Jurisdiction applies regardless of project size. Section 10(a)(1) of the FPA (16 U.S.C. 803[a][1]) establishes the comprehensive development standard which each project must meet to be licensed (Source: Federal Energy Regulatory Commission, Report on Hydroelectric Licensing Policies, Procedures, and Regulations – Comprehensive Review and Recommendations Pursuant to Section 603 of the Energy Act of 2000, May 2001, pp. 9-11).

[4]/ Federal Energy Regulatory Commission, Engineering Guidelines for the Evaluation of Hydroelectric Projects, April 1991, updated July 1, 2005.

[5]/ Federal Emergency Management Agency, Federal Guidelines for Dam Safety – Hazard Potential Classification System for Dams, April 2004.

and Federal Emergency Management Agency[7] (FEMA) regulations, guideline, and manuals. Final dam design and specification shall be subject to the findings of the design-level seismic investigation conforming to FERC,[8] FEMA,[9] and applicable California Department of Water Resources - Division of Safety of Dams[10] (DSOD) standards.

As required, the Applicant's "standard technical information document" (STID) will include a surveillance and monitoring plan (SMP) providing the details of how the owner will monitor and evaluate the performance of the dam and project structures. The SMP will include the requirement to periodically submit a surveillance and monitoring report (SMR) presenting, evaluating, interpreting, and providing findings on the overall performance of the dam.[11]

Signage, conforming to FERC standards, will be placed at the hydropower facilities.[12] Excluding the afterbay, the project's facilities will be landscaped to provide screening along abutting street frontages. Final landscape plans for those facilities located on NFS lands will be developed in coordination with the Forest Service.

Presented below is a brief discussion of the key facilities that collectively comprise LEAPS, including non-energy-related facilities that are associated with the project.

4.3.2.1 Decker Lake Upper Reservoir

Proposed is the creation of a new approximately 110-acre open reservoir (forebay), located in the south fork of Decker Canyon (Sections 21 and 22, T6S, R5W, SBBM USGS 7.5-Minute Alberhill Quadrangle),[13] at the headwaters of San Juan Creek, at MP 11.7. The proposed upper reservoir (forebay) is located within the TRD, at elevations 2440 to 2850 feet above msl, on land under Forest Service jurisdiction. The proposed reservoir site is located adjacent to and south of Killen Truck Trail/South Main Divide Truck Trail (Forest Route 6S07) (South Main Divide Truck

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[6]/ Federal Energy Regulatory Commission, Guidelines for Preparation of Emergency Action Plans, November 1979, revised September 1988.

[7]/ Federal Emergency Management Agency, Federal Guidelines for Dam Safety, April 2004; Federal Emergency Management Agency, Federal Guidelines for Dam Safety – Emergency Action Planning for Dam Owners, April 2004; Federal Emergency Management Agency, Federal Guidelines for Dam Safety – Selecting and Accommodating Inflow Design Floods for Dams, April 2004.

[8]/ Op. Cit., Engineering Guidelines for the Evaluation of Hydropower Projects, April 1991, updated July 1, 2005; Federal Energy Regulatory Commission, Guidelines for Public Safety at Hydropower Projects, March 1992.

[9]/ Federal Emergency Management Agency, Federal Guidelines for Dam Safety – Earthquake Analysis and Design of Dams, May 2005.

[10]/Parts 1 and 2 of Division 3 (Dams and Reservoirs) of the CWC; Chapter 1 of Division 2, Title 23 (Waters) of the CCR; and Current Practices of the Department in Supervision of Dams and Reservoirs. Sections 6000-6004.5 of the CWC identify dams and reservoirs that are in State jurisdiction. Dams and reservoirs owned by the United States are not subject to State jurisdiction, except as otherwise provided by federal law.

[11]/An outline of the Applicant's SMP is presented in "Supplement No. 1 to Geotechnical Feasibility Report – Preliminary Guidelines for a Monitoring and Surveillance Program, Lake Elsinore Advanced Pumped Storage Project, Riverside County, California" (GENTERRA Consultants, Inc., October 16, 2003), included in the FLA.

[12]/Federal Energy Regulatory Commission, Safety Signage at Hydropower Projects, October 2001.

[13]/Latitude: 33.37N; Longitude: 117.2532W.

Trail), an all-weather, County-maintained two-lane road[14] extending eastward from SR-74 (Ortega Highway).

The proposed upper reservoir is not intended for the storage of potable water and no water treatment activities, other than as may be associated with vector control, are proposed therein. No public access to the reservoir site and no recreational contact with the water within that reservoir would be authorized. Access to and waters stored within the upper reservoir will, however, be made available for firefighting purposes.

The new upper reservoir capacity will be approximately 5,750 acre-feet (AF) (approximately 5,500 AF live storage and approximately 250 AF dead storage). A 20 foot wide crushed stone, gravel, or asphalt-paved roadway will be provided around the embankment to allow access for maintenance and inspection. Access will be restricted by signage and an approximately 8 foot high chain-link fence located on the outer side of the crest roadway. Surface water channels will be constructed within the perimeter access corridor. The sides and bottom of the upper reservoir will be provided with an impermeable dual liner (i.e., clay and double geomembrane) system to minimize water loss and seepage. The liner system will allow for steepened reservoir side slopes by protecting the side slopes from rapid drawdown damage (e.g., sloughing, erosion, and landsliding) and will protect the reservoir floor from erosion and scour.

In addition to the use of low-permeability soil for the impermeable layer of the floor and side slopes, the upper reservoir will incorporate a double-liner system. The liner system will include a high-density polyethylene (HDPE) liner, drainage layer under the primary geomembrane to collect and convey leakage, secondary HDPE geomembrane under the drainage layer to separate leakage from native groundwater, secondary seepage collection system under the secondary geomembrane to relieve water pressures from under the liner system, and grading preparation as needed to protect the liner system from sharp bedrock protrusions.

Redundant controls will be provided to protect against over-pumping. Three independent systems will be installed to monitor and control the water level in the upper reservoir and to ensure that all units operating in the pumping mode will be tripped before the water level exceeds the final design capacity. These monitoring devices will be coordinated and interlocked in operation to preclude the possibility that failure of a device or a combination of devices and/or any human operating error will allow safe operating levels from being exceeded. For this reason, and since the upper reservoir has no contributory drainage area, no reasonable possibility of exceeding maximum water level will exist.

An intake/outlet structure located in the upper reservoir will interconnect the new upper reservoir with the powerhouse through a single 25 foot diameter nominal conveyance channel and tunnel, with a gated inlet structure. Radial gates, slide gates, or an emergency bulkhead will be installed to shut off water flow from the upper reservoir in the event of an emergency or for inspection and repair.

[14] /South Main Divide Truck Trail (Killen Trail) links State Route 74 (SR-74 or Ortega Highway) to the residential area of Rancho Capistrano (Morrell Potero) and to the eastern portion of the TRD. At its eastern terminus, South Main Divide Truck Trail becomes Forest Route 7S04 which extends southward to Tenaja Road, near the southeastern border of the TRD.

The proposed upper reservoir will be designed for and will accommodate access by firefighting helicopters and other firefighting personnel. Helicopters will be able to utilize reservoir waters to fill suspended "bambi buckets" or other devices for fire suppression. A wind sock or similar device will be installed in a clearly visible location adjacent to the reservoir to assist pilots by indicating wind conditions during fire fighting events. In addition, the reservoir's waters can be pumped from the upper reservoir by mobile water pumping equipment for other fire-response purposes.

The proposed upper reservoir design includes: (1) an approximately 300 foot high main embankment dam[15] located on the southwest side of the reservoir; (2) maximum and minimum pond elevation of approximately 2790 feet and 2660 feet above msl, respectively; (3) a crest elevation of 2800 feet above msl; and (4) an inlet at elevation of approximately 2600 feet above msl feet for the intake structure. The conceptual drawing for the proposed upper reservoir is included in the Appendix section of this Application.

The required fill volume of the dam is about 3.0 million cubic yards (CY). Grading operations will be conducted in compliance with applicable National Pollutant Discharge Elimination System (NPDES) permit requirements.[16]

While most of the excavation will come from within the area of the reservoir itself, alternative dam designs are presented in Section 6.2. Additional excavation materials may come from the powerhouse, shafts, and penstock tunnels. Excavated and/or imported materials will be used to construct the dam and other earth structures required for the impoundment. Materials may be trucked to and from the upper reservoir site along SR-74, via Main Divide Truck Trail.

