REPORT

GEOTECHNICAL AND GEOLOGIC HAZARDS INVESTIGATION
MOUNTAIN SPRINGS GRADE AREA
SUNRISE POWERLINK SOUTHERN ROUTE
SAN DIEGO AND IMPERIAL COUNTIES,
CALIFORNIA

PREPARED FOR:
SARGENT & LUNDY ENGINEERS, LTD.

URS PROJECT NO. 27668031.00030

JUNE 30, 2009
GEOTEchnical and GEOlogic HAZARDS INVESTIGATION
MOUNTAIN SPRINGS GRADE AREA
SUNRISE POWERLINK
SOUTHERN ROUTE
SAN DIEGO AND IMPERIAL COUNTIES, CALIFORNIA

Prepared for
Sargent & Lundy Engineers, Ltd.
Mr. Brian Wood
55 East Monroe Street
Chicago, IL 60603-5780

URS Project No. 27668031.00030

June 30, 2009

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Subject: Geotechnical and Geologic Hazards Investigation
Mountain Springs Grade Area
Sunrise Powerlink Southern Route
San Diego and Imperial Counties, California
URS Project No. 27668031.00030

Dear Mr. Wood:

URS Corporation Americas (URS) is pleased to present this Geotechnical and Geologic Hazards report to support the proposed Sunrise Powerlink Southern Route. Our work is intended to assist Sargent & Lundy Engineers, Ltd. (Sargent & Lundy), San Diego Gas & Electric (SDG&E) and their consultants with project planning and design.

The results of our investigation indicate that the project is not impacted by geologic hazards or geotechnical issues that cannot be mitigated by design and construction. If you have any questions regarding this report, please contact us.

Sincerely,

URS CORPORATION

Michael E. Hatch, C.E.G 1925
Principal Engineering Geologist

MEH/JLN:ml
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SECTION ONE

SECTION 1  INTRODUCTION

1.1 BACKGROUND AND PROJECT DESCRIPTION

The Southern Route alignment for the Sunrise Powerlink Project is a proposed 230/500 kilovolt (kV) transmission line that would extend from the San Diego Gas & Electric (SDG&E) Sycamore Substation eastward to the SDG&E Imperial Valley Substation. Figure 1 presents a vicinity map that includes the locations of the various project elements and identifies the Mountain Springs Grade area.

The western portion of the proposed route would be a 230kV transmission line beginning at Sycamore Substation and extending to the proposed Suncrest Substation located east of Alpine and south of Interstate 8 in the Bell Bluff area. From the Suncrest Substation, a 500 kV transmission line would extend eastward, crossing Interstate 8 twice between the Suncrest Substation and the Jacumba area. From the Jacumba area eastward, the proposed route generally parallels the existing Southwest Powerlink 500 kV Transmission Line (SWPL) to the Imperial Valley Substation. Noteworthy elements of the SWPL parallel alignment include the Mountain Springs Grade area and two Interstate 8 crossings. Mountain Springs Grade represents a steeply descending transition from the Peninsular Ranges to the desert floor.

Mountain Springs Grade extends from an elevation of approximately 3,300 feet Mean Sea Level (MSL) in the In Koh Pah area to about 850 feet MSL at the base of the mountain front. For the purposes of this report, we have considered the project elements that extend from the In Koh Pah area at the top of the grade down to the second Interstate 8 crossing near the desert floor. This includes the eastern portion of transmission line Section 9C and all of Section 10A, incorporating proposed Structures P255 to P281.

1.2 PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to provide geotechnical design information and geologic hazard evaluations to assist with project planning and engineering design of tower foundations. The scope of our work included site reconnaissance, terrain analysis based on interpretations of available imagery, review of in-house and published sources of information, review of previous geotechnical investigations for the SWPL transmission line, review of as-built information from SDG&E files, and preparation of this report. No subsurface investigations were performed for this scope of work.
SECTION 2 AVAILABLE INFORMATION

This section summarizes the available information reviewed to develop the conclusions and recommendations presented in this report. The information included published geologic maps, aerial imagery, topographic information, previous geotechnical investigations, and available construction records. Detailed references are presented in Section 6 of this report.

2.1 GEOLOGIC MAPS AND AERIAL IMAGERY

Published geologic maps were used to evaluate the geologic units anticipated at the proposed tower sites. The primary geologic mapping performed by Kennedy and Tan (2005) was used as the base for the Site Plan and Generalized Geologic Maps (Figures 2a and 2b). Figure 2c presents a Key to Geologic Maps. Table 1 presents a summary of the tower site geology. Aerial imagery used included digital information from Google Earth Pro and historic stereographic aerial photographs.

2.2 GEOTECHNICAL INVESTIGATIONS

Geotechnical investigations performed by URS (formerly Woodward-Clyde Consultants) for the SWPL Transmission Line in 1980, 1981, and 1982 provided information regarding subsurface conditions and foundation design information for this previous project.

The geotechnical investigations performed for the SPWL project along the proposed transmission line in the Mountain Springs Grade area included geologic reconnaissance, seismic refraction traverses, and borings. Information from the borings and seismic refraction traverses is summarized in Table 2.

Figures 2a and 2b present the locations of the seismic refraction traverses and borings performed for the previous investigations. Copies of the seismic refraction traverses and boring logs from these investigations are presented in Appendix A.

2.3 FOUNDATION CONSTRUCTION RECORDS

SDG&E provided construction records from the SWPL tower sites. The records indicate the depth and diameter of each of the four tower foundations, as well as a general description of the subsurface conditions encountered. Information from these foundation construction records is summarized in Table 2 and copies of the pertinent records are presented in Appendix B.
SECTION THREE

SITE AND GEOLOGIC CONDITIONS

This section provides an overview of the geologic setting and geologic hazards for the proposed Mountain Springs Grade portion of the Southern Route Sunrise Powerlink project. The Mountain Springs Grade area includes portions of the Southern Route transmission line Section 9C and all of Section 10A. Figure 1 shows the Southern Route and the various transmission line section locations and the approximate location of the Mountain Springs Grade area. Our knowledge of the site conditions has been developed from site reconnaissance, a review of area geology, geologic hazards information and previous investigations. No subsurface investigations have been performed for this portion of the Southern Route.

3.1 PHYSIOGRAPHIC AND GEOLOGIC SETTING

The Mountain Springs Grade area extends from the northeastern edge of Oneill Valley along a notch in mountain front cut by Boulder Creek eastward across a steeply descending mountain front. This mountain front is characterized by extensive boulder outcrops of granitic rock and deeply incised drainages including Boulder Creek and Myer Creek. This is an arid area with sparse desert vegetation. The steep rocky terrain provides habitat for Big Horn Sheep.

The Mountain Springs Grade area represents the transition from the Peninsular Ranges physiographic province to the Colorado Desert physiographic province. The majority of this transmission line segment is underlain by granitic rock of the Peninsular Range batholith. There are minor occurrences of metamorphic rock and some Tertiary-age volcanic rocks and various Quaternary-age alluvial or colluvial deposits. Figures 2a and 2b illustrate the generalized geology along the alignment in this area.

3.2 GENERAL SURFACE AND GEOLOGIC CONDITIONS

As described above, the proposed Sunrise southern route alignment traverses varied terrain and diverse geologic conditions. A brief description of the site and geologic conditions along Mountain Springs Grade follows.

3.2.1 Mountain Springs Grade

Mountain Springs Grade is dominated by the bold outcrop terrain developed within the granitic rocks of the Peninsular Ranges. Alluvial deposits, including valley fill, alluvial fan deposits and rock talus are encountered within the project alignment. The only significant area of alluvial deposits is located at the top of the grade between Structures 255 and 258 as shown on Figure 2a.

The proposed structures in the upper reaches of the grade are underlain entirely by granitic rocks of the La Posta pluton, described below. A small zone of older metamorphic rocks is present within the central portion of the grade as shown on Figure 2b. Structure 272 is located within this rock unit and Structure 273 is underlain by mixed rock conditions in a linear zone of pegmatitic dikes and bands of this older metamorphic rock. The remainder of the central and lower portions of the grade are underlain by the granitic rocks of the La Posta pluton and characterized by the bold relief and bouldery surface expression. At the very bottom of the grade, the alignment crosses a zone of Tertiary-age volcanic rock of the Jacumba Volcanics.
3.3 GEOLOGIC UNITS

The bedrock geologic units and surficial deposits along the alignment in the Mountain Springs Grade area are discussed briefly below starting with the youngest in geologic age to the oldest. The approximate aerial extent of the soil/rock zones and corresponding geologic map symbols are shown on Figures 2a and 2b.

3.3.1 Alluvium and Older Alluvium, (Qal and Qt/f)

Alluvium deposits are present in the upper portion of the Mountain Springs Grade area and locally within some of the drainages crossed within the descending portion of the grade. The composition and strength of these materials are variable depending on the local parent sources, geologic age and mode of deposition. The alluvial deposits include younger alluvium and older alluvium, which includes terrace, fan and talus deposits. The composition of the alluvium or talus typically reflects its granitic source as it contains granitic cobbles and boulders in a silty sand matrix. Clayey sand or sandy clay matrix material may be encountered locally. Coarse-grained alluvial fan deposits that contain very large clastic material may be encountered near the mountain fronts.

Large boulders that result from exfoliation and differential weathering processes are also present at the ground surface throughout much of the area underlain by granitic terrain. Material from the rocky outcrops is subject to some down slope movement; thus, some of the rock at the surface has been transported short distances by gravity.

3.3.2 Volcanic Rocks (Tj)

Minor outcrops of volcanic rock are mapped along the lower slopes of the grade as part of the Jacumba Volcanics geologic unit. This unit contains andesitic flow rocks as well as volcanic tuffs and breccias.

3.3.3 Granitic Rocks of the La Posta Pluton (Klp)

Cretaceous-age granitic rocks of the La Posta pluton dominate the geology of the Mountain Springs Grade. These granitic rocks are light colored and of felsic and intermediate compositions (e.g., contains a large percentage of quartz and feldspar) referred to as granite, granodiorite and tonalite. Relative to shallow excavations and foundation design, the degree of weathering and fracturing, rather than granitic rock composition, has a more significant affect on rock quality and engineering properties. The granitic rock in the Mountain Springs Grade area tends to be pervasively fractured and jointed; hence, the degree of weathering can be highly variable locally.

3.3.4 Metamorphic Rocks

A small body of older metamorphic rocks is present in the central portion of the grade. These are primarily metasedimentary rocks consisting of interlayered quartzite, metasandstone, schist, and phyllite. Smaller bodies and inclusions of metamorphic rocks are present locally within the La Posta plutonic rocks.
3.4 STRUCTURE AND TECTONICS

The current tectonic setting of southern California is controlled by its location within the plate boundary zone between the Pacific and North American tectonic plates. The Pacific plate, which includes the San Diego and western Imperial Valley area, is traveling northwest relative to the North American plate at a rate of about 50 millimeters per year (mm/yr) (deMets et al., 1994). Most of this plate motion is accommodated on a series of strike-slip fault zones that constitute the San Andreas Fault System, which includes the San Andreas, San Jacinto, Elsinore fault zones. This crustal interaction of predominantly dextral (right-slip) faults spans from the Salton Trough across the Peninsular Ranges, and extends west approximately 60 miles offshore into the Continental Borderland Province.

Over geologic time, uplift and tilting of the Peninsular Ranges followed by erosion have resulted in the relatively modest mountainous terrain seen today. Episodic Miocene-aged volcanism developed in parts of the eastern margins of the Peninsular Ranges resulting in localized lava flows and a variety of volcanic deposits, including those traversed by the route in the Jacumba area. This period of volcanic upheaval also resulted in some faulting and fracturing of the older crystalline rocks in the area. Later the rifting of the Gulf of California (Todd et al., 2003) resulted in marine and nonmarine deposits in the Salton Trough, including the Imperial and Palm Springs Formations traversed in Section 10B.