Embankment material would consist of silty sand and rock materials generated from excavated granitic bedrock and weathered granite. Depending upon the conditions of the bedrock foundation, the dam may be keyed into the foundation rock and the rock foundation may be grouted. All slope inclinations of the dam's slopes will be approximately 3:1 (horizontal to vertical) but may be constructed flatter to accommodate ground motion criteria currently being evaluated. A freeboard of 10 feet was used to estimate the height of the dam. The crest of the dam will have a relatively narrow width (approximately 30 feet). The dam would include a concrete-lined emergency spillway and a low-level outlet.

4.3.2.2 Project Tunnels/Shaft

Water will be transferred between the upper reservoir and the powerhouse through a single approximately 25 foot diameter, primarily concrete-lined tunnel. The inlet elevation at the proposed upper reservoir will be about 2600 feet above msl.

[15] /Dams are defined according to 33 CFR 222.6(h) as all artificial barriers, together with appurtenant works, which impound or divert water and which: (1) are 25 feet or more in height; or (2) have an impounding capacity of 50 acre feet or more. Federal regulations define dams for the purpose of ensuring public safety (Source: United States Environmental Protection Agency, National Management Measures to Control Nonpoint Source Pollution from Hydromodifications, July 2006, p. I-2).

[16] /California Regional Water Quality Control Board, San Diego Region, Order No. R9-2007-0001, NPDES No. CAS0108758, Waste Discharge Requirements for Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds of the County of San Diego, the Incorporated Cities of San Diego County, the San Diego Unified Port District, and the San Diego County Regional Airport Authority, January 24, 2007, Section D.2.c(1)(a)(vi).

A tunnel-boring machine (TBM) or conventional hard-rock mining operation will be used to excavate the headrace tunnels. It is anticipated that the high-head conductor will be excavated into competent granitic bedrock. In general, the pipeline alignments will seek to follow the most direct route between the upper reservoir and the powerhouse, taking into consideration the area's topography and subsurface geotechnical features.

A vertical tunnel will descend from a location northeast of the upper reservoir. The vertical tunnel will connect to a lower sub-horizontal tunnel that would have a gradient of approximately five percent downward toward the powerhouse. The horizontal tunnel will be unlined or concrete-lined where there is adequate rock cover over the tunnel and steel lined where there is inadequate rock cover. The horizontal tunnel would then split into a steel-lined manifold immediately upstream of the powerhouse, directing the water flows to the turbines in the powerhouse.

A double-seated spherical valve will be provided at the inlet for each pump-turbine spiral case. The valves will be used to isolate the pump-turbine from the penstock for inspection and maintenance and to close in an emergency. Draft tube bulkhead gates will be provided to be used in conjunction with the penstock valves for dewatering the pump-turbine water passages.

4.3.2.3 Project Powerhouse

The proposed Santa Rosa Powerhouse site (Section 14, T6S, R5W, SBBM, Lake Elsinore 7.5-Minute USGS Topographic Quadrangle) is approximately located west of the terminus of Santa Rosa Drive, between Ponce Drive and Grape Street, within unincorporated Lakeland Village area of Riverside County. The site is located to the south of SR-74 and west of Grand Avenue.

The proposed underground powerhouse will be situated approximately 3,000 feet from Lake Elsinore, with its roof located 330 feet below surface at elevation 1,170 msl, and with the centerline of the pump/turbine spiral cases at 1,050 msl. The powerhouse will contain two reversible Francis-type pump-turbine/motor generators, nominally rated at 300 MW each when pumping. The elevation of the pump/turbines at 195 feet below the surface of the Lake is due to their hydraulic characteristics, so as to provide sufficient suction pressure at the impellers. This suction pressure ensures that the machines will operate without cavitation either in the pump mode or in the turbine mode. The entire water conveyance system (that is the headrace tunnels, the pump/turbine cases, and the tailrace tunnel) is a closed conduit system, so that, when generating, the differential head drop from the upper reservoir (Decker Lake) to the lower reservoir (Lake Elsinore) is the motive energy force and the elevation of the powerhouse, whether above or below the surface of Lake Elsinore does not affect the gross head available to drive the machines.

Each pump/turbine will have adjustable wicket gates controlled by an electronic governor through oil-operated servomotors. Consistent with all Francis-type pump/turbines, the units will operate at relatively constant flow rate while pumping. The pump/turbine runner and wicket gates, as well as other components that may otherwise be susceptible to cavitation, will be of solid stainless steel construction, to prevent cavitation damage.

A service bay will be provided at one end of the powerhouse. Equipment access by overhead crane to the powerhouse will be via a vertical shaft extending from the land surface down to a service bay and laydown area on the generator floor. Personnel will have access via an elevator.

Powerhouse equipment will include an over-head bridge crane supported on high-level beams along the length of the powerhouse. The crane will be sized to handle the heaviest lift during equipment installation and maintenance. The powerhouse cavern housing the pumping/ generating units will be approximately 175 feet long, 250 feet wide, and 160 feet high.

The main powerhouse cavity will contain local operating and control equipment for each unit. The powerhouse roof will be supported by rock bolts or rock anchors with wire mesh and shotcrete for support as needed. The powerhouse will accommodate spherical turbine inlet valves to control flow into the units. The valves will be placed immediately upstream of the spiral case so that they can be handled by the main powerhouse crane.

Galleries for electrical and mechanical services will be provided on the upstream and downstream sides of the powerhouse, respectively. Discharge from the units in the generating mode will pass through the draft tubes into the tailrace tunnel. This tunnel will be D-shaped and concrete-lined.

The power plant's mechanical systems will be designed to maintain suitable and safe conditions for operators and maintenance personnel. Ventilation air in and out of the powerhouse access tunnel will be provided. The major heat-producing units will be cooled by oil-water and air-water heat-exchange systems. A system of ducting, bulkhead controls, and circulating fans will be installed to ensure equitable distribution of air throughout the facility and prevent the accumulation of carbon monoxide (CO) and other gases. Fire doors, incorporating air locks, will be provided at key locations. Fire prevention systems in the underground plant will be conventional deluge-type for the major items of equipment. Tied to these systems will be a system of isolating dampers and bulkheads connected to the ventilation system for control of smoke and fumes. In accordance with fire and building code standards, a high-pressure fire system will supply water to fire hose stations located throughout the facility. Unit dewatering will employ high-capacity pumps in pressurized pump pits.

Two 2,000 kW emergency diesel generators will run an air compressor and essential cooling pumps for the powerhouse complex.

Although computer and programmable logic control (PLC) systems improve plant operation by providing greater flexibility in control, alarming, and sequence of events recording, the essential emergency shutdown controls shall remain hardwired. This will guarantee that a safe and orderly shutdown of the plant can be accomplished in an emergency situation during which the computer and PLC systems have failed.

4.3.2.4 Lake Elsinore Intake/Outlet Structure

Between the powerhouse and lower reservoir, the inlet/outfall structure and its associated conduit (tailrace) will be located within an unincorporated County area. At the lakeshore, the inlet/outlet and other associated improvements extending into Lake Elsinore (e.g., intake headwall structure, reinforced dredged channel, and boat dock) will be constructed within the corporate boundaries of the City.

The lower reservoir will be located near the southwest shoreline of Lake Elsinore. The structure will extend from the portal of the tailrace tunnel to a headwall structure fitted with trashracks at the shoreline. The structure will be designed to provide a maximum discharge velocity of 1.8 feet per second (fps) at the trashracks during generation and a maximum intake velocity of 1.4 fps at the trashracks during pumping. Stoplogs will be provided at the portal so that the tailrace tunnel can be isolated from Lake Elsinore.

A rip-rap lined, reinforced dredged channel at the inlet/outlet (tailrace) structure will be installed to reduce velocities, provide a natural silt trap, and shape a velocity profile into the intake screens, structure, and gates. Following construction, the cofferdam will be removed. A paved maintenance road would provide shoreline access and a boat dock installed to allow for lake access during facility maintenance. The area will be equipped with security cables, warning signs, warning buoys, security cameras, and navigational warning lights.

The tailrace structure for the upper reservoir will consist of a gated inlet structure where the water flows into a horizontal or sloping conduit. Radial gates, slide gates, or an emergency bulkhead will be installed to shut off water flow from the upper reservoir in the event of an emergency and for inspection and repair of the high-head conduit. The intake/outlet structures will be equipped with trashracks to prevent large debris from entering the conduit system. The structure will be located at sufficient depth below minimum operating level to prevent air entrainment. The intake/outlet structure will be reinforced concrete with automated trashracks and stoplogs and will incorporate fish excluders. Fish excluders can be changed seasonally but not automated.

4.3.2.5 Lake Elsinore as the Lower Reservoir

Lake Elsinore will serve as the afterbay for LEAPS. Lake Elsinore is a relatively shallow lake with a large surface area. The lake, a naturally occurring sink for the San Jacinto River watershed, has been significantly modified for water control.[17] At the current lake outlet sill elevation of 1255 feet above msl, the lake has an average depth of 24.7 feet and the hypolimnetic water volume and surface area are 54,504 AF and 3,606 acres, respectively.[18] Waters within the lake are owned by the EVMWD and the real property within the OHWM is owned by and located within the corporate boundaries of the City. Public access to the lakeshore is limited to locations along the lakeshore where property is publicly owned.

Water from Lake Elsinore will be used for the initial filling of the upper reservoir, for the replenishment of evaporative losses from that reservoir, and for any supply waters that may be

[17] /Lichvar, Robert, Gustina, Gregory, Ericsson, Michael, Planning Level Delineation and Geospatial Characterization of Aquatic Resources for San Jacinto and Portions of Santa Margarita Watershed, Riverside County, California, United States Army Corps of Engineers, March 2003, p. 28.

[18] /Lake Elsinore and San Jacinto Watershed Authority (Montgomery Watson Harza), Final Program Environmental Impact Report – Lake Elsinore Stabilization and Enhancement Project, SCH No. 2001071042, September 2005, p. 5-19.

required within either the Santa Ana River or San Juan Creek watersheds for the mitigation of any project-related water-diminishment or habitat restoration impacts.[19]

During the facility's operation, waters will be cycled between the existing lower reservoir and the new upper reservoir through a closed loop system.

Under normal operations, approximately 5,000 AF of water will cycle between the two waterbodies, producing an approximately 20-inch maximum horizontal rise or fall of surface water elevations in Lake Elsinore during a weekly cycle (at lake elevation of 1240 feet ABOVE MSL). The maximum daily hydraulic drawdown for Lake Elsinore is projected to be about 0.98 feet per week and the maximum weekly hydraulic drawdown of Lake Elsinore is projected to be about 1.72 feet per week. The maximum projected drawdown of 1.72 feet per week represents 5,340.3 AF (maximum hydraulic storage). Since much of the shoreline slopes between 4 and 8 percent, the resulting shoreline fluctuation through each cycle will be between approximately 12 and 38 feet. A greater shoreline withdrawal could occur in areas with extremely shallow slope or if drawdown during the facility's operation were to exceed these projections.

It is assumed that the starting elevation of water in Lake Elsinore is 1240 feet above msl. At an elevation of 1240 feet above msl, Lake Elsinore contains 38,518 AF of water. At this elevation, the lake will have its maximum level change based on a given water transfer. At elevation 1247 feet above msl, the capacity of Lake Elsinore is 61,201 AF. The rate of change at this elevation is 37 percent less for the same water transfer.

4.3.2.6 Excavation Volumes

As shown in Table F - 1: Excavation Volumes, combined fill volumes of the upper dam at Decker Canyon and the embankments at the intake works at Lake Elsinore are estimated to be 2,839,000 cubic yards. It is therefore expected that excavation and fill volumes will be approximately balanced. Please also refer to Section 2.3.2-Construction Sequence of the FEIS.

Table F - 1: Excavation Volumes

Project Component	Excavation volume (cu yards)
Upper reservoir (will be re-used in dam where possible)	2,036,000
Penstock, (headrace, including adits, inlets etc))	177,500
Powerhouse cavern	207,000
Powerhouse access shaft	53,000
Powerhouse draft tubes	6,000
Penstock (tailrace)	65,000
Ventilation shaft	500
Surge shaft	32,000

[19] /All such waters shall be provided under the terms of the existing comprehensive water management agreement between the City of Lake Elsinore and the Elsinore Valley Municipal Water District. Nevada Hydro expects to provide funds to the City in order that it can meet its obligations under this purpose.

Project Component	Excavation volume (cu yards)
Lower reservoir intake	200,000
Santa Rosa Tunnel	33,000
Ridge Tunnel	56,000
Total volume	**2,866,000**

Source: The Nevada Hydro Company

4.3.3 Electrical Components

The electrical components of the project have been thoroughly described for the CPCU, and is repeated here. These components consist of above and below ground components as well as substations and switchyeard..

4.3.3.1 Transmission Line Construction (Above Ground)

This section describes the specific plans for each of the construction area types and individual components of gen–ties above ground construction. This includes the activities associated with the substations, the new overhead line construction, and reconductoring work within the Talega-Escondido ROW.

4.3.3.1.1 Pulling and Splicing Locations

The dimensions of the area needed for the stringing setups associated with wire installation are variable and depends upon terrain. On average, however, pulling and splicing equipment set-up sites require an area of 200 feet by 200 feet (0.92 acre); however, crews can work from within a slightly smaller area when space is limited. These locations require level areas to allow for maneuvering of the equipment. When possible, pulling and splicing locations would be located on existing level areas and existing roads to minimize the need for grading and cleanup. Stringing set-up locations on Forest Service land that would be located outside the established utility corridor would be authorized under a temporary Special Use Permit as necessary. All stringing equipment & splicing locations are identified and shown in Figures in the Attachment section of this Application, defined as pulling sites, and identified in the legend as Proposed Construction Work Area. Additional splicing locations may only be known after final design is accomplished.

Each pulling location would include one puller positioned at one end and one tensioner and wire reel stand truck positioned at the other end. Specialized support equipment such as skidders and wire crimping equipment would be strategically positioned to support the operations. Pulling and splicing set-up locations would be used to remove temporary pulling splices and install permanent splices once the conductor is strung through the rollers located on each tower, and are necessary as the permanent splices that join the conductor together cannot travel through the rollers. For stringing equipment that cannot be positioned at either side of a dead-end transmission tower, field snubs (i.e., anchoring and dead-end hardware) would be temporarily installed to sag conductor wire to the correct tension.

The puller, tensioner, and splicing set-up locations associated with the construction are anticipated to disturb a total of approximately 317 acres. These disturbances would be temporary and the land would be restored to its previous condition following completion of pulling and splicing activities. Estimates of the land disturbance associated with this activity for each segment are provided in Table F - 2: Estimate of Land Disturbance for Substation Sites.

All pulling & splicing locations are indicated on Figures in the Attachment section of this Application, defined as Construction Work Area Polygons.

Table F - 2: Estimate of Land Disturbance for Substation Sites

	Lake Switchyard		Santa Rosa Substation		Case Springs Substation	
	Dimensions (Ft)	Area of Disturbance (Ac)	Dimensions (Ft)	Area of Disturbance (Ac)	Dimensions (Ft)	Area of Disturbance (Ac)
Substation Pad	300 ft W 900 ft L	6.20 ac	310 ft W 407 ft L	2.90 ac	300 ft W 900 ft L	6.20 ac
Side Slope Grading		0.14 ac.		2.11 ac.		
Primary Access Road	Temescal Canyon Rd.	County Rd.	Santa Rosa Avenue	County Rd.	SDG&E Access Rd.	Camp Pendleton
Total Estimated		6.34 ac.		5.01 ac.		6.2 ac.

Source: The Nevada Hydro Company

4.3.3.1.2 Pole Installation and Removal

Grading and Excavation

For the construction tower pads, each location would first be graded and/or cleared to provide a reasonably level and vegetation-free surface for footing construction. Sites would be graded such that water would run toward the direction of the natural drainage. In addition, drainage would be designed to prevent ponding and erosive water flows that could cause damage to the tower footings. The graded area would be compacted to at least 90 percent relative density, and would be capable of supporting heavy vehicular traffic.

An area of approximately 2,000 to 3,000 square feet would be required to accommodate the four footings needed for each new lattice steel tower (LST).

In mountainous helicopter-access areas, benching may be required to provide access for footing construction, assembly, erection, and wire-stringing activities during line construction. Benching is a technique in which, either manually or by a tracked earth-moving vehicle, a terraced access is excavated in extremely steep and rugged terrain. It would be used minimally and for two purposes:

1. To help ensure the safety of personnel during construction activities.
2. To control costs in situations where potentially hazardous, manual excavations would be required.

An illustration of this technique appears as Figure F - 1: Typical Benching on LST.