3.4.1 San Andreas Fault System

The San Andreas Fault System is the main component of the transform boundary between the Pacific and North American plates in California. It is about 1,100 kilometers (km) long and links the Mendocino fracture zone and the Cascadia subduction zone in northern California to the spreading center in the Gulf of California. The system is broad and complex in its northern and southern reaches but relatively simple in the central section. The San Andreas fault zone is the easternmost and largest of the faults in the San Andreas Fault System.

In southern California, the San Andreas Fault System comprises a suite of northwest-striking, subparallel, right-lateral strike-slip faults that occupy a 200-km-wide swath straddling the coast of southern California. Cumulatively, these faults, which occur both on- and offshore, carry about two-thirds of the total relative plate motion. The primary onshore faults include the San Andreas, San Jacinto, Imperial, and Elsinore faults (Figure 3). The Newport-Inglewood and Rose Canyon fault zones are located west of the aforementioned faults and have both onshore and offshore components. Significant offshore faults include the San Diego Trough and San Clemente fault zones.

3.4.1.1 San Andreas Fault Zone

The southern San Andreas fault zone with its high slip rate generates frequent large earthquakes. Figure 4 presents a Regional Earthquake Epicenter Map showing the distribution of earthquakes in the San Diego and Imperial County areas. The 1857 Mw 7.9 Fort Tejon earthquake was caused by rupture of 360 km of the fault from Parkfield in central California to Cajon Pass. In this event, the amount of slip varied along strike, with about 5 meters (m), 10 m, and 4 m on the Cholame, Carrizo, and Mojave segments, respectively. An estimated $M_w \cong 7$ to 7.5 earthquake in 1812 ruptured the Mojave and northern San Bernardino segments (SCEC, 2008). South of Cajon Pass, paleoseismic evidence indicates that the San
SECTION THREE

Site and Geologic Conditions

Andreas sustains great earthquakes but also has moderate earthquakes such as the historical 1986 Mw 5.6 North Palm Springs earthquake and the 1948 Mw 6.0 Desert Hot Springs earthquake on the southern branch of the San Andreas fault (Banning fault).

The San Andreas fault zone ends in the Salton Trough, an extensional basin that is the transition between the San Andreas transform system and the Gulf of California spreading center. In the Salton Trough, the slip generated at the spreading center is transferred from the Imperial fault through the Brawley Seismic Zone to the San Andreas fault zone. The Imperial fault links the Salton Trough, the northernmost ridge segment, with the rest of the rift system that continues offshore in the Gulf of California. About 5 of its 20 mm/yr of slip is accommodated by creep, and the rest is released in moderate earthquakes (M 6 to 7). The Imperial fault has experienced two historical surface-rupturing earthquakes in 1940 (Mw 7.1) and 1979 (Mw 6.6) (Sharp et al., 1982). The 1979 event ruptured part of the 1940 rupture. The Brawley Seismic Zone has frequent shallow microseismicity and is prone to seismic swarms.

3.4.1.2 San Jacinto Fault Zone

The 210-km-long San Jacinto fault zone splays from the San Andreas fault near Cajon Pass, (Figure 3) and has the highest slip rate of any fault in southern California besides the San Andreas and Imperial faults. The fault is complex and highly segmented comprising numerous subparallel and en echelon strands separated by up to several kilometers. The San Jacinto fault zone is extremely seismically active and has Mw \( \geq 6 \) earthquakes on average every 10 years (Hutton et al., 1991). Recent historical earthquakes have included the 1968 Mw 6.5 Borrego Mountain, 1987 Mw 6.6 Superstition Hills, and 1954 Mw 6.4 San Jacinto earthquakes (SCEC, 2008).

A southern extension of the San Jacinto has been postulated based on previous investigations in the Salton Trough. The State map sheet includes a very lengthy projection of a buried fault that extends from near the southern end of the Superstition Mountain fault to the US-Mexico border. Subsequent site specific studies on faults in Mexico and in the Imperial Valley as well as regional seismicity studies have lead to the idea of a Cerro Prieto-San Jacinto fault zone. This fault’s location is inferred based on seismicity studies and preliminary geomorphic evidence.

3.4.1.3 Elsinore Fault Zone

The Elsinore fault is a 250-km-long right-lateral strike-slip fault that is a significant part of the San Andreas Fault System. It strikes northwest and runs west of the Salton Trough near the Mexican border to Corona where it branches into the Whittier and Chino faults. The central part comprises several segments, separated by step-overs, which include, from north to south, Glen Ivy, Temecula, Julian, and Coyote Mountain segments. The southern end of the Coyote Mountains segment is located approximately 4 miles northeast of the Mountain Springs Grade area. The Laguna Salada fault extends from the southern end of the Elsinore fault into Mexico.

An M L 6 earthquake in 1910 occurred on the northern end of the Elsinore fault, and its Mexican extension, the Laguna Salada fault, had an estimated Mw 7 earthquake in 1892 (SCEC, 2008 and Petersen and Wesnousky, 1994).
The Elsinore fault zone is the nearest active fault segment to the Mountain Springs Grade area. The slip rate on the Elsinore fault is about 3 to 5 mm/yr (Pinault and Rockwell, 1984; Rockwell and Pinault, 1986). The Coyote Mountain segment has a Holocene slip rate of about 3 mm/yr (WGCEP, 2008). The Julian segment has two strands and a late Quaternary slip rate of 3 to 6 mm/yr based on soil chronostratigraphy (Vaughan and Rockwell, 1986; Petersen and Wesnousky, 1994; Wills et al., 2008). The multi-strand Temecula segment has a minimum late Holocene slip rate of about 2.5 mm/yr along one strand (Wills et al., 2008). Drainage offsets and estimated ages from soil development have yielded an average slip rate of about 5.5 mm/yr for the Glen Ivy segment (Millman and Rockwell, 1986; Wills et al., 2008). The Laguna Salada fault has a right-lateral slip-rate of 2 to 3 mm/yr, with a similar component of dip-slip motion (Mueller and Rockwell, 1995).

Yuha Wells and Jacume Faults

The Yuha Wells fault and the informally named Jacume fault east of the Jacumba area are relatively minor geologic structures located in the western portion of Salton Trough and eastern portion of the Peninsular Ranges, respectively. Both faults appear to be northeasterly striking left lateral faults that are considered secondary features that may accommodate stresses developed between the major northwesterly striking faults.

The Yuha Wells fault consists of a complex zone of short, branching and stepping strands generally located between the northern terminus of the Laguna Salada fault and the southern end of the Elsinore fault (Rockwell, et al., 1990). This fault is located approximately 8 miles east of the Mountain Spring Grade area. There is little published information on this fault.

Similarly, the Jacume fault is a short series of stepping fault traces that appears to be associated with a moderate level of microseismicity and no definitive evidence of recent surface rupture. Neither fault is considered active based on the State of California’s review of fault rupture hazard.
SECTION 4 GEOLOGIC HAZARDS

This section addresses potential geologic and seismic hazards in the Mountain Springs Grade area. The primary geologic hazard in this reach is strong ground motion from a seismic event centered on one of several nearby or more distant active faults. Evaluations of major faults crossings, seismic shaking, liquefaction and seismic settlement, landslides, rockfalls and slope stability along the route are discussed below.

4.1 FAULT CROSSINGS

The proposed Mountain Springs Grade portion of the southern route does not cross any active faults. The Elsinore fault zone east of the Mountain Springs Grade area is the nearest active fault located approximately 4 miles northeast of the bottom of Mountain Springs Grade. The proposed transmission line does cross the projection of the Jacume fault between Structures 256 and 257, as shown on Figure 2a. The Jacume fault is considered a potentially active fault for the purposes of this evaluation. There is no evidence of Holocene surface faulting along the Jacume fault and the potential for moderate or large displacement surface rupture of the Jacume fault is judged to be very low.

4.2 SEISMIC SHAKING

Figure 3 presents the peak horizontal ground acceleration (PGA) as a percentage of the acceleration of gravity (g) along the southern route alignment. The hazard level depicted represents the PGA associated with a 10 percent probability of being exceeded in 50 years. The map is derived from seismic hazard curves calculated on a grid of sites across the southwestern United States that describe the frequency of exceeding a set of ground motions within delineated fault sources. The ground motions relate the source characteristics of the earthquake and propagation path of seismic waves through the ground at a particular site or vicinity. The predicted ground motion is typically quantified in terms of a medium value (i.e., a function of magnitude, distance, type of faulting, the geologic or subsurface characteristics, and other factors) and a probability density function of peak horizontal ground acceleration (Peterson et al., USGS 2008). For the Mountain Springs Grade area, the ground motions associated with the 10 percent probability of exceedance in 50 years hazard level range from a PGA of 0.25g to 0.30g as shown on Figure 3.

4.3 LIQUEFACTION AND SEISMIC SETTLEMENT

Liquefaction and seismic settlement are secondary effects associated with seismic shaking. Liquefaction is a phenomenon in which loose to medium dense, saturated, granular materials undergo matrix rearrangement, develop high pore water pressure, and lose shear strength because of cyclic ground vibrations induced by earthquakes. This rearrangement and strength loss is followed by a reduction in bulk volume of the liquefied soils. The secondary effects of liquefaction can include the loss of bearing capacity below foundations, settlement in level ground, and instability in areas of sloping ground (also known as lateral spreading). Typically, liquefaction effects in granular materials are considered to a depth of 50 feet below ground surface.
Geologic Hazards

SECTION FOUR

Liquefaction is not considered a significant hazard in the Mountain Springs Grade area. Only the western most structures are underlain by alluvial deposits and these are older alluvial fan and very coarse grained talus deposits. This setting is less conducive to liquefaction events of major consequence because of the anticipated depth to water and the tendency for the materials to be only moderately susceptible to liquefaction due to their very coarse-grained nature and relative density.

Seismic settlement results from the densification of granular soils during earthquake-induced shaking in dry or partially saturated soils. The potential for seismic settlement is present in younger alluvial deposits along the alignment and most significant in Jacumba Valley to the west of the Mountain Springs Grade area and in the Imperial Valley to the east of the Mountain Springs Grade area. Seismic settlement is not considered a significant hazard for the Mountain Springs Grade area.

4.4 LANDSLIDES, ROCKFALLS AND DEBRIS FLOWS

Landslides are a significant geologic hazard in southern California. Within San Diego County, the areas of greatest landslide hazard are generally located in the coastal plain area where layered sedimentary deposits contain inherently weak layers that may be exposed by natural erosion or grading activities. When unfavorable geologic and topographic conditions coincide, landsliding may result.

The majority of the Southern Route is underlain by crystalline rocks with minor alluvial deposits and a minor occurrence of sedimentary and layered volcanic rocks in the Jacumba area. Landslides are possible, but relatively rare in the crystalline rock setting. Based on our field reviews and terrain analysis of the route, no landslides were mapped in or adjacent to the transmission line in the Mountain Springs Grade area.

In addition to landslides, areas of intense erosion, debris flows and soil slips, and rock falls occur in areas of sloping terrain in San Diego and Imperial Counties. Areas of intense erosion or recent debris flows or soil slips are evidenced by fresh scarps and slopes barren of vegetation. Given the sparse vegetation and generally very thin soil cover in the Mountain Springs Grade area, the potential for debris flows and soil slips is low. This assessment was supported by our field investigation and terrain analysis for the Mountain Springs Grade area.

Rockfalls occur in areas with bold rock outcrops and steep natural slopes. Additionally, jointed rock may undergo rockfalls if construction slopes were to undercut a rock slope or if subjected to seismic shaking. In general, the rock fall hazard is greatest in areas with slope inclinations in excess of 60 degrees from horizontal. Extensive boulder outcrops and steep slopes are encountered locally along the route within the Mountain Springs Grade area, and rockfalls have occurred in this area during the geologic past. Based on our review of the structure sites, there are no structures located within zones characterized as having a high risk of rock fall hazard. Based on our field investigations, there are not large, precarious boulders that pose a significant risk to the proposed structure sites. In general, most of the structure sites are located near the upper reaches of slopes or minor ridges and areas of large precarious boulders have not been identified above these proposed structures.
4.5 EXPANSIVE AND COLLAPSIBLE SOILS

The soil conditions observed at the ground surface and in the two previous borings performed for the SWPL transmission line indicate coarse-grained soils. Based on the five seismic refraction surveys for the SWPL transmission line, the coarse-grained surficial soils are underlain by weathered rock at relatively shallow depths.

Changes in moisture can cause shrinkage and swelling of clayey fine grained soils. Collapse can occur in dry soils that have unstable soil structure due to decomposition or irrigation processes, typically with a skeletal structure that is weakly cemented by soluble salts or clays. Increases in moisture content can cause the interparticle cementation to reduce, causing changes in volume (collapse), especially when loaded.

The coarse-grained soils and weathered rock at the tower sites in the Mountain Springs Grade area are not considered to have significant expansion or collapse potential.
SECTION 5  TOWER FOUNDATION RECOMMENDATIONS

The tower foundation recommendations presented in this report are based on information provided to us, review of available information, empirical correlations, engineering and geologic analyses, and professional judgment.

We understand that the proposed tower foundations may consist of four cast-in-place drilled pier or rock anchor foundations. These foundations may be subject to high downward and upward loads, overturning moments, and lateral forces. This report provides preliminary drilled pier foundation design information for each of the tower sites, however, we understand that the rock anchors will be considered for many sites in the Mountain Springs Grade area.

5.1 GENERAL FOUNDATION CONDITIONS

The Site Plan and Generalized Geologic Maps presented on Figures 2a and 2b indicate the primary geologic units observed and mapped along the transmission line corridor. The characteristics of the foundation materials anticipated during construction are based on the geologic conditions described in Section 3 and the results of previous subsurface investigations for the existing SWPL transmission line.

Most of the transmission line within Mountain Springs Grade will encounter variably weathered rock, and predominantly granitic rock, that is highly fractured. In our opinion, these materials should provide sound foundation conditions for the new towers as has been the case for the existing SWPL.

Other conditions that may influence the design of the tower foundations include the inclination of adjacent slopes and the depth of relatively disturbed or weak materials. Disturbed or weak materials may include residual soils, alluvium and slopewash.

5.2 FOUNDATION EXCAVATION CHARACTERISTICS

To provide insight regarding excavation augerability, we have considered the seismic refraction data and boring data at the existing structure sites. Further, we have reviewed the actual pier drilling conditions during construction of the SWPL.

Shafts are expected to be relatively easy to excavate to design depths within alluvial deposits and completely weathered granitic materials. Caving of the drilled holes was noted during construction of the SWPL foundations and is likely in the alluvial deposits. Caving may be exacerbated where perched groundwater is present. In the majority of the new alignment, there may be several feet of surficial material that may slough back into the excavated hole. Such materials should be cased or sloped back to a stable inclination during construction.

In general, we anticipate that many of the locations along the Mountain Springs Grade will encounter fractured rock and that large-diameter rock coring equipment may be more suited for the proposed excavations.

In rock areas that indicate refusal to drilling conditions, it may be required to use controlled blasting techniques or to utilize rock bolted foundations. Blasting should be performed by an experienced and
qualified blasting engineer/contractor familiar with local conditions and pole foundation excavation requirements. All blasting should be performed to minimize overbreakage in the foundation zone. It should be anticipated that blasting will produce excavations with irregular sidewall conditions.

5.3 DRILLED PIER FOUNDATION DESIGN

We understand that the drilled pier foundations will be designed using the Electric Power Research Institute (EPRI) computer program *Compression Uplift Foundation Analysis and Design* (CUFAD). The design soil parameters required to use the CUFAD program include:

- Soil Layer Depths
- Groundwater Depth
- Total Unit Weight
- Friction Angle
- Cohesion
- Horizontal Stress Coefficient
- Surficial Material Discount Depth

Estimates of these parameters were developed based on the results of the previous investigations and construction records, engineering evaluation and analysis, empirical correlation, literature research, and professional judgment.

5.3.1 Soil Layer Depths

Stratigraphic profiles at the proposed tower locations were developed based on the seismic refraction traverses, borings, and foundation construction records from the SWPL tower sites. These profiles are presented in the Interpretive Seismic Velocity Profiles illustrated in Figure 5. We have developed soil and rock design parameter sets using correlations, indirect theoretical elastic methods, and engineering judgment.

5.3.2 Design Groundwater

Based on the geologic setting and the absence of groundwater reported during construction of the SWPL foundations, groundwater is not a foundation design consideration in the Mountain Springs Grade area.

5.3.3 Soil Parameters

The foundation design parameters for soil and rock presented in Table 3 are based on our understanding of the geologic setting and subsurface conditions encountered in previous investigations. The design parameters are intended for use in the CUFAD computer program and may not reflect actual strengths. The structural design should also evaluate the values of displacement required by CUFAD to mobilize tip resistance.
5.3.4 Foundation Design Coefficients

The CUFAD computer program also requires the values of two horizontal stress coefficients 1) the operative/in-situ horizontal stress ratio and 2) the horizontal stress coefficient which converts vertical to horizontal effective stress.

Based on the type of construction anticipated for typical drilled pier construction in the Mountain Springs Grade area including no casing, dense soils, concrete slump of greater than 5 inches, and foundation excavations being left open for greater than 12 hours, we recommend an operative/in-situ horizontal stress coefficient of 0.9. We recommend an effective stress horizontal stress coefficient of 0.60 for initial design. We recommend an interface-to-soil friction angle coefficient of 1.0.

5.3.5 Discount of Surficial Materials

We recommend that a depth of surface material be discounted in all cases of the foundation analyses. This recommendation is based on the presumption that the weathered near surface materials inherently have lower strengths with a higher potential for erosion. The recommended depth of surficial material discounting is presented in Table 3. These discount depths do not account for discount depth (or reduction in resistance) due to descending ground adjacent to the tower foundations.
SECTION 6 DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

This section presents a discussion of the general impacts to the project as a result of geologic and seismic hazards and general recommendations and conclusions regarding geologic and seismic hazards.

6.1 FAULTING CROSSINGS

The project does not cross any active faults and the risk of fault rupture within the Mountain Springs Grade area is considered low. The nearest active fault is the Elsinore fault zone within Section 10A located approximately 4 miles northeast of the Mountain Springs Grade area.

The transmission line crosses a projection of the Jacume fault within the Mountain Springs Grade area. This fault is not an active fault and is not considered a significant ground rupture hazard relative to the proposed transmission line structures.

6.2 SEISMIC SHAKING

Seismic shaking levels and the subsequent hazard varies across the project as shown by the peak bedrock accelerations presented on Figure 3. Transmission line structures and their foundations are designed with seismic and wind loads as part of their structural design. Therefore, hazards associated with seismic shaking are mitigated by design level engineering studies and the subsequent construction.

6.3 LIQUEFACTION AND SEISMIC SETTLEMENT

Overall, the exposure to liquefaction and seismic settlement hazards within the Mountain Springs Grade area is considered to be very low. Based on our field review and the geologic setting of the tower sites, liquefaction and seismic settlement are not significant hazards in the Mountain Springs Grade area which is dominated by crystalline rock or older fan and talus slope deposits.

6.4 LANDSLIDES, DEBRIS FLOWS, AND ROCKFALLS

Based on our field review, landslides and debris flows are not a significant hazard to the proposed structure locations within the Mountain Springs Grade area. Areas of higher erosion potential are present locally along the alignment. These areas tend to be relatively small and localized, although areas of steeper terrain have an increased potential for such problems. Erosional areas have been avoided during the structure locating process.

The rockfall hazard is considered low or non-existent for most of the structures along Mountain Springs Grade. However, given the locally steep slopes and bold rock outcrops some potential for rockfalls exists. Perhaps the most dramatic area of possible rock fall hazard within the area lies along the upper reaches of Boulder Creek in the In Koh Pah area. The upper portions of the northwesterly facing slopes of Carries Mountain has a very steep, rock face that over geologic time, has shed some large boulders that have accumulated along the toe of the slope. Structures 256 and 257 are located downslope from this area where rockfalls have occurred in the geologic past. However, given the distance away from the rock fall...
source and the distance out away from the toe of the slope the potential for large damaging rock falls to reach either Structure 256 or 257 is considered low.

Additionally, some low to moderate rockfall hazard has been identified at Structures 265, 266 and 269. The setting for these three areas is rather different than the In Koh Pah area, however. In these areas, smaller locally steep slopes above the structures have some potential for rock fall in closer proximity to the structures. These areas do not have the potential to generate rock of any significant size relative to the structural integrity of proposed structures. These areas are characterized by a natural fracture pattern in the rock that results in relatively small boulders and cobble sized on the slope face. The potential for any significant damage to the structures in these locations as a result of rockfall is considered low. However, these areas should be evaluated during construction and any loose rock above the work areas should be dislodged to provide appropriate worker safety.

6.5 EXPANSION AND COLLAPSE POTENTIAL

Based on our field review and review of two SWPL borings, expansion and collapse potential is not a significant hazard to the structure locations within the Mountain Springs Grade area. The site materials are not generally susceptible, and drainage design should direct water away from foundations.

6.6 CORROSION POTENTIAL

We anticipate that the granitic soils in the Mountain Springs Grade area will be slightly to moderately corrosive, based on our experience with similar granitic soils in San Diego County. Similarly, we anticipate that sulfate attack to concrete should be negligible.
SECTION 7  UNCERTAINTIES AND LIMITATIONS

The recommendations made herein are based on the assumption that soil conditions do not deviate appreciably from those observed during our field review and found during the previous investigations reviewed for this study. We recommend that URS review the foundation plans to verify that the intent of the recommendations presented herein has been properly interpreted and incorporated into the contract documents. We further recommend that foundation excavations be observed by a qualified engineer or geologist to verify that site conditions are as anticipated, or to provide revised recommendations, if necessary.

Geotechnical engineering and the geologic sciences are characterized by uncertainty. Professional judgments presented herein are based partly on our understanding of the proposed construction, and partly on our general experience. Our engineering work and judgments rendered meet current professional standards; we do not guarantee the performance of the project in any respect.