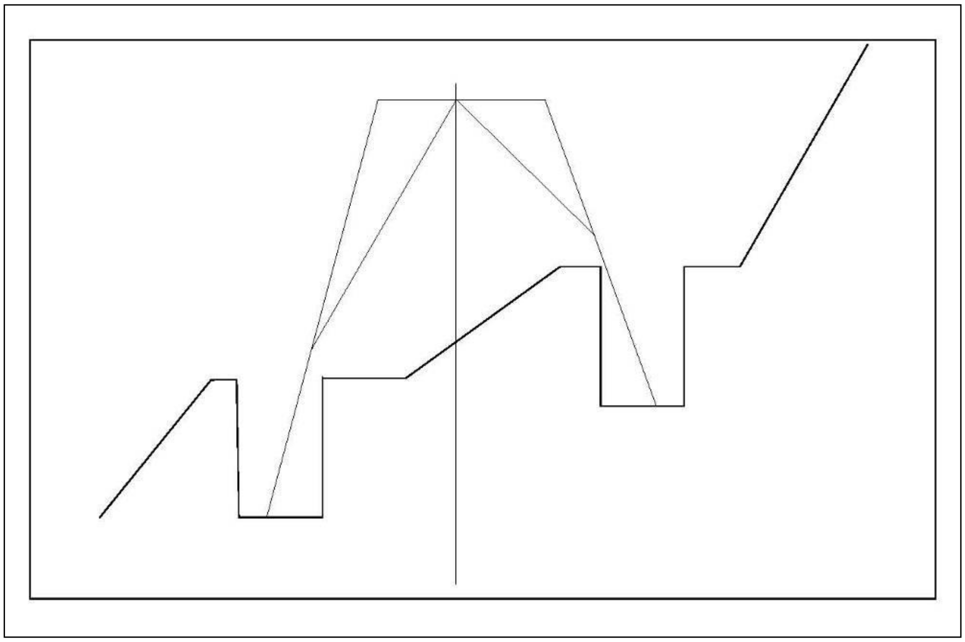

Figure F - 1: Typical Benching on LST

Source: Siemens Power Transmission & Distribution

Foundations

Foundation pits for structure foundations would typically be either excavated by (i) excavators (foundation-type for good soil), (ii) rock excavation by means of drilling and blasting (rock foundation) or (iii) rock anchors grouted into solid rock (rock anchor foundations). The maximum augur depth below ground surface for the various types of towers, are expected to be about 35 feet for a 500KV Four-legged Single Circuit Lattice Steel Tower.

Actual foundation depth & design would depend on the soil conditions and topography at each site and would be determined after the soil-investigation during final engineering. However, it is expected that the majority of towers would have foundation depth substantially less than the max depth listed above.

For those tower locations marked with H (Helicopter access only) on Figures in the Attachment section of this Application, all necessary equipment for excavation of the foundation pits, drilling rig for the rock anchors as well as auguring the holes for the blasting will be flown in by helicopter. Blasting will be done in accordance with prevailing blasting conditions and regulations of the State and the Forest Service.

A foundation set for each LST would include four footings.

Following excavation of the foundation pits, reinforcing steel and stub angles would be installed and the concrete would then be placed. Steel reinforced cages and stub angles would be assembled at lay-down areas and delivered to each tower location by flatbed truck or helicopter. During construction, existing concrete supply facilities would be used where feasible, while in more remote areas, temporary concrete batching plant may be set up on staging areas.

Equipment would include a central mixer unit (drum type), three silos for injecting concrete additives, fly ash, and cement, a water tank; portable pumps; a pneumatic injector; and a wheel loader for handling concrete additives (sand & crushed gravel) not in the silos. Dust emissions would be controlled by watering the area and by sealing the silos and transferring the fine particulates pneumatically between the silos and the mixer.

Concrete would be hauled to tower sites by standard or 4WD mixer truck's and to tower locations marked with (H) by helicopter. At any given lattice steel tower, no more than eight concrete mixer trucks would be working to support the installation of the needed footings. A second lattice steel tower footing project could be under way at the same time, thus doubling the quantity of trucks working. One footing on a 500 kV lattice steel tower could require as much as 16 to 20 cubic yards of concrete, depending on the final foundation design.

Topsoil will be excavated and stored at a separate location and will be used after backfilling as the final top layer. Suitable excavated material will be used for backfilling the foundation pits; the excess material or material not suitable for backfilling will either be used for landscaping around the tower location or be removed from the construction site and disposed at designated sites as permitted.

Concrete samples would be drawn at time of pour and tested according to prevailing specification after 7 and 28 days to ensure engineered strengths were achieved. Once the required concrete compression strength has been achieved, crews would be permitted to commence with the erection of the tower steel.

Tower and Pole Assembly

At the structure fabrication plant, structural members would be bundled and shipped by rail or trucks to the construction yards, and then trucked to the accessible tower locations. At the tower site, sections would be pre-assembled and erected by crane or derrick post.

At tower locations marked with (H), tower members or prefabricated tower sections will be flown to the individual tower locations and erected by helicopter.

Assembly and erection of structure required would consist of four main activities.

1. Assembly of tower sections
2. Erection of the tower sections
3. Torque down bolts and nuts to the designed torque.
4. Final cleanup

Installation of insulators and sheaves and the final checkout and cleanup would then conclude structure assembly and erection.

Tower and Pole Erection

The use of helicopters for the erection of LSTs would be in accordance with construction specifications and would be similar to methods detailed in IEEE 951-1966, Guide to the Assembly and Erection of Metal Transmission Structures, Section 9, Helicopter Methods of Construction. During helicopter operations, public access to defined areas would be restricted. Temporary road closures, traffic detours, and posted notices and signs would be used to restrict public access to construction areas.

The operations area of the helicopters would be limited to helicopter staging areas and positions near construction locations that have been designated for this purpose and are considered safe locations for landing. Final sitting of staging areas for the gen–ties would be conducted with the input of the helicopter contractor, and affected private landowners and land management agencies. The size of each staging area would be dependent upon the size and number of towers to be installed. Staging areas would likely change as work progresses.

Helicopter fueling would occur at staging areas or at a local airport using the helicopter contractor's fuel truck, would be supervised by the helicopter fuel service provider, and SWPPP measures would be followed, as applicable. The helicopter and fuel truck would stay overnight at a local airport or at a staging area if adequate security is in place.

4.3.3.1.3 Conductor/Cable Installation

Wire-stringing includes all activities associated with the installation of conductors onto the LSTs and for the gen–ties and for re-conductoring at the 230KV Talega – Escondido transmission line. This activity includes the installation of primary conductor and ground wire, vibration dampeners, weights, spacers, and suspension and dead-end hardware assemblies. Insulators and stringing sheaves (rollers or travelers) are attached as part of the wire-stringing activity if the work is a part of a re-conductoring effort; otherwise they are typically attached during the steel erection process. Wire-stringing activities would be conducted in accordance with the construction specifications, which is similar to process methods detailed in IEEE Standard 524-1992, Guide to the Installation of Overhead Transmission Line Conductors. A standard wire-stringing plan includes a sequenced program of events starting with determination of wire pulls tension and wire pull equipment set-up positions. Advanced planning by supervision determines circuit outages, pulling times, and safety protocols needed for ensuring that safe and quick installation of wire is accomplished.

Prior to stringing activities, temporary protective netting systems or wood pole guard structures would be erected at crossings for roads, streets, railroad, highways, or other transmission, distribution or communication facilities, as required. On roads where traffic is light, guard structures may not be necessary, however, the use of barriers, flagmen, and/or temporary stopping of traffic would be required.

The stringing of conductor and overhead ground-wire including OPGW on new transmission lines typically commence once a number of structures (sections between 2 tension towers) have been erected, inspected and approved for stringing. Stringing equipment locations would be temporarily set up adjacent to tension towers. These could be areas 200 feet to 300 foot in size adjacent to access roads (within the ROW) and spaced approximately every three to fifteen thousand feet, depending on the accessibility and topography of transmission line.

Due to the very mountainous terrain within the CNF, approximately 54% of the tower locations will only be accessible by means of helicopter. For these, a helicopter would pull a lightweight pilot line through the conductor sheaves. The lightweight pilot-line will be used to subsequently pull larger pilot wires, which finally will pull the ground wire, OPGW and conductor into position by the means of stringing equipment.

We have identified tower locations on which the setup of stringing equipment and conductor reels could have an excessive impact. In order to avoid the environmental impact we have worked out the following preliminary work program, which may be revised during the final line design. The following example is based on tower locations shown on Figures in the Attachment section of this Application, page 4 of 23, Section T 26 to T30 & T32

- T26 will be the staging area for the conductor reels and rolling machine, on T 32 will be the staging area of the winch machine.
- The conductor will be pulled through from T 26 to T32, also having an angle tension tower T30 in between.
- Once the conductor tension clamp is finally hooked to the insulator on T26, the winch machine placed at T32 will pull the conductor into almost sag position.
- At T30 the stringing crew will place working clamps in both directions to T26 and T 32 and they will install chain hoists with adequate capacity, and sag the conductor in accordance to temperature and sagging chard into final sag.
- The conductor on T30 will be cut to the required length and the compression dead end clamps will be installed and attached to the insulator string.
- At T32 the crew after rechecking the sag will also install the compression dead end clamp and attach it to the insulator string.
- The same method applies for the ground wire too.
- OPGW in anyway will have longer designed sections for splicing, but the stringing method will be the same, however, instead of compression dead end clamp a preformed helix grip will be used.

The same stringing method as described above applies for the following sections which are marked “H” for helicopter erection, and identified in Table F - 3: Tower Sections Marked for Helicopter Erection.

Table F - 3: Tower Sections Marked for Helicopter Erection

Page 4 of 23	T32 via T36 to T39
Page 5 of 23	T41 via T42 to T43
Page 6 & 7 of 23	T43 via T46 via T49 via T51 to T53
Page 7 of 23	T53 via T55 to T56
Page 7 & 8 of 23	T56 via T57 to T58
Page 10 & 11 of 23	T64 via T68 via T71 to 74

Page 11 & 12 of 23	T74 via T76 to T79
Page 12,13 & 14 of 23	T81 via T84 to T90
Page 14,15,16 & 17 of 23	T93 via T107 to T109
Page 18 of 23	T113 via T115 via 116 to T119
Page 19 & 20 of 23	T121 via T128 to T130
Page 21 & 22 of 23	T134 via T136 to T138

*All references are to pages appearing in the Attachment Section of this Application.
Source: The Nevada Hydro Company

To ensure the safety of workers and the public, safety devices such as traveling grounds, guard structures, and radio-equipped public safety roving vehicles and linemen would be in place prior to the initiation of wire-stringing activities.

The following four steps describe the wire installation activities proposed to be used:

Step 1: Sock Line; Threading: A helicopter would fly a lightweight sock pilot line from tower to tower, which would be threaded through the wire rollers in order to engage a cam-lock device that would secure the pulling sock in the roller. This threading process would continue between all towers through the rollers of a particular set of spans selected for a conductor pull.

Step 2: Pulling: The sock lightweight pilot line would be used to pull in the conductor pulling cable. The conductor pulling cable would be attached to the conductor using a special swivel joint to prevent damage to the wire and to allow the wire to rotate freely to prevent complications from twisting as the conductor unwinds off the reel. A piece of hardware known as a running board would be installed to properly feed the conductor into the roller; this device keeps the bundle conductor from wrapping during installation.

Step 3: Splicing, Sagging, and Dead-ending: After the conductor is pulled in, all mid-span splicing would be performed. Once the splicing has been completed, the conductor would be sagged to proper tension and dead-ended to towers.

Step 4: Clipping-in, Spacers: After conductor is dead-ended, the conductors would be attached to all tangent towers; a process called clipping in. Once this is complete, spacers (in accordance to an approved installation schedule) would be attached between the bundled conductors of each phase to keep uniform separation between each conductor.

As noted above, the threading step of wire installation would require helicopter use. While only one small helicopter is needed, two helicopters may be used to shorten the time for this phase. On average, each helicopter would operate 4 hours per day during stringing operations. The operations area of the small helicopter would be limited to helicopter staging areas and positions along the utility corridor that have previously been sited for this purpose and are considered safe locations for landing. Final sitting of staging areas for the gen–ties would be conducted with the input of the helicopter contractor, and affected private landowners and land management agencies. The size of each staging area would be dependent upon the size and number of towers to be removed and installed. Staging areas would likely change as work progresses along the transmission lines?

Helicopter fueling would occur at staging areas or at local airports using the helicopter contractor's fuel truck, and would be supervised by the helicopter fuel service provider. The helicopter and mobile fuel truck would stay overnight at a local airport or at a staging area if adequate security is in place.

4.3.3.1.4 Guard Structure Installation

Guard poles or guard structures may be installed at transportation, flood control, and utility crossings. Guard structures may also be installed at other locations such as parks or near residences. These are temporary facilities designed to stop the travel of a conductor should it momentarily drop below a conventional stringing height, and are removed after conductors are installed. If required, temporary netting would be installed to protect some types of under-built infrastructure. In some cases, guard structures can be specially equipped boom type trucks with heavy outriggers. Typical guard structures are standard wood poles, 60 to 80 feet tall, arranged in such a manner as to arrest the travel of conductor should it momentarily drop below a conventional stringing height. Depending on the width of the line being constructed, the number of guard poles installed on either side of a crossing would be between 2 and 4.

Public agencies differ on their policies for guard structures and their preferred methods for public safety. For highway and open channel aqueduct crossings, the applicant would work closely with the applicable jurisdiction to secure the necessary permits to string conductor across the applicable infrastructure. For major roadway crossings, typically one of the following four methods is employed to protect the public:

- Erection of a highway net guard structure system.
- Detour of all traffic off of the highway at the crossing position.
- Implementation of a controlled continuous traffic break while stringing operations are performed.
- Establishment of special line trucks with extension booms onto the highway deck at strategic positions.

4.3.3.2 Transmission Line Construction (Below Ground)

4.3.3.2.1 General

Depending upon final cost and engineering, any of the following four underground technologies may be commercially available for 500 kV transmission: Gas Insulated Line (GIL); high-pressure fluid-filled (HPFF) cables; self-contained fluid-filled (SCFF) and solid dielectric (XLPE) transmission cables.

Below ground construction consists of two defined tunnels. The first is the Ridge Tunnel which runs between towers 63 at MP 11.5 and 64 at MP 13.2, roughly in line with the South Main Divide Road. The second is the Santa Rosa Tunnel which connects the Ridge Tunnel to the Santa Rosa Substation. The arrangement of the tunnels is depicted in Figures in the Attachment section of this Application, sheets 9, 23 and 24.

GIL (Gas Insulated Line): Installation of GIL would require an underground tunnel from Mile Post 11.5 to MP 13.2 (the Ridge Tunnel), with a transition point to the OHL on each end. At MP

12.3 an underground tunnel will link the gen–tie to the Santa Rosa Substation (the Santa Rosa Tunnel). In this tunnel the 2 GIL circuits will connect northward to Lake Switchyard and southward to Case Spring Substation. These two circuits will turn into north and south directions at MP 12.3. At the Santa Rosa Substation the GIL will be directly connected to the 500kV GIS Switch Gear. See for an illustration of the transition structures.

Cable Link: Installation of HPFF, SCFF or XLPE transmission cables will require generally the same underground tunnel already described for construction of the GIL system. In addition to the tunnel on the north end (MP 11.5) and on the south end (MP 13.2), a 500 KV switch yard would be required to accommodate the protection equipment (CB's) for the cable solution, and additional room would be required for the fluid pressurization equipment needed for the HPFF Cable.

While HPFF and SCFF are feasible technologies, they have a potential to release dielectric fluid into the environment. HPFF or SCFF cables installed in a tunnel bear a risk of a fire hazard during a fault in the electrical system. If HPFF cable were installed, additional space would be required at the transition station for the fluid pressurization equipment.

A small number of 500 kV XLPE systems have been installed worldwide to date.

Underground transmission cable manufacturing constraints limit the maximum cable size. In many cases, it is not possible for underground transmission lines to match the capability of overhead transmission lines without the installation of more underground cables than overhead conductors. For example, a 500 kV overhead transmission line requires six conductors, whereas under grounding would require a minimum of nine, and possibly up to twelve cables.

4.3.3.2.2 Tunnels: General

In mountainous terrain, the underground tunnel design will result in construction that will be compatible with the mechanical restrictions associated with 500 kV underground cables. In addition, the gravitational pull on the cables in terrain with significant uphill and downhill grades would require the installation of anchoring facilities in order to minimize cable slippage. As with any high-voltage facility, the design would include the installation of the cables and associated underground infrastructure with proper access for maintenance. For all tunnels, the anticipated construction method will be "Drill and Blast" which, being sub-surface, will cause minimal disturbance to existing ground conditions. The configuration of all of the tunnels is shown in Plate 24 of Figures in the Attachment section of this Application.

4.3.3.2.3 Construction of Vertical Shafts for the Ridge Tunnel

Construction of the Ridge Tunnel will begin with the installation of four vertical access shafts at locations that, to the extent possible, match the existing terrain and topography, and that also are able to minimize the depth of the shafts below the surface. One of these access shafts will be located at each end of the Ridge Tunnel, that is near Towers 63 and 64. The other two vertical access shafts will be placed approximately at the mid-point between the transition point to the upper end of the Santa Rosa Tunnel and the towers, one on each side.