Specific details for the proposed project are not available at this time. The recommendations presented in this report are intended to assist Sargent & Lundy, SDG&E, and their subconsultants in the planning and design of the project. The professional judgments and interpretations presented in this report are based on our current knowledge of the proposed project, our interpretations of the subsurface conditions in the project area, and our understanding of the geologic and tectonic setting of the project site. This knowledge is based on the information provided to us, published literature, previous studies, and our investigations referenced in this report.
SECTION 8 REFERENCES

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Table 1
Tower Site Geology
Mountain Springs Grade Area

<table>
<thead>
<tr>
<th>Geologic Unit</th>
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<tbody>
<tr>
<td>Alluvium (Qal)</td>
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<tr>
<td>Older Alluvium/Fan or Talus Deposits (Qt/f)</td>
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<tr>
<td>Jacumba Volcanics (Tj)</td>
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<tr>
<td>Tonalite of La Posta (Klp)</td>
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<tr>
<td>Rocks of Jacumba Mountains (MzPzm)</td>
<td>272</td>
</tr>
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</table>
## Table 2
### Summary of Tower Site and Subsurface Information
#### Mountain Springs Grade Area

<table>
<thead>
<tr>
<th>Mountain Springs Grade Area Proposed Structure Designation</th>
<th>Structure Type a</th>
<th>Closest SWPL Structure Designation</th>
<th>Nearby Subsurface Information</th>
<th>Geologic Unit b</th>
<th>Previous Boring Information</th>
<th>Previous Seismic Refraction Information</th>
<th>As-Built Design Information</th>
<th>Notes</th>
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<tr>
<td>P255 Dead End</td>
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<td>P257 Tangent</td>
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<td>5 to 18</td>
<td>1,750</td>
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<td>78</td>
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<td>P259 Tangent</td>
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<td>Rock encountered 4 feet -10 feet bgs in Structures A, C, and D.</td>
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<tr>
<td>Mountain Springs Grade Area Proposed Structure Designation</td>
<td>Structure Type</td>
<td>Closest SWPL Structure Designation</td>
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<td>Geologic Unit</td>
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<td>Previous Seismic Refraction Information</td>
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<td></td>
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<td></td>
<td>Profile (feet)</td>
<td>USCS Symbol</td>
<td>Shaft Diameter (inches)</td>
<td>Belled Shaft Diameter (inches)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Profile (feet)</td>
<td>Average P-Wave Velocity (ft/sec)</td>
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<td>Rock encountered 1 foot-5 feet bgs in all Structures.</td>
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<td>Klp</td>
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<td>Rock encountered 2 feet-6 feet bgs in all Structures.</td>
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<td>P263 Angle</td>
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<td>60</td>
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<td>Rock encountered at surface in all Structures.</td>
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<td>Rock encountered at surface in Structures B and D.</td>
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<td>NA</td>
<td>10.0</td>
<td>Actual diameter 32 inches. Rock encountered 3 feet bgs in Structure A and 8 feet bgs in Structure D.</td>
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### Table 2
Summary of Tower Site and Subsurface Information
Mountain Springs Grade Area
(Continued)

<table>
<thead>
<tr>
<th>Mountain Springs Grade Area Proposed Structure Designation a</th>
<th>Structure Type a</th>
<th>Closest SWPPL Structure Designation</th>
<th>Nearby Subsurface Information</th>
<th>Geologic Unit b</th>
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## Table 2
Summary of Tower Site and Subsurface Information
Mountain Springs Grade Area
(Continued)

<table>
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<th>Mountain Springs Grade Area Proposed Structure Designation a</th>
<th>Structure Type a</th>
<th>Closest SWPL Structure Designation</th>
<th>Nearby Subsurface Information</th>
<th>Geologic Unit b</th>
<th>Previous Boring Information</th>
<th>Previous Seismic Refraction Information</th>
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<td>Average P-Wave Velocity (ft/sec)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P279 Tangent 240</td>
<td>Klpm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2
Summary of Tower Site and Subsurface Information
Mountain Springs Grade Area
(Continued)

<table>
<thead>
<tr>
<th>Mountain Springs Grade Area Proposed Structure Designation a</th>
<th>Structure Type a</th>
<th>Closest SWPL Structure Designation</th>
<th>Nearby Subsurface Information</th>
<th>Geologic Unit b</th>
<th>Previous Boring Information</th>
<th>Previous Seismic Refraction Information</th>
<th>As-Built Design Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Profile (feet)</td>
<td>USCS Symbol</td>
<td>Profile (feet)</td>
</tr>
<tr>
<td>P280 Tangent 241 Seismic Refraction Tj</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 to 5</td>
<td>1,900</td>
<td>5 to 28</td>
</tr>
<tr>
<td>P281 Dead End 242 Seismic Refraction Tj</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 to 20</td>
<td>1,300</td>
<td>20 to 30</td>
</tr>
</tbody>
</table>

Notes:

a. Proposed structure name and type provided by SDG&E.
b. Site Plan and Generalized Geologic Maps are presented as Figures 2a and 2b.
c. SPT blowcount is calculated as 80 percent of the modified California blowcount for the last 12 inches of driving.
d. Interpretive Seismic Velocity Profiles presented in Figure 5.
### Table 3
Soil and Rock Design Parameter Sets
Mountain Springs Grade Area

<table>
<thead>
<tr>
<th>Design Parameter Set</th>
<th>Compression Wave Velocity, Vp (ft/sec)</th>
<th>Total Unit Weight, γ (pcf)</th>
<th>Friction Angle, φ' (degrees)</th>
<th>Cohesion, C' (psf)</th>
<th>Adhesion Factor</th>
<th>Discount Depth b (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soil / Sedimentary Rock / Weathered Granitic and Metamorphic Rock</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1,000-2,000</td>
<td>120</td>
<td>33</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2,000-3,000</td>
<td>125</td>
<td>35</td>
<td>250</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>3,000-4,000</td>
<td>130</td>
<td>37</td>
<td>500</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>&gt;4,000</td>
<td>135</td>
<td>39</td>
<td>1,000</td>
<td>0.8</td>
<td>0</td>
</tr>
<tr>
<td><strong>Granitic Rock and Metamorphic Rock</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5,000-6,000</td>
<td>145</td>
<td>45</td>
<td>1,500</td>
<td>0.6</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>&gt;6,000</td>
<td>155</td>
<td>47</td>
<td>2,000</td>
<td>0.5</td>
<td>0</td>
</tr>
</tbody>
</table>

**Notes:**

a. These soil/rock parameters are intended for input for the computer program CUFAD and may not reflect actual strengths.

b. Discount depth does not include discount for sloping ground.
KEY TO GEOLOGIC MAPS
SUNRISE POWERLINK SOUTHERN ROUTE
MOUNTAIN SPRINGS GRADE AREA

CREATED BY: RC
PM: MEH
DATE: 6-30-09
PROJ. NO: 27668031.00030
FIG. NO: 2c

Fill
Ql, Sediments of ancient Lake Cahuilla
Qal, Alluvium
Qt/f, Older alluvial deposits, including terraces and fans
QTps, Palm Spring Formation
QTpsl, Palm Spring Formation overlain by lake beds
QTpsa, Palm Spring Formation overlain by alluvium
QTpsp, Palm Spring Formation overlain by pediment gravels
Ti, Imperial Formation
Tip, Imperial Formation overlain by pediment gravels
Tsm, Split Mountain Formation
Ta, Anza Formation
Tal, Alverson Andesite
Tj, Jacumba Volcanics
Klp, Tonalite of La Posta
Kih, Indian Hill granodiorite of Parrish and others
Jsp, Migmatitic schist and gneiss of Stephenson Peak
MzPzm, Rocks of Jacumba Mountains
GEOTECHNICAL INVESTIGATION FOR
THE MIGUEL–IMPERIAL VALLEY
500 KV TRANSMISSION LINE
(TOWER SITES 25 THROUGH 213)

APPENDIX H

February 22, 1980
APPENDIX H

SUBSURFACE INVESTIGATION DATA

The information from field geologic reconnaissance have been recorded on the Tower Site Inspection Summary sheets for each site. These sheets are included in this Appendix. In addition, the information from seismic refraction traverses, augered borings, and air-drill borings have been consolidated into a single sheet and follow the inspection summary sheets for each site. Where applicable, the summary sheets include the material type encountered in each boring, the air-drill time rates, the seismic p-wave velocities and the depth range for each velocity, the depth of each sample obtained by augered borings, and the standard penetration resistance of the sampler. Field coring logs are also included for Tower Sites 26 and 177.
APPENDIX D

SUBSURFACE INVESTIGATION DATA

The information from field geologic reconnaissance has been recorded on the Tower Site Inspection Summary Sheets for each site. These sheets are included in this Appendix. In addition, the information from seismic refraction traverses and augered borings have been consolidated into a single sheet and follow the inspection summary sheets for each corresponding site. Where applicable, the summary sheets include the material type encountered in each boring, the seismic p-wave velocities and the depth range for each velocity, the depth of each sample obtained by augered borings, and the standard penetration resistance of the sampler.
| **TABLE I**  
<table>
<thead>
<tr>
<th><strong>TOWER SITE INSPECTION SUMMARY</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tower No.</strong></td>
</tr>
<tr>
<td><strong>Station:</strong></td>
</tr>
<tr>
<td><strong>Tower Type:</strong></td>
</tr>
<tr>
<td><strong>Geophysical Survey:</strong></td>
</tr>
<tr>
<td><strong>Soil Description of Surface and Anticipated Subsurface Conditions:</strong></td>
</tr>
<tr>
<td><strong>Toe - Surface covered with 1' to 8' diameter boulders</strong></td>
</tr>
<tr>
<td><strong>Thickness estimated 25' to 50'</strong></td>
</tr>
<tr>
<td><strong>Anticipated Groundwater Conditions:</strong></td>
</tr>
<tr>
<td><strong>Site Slope Conditions:</strong></td>
</tr>
<tr>
<td><strong>Erosion Potential and Possible Erosion Control Techniques:</strong></td>
</tr>
<tr>
<td><strong>Slope</strong></td>
</tr>
<tr>
<td><strong>Geologic Hazards:</strong></td>
</tr>
<tr>
<td><strong>Boring Recommendation:</strong></td>
</tr>
<tr>
<td><strong>Access:</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Pictures:</strong></td>
</tr>
<tr>
<td><strong>Notes:</strong></td>
</tr>
<tr>
<td><strong>Sketch:</strong></td>
</tr>
<tr>
<td><strong>Inspection Team:</strong></td>
</tr>
<tr>
<td><strong>Date:</strong></td>
</tr>
<tr>
<td><strong>TABLE I</strong></td>
</tr>
<tr>
<td><strong>TOWER SITE INSPECTION SUMMARY</strong></td>
</tr>
</tbody>
</table>

| Tower No:   | 215       |
| Station:    | 2865 + 90 |

**Tower Type:** Tangent  
**Geophysical Survey:** Yes / No

**Soil Description of Surface and Anticipated Subsurface Conditions:**
- Talus slope
- Surface covered by fragmented to subangular 1'-3' diameter boulders
- Talus could be 50 to 100 feet thick

**Anticipated Groundwater Conditions:** None expected within depths of 50' to 100'

**Site Slope Conditions:**
- Uniform talus slope
- Average 20° slope

**Erosion Potential and Possible Erosion Control Techniques:** None under present conditions

**Geologic Hazards:** None — possible rock falls from above

**Boring Recommendation:** None

**Access:** None except by foot

**Notes:**

**Sketch:**

**Inspection Team:** ERA plus G.D. plus 2.5

**Date:** 9-20-79
# Subsurface Investigation Summary

**Tower Site 215**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Subsurface Materials</th>
<th>Seismic P-Wave Velocity (ft/sec)</th>
<th>Auger Boring Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boring</td>
<td></td>
<td>T-1</td>
<td>T-1r</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>1420</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>1950</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>3030</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>4340</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>5500</td>
<td>(5000)</td>
</tr>
</tbody>
</table>

**Legend:**
- Bag Sample
- Auger Boring Sample
- Mod CA Blowcount

*Printed on Clearprint 1000 W*
## TABLE 1

**TOWER SITE INSPECTION SUMMARY**

<table>
<thead>
<tr>
<th>Tower No:</th>
<th>216</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station:</td>
<td>not given</td>
</tr>
<tr>
<td>Tower Type:</td>
<td>Target</td>
</tr>
<tr>
<td>Geophysical Survey:</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Soil Description of Surface and Anticipated Subsurface Conditions:</td>
<td>loose gravel, silty coarse sand (50) slpewash</td>
</tr>
<tr>
<td>Anticipated Groundwater Conditions:</td>
<td>within depths of 25 to 50'</td>
</tr>
<tr>
<td>Site Slope Conditions:</td>
<td>gently sloping, coalescing fans, 40 to northwest</td>
</tr>
<tr>
<td>Erosion Potential and Possible Erosion Control Techniques:</td>
<td>possible in present location (small drainage channel) - move site northward 50 feet</td>
</tr>
<tr>
<td>Geologic Hazards:</td>
<td>None except for possible erosion</td>
</tr>
<tr>
<td>Boring Recommendation:</td>
<td>auger borings</td>
</tr>
<tr>
<td>Access:</td>
<td>relatively good - jeep truck road to towers</td>
</tr>
<tr>
<td>Pictures:</td>
<td>1-1-27</td>
</tr>
</tbody>
</table>

**Notes:** Site is to be moved approximately 50' to 60' northly.

**Seismic Traverse:** T-2 & T-2r

**Inspection Team:** ER1 plus S.06 & E.02

Date: 9-14-79
# Subsurface Investigation Summary

## Tower Site 216-1

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Subsurface Materials</th>
<th>Seismic P-Wave Velocity (ft/sec)</th>
<th>Auger Boring Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boring</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Qnl or slopewash</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Dg (6M)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- Bag Sample
- Auger Boring Sample
- Mod_CA Blowcount

![Diagram](image_url)
**TABLE I**

**TOWER SITE INSPECTION SUMMARY**

<table>
<thead>
<tr>
<th>Tower No:</th>
<th>217</th>
<th>Station:</th>
<th>2902 + 35</th>
</tr>
</thead>
</table>

**Tower Type:** Target  
**Geophysical Survey:** Yes  
**No**  

Soil Description of Surface and Anticipated Subsurface Conditions: Some decomposed sand and gravel. Weathered quartz sandstone.  