A fifth vertical access shaft will be located above the transition point of the Ridge Tunnel to the top of the vertical section of the Santa Rosa Tunnel to provide access and a connection to the transition point and will extend vertically down to meet up with lower section of the Santa Rosa Tunnel. This shaft cannot be used as access for construction of the Ridge Tunnel because it will be excavated much deeper than the Ridge Tunnel invert and tunnel crews cannot work above crews on other tunnels.

The five vertical access shafts will be separated by approximately two thousand two hundred feet.

All of the five vertical access shafts will be constructed simultaneously to minimize schedule requirements.

4.3.3.2.4 Construction of the Ridge Tunnel

Excavation of the Ridge Tunnel will commence as soon as the access shafts have been completed and load-out facilities have been assembled. The excavation of the tunnel will proceed toward the east from the Tower 63 shaft for approximately 1,100 feet. Similarly, the excavation of the tunnel will proceed simultaneously to the west from the Tower 64 shaft for approximately 1,100 feet. At the same time, excavation will begin at the two mid-point access shafts and will proceed in two directions from each: one approximately eleven hundred feet 1,100 feet toward the tower until it meets with the crew coming from the direction of the respective tower, the other approximately 2,200 feet in the direction of the transition point to the Santa Rosa Tunnel. Therefore, up to a maximum of six excavation crews will be deployed. The east and west sections will converge together and with the vertical shaft of the Santa Rosa Tunnel at a transition point at elevation approximately 2,508 msl.

Removed materials will be lifted out of the shaft and will be moved to the Decker Canyon temporarily for use in the construction of the dam associated with the LEAPS upper reservoir.

The Ridge Tunnel will be approximately 12 feet x 12 feet and will be lined with shotcrete.

4.3.3.2.5 Construction of the Santa Rosa Tunnel

The average slope of the Santa Rosa Tunnel directly from the substation to the transition point at the Ridge Tunnel is around 25%. As this is too steep for excavation and mining equipment, the Santa Rosa Tunnel will be constructed in two parts: one is a horse shoe-shaped lower section beginning at the substation, which will incline upward at approximately 10%, and the other is a cylindrical vertical access shaft section of around 872 feet extending from the surface elevation of 2,813 msl down to the connection with the lower section at elevation 1,941 msl. which will connect to the transition point.

Construction of the Lower Section of the Santa Rosa Tunnel

Excavation of the lower section will commence after a portal shaft has been installed for access by equipment and crews. The excavation will proceed in a direction to coincide with the lower end of the vertical shaft. The upward slope of the tunnel will be approximately 10%

The horseshoe-shaped Ridge Tunnel will be approximately 13 feet x 13 feet and will be lined with shotcrete.

Construction of the Vertical Shaft for the Santa Rosa Tunnel

Construction of the Vertical Access Shaft for the Santa Rosa Tunnel will begin at the upper end in the area of the transition point where the Ridge Tunnel will connect to the Santa Rosa Tunnel. The exact location of the shaft has been optimized in consideration of the requirements of the topography. The height of the shaft will be approximately 872 feet. As mentioned above, this shaft will not be used for construction of the Ridge Tunnel.

Before excavation can begin, a large headworks and permanent elevator structure must be installed for safe construction and also for providing access to the lower section of the tunnel. Once the headworks and elevator structure have been completed, the excavation of the vertical shaft can begin in a downward direction. Removed materials will be lifted out of the shaft by a conveyor or similar equipment and will be moved to the nearby Decker Canyon area for use in the construction of the LEAPS dam.

The vertical shaft will be circular in cross section, with a finished inside diameter of approximately 16 feet. The walls will be lined with reinforced concrete to carry loads applied by the suspended equipment. Access for maintenance and inspection to the equipment in the vertical shaft will be by permanent elevator and a suitable system of permanent and removable platforms.

4.3.3.2.6 Disposal of Removed Material

Material Removed during Mining Operations

At mobilization, the tunneling operations would begin as critical path tasks, with construction of the Upper Reservoir at Decker Canyon is a first priority. At Decker Canyon, an area will be set aside immediately for the temporary deposition of removed materials from tunneling associated with the Ridge Tunnel and also the vertical access shaft and the upper part of the lower section of the Santa Rosa Tunnel. These materials will eventually be used in the construction of the dam at the Upper Reservoir in Decker Canyon.

The vertical access shaft at the upper end of the Santa Rosa Tunnel will progress downwards to the designated lowest elevation (approximately 2,100 feet msl) and then the crew will move into the lower section and progress in the direction of the Santa Rosa site. Work will also commence as soon as possible after mobilization in the lower section of the Santa Rosa Tunnel at the Santa Rosa Substation location, and the crew will move toward the vertical access shaft. The two crews will meet up in the lower section. Materials removed from the vertical access shaft (approximately 8,500 cubic yards) and from the lower section down to the meeting point (approximately 13,000 cubic yards) will be taken to the top and will be deposited at the Decker Canyon temporary site. The remaining approximately 19,000 cubic yards removed from the Santa Rosa Tunnel from the Santa Rosa end will be utilized in the grading to a level condition of the Santa Rosa Substation area, for which approximately 20,000-25,000 cubic yards are needed.

Material Removed during Tower Installation

Topsoil will be excavated and stored at a separate temporary location and will be used after backfilling as the final top layer. Suitable excavated material will be used for backfilling the foundation pits; the excess material or material not suitable for backfilling will either be used for landscaping around the tower location or be removed from the construction site and disposed of at designated sites as permitted.

4.3.3.3 Substation and Switchyard Construction

4.3.3.3.1 General Construction Considerations – All Sites

Substation and switchyard construction would include construction of three new facilities:

- The Lake Switchyard on the northern end of the project, at MP 2.0.
- The Santa Rosa Substation near the LEAPS Powerhouse, roughly midway between the Lake Switchyard and Case Springs Substation, offset one mile to the southeast from roughly MP 12.3.
- The Case Springs Substation at the southern end of the gen–ties, at MP 31.2.

Minor upgrades to protection and communications equipment at SCE's Valley and Serrano Substations, new line positions, and protection and communications equipment at SDG&E's Talega and Escondido Substations are also included in the project. In general, construction efforts would occur in accordance with accepted construction industry standards. Work generally would be scheduled during daylight hours (7:00 A.M. to 5:00 P.M.), Monday through Saturday. When different hours or days are necessary, the Applicant would obtain variances, as necessary, from the jurisdiction in which the work would take place. All materials associated with construction efforts would be delivered by truck to the individual substation sites or by train to the Camp Pendleton rail head and then trucked up to the Case Springs site. Delivery activities requiring major street use would be scheduled to occur during off-peak traffic hours.

Construction of new substations, substation expansions, and associated access roads would require earthwork activities. Construction sites would first be cleared of vegetation and loose rock and then graded to provide a near-level surface. Soils generated from the grading activities would be tested to determine if environmental contamination is present before soil removal for disposal. During grading operations, dust would be controlled by measures outlined in the SWPPP.

Installation of new equipment and structures at each substation requires excavation for major reinforced concrete footings, GIS equipment slabs, transformer foundations oil containment pits and water separators. In parallel with the foundation excavation cable duct trenches are dug. Soil from these excavations would be redistributed on substation property.

Construction debris from activities at each substation site would be placed in appropriate onsite containers and periodically disposed of per applicable regulations. All construction will be performed by licensed experience substation construction contractors under the control of a general site contractor. Major civil portions of the work including earth work, foundations cable trenching, ground mat, drainage SWPPP, etc. will be performed by the civil contractor. The electrical installation will be performed by qualified electrical contractor this work involves equipment assembly, installation, cable and wiring terminations, etc.

The Applicant plans to enter into a turn-key project agreement with a major firm for overall electrical system level design, high voltage equipment supply and substation construction. This firm will develop overall EPC requirements incorporating design standards from SCE & SDG&E. The general contractor or Engineer Procure and Construct (EPC) will select qualified subcontractors including specialized contractors for fiber cable splicing, paving access roads with in the switch yards, fencing, environmental screening and testing, painting, etc. This firm will provide supervisory field engineers for equipment assembly and commissioning. System level design has been performed by Siemens SPTI and PT&D with oversight from CAISO, SCE and SDG&E during the CAISO CSRPT process. Detail design will be performed by a major EPC contractor who will also serve as the general site contractor. Construction design and construction drawings will be prepared by the EPC contractor, and all design will be prepared by or under the supervision of a California Professional Engineer (PE). Commissioning and energization will be conducted by a joint commissioning team consisting of Siemens, SCE and SDG&E field engineers in cooperation with CAISO.

Drainage. The drainage for any site would be developed during final engineering design to control surface runoff. Typical drainage improvements would consist of concrete swales, ditches, and culverts. Surface runoff from existing upslope areas would be modified to direct the flow around the substation facility. Surface runoff would be mitigated as needed through the use of earthen berms and energy dissipation devices, such as filter cloths, slope drains, and riprap placed near drain openings. All of these methods are designed to minimize the velocity of surface water runoff and protect the landscape from erosion.

In compliance with the CWA, site construction activities would be consistent with NPDES program requirements, which would include development of an SWPPP for the site before construction commences. The SWPPP would focus on implementation of Best Management Practices and other actions during construction to protect the quality of waters near the construction site.

Access. The primary facility access would be via a new 30 foot wide asphalt concrete paved road with 5 foot wide compacted dirt shoulders connecting the main substation entrance to the exterior access roads.

Paving. For all sites, asphalt concrete paving would be applied to the facility access road and to all designated internal driveways over an aggregate base material and a properly compacted sub-grade, as recommended by the results of geotechnical investigation at the site.

Surfacing. For all sites, those areas within the substation perimeter that are not paved or covered with concrete foundations or trenches would be surfaced with a 4-inch layer of untreated, ¾-inch nominal crushed rock. The rock would be applied to the finished grade surface after all grading and below grade construction has been completed.

Spill Control and Countermeasures (SPCC) Plan. A SPCC plan would be required for all sites. Under United States Environmental Protection Agency (EPA) CWA regulations, the owner of a substation facility is required to implement an SPCC plan if the facility meets the following three criteria:

The facility is not related to transportation.

The oil containing equipment at the facility has an aggregate of at least 1,320 gallons (only considering containers that are 55 gallons or more) or an underground oil storage capacity of at least 42,000 gallons.

There is a reasonable expectation of discharge into or upon navigable waters of the United States or adjoining shorelines. In addition, regulations by the State of California independently require that an SPCC plan be implemented for any facility with an aboveground oil storage capacity of at least 10,000 gallons. The total storage capacity of the oil containing equipment of the interconnection facilities at the Lake Switchyard exceeds 1,320 gallons; therefore it would trigger the threshold for the EPA requirement for an SPCC plan. The Applicant would proceed with preparation of an SPCC plan in accordance with state and federal requirements.

Storm Water Pollution Prevention Plan (SWPPP). Storm water management measures would be in place to ensure that contaminants are not discharged from the site. A SWPPP would be developed that would define areas where hazardous materials would be stored; where trash would be placed; where rolling equipment would be parked, fueled and serviced; and where construction materials, such as reinforcing bars and structural steel members, would be stored. Erosion control during grading of the unfinished site and during subsequent construction would be in place and monitored as specified by the SWPPP. One or more basins would be established to capture silt and other materials that might otherwise be carried from the site by rainwater surface runoff. Site improvements may result in impervious areas from all concrete foundations used for equipment and structures, and asphalt and concrete driveways. Management of drainage from these areas would be addressed in the facility drainage plan.

Perimeter Security. All alternative sites would require 8 foot high chain link perimeter fence with barbed wire and double drive gates.

The following sections describe the site-specific construction activities that would be associated with the various substations and switchyards that are part of the electrical system of the Proposed Project.

Lake Switchyard

The Lake Switchyard would be located north and east of Interstate 15 northwest of the city of Lake Elsinore, at MP 2.0, as shown on Figures in the Attachment section of this Application. The substation site is located just north of the junction of Temescal Canyon Road and Lee (Corona) Lake.

Most activities supporting construction of the Lake Switchyard would be common to all sites, although there would be some variation in the amounts of total disturbance required based on the pad configuration on each site and road access to each site. A conceptual grading plant for the Lake Switchyard site is presented in Figures in the Attachment section of this Application.

Site Preparation. The following elements of site preparation would be required for the Lake Switchyard:

- Clear and grub any vegetation and organic materials from the area.
- Grade the entire substation pad.

- Grade the cut and fill side slopes to blend the existing terrain with the new pad.
- Grade and install the substation access roads.
- Excavation for all subsurface features, primarily buried conduits and below-grade construction for structure foundations.

Prior to the start of grading, the entire area to be graded would be stripped of all organic matter and loose rocks. Any waste material encountered would be removed as required by the environmental and geotechnical investigations. Waste collected from these stripping operations would be tested for contamination.

The proposed Lake Switchyard would be located on previously disturbed land adjacent to Lee Lake. For the purposes of determining environmental impacts, an average of 2 inches of stripping is anticipated over the entire substation site resulting in an estimated quantity of 15,000 cubic yards of soil mixed with small stones and organic matter that would need to be transported from the site and disposed of at an appropriate waste disposal facility.

Construction within the switchyard after site preparation involves footings up to 12 feet deep to support equipment and steel structures. The major foundations include the 500 kV switch gear pad. In addition, a network of partially buried concrete trenches, approximately 800 feet in total length, would be installed. The estimated total volume of soil that would need to be excavated for foundation and trenches is 1,200 cubic yards, and would be spread on a portion of the switchyard property.

Guard Structure Installation. Foundations of various sizes would be constructed throughout the switchyard pad to support equipment and steel structures. In addition, a network of partially buried concrete trenches would be installed. Excavations of these foundations and trenches would commence following the completion of grading and other yard improvements, and would continue for several weeks. The estimated total volume of soil that would need to be excavated for foundation and trenches will be determined in future design stages, but excess excavated soils would be spread on a portion of the switchyard property.

4.3.3.3.2 Santa Rosa Substation

Site Preparation. The conceptual plan for the Santa Rosa Substation site, located roughly midway between the Lake Switchyard and Case Springs Substation, offset one mile to the southeast from roughly MP 12.3, is presented in Figures in the Attachment section of this Application. Prior to the start of grading, the entire area to be graded would be stripped of all organic matter and loose rocks. Any waste material encountered would be removed as required by the environmental and geotechnical investigations. Waste collected from these stripping operations would be tested for contamination. Once the surface has been cleared, the grading operations would begin. An estimated 15,000 cubic yards of material removed from the Santa Rosa Tunnel would be added to the 5,000 cubic yards areas of material cut from the higher elevation of the site and placed as fill over the lower elevation to match the 500 kV substation elevation. During grading operations, dust would be controlled by measures outlined in the SWPPP.

Foundation Excavation. Foundations of various sizes would be constructed throughout the substation pad to support equipment and steel structures. In addition, a network of partially buried concrete trenches approximately 200 feet in total length would be installed. Excavations of these foundations and trenches would commence following the completion of grading and other yard improvements, and would continue for several weeks. The estimated total volume of soil that would be excavated for foundation and trenches is about 1,800 cubic yards, and would be spread on a portion of the substation property.

4.3.3.3.3 Case Springs Substation

Site Preparation. For the Case Springs Substation, at MP 31.5, the proposed 500/230 kV substation would require an area approximately 363 feet wide by approximately 771 feet, and would comprise approximately 7 acres. Construction would involve grading on a steep slope. The conceptual grading plan for the Case Springs Substation is presented in Figures in the Attachment section of this Application. To limit significantly the quantity of earthwork that would be needed to extend the area, a crib wall would be constructed along the majority of the perimeter of the site. Most of the northerly and easterly sides of the site would be in cut, with the crib wall height varying from 1 foot high at each end to approximately 160 feet high near the center. Most of the southerly and westerly sides of the site would involve a fill situation, with the crib wall varying from 1 foot high to approximately 75 feet high. The pad area of the substation site would be over-excavated, backfilled, and compacted to recommended requirements. The final crib wall design and the actual quantity of soil required for backfill would be calculated during final engineering.

The 500/230 kV substation would require that an estimated 545,000 cubic yards of soil would be cut from higher elevations and relocated to the lower elevations as fill to provide a level pad with a slope between 1 and 2 percent. The amount of fill required would be about 70,000 cubic yards, which would require approximately 475,000 cubic yards of soil to be exported from the site.

Conceptual grading plans for the alternate Case Springs Substation sites are presented in Figures in the Attachment section of this Application.

4.3.3.4 Upgrade Construction

4.3.3.4.1 Talega-Escondido Line Upgrades

The Appicant proposes to remove the existing 230 kV and 69 kV LSTs through the following activities:

Grading: Existing access routes would be used to reach tower sites, but some rehabilitation work on these routes may be necessary before removal activities begin. In addition, grading may be necessary to establish crane pads for reconductoring work. Construction of most segments of the TE line upgrades would require the removal and reconductoring of the existing transmission line. Transmission line equipment to be removed includes existing 69 kV conductors. New 69 kV poles and associated hardware (i.e., insulators, vibration dampeners, suspension clamps, ground wire clamps, shackles, links, nuts, bolts, washers, cotters pins, insulator weights, and bond wires), as well as the transmission line primary conductor and ground wire will be installed along a new route.