Anticipated Groundwater Conditions: None within depth of 50' to 100'.  

Site Slope Conditions: 15°-20° northwest = Steep slope.  

Erosion Potential and Possible Erosion Control Techniques: None.  

Geologic Hazards: None.  

Boring Recommendation: Possibly could be augered.  

Access: None.  

Pictures: 5-1-25  

Notes: Site to be marked.  

Sketch:  

**Inspection Team:** ESA plus  

Date: 9-14-79
TABLE I
TOWER SITE INSPECTION SUMMARY

Tower No: 218  Station: 2908 + 10

Tower Type: Target  Geophysical Survey: Yes  No

Soil Description of Surface and Anticipated Subsurface Conditions: 
Decomposing over silty coarse sand (Dg)

Anticipated Groundwater Conditions: None within depth of 50' to 100'

Site Slope Conditions: 33° area on site - 6° to northwest
Site is located in a small embankment bed on hill

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

Boring Recommendation: Could be augered to 5' to 10'?

Access: None at present except by foot

Pictures: 5-1-76

Notes: 

Sketch:

Inspection Team: ERA + SDE + Eady + E

Date: 9-14-79
TABLE I
TOWER SITE INSPECTION SUMMARY

Tower No: 219  Station: Z921 + 50

Tower Type: Target  Geophysical Survey: Yes  No

Soil Description of Surface and Anticipated Subsurface Conditions:

Rocks outcrop of quartz dike - legs A + B at base of outcrop
Outcrop in loose surface boulders, probably 2 to 3' thick

Anticipated Groundwater Conditions: None within depths of 50' to 100'

Site Slope Conditions: 330° to east breaks up to 170° to 80° at west
located new ridge line in small swale

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

Boring Recommendation: None  rock anchor site?

Access: None except by cat

Pictures:

Notes: Possible rock anchor site  Sketch:

Inspection Team: 9-20-79 FEA pl
Date: 9-20-79 50.64E pm
of 5
<table>
<thead>
<tr>
<th>TABLE I</th>
<th>TOWER SITE INSPECTION SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tower No: 220</td>
<td>Station:</td>
</tr>
<tr>
<td>Tower Type: Tangle</td>
<td>Geophysical Survey: Yes  No</td>
</tr>
<tr>
<td>Soil Description of Surface and Anticipated Subsurface Conditions: Rock outcrops of granite dominate</td>
<td></td>
</tr>
<tr>
<td>Anticipated Groundwater Conditions: None</td>
<td></td>
</tr>
<tr>
<td>Site Slope Conditions: Estimated 5° - 7° northeast, located on small relatively flat topped knoll</td>
<td>Outcrops of rock are near site</td>
</tr>
<tr>
<td>Erosion Potential and Possible Erosion Control Techniques: None</td>
<td></td>
</tr>
<tr>
<td>Geologic Hazards: None</td>
<td></td>
</tr>
<tr>
<td>Boring Recommendation: None</td>
<td></td>
</tr>
<tr>
<td>Access: None except by foot</td>
<td></td>
</tr>
<tr>
<td>Pictures:</td>
<td></td>
</tr>
<tr>
<td>Notes: Good soil</td>
<td>Sketch:</td>
</tr>
</tbody>
</table>
| Inspection Team: ERA plus 50.6 ft plot of 5 | Date: 9-20-79
# TABLE I

## TOWER SITE INSPECTION SUMMARY

**Tower No:** [221]  
**Station:** Sta 2945 + 83.53

**Tower Type:**  
**Geophysical Survey:** Yes _✓_  
No _✓_

**Soil Description of Surface and Anticipated Subsurface Conditions:** Some loose, silty fine to coarse sand scattered between boulders of decomposition - Outcrops of granite/quartz diorite on and around site.

**Anticipated Groundwater Conditions:** None - G.W.T. expected at very deep depths

**Site Slope Conditions:** Located in small swale along east-west trending ridge - 2' to 6' diameter boulders of decomposition over slightly to moderately weathered rock - Slope inclinations are low in vicinity of site

**Erosion Potential and Possible Erosion Control Techniques:** Low to very low erosion potential

**Geologic Hazards:** None

**Boring Recommendation:** Not drillable with W.C.C. type rig

**Access:** None except by foot

**Pictures:** None

**Notes:** Texture of rock is coarse  

Sketch:

- to very coarse; rock is cut by  
- small pegmatites of quartz

**Inspection Team:** ERA and S.D.E. party of 10

**Date:** 9-4-79
<table>
<thead>
<tr>
<th>TABLE I</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOWER SITE INSPECTION SUMMARY</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tower No: 222</th>
<th>Station: 2953+00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tower Type:</td>
<td>Geophysical Survey: Yes</td>
</tr>
<tr>
<td>Soil Description of Surface and Anticipated Subsurface Conditions: Similar rock type as at 21 - loose bands of decomposed up to 12' diameter on site near pier</td>
<td></td>
</tr>
<tr>
<td>Anticipated Groundwater Conditions: None within depth of 50 to 100 feet</td>
<td></td>
</tr>
<tr>
<td>Site Slope Conditions: Located on 5:1 of 2:1 slope (20°-25°) drops off to 1:1 (35°-45°) within 100 feet of site</td>
<td></td>
</tr>
</tbody>
</table>

Erosion Potential and Possible Erosion Control Techniques: **Virtual Very Low** |

Geologic Hazards: None |

Boring Recommendation: None |

Access: None except by foot |

Pictures: |

Notes: Discussion on site to move Sketch: Site on line northward approximately 25 feet |

Inspection Team: ERA plus S.O.G.E. p.n. 7-10 |

Date: 9-4-79
TABLE I
TOWER SITE INSPECTION SUMMARY

Tower No: 223  Station: 2968 + 51

Tower Type: ________________  Geophysical Survey:  Yes  No

Soil Description of Surface and Anticipated Subsurface Conditions: Scattered surface soils a few inches thick around boulders and outcrops of granite/Quartz dikes - Surface boulders 2' to 4' diameter

Anticipated Groundwater Conditions: None within depth of 50 to 100 feet

Site Slope Conditions: Surface slopes approximately 120° to 20° northeast with small benches

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

Boring Recommendation: Probably not drillable with auger; rig deeper than 5-10'

Access: None except by foot

Pictures: 

Notes: ______________________________________________________________________ Sketc

__________________________________________________________________________________

Inspection Team: EEA P. 5.0.63.8.17.2, 5.10

Date: 9-4-79
TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 229  Station: 2978 + 13 86

Tower Type: __________________  Geophysical Survey: Yes  No

Soil Description of Surface and Anticipated Subsurface Conditions: Quate boulders/gravel/soil
rock outcrops surround the site - large boulders of decomposition located
in the swale - some coarse sand soil

Anticipated Groundwater Conditions: None within depths of 50' to 100'

Site Slope Conditions: Located in small swale a massive rock outcrop
less than 10' in the swale

Erosion Potential and Possible Erosion Control Techniques: Very low

Geologic Hazards: None

Boring Recommendation: None

Access: None except by Foot

Pictures: 1

Notes: Possible seismic profile

Sketch:

Inspection Team: ERA plus SDG&E July 8-10

Date: 9-4-79
| **Table I** |
| **Tower Site Inspection Summary** |

**Tower No:** 225-1  
**Station:** 2997 + 52

**Tower Type:** __________________  
**Geophysical Survey:** Yes ___ No ___

**Soil Description of Surface and Anticipated Subsurface Conditions:** Silty coarse sand

**Grading:**

**Anticipated Groundwater Conditions:** None within depth of 50 to 100 feet

**Site Slope Conditions:** Relatively flat site

**Erosion Potential and Possible Erosion Control Techniques:**

**Geologic Hazards:** None

**Boring Recommendation:** Possibility of auger boring for this tower

**Access:** None except by foot

**Notes:** Possible seismic profile

**Sketch:**

**Inspection Team:** ERA plus S.D. plus Eudy of 10

**Date:** 9-4-79
TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 226  Station: 3011 + 65

Tower Type: Geophysical Survey: Yes No ✓

Soil Description of Surface and Anticipated Subsurface Conditions: Rock Outcrops of quartz Diante

Anticipated Groundwater Conditions: None within depth of 100 feet

Site Slope Conditions: Site located on crest of northwest plunging ridge

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures:

Notes: Sketch:

Inspection Team: ERA plus S.O.6 + E Polyl of 10

Date: 9-4-79
TABLE I

TOWER SITE INSPECTION SUMMARY

Tower No: 227 Station: __________

Tower Type: Tower Geophysical Survey: Yes / No

Soil Description of Surface and Anticipated Subsurface Conditions: C cocktails of

clayey diorite/granodiorite with coarse sand in and around

sands - sand is decomposed rock

Anticipated Groundwater Conditions: None within depth of 50 feet

Site Slope Conditions: relatively flat site located in low saddle area - 60-80' southerly slope

Erosion Potential and Possible Erosion Control Techniques: Low

Geologic Hazards: None

Boring Recommendation: Possibility of augering 5' to 12'

Access: Road at present except by foot

All-Terrain type rig could drill

Pictures: R-1-1

R-1-2 new center of site (green tea shot)

Notes: S.H. to be moved 15' to west to move legs of
cdog

possible seismic site

T-3 & T-3r

Inspection Team: ERA plus 50.5+5 ern, of 9

Date: 9-5-79
# Subsurface Investigation Summary

**Tower Site 227**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Subsurface Materials</th>
<th>Seismic P-Wave Velocity (ft/sec)</th>
<th>Auger Boring Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>T-3</td>
<td>1190</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>T-3</td>
<td>1700</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>4500</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td>3000</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- □ □ Bag Sample
- □ □□ Auger Boring Sample
- 5 6 7 Mod CA Blowcount
| TABLE I |
| TOWER SITE INSPECTION SUMMARY |

Tower No: 228  
Station: 3041 + 80

Tower Type:  
Geophysical Survey: Yes  No

Soil Description of Surface and Anticipated Subsurface Conditions: Bold mosses  
Rock outcrop of granite diorite - virtually no loose soil  
3'-12' diameter boulders on site

Anticipated Groundwater Conditions: None within depth of 50 feet

Site Slope Conditions: Low profile

Erosion Potential and Possible Erosion Control Techniques: Low to very low

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: 5-1-3  
new site 5-1-4

Notes: Low soil area - decomposed rock  Sketch:  
to silty coarse sand - auger site  
new legs C + 0 auger to 10'  
new legs A + B auger to 7-6'

Site not confirmed as to precise location

Inspection Team: FEAA 6A, 506+6 rest of 9

Date: 9-5-79
<table>
<thead>
<tr>
<th><strong>TABLE I</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOWER SITE INSPECTION SUMMARY</strong></td>
</tr>
<tr>
<td><strong>Tower No:</strong> 229</td>
</tr>
<tr>
<td><strong>Tower Type:</strong></td>
</tr>
<tr>
<td><strong>Soil Description of Surface and Anticipated Subsurface Conditions:</strong> decomposed geotics - slopewash covers most of site</td>
</tr>
<tr>
<td><strong>Anticipated Groundwater Conditions:</strong> None within depths of 50 feet</td>
</tr>
<tr>
<td><strong>Site Slope Conditions:</strong> relatively flat site, may move site 5' south to get 15' away from rocks</td>
</tr>
<tr>
<td><strong>Erosion Potential and Possible Erosion Control Techniques:</strong> 120</td>
</tr>
<tr>
<td><strong>Geologic Hazards:</strong> None</td>
</tr>
<tr>
<td><strong>Boring Recommendation:</strong> None</td>
</tr>
<tr>
<td><strong>Access:</strong> None except by foot</td>
</tr>
<tr>
<td><strong>Pictures:</strong> r-1-5</td>
</tr>
</tbody>
</table>

**Notes:**
- Surface conditions indicate possible anger 5 to 15 feet deep - expect to encounter some scattered boulders
- Possible seismic site T-4 & T-4r

**Inspection Team:** ERA plus 5.06+F and J.G  
**Date:** 9-5-75
## Subsurface Investigation Summary

**Tower Site 229**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Subsurface Materials</th>
<th>Seismic P-Wave Velocity (ft/sec)</th>
<th>Auger Boring Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- **X** Bag Sample
- **5 6 7** Mod.CA Blowcount
- **Auger Boring Sample**
TABLE I
TOWER SITE INSPECTION SUMMARY

Tower No: 230  Station: 30641 + 80

Tower Type: ___________________  Geophysical Survey:  Yes  No  

Soil Description of Surface and Anticipated Subsurface Conditions: Entire site covered by outcrops of granite with a few inches of coarse sandy soils around rocks - rock is generally cut, top of schist.

Anticipated Groundwater Conditions: None within 50' of 100' south of site.

Site Slope Conditions: in a low swale at crest of two swales & 2 ridges.

Erosion Potential and Possible Erosion Control Techniques: Low

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: r-1-6

Notes: may move site 20' south to Sketch:
avoid large rock at leg A +
drop off at leg D

Inspection Team: ERA plus S.D.C.E.P.L. of G

Date: 9-5-79
| TABLE I |
| TOWER SITE INSPECTION SUMMARY |

Tower No: 231  
Station: 3078 + 30 78

Tower Type: Tangus ?  
Geophysical Survey: Yes  
No  

Soil Description of Surface and Anticipated Subsurface Conditions: Virtually no soil - possibly several inches of coarse sand over slightly weathered fractured quartz diorite/granodiorite

Anticipated Groundwater Conditions: None within depths of 50 to 100 feet

Site Slope Conditions: site is a small bench near ridge top

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: 5-1-7

Notes: Some discern to move

Sketch:

Inspection Team: ERA plus S.D.G+E part of 9

Date: 9-5-79
TABLE I
TOWER SITE INSPECTION SUMMARY

<table>
<thead>
<tr>
<th>Tower No:</th>
<th>232</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station:</td>
<td>3088 + 20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tower Type:</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geophysical Survey:</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Soil Description of Surface and Anticipated Subsurface Conditions:
- gneissic rock
- next canyon to north schist - surface covered with 3" to 1"
- granite gneiss - diameter rocks

Anticipated Groundwater Conditions: None within 50 to 100 feet

Site Slope Conditions: Located on east sloping ridge - 5° to 8° east

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: None

Boring Recommendation: None

Access: None except by foot

Pictures: 5-1-79

Notes:
- may move site guard
- 15' to creek tower
- on middle of ridge

Sketch: [Diagram]

Inspection Team: ERA plus S.D. plus C

Date: 9-13-79
# TABLE I

**TOWER SITE INSPECTION SUMMARY**

<table>
<thead>
<tr>
<th>Tower No:</th>
<th>233</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station:</td>
<td></td>
</tr>
</tbody>
</table>

**Tower Type:** Target

**Geophysical Survey:** Yes [ ] No [X]

**Soil Description of Surface and Anticipated Subsurface Conditions:**
- Surface on metamorphic rock - last 500 to 700 feet below 233.
- We found striking marble, schist beds, possible drill to 5'.

**Anticipated Groundwater Conditions:** None within 50 to 100 feet.

**Site Slope Conditions:** Flat to 2° easterly.

- Erosion Potential and Possible Erosion Control Techniques: None
- Geologic Hazards: None
- Boring Recommendation: None
- Access: None except by foot
- Pictures: 1-1-19

**Notes:**

**Sketch:**

**Inspection Team:** ERA plus S.D. G & E

**Date:** 9-13-79
## TABLE I
### TOWER SITE INSPECTION SUMMARY

<table>
<thead>
<tr>
<th>Tower No:</th>
<th>234</th>
<th>Station:</th>
<th>3120+40</th>
</tr>
</thead>
</table>

**Tower Type:**

- **Geophysical Survey:** Yes  No  

**Soil Description of Surface and Anticipated Subsurface Conditions:** Boulder outcrop of diorite/granodiorite - some boulders of decomposition 1' to 4' in diameter.

**Anticipated Groundwater Conditions:** None within depths of 50 to 100 feet.

**Site Slope Conditions:** Located on top of easterly sloping ridge, 1% to 10% slope.

- Boulder layer 1 thick on ridge top covered with 50' boulders.

**Erosion Potential and Possible Erosion Control Techniques:** None.

**Geologic Hazards:** None.

**Boring Recommendation:** None.

**Access:** None except by foot.

**Pictures:** 5-1-75

**Notes:**

- Rock anchor site
- Site to be moved 40' to 45'
  - On line to south
  - Maybe 50' south on line

**Sketch:**

**Inspection Team:** ERA plus S.O.G. E fol. of 6

**Date:** 9-13-75
TABLE I
TOWER SITE INSPECTION SUMMARY

<table>
<thead>
<tr>
<th>Tower No:</th>
<th>235</th>
<th>Station:</th>
<th>3140 + 98 243</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tower Type:</td>
<td>Tgnt</td>
<td>Geophysical Survey:</td>
<td>Yes  No</td>
</tr>
<tr>
<td>Soil Description of Surface and Anticipated Subsurface Conditions:</td>
<td>loose breke to 3' Janke - graduke - water cap, deep water.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anticipated Groundwater Conditions:</td>
<td>None within depth of 50 to 100 feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site Slope Conditions:</td>
<td>25° slope break 8°-10° slope break</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion Potential and Possible Erosion Control Techniques:</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geologic Hazards:</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boring Recommendation:</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access:</td>
<td>None except by foot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pictures:</td>
<td>7-1-7?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes:</td>
<td>Move site northly 35 feet Sketch:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>To avoid steep S.E. corner</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>To develop on 8°-10° slope</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection Team:</td>
<td>ERT plus C.0.6+E plus of 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td>9.13.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TABLE I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOWER SITE INSPECTION SUMMARY</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Tower No: | 236 |
|-----------|
| Station:  | 3151 + 30 |

<table>
<thead>
<tr>
<th>Tower Type:</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geophysical Survey:</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Soil Description of Surface and Anticipated Subsurface Conditions:** 
Gravelly sand/loam

With the quartz stones - 1' to 6' diameter boulders loose on surf.

Ex. Gneiss slightly weathered basal virtually no soil

**Anticipated Groundwater Conditions:** None within depth of 50 to 100 feet

**Site Slope Conditions:** 5° to 10° northwest

**Erosion Potential and Possible Erosion Control Techniques:** None

**Geologic Hazards:** None

**Boring Recommendation:** None

**Access:** None except by foot

**Pictures:** 5-1-79

**Notes:** Remove loose boulders

**Sketch:**

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```

**Inspection Team:** ERA plus 506 + Epa 4

**Date:** 9-13-79
TABLE I
TOWER SITE INSPECTION SUMMARY

Tower No: 237 Station: 3170 + 05

Tower Type: Tangle Geophysical Survey: Yes No

Soil Description of Surface and Anticipated Subsurface Conditions: Loose 1'-3' below on surface of weathered gneissic granite

Anticipated Groundwater Conditions: None within depths of 50'-100'

Site Slope Conditions: 30°-32° southeast

Erosion Potential and Possible Erosion Control Techniques: None

Geologic Hazards: Non-

Boring Recommendation: None but probably drillable to 7' 10'

Access: None except by foot

Pictures: 5-1-24

Notes: Sketch:

Inspection Team: ERA plus S.D.G. E 7, 6

Date: 9-14-79
**TABLE I**

**TOWER SITE INSPECTION SUMMARY**

<table>
<thead>
<tr>
<th>Tower No: 238</th>
<th>Station: 3183 + 49°</th>
</tr>
</thead>
</table>

**Tower Type: Tange** Geophysical Survey: Yes No

**Soil Description of Surface and Anticipated Subsurface Conditions:**

Talus slope of Scree or similar type deposit mostly quartz. Do not expect the underlying rock to be...

**Anticipated Groundwater Conditions:** None within depth of 50 ft 100 ft

**Site Slope Conditions:** 40° to southeast
Sheer located on site (middle) of 300 ft high

**Erosion Potential and Possible Erosion Control Techniques:** None

**Geologic Hazards:** None

**Boring Recommendation:** None

**Access:** None except by foot

**Pictures:** I-1-22

Notes: Sketch:

**Inspection Team:** ERA

Date: 9-14-79
### TABLE I

**Tower Site Inspection Summary**

<table>
<thead>
<tr>
<th>Tower No:</th>
<th>239</th>
<th>Station:</th>
<th>3198 +32 515</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tower Type:</td>
<td>Tapered</td>
<td>Geophysical Survey:</td>
<td>Yes</td>
</tr>
<tr>
<td>Soil Description of Surface and Anticipated Subsurface Conditions:</td>
<td>Basalt, 10'-20' diameter over weathered quartz diorite</td>
<td>no soil</td>
<td></td>
</tr>
<tr>
<td>Anticipated Groundwater Conditions:</td>
<td>None with depth of 50' to 100'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site Slope Conditions:</td>
<td>Located on top of relatively flat topped ridge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion Potential and Possible Erosion Control Techniques:</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geologic Hazards:</td>
<td>None except for builders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boring Recommendation:</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access:</td>
<td>None except by foot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pictures:</td>
<td>1-1-22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes:</td>
<td>Sketch:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Inspection Team: ERA plus S.06+E part 056*

*Date: 9-14-71*
## TABLE I

### TOWER SITE INSPECTION SUMMARY

<table>
<thead>
<tr>
<th>Tower No:</th>
<th>240</th>
<th>Station:</th>
<th>3204 + 08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tower Type:</td>
<td>Tangent</td>
<td>Geophysical Survey:</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Soil Description of Surface and Anticipated Subsurface Conditions:</td>
<td>Silt over weathered rock - layer of boulde</td>
<td>3'-15' below</td>
<td></td>
</tr>
<tr>
<td>Anticipated Groundwater Conditions:</td>
<td>None within depth of 50 to 100 feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site Slope Conditions:</td>
<td>See sketch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion Potential and Possible Erosion Control Techniques:</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geologic Hazards:</td>
<td>None except for steep slopes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boring Recommendation:</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access:</td>
<td>None except by foot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pictures:</td>
<td>5-1-71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes:</td>
<td>Move 3 ft. forward 10 feet to edge of ridge</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sketch:**

![Sketch](image)

**Inspection Team:** ERA plus S.G. E. L. J. L. K. C. L. 

**Date:** 9-11-79
<table>
<thead>
<tr>
<th>Tower No:</th>
<th>241</th>
<th>Station:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tower Type:</td>
<td>Tengent</td>
<td>Geophysical Survey:</td>
</tr>
<tr>
<td>Soil Description of Surface and Anticipated Subsurface Conditions:</td>
<td>boulder conglomerate (desert pavement) covers surface; nearby gully indicates site underlain by bedded sand and gravel (fluvial) deposits</td>
<td></td>
</tr>
<tr>
<td>Anticipated Groundwater Conditions:</td>
<td>none within depths of 50 to 100 feet</td>
<td></td>
</tr>
<tr>
<td>Site Slope Conditions:</td>
<td>uniform northwest slope inclination of 10° to 12°</td>
<td></td>
</tr>
<tr>
<td>Erosion Potential and Possible Erosion Control Techniques:</td>
<td>None or very low potential unless desert pavement is completely removed</td>
<td></td>
</tr>
<tr>
<td>Geologic Hazards:</td>
<td>None - see above</td>
<td></td>
</tr>
<tr>
<td>Boring Recommendation:</td>
<td>Possible drill with W.C.C. rig if access road is built</td>
<td></td>
</tr>
<tr>
<td>Access:</td>
<td>None at present except by foot</td>
<td></td>
</tr>
<tr>
<td>Pictures:</td>
<td>(5-1-11)</td>
<td></td>
</tr>
<tr>
<td>Notes:</td>
<td>Some boulders up to 5 foot diameter</td>
<td></td>
</tr>
<tr>
<td>Sketch:</td>
<td>![Sketch Image]</td>
<td></td>
</tr>
</tbody>
</table>

**Inspection Team:** ERA plus S.06+E point of 8

**Date:** 9-5-79
# Subsurface Investigation Summary

**Tower Site 241-1**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Subsurface Materials</th>
<th>Seismic P-Wave Velocity (ft/sec)</th>
<th>Auger Boring Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boring</td>
<td></td>
<td>T-5</td>
<td>T-5r</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td><img src="image.png" alt="Image" /></td>
<td><img src="image.png" alt="Image" /></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td><img src="image.png" alt="Image" /></td>
<td><img src="image.png" alt="Image" /></td>
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<tr>
<td>15</td>
<td></td>
<td><img src="image.png" alt="Image" /></td>
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<tr>
<td>20</td>
<td></td>
<td><img src="image.png" alt="Image" /></td>
<td><img src="image.png" alt="Image" /></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td><img src="image.png" alt="Image" /></td>
<td><img src="image.png" alt="Image" /></td>
</tr>
</tbody>
</table>

*LEGEND:*
- **Bag Sample**
- **Auger Boring Sample**
- **5 & 7 Mod.cA Blowcount**
| **TABLE I**  
<table>
<thead>
<tr>
<th><strong>TOWER SITE INSPECTION SUMMARY</strong></th>
</tr>
</thead>
</table>
| **Tower No:** 242  
**Station:** 3233 + 90 |
| **Tower Type:** Tangent  
**Geophysical Survey:** Yes ✅ No |
| **Soil Description of Surface and Anticipated Subsurface Conditions:**  
Desert pavement covers surface; nearby valley indicates site underlain by bedded sand gravel (riparian) deposits |
| **Anticipated Groundwater Conditions:** None within depth of 50 to 100 feet |
| **Site Slope Conditions:** Gentle (5°) slope to the west |
| **Erosion Potential and Possible Erosion Control Techniques:** None or very low potential  
**unless desert pavement is completely removed** |
| **Geologic Hazards:** None - see above |
| **Boring Recommendation:** Possible drill with W.C. rig if access road built |
| **Access:** None at present except by foot |
| **Pictures:** photo (r-1-10) |
| **Notes:** Should expect some lumpy material in upper 4 to 5 feet  
Seismic Traverse 7-6+70'  
Tower 242.2 Sta. 3238 + 65 |
| **Sketch:** |
| **Inspection Team:** ERA plus S.O.E. party of 8  
**Date:** 9-5-79 |
FOUNDATION BORING REPORT

PROJECT TITLE: 500 K.V. Mog - E.F. Substation

CONTRACTOR: COMMONWEALTH (CA)

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS

OTHER (DESCRIPTION)

RIGHT-OF-WAY CLEARED: YES  NO  STR. STAKED: YES  NO  STR. ROADS SATISF: YES  NO

FMN. TYPE: SPEC.

STR. A  5.27 1.5 5.27 1.5 5.27 1.5 5.27 1.5

STR. B  9.5 27.0

STR. C  9.5 27.0

STR. D  9.5 27.0

---

**Remarks:**

LEG "A" - BELL IS VERY CLEAN. LEG "B" - BELL CLEAN.

LEG "C" - BELL CLEAN LEG "D" - BELL CLEAN.

SOIL TYPE IS COMPARABLE WITH SOIL TYPE "D" WITH EXCEPTION OF UPPER 10FT WHICH IS A CONSOLIDATED B.G.

SKETCH LEGEND:

SA - Sand  SI - Silt  CL - Clay  CR - Gravel

CO - Cobbles  RO - Boulders  F.R. - Fractured Rock

Note Drill Rate in Sketch Space if Rock Anchor(s)

References

Cont. Rep.:

LESCO REP:

DATE: 3.9.83
### Foundation Boring Report

**LEEMO ENGINEERING, INC.**

**Project Title:** 500 K.V. Hig - F. V. Substation

**Contractor:** COMMON WEALTH (OWN)

**Description of Surrounding Area:** MOUNTAINOUS

**Woods/Orchard:** CULTIVATED

**Right-of-Way Cleared:** Y

**Str. Staked:** Y

**Constr. Roads Satisf:** Y

**Fin. Type:** (Specify):

**Str. A:**

- **Sk. 5:** 12"
- **Sketch:** Some Surf. Soil
- **Description:** Sandy loam
- **Profile:** 3.8"
- **Depth:** 31/2'
- **Finish:** 11:46 A.M.
- **Boring:** 12:05 P.M.
- **Rock:** 4' 6"

**Str. B:**

- **Sk. 5:** 13"
- **Sketch:** Some Surf. Soil
- **Description:** Sandy loam
- **Profile:** 3.8"
- **Depth:** 31/2'
- **Finish:** 11:46 A.M.
- **Boring:** 12:05 P.M.
- **Rock:**

**Str. C:**

- **Sk. 5:** 13"
- **Sketch:** Some Surf. Soil
- **Description:** D.G. VERY FIRM DARK YELLOW IN COLOR
- **Profile:** 3.8"
- **Depth:** 31/2'
- **Finish:** 11:46 A.M.
- **Boring:** 12:05 P.M.
- **Rock:**

**Str. D:**

- **Sk. 5:** 13"
- **Sketch:** Some Surf. Soil
- **Description:** D.G. VERY FIRM DARK YELLOW IN COLOR
- **Profile:** 3.8"
- **Depth:** 31/2'
- **Finish:** 11:46 A.M.
- **Boring:** 12:05 P.M.
- **Rock:**

---

### Remarks:

- 4' 6" DRILL BAR

**Sketch Legend:**

- SA - Sand
- SI - Silt
- CL - Clay
- CR - Gravel
- CO - Cobbles
- RO - Boulders
- F.R. - Fractured Rock
- RO - Rock
- W.T. - Water Table

*Note: Drill Rate in Sketch Space if Rock Anchor(s)*

**References:**

- WM 3-18-83
- Str. No. 214
- Sta. No. 25541.8176
- Date 3-16-83

**Cont. Repr.:** C. P. Goll

**Str. Type:** EMT
**FOUNDATION BORING REPORT**

**LEMCO ENGINEERS, INC.**

**PROJECT TITLE** 500 K.V. HIG - 500 V. SUBSTATION

**CONTRACTOR** COMMON WEALTH (OWN) **TEMPERATURE** 60° F. **WEATHER** PLENTY

**DESCRIPTION OF SURROUNDING AREA:** MOUNTAINOUS **HILLY** **LEVEL**

**RIGHT-OF-WAY CLEARED** **NO** **STR. STARED** **YES** **NO** **CONSTR. ROADS SATISF.** **YES** **NO**

**FON. TYPE** (SPEC.): APA2 4.5' APA2 4.5' APA2 4.5' APA2 4.5' APA2 4.5'

<table>
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<tr>
<th>STR. A</th>
<th>STR. B</th>
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<tr>
<td>Description</td>
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<td>Description</td>
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<tr>
<td>7.5-10'</td>
<td>D.G.</td>
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<td>72.1'</td>
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<tr>
<td>99X100'</td>
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</table>

**REMARKS:**
- 8.5-8.3 - STUBPED YELLOW OIL AT DEPHT - TIME 3:30 P.M.
- 4-5-83

**SKETCH LEGEND:**
- SA - Sand
- SI - Silt
- CL - Clay
- CR - Gravel
- CO - Cobble
- BO - Boulders
- F.R. - Fractured Rock
- RO - Rock
- W.T. - Water Table

**Note Drill Rate in Sketch Space if Rock Anchor(s)**

**References**

**Str. No.** 215

**Str. Type** ET

**DATE** 4-14-83
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Notes: All shafts hand dug.
### Foundation Boring Report

**Project Title:** 500 K.V. Hlg - F.V. Substation

**Contractor:** Commonwealth

**Temperature:** 90°F

**Weather:** Sunny

**Description of Surrounding Area:** Mountainous

**Right-Of-Way Cleared:** Yes

**Str. Staked:** Yes

**Str. Roads Satisfy:** Yes

**Str. Type:** (Spec.): 4" B.B.

**Str. A:**
- Description: Rock
- Sketch: 
- Depth: 13 ft
- Ft.: 10 ft

**Str. B:**
- Description: Rock
- Sketch: 
- Depth: 13 ft
- Ft.: 10 ft

**Str. C:**
- Description: Da
- Sketch: 
- Depth: 13 ft
- Ft.: 10 ft

**Str. D:**
- Description: Da
- Sketch: 
- Depth: 13 ft
- Ft.: 10 ft

**Remarks:**

**Sketch Legend:**
- SA - Sand
- SI - Silt
- CL - Clay
- CR - Gravel
- CO - Cobble
- RO - Boulders
- F.R. - Fractured Rock
- W.T. - Water Table

**Received:**
- Aug 8

**Drill Rate in Sketch Space if Rock Anchor(s):**

**References:**

**Str. No.:** 218

**Sta. No.:** 2908-410

**Str. Type:** EMT

**Date:** 8-9-83
**FOUNDATION BORING REPORT**

**PROJECT TITLE** 300 K.V. HIGH-VOLTAGE SUBSTATION

**CONTRACTOR** COMMONWEALTH (P.O.)

**DESCRIPTION OF SURROUNDING AREA:** MOUNTAINOUS LEVEL

**WEATHER** SUNNY

**WOODS/ORNAMENT** CULTIVATED

**RIGHT-OF-WAY CLEARED:** NO

**RECEIVED**

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<th>STR. C</th>
<th>STR. D</th>
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<tr>
<td>Ft.</td>
<td>54&quot;Φ</td>
<td>Ft.</td>
<td>54&quot;Φ</td>
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<tr>
<td>DG 4 Rock</td>
<td>3FT</td>
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<td>1FT</td>
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<tr>
<td>Fract Rock</td>
<td>6.2 FT</td>
<td>Fract Rock</td>
<td>4FT</td>
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<td>13.3FT</td>
<td>14FT</td>
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**REMARKS:**

**SKETCH LEGEND:**
- SA - Sand
- SI - Silt
- CL - Clay
- GR - Gravel
- CO - Cobble
- BO - Boulder
- F.R. - Fractured Rock
- RO - Rock
- W.T. - Water Table

**Note:** Drill Rate in Sketch Space if Rock Anchor(s)

**References**

**Cont. Repr.** Donald W. Schmidt

**LEMCO REPR.**

**DATE** 7-22-83

**Sta. No.** Z19

**Str. No.** Z19

**Sta. 2921 + 00**

**Str. Type** EHT
FOUNDATION BORING REPORT

LEMCO ENGINEERS, INC.

PROJECT TITLE 
500 KV H.G. - T.V. SUBSTATION

CONTRACTOR
COMMONWEALTH

DESCRIPTION OF SURROUNDING AREA:
MOUNTAINOUS

WOODS/ORCHARD
CULTIVATED
OTHER (DESCRIPTION):

RIGHT-OF-WAY CLEARED
YES
NO
STR. STAKED
YES
NO
CONSTR. ROADS SATISFY
YES
NO

FIN. TYPE (SPEC.):
5/16" Abac
5/8" Abac
5/16" Abac
5/8" Abac

STR. A
STR. B
STR. C
STR. D

<table>
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<tr>
<th>Description</th>
<th>Sketch</th>
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<td>0.0</td>
<td>5.5&quot; D.G. Rock</td>
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<td>Ro</td>
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<td>Ro</td>
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Remarks:

RECEIVED

JUL 26, 1983

SKETCH LEGEND:
SA - Sand
SI - Silt
CL - Clay
CR - Gravel
CS - Cobble
BE - Boulders
F.R. - Fractured Rock
RO - Rock
W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References: 910142
Str. No. 220
Sta. No. 2929+00
Str. Type EMT

Cont. Rep. Dave Cus
LEMCO Repr. Robert W. Horn

DATE 7-26-83
### LEMCO ENGINEERS, INC.

**PROJECT TITLE:** 500 K.V. H.G. - 15 K.V. SUBSTATION W.O. NO. 5593870

**CONTRACTOR:** COMMONWEALTH (CIV)  
**TEMPERATURE:** 90°F  
**WEATHER:** SUNNY  
**DESCRIPTION OF SURROUNDING AREA:** HОUNDRAI[EUS  
**LEVEL:** HILLY  
**WOODS/ORCHARD:** CULTIVATED  
**OTHER (DESCRIPTION):**

**RIGHT-OF-WAY CLEARED:** YES  
**NO STR. STAKED (YES):** YES  
**CONSTR. ROADS SATISF.:** YES  
**N:**

**STN.**  
**TYPE:** AE  
**SPEC.:** 5'14"  
**JUN 20 1983**

### LEMCO-JAMU

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<td>5'-23 Ft.</td>
<td>5'-23-83'Ft.</td>
<td>5'-26-83'Ft.</td>
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<td>0'</td>
<td>0'</td>
<td>0'</td>
<td>0'</td>
</tr>
<tr>
<td>RO</td>
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<tr>
<td>14.0'</td>
<td>14.0'</td>
<td>19.0'</td>
<td>14.0'</td>
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**REMARKS:** NA DIA. HOLES  
**5'14'DIA. HOLES**

### RECEIVED

**JUN 20 1983**

**Sketch Legend:**  
SA - Sand  
SL - Silt  
CL - Clay  
CR - Gravel  
CO - Cobbles  
RO - Boulders  
F.R. - Fractured Rock  
RO - Rock  
W.T. - Water Table

**Reference:** Sketch Space if Rock Anchor(s)

**Str. No.:** 221  
**Stat. No.:** 2945+83.63  
**Str. Type:** ELA  
**DATE:** 6-17-83

**LEMC. MIGUEL**  
**LEMC. REPR.:** David G. Caro  
**LEMC. REPR.:** James L. Rippy
FOUNDATION BOILING REPORT

PROJECT TITLE: 500 K.V. HIG - E.V. SUBSTATION W.O. NO. 5593970
CONTRACTOR: LEMCO ENGINEERS, INC.

DESCRIPTION OF SURROUNDING AREA:
- MOUNTAINEOUS
- HILLY
- LEVEL

WEATHER:
- SUNNY

RIGHT-OF-WAY CLEARED:
- YES

STR. STAKED:
- YES

STR. CONSTR. ROADS SATISF.
- YES

JUL 5 1983

(SON. TYPE): 54°/13′ ABAZ
54°/13′ ABAZ
54°/13′ ABAZ
54°/13′ ABAZ

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<td>0 FT</td>
<td>D.G 4</td>
<td>0 FT</td>
<td>D.G 3</td>
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**REMARKS:**

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**SKETCH LEGEND:**
- SA - Sand
- SI - Silt
- CL - Clay
- CR - Gravel
- CO - Cobbles
- BO - Boulders
- F.R. - Fractured Rock
- RO - Rock
- W.T. - Water Table

**Note Drill Rate in Sketch Space if Rock Anchor(s)**

**References**

**CANT. REPR.:**

**LEMCO REPR.:**

**DATE:** 6-30-83
## Foundation Drilling Report

**Subject Title:** 500 K.V. H.G. - T.V. Substation W.O. No. 5593970

**Contractor:** Commonwealth (OWI)

**Description of Surrounding Area:** Mountainous X Hill Level

**Woods/Organized:** Cultivated Other (Description)

**Right-Of-Way Cleared:** Yes No Str. Staked Yes No Constr. Roads Satisf. Yes No

**FN. Type Spec.:** 60°/17′ AHBZ 60°/14′ AHBZ 60°/14′ AHBZ 60°/12′ AHBZ

<table>
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<td>0′</td>
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<tr>
<td>Fract. Rock</td>
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<td>12′</td>
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<td>D.G. w/ Rocks</td>
<td>17'</td>
<td>D.G. w/ Rocks</td>
<td>17′</td>
<td>D.G. w/ Rocks</td>
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<tr>
<td>U. L. Bell</td>
<td>102 in</td>
<td>U. L. Bell</td>
<td>102 in</td>
<td>U. L. Bell</td>
<td>102 in</td>
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<td>L. F. Rock</td>
<td>12′</td>
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<td>L. F. Rock</td>
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**REMARKS:**

**RECEIVED:**

**AUG 4 1983**

**LEMCO-JAMUL**

**Drill Rate in Sketch Space if Rock Anchor(s)**

**References**

**Str. No.:** 223

**Stat. No.:** 5968 ± 59.99

**Str. Type:** ELO

**DATE:** 8-1-83

**Certified:** [Signature]

**Cont. Repr.:** [Signature]
FOUNADON BORING REPORT
Lenco Engineers, Inc.

PROJECT TITLE 500 K.V. H.G. - I.V. SUBSTATION
CONTRACTOR COMMONWEALTH (W.O.)
TEMPERATURE
WEATHER
DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS
WOODS/ORECRD
CULTIVATED
OTHER (DESCRIPTION)
RIGHT-OF-WAY CLEANED
YES NO
STR. STAKED
YES NO
CONSTR. ROADS SATISF
YES NO
FIN. TYPE
(SPEC.):

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<tr>
<td>10'</td>
<td>D.G. VERRY Firm</td>
<td>21'</td>
<td>Hit Rock</td>
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<tr>
<td>9.2'</td>
<td>Bell X 12.0 in.</td>
<td>Bell Dia</td>
<td>0 in.</td>
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<td>9.1'</td>
<td>L.F. Rock 2</td>
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<td>2.1'</td>
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<td>E Rock</td>
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REMARKS: ALL SHAFTS HAND DRILLED

SKETCH LEGEND: SA - Sand  SI - Silt  CL - Clay  OR - Gravel
CO - Cobbles  BO - Boulders  F.R. - Fractured Rock
RO - Rock  W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References

Str. No. 214-
Sta. No. 247813.99
Str. Type ELT

DATE 7.13.83
## Foundation Boring Report

**Str. No.** 225

**LEMCO ENGINEERS, INC.**

**Title** 500 K.V. H.G. - J.V. Substation

**Contractor** COMMON WEALTH (Owner)

**Description of Surrounding Area:** MOUNTAINOUS X HILLY LEVEL

**Wooded/Orchard** CULTIVATED OTHER (DESCRIPTION): 25 acres

**Right-of-Way Cleared** YES NO Str. Staked **YES NO** Consh. Roads Satisf. YES NO

**FDM. TYPE** (SPEC.): AAAI 30° AAAI 30° AAAI 30° AAAI 30°

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<tr>
<td>5' 1/4 Ft.</td>
<td>5' 1/4 Ft.</td>
<td>5' 1/4 Ft.</td>
<td>5' 1/4 Ft.</td>
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<tr>
<td>7' of Medium Hard D.G.</td>
<td>4' of Medium Hard D.G.</td>
<td>10' of Medium Hard D.G.</td>
<td>B' of Medium Hard D.G.</td>
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### Remarks:
Rock No Good for Rock Anchors

**Sketch Legend:**

- SA - Sand
- SI - Silt
- CL - Clay
- CR - Gravel
- CO - Cobble
- BO - Boulders
- FR - Fractured Rock
- RO - Rock
- WT - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

**References:**

- H1/05 5-25-83
- 2977+52

**Cert. Rep.:** David Rong

**LEMCO REPR.:** Ray B. Brightwell

**Date:** 5-23-83
FOUNDATION BORING REPORT

LEMCO ENGINEERS, INC.

PROJECT TITLE 500 KV. HIG- F. V. SUBSTATION W. O. NO. 5583970
CONTRACTOR COMMONWEALTH (CMW)

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS

TEMPERATURE 80°, WEATHER Sunny

RIGHT-OF-WAY CLEARED YES NO STR. STAKED YES NO CONSTR. ROADS SATISF. YES NO

FDN. TYPE (SPEC.): 5.5'/5'

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<td>60&quot; $/63$ Ft.</td>
<td>60&quot; $/63$ Ft.</td>
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<tr>
<td>Rock</td>
<td>Rock</td>
<td>Rock</td>
<td>Ro</td>
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<tr>
<td>Finish 6/26/83 5.0'</td>
<td>Finish 6/26/83 5.0'</td>
<td>Finish 6/26/83 5.0'</td>
<td>Finish 6/26/83 5.0'</td>
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<tr>
<td>F. Rock SFT</td>
<td>F. Rock SFT</td>
<td>F. Rock SFT</td>
<td>F. Rock SFT</td>
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REMARKS: DEPENDING ON HARDNESS OF ROCK, HOLES FOR ROCK ANCHOR WERE TAKING 5-7 MINUTES PER FOOT BY JACKHAMMER

SKETCH LEGEND: SA - Sand SL - Silt CL - Clay GR - Gravel

CO - Cobble H0 - Boulder F.R. - Fractured Rock
HO - Rock W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

Received

JUN 24 1983 WOODS/ Orchard CULTIVATED OTHER (DESCRIPTION)

Str. No. 226

Str. Type EHT Dat 6-22-83

Str. No. 3011 + 05

Str. Type EHT Dat 6-22-83

Str. Type EHT Dat 6-22-83
**Foundation Boring Report**

**Project Title:** 500 K.V. H.G. - E.V. Substation

**Contractor:** Commonwealth

**Description of Surrounding Area:** Mountainous

**Right-of-Way Cleared:** Yes

**Soils/Organization:** Cultivated

**Weather:**

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<td>Fractured Rock</td>
<td>Fractured Rock</td>
<td>M.S. CO HARD D.G.</td>
<td>Soft to Hard D.G.</td>
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</table>

**Remarks:** HAND DUG Holes

**Sketch Legend:**
- SA - Sand
- SI - Silt
- CL - Clay
- GR - Gravel
- CO - Cobbles
- BO - Boulders
- F.R. - Fractured Rock
- RO - Rock