4.3.3.4.2 IT Facility Construction

New OPGW or optical fiber is typically installed in continuous segments of 5,000 feet or less, depending upon various factors including line direction, inclination, and accessibility. Following placement of fiber on the OHGW, the strands in each segment are spliced together to form a continuous length from one end of a transmission line to the other. Splices occur near the foot of transmission towers, and may be identified by the metal enclosures (3 feet by 3 feet by 1 foot) that are mounted on the tower legs some distance above the ground. At a splice tower, the fiber cables are routed down a tower leg and into the bottom of the metal enclosure where the splice case is placed. On the last tower at each end of a transmission line, the overhead fiber is spliced to another section of fiber cable that runs in underground conduit from the tower into the communication room inside the adjacent substation.

Splicing activities are conducted by dedicated crews. Typically activities are conducted by two crews per each segment, with three persons in each crew. Each crew is also accompanied by a foreman. Both crews and foremen use pickup trucks for transport of materials along transmission line segments. All materials are carried in vehicles; therefore, no staging areas are needed to support OPGW installation. Crews typically complete four splices per 8 hour work period.

The Applicant proposes to remove the existing 230 kV and 69 kV LSTs through the following activities:

Grading: Existing access routes would be used to reach tower sites, but some rehabilitation work on these routes may be necessary before removal activities begin. In addition, grading may be necessary to establish crane pads for reconductoring work.

The Contractor anticipates a construction schedule of approximately 10 to 12 months for this project, with steel assembly to take place while foundations are being installed along with the legs and body extensions, structures to be flown in month six (6) or seven (7) and being ready to start wire installation starting in month seven (7) or eight (8). Utilization of helicopters during installation of legs and body extensions and especially during the wire installation greatly improves efficiency, minimizes environmental impact and keeps the Project on schedule.

4.3.4 Construction Workforce and Equipment

The construction workforces for have been estimated. Table F - 4: Gen–Ties Construction Equipment/Workforce and Table F - 5: LEAPS Construction Equipment/Workforce present those estimates of workforce for the elements of the Proposed Project.

Table F - 4: Gen–Ties Construction Equipment/Workforce

Electrical Construction Equipment Type	Number	Hrs/Day No. of shifts x hrs/shift	No. days/week	Duration Needed	Personnel	Number
Above-Ground Transmission Lines						
4x4 Pickups/Work Trucks	4	1 x 10	6	10 to 12 months	Supervision	4
4x4 One-Ton Framers	4	1 x 10	6	10 to12 months	Framers	12
Skycrane	1	1 x 10	6	3 to 4 month	Pilots	2
	1	1 x 10	6	3 to 4 month	Ground Crew	2
Mid-Capacity Lift Helicopter	2	1 x 10	6	2 to 3 months	Pilots	2
		1 x 10	6	2 to 3 months	Ground Crew	2
Yard Crane (30-ton)	3	1 x 10	6	10 to 12 months	Operator	1
D-8 Sag Cat	1	1 x 10	6	4 to 5 months	Operator	1
Bundle Tensioner	1	1 x 10	6	4 to 5 months	Operator	1
50-Thousand Pound Pulling Rig	1	1 x 10	6	4 to 5 months	Operator	1
3 Reel Wire Trailers	3	1 x 10	6	4 to 5 months	Operator	3
4 Drum Pullers with 3/8" Hardline	2	1 x 10	6	4 to 5 months	Operator	2
Digger Derrick for Guard Poles	1	1 x 10	6	4 to 5 months	Teamster	1
Fifth Wheel Trucks 6x6	3	1 x 10	6	4 to 5 months	Teamster	3
Extra Float Trailer 40'/60'	1	1 x 10	6	10 to 12 months	Operator	1
Hughes 500 helicopters	2	1 x 10	6	7 to 8 months	Pilots	3
	2	1 x 10	6	7 to 8 months	Ground Crew	3
Office Trailer	1	1 x 10	6	10 to 12 months	Secretary	1
Tool Van	1	1 x 10	6	10 to 12 months	Warehouseman	1
Bundle Fly Travelers	200	1 x 10	6	7 to 8 months		
OHGW and OPGW Fly Travelers	150	1 x 10	6	7 to 8 months		
Reel Jacks for OHGW and OPGW	2	1 x 10	6	4 to 5 months	Operator	2
Water Trucks	2	1 x 10	6	7 to 8 months	Operator	2
Hydraulic Pole Jack	1	1 x 10	6	3 to 4 weeks	Operator	1
Below-Ground Transmission Lines						
4 X 4 Pickup	12	2 x 12	7	16 to 18 months	Operator	18

Electrical Construction Equipment Type	Number	Hrs/Day No. of shifts x hrs/shift	No. days/week	Duration Needed	Personnel	Number
Yard Cranes 18 ton	6	2 x 12	7	10 to 12 months	Operator	6
200 ton track crane	4	2 x 12	7	10 to 12 months	Operator	4
Double Drum Mine Hoist	1	2 x 12	7	14 to 16 months	Operator	2
Drill Jumbo- 2 boom	9	2 x 12	7	14 to 16 months	Operator	18
3.5 CY Scoop Tram	16	2 x 12	7	10 to 12 months	Operator	32
16-Ton Mine Truck	4	2 x 12	7	10 to 12 months	Operator	8
Shotcrete Pump & Nozzle	7	2 x 12	7	3 to 5 months	Operator	14
950 CAT Loader	6	2 x 12	7	10 to 12 months	Operator	9
Small Motor Grader	1	2 x 12	7	10 to 12 months	Operator	2
10 CY Dump truck	12	2 x 12	7	10 to 12 months	Operator	18
1400 CFM Air Compressor	6	2 x 12	7	10 to 12 months		
500kW Genset	6	2 x 12	7	10 to 12 months		
1000kW Genset	2	2 x 12	7	10 to 12 months		
Fuel truck	1	2 x 12	7	14 to 16 months	Operator	2
Office Trailers	10	2 x 12	7	18 to 19 months	Secretary	4
Tool Van	6	2 x 12	7	12 to 14 months	Warehouseman	2
					Superintendent	6
					Engineers	10
					Lead miner	28
					Miner	96
					Top Landers	22
					Bottom Landers	22
					Surface Laborers	44

* Note: Equipment and Personnel needs vary for the anticipated duration of the project.

Source: The Nevada Hydro Company

Table F - 5: LEAPS Construction Equipment/Workforce

LEAPS Construction Equipment Type	Number	Hrs/Day No. of shifts x hrs/shift	No. days/week
CAT 436 Rubber Equipment Backhoe	1	2x10	5
Ready Mix Truck	3	2x10	5

LEAPS Construction Equipment Type	**Number**	**Hrs/Day No. of shifts x hrs/shift**	**No. days/week**
150-Ton Crane	1	2x10	5
250-Ton Crane	1	2x10	5
25-Ton Crane	1	2x10	5
60-Ton Crane	1	2x10	5
CAT D10R Dozer	1	2x10	5
CAT D6 Dozers	5	2x10	5
CAT D8R Dozer	3	2x10	5
CAT Motor Graders	1	2x10	5
Misc. Compressors & Generators	20	2x10	5
Portable Light Plants	10	2x10	5
CAT Loaders	6	2x10	5
CAT Compactors	2	2x10	5
CAT Scrapers	4	2x10	5
CAT Rock Trucks	5	2x10	5
Crew & Supervisory Pickups	20	2x10	5
Grout Plant	1	2x10	5
Tunnel Drill Jumbos	4	2x10	5
Tunnel Scoop Trams	4	2x10	5
Water Trucks	5	2x10	5
Tunnel Boring Machine	1	2x10	5
Over the road Haul Trucks	20	2x10	5
Workforce	Number		
Laborers	40		
Teamsters	25		
Heavy Equipment Operators	60		
Tunnel Personnel	70		
Carpenters	10		
Ironworkers	10		
Mechanics & Welders	5		
Supervisory	35		

Note: Equipment and Personnel needs vary for the anticipate 5-year duration of the project.

Source: The Nevada Hydro Company

4.4 Stability and Stress Analysis

A stability and stress analysis will be performed as part of the detailed engineering and design work. Results will be provided.

4.5 Seismic Loading Bases

Two areas have been assessed to date. They are active faulting and ground motion. Additional studies will be preformed as part of the additional work required for the detailed engineering and design. This additional work will include the Spillway Design Flood analysis.

Please see Section 4.1, above, for more information.

5.0 Copies of Supporting Design Report

Two copies of the final supporting design report will be provided to the Commission for review at the time preliminary and final design drawings are submitted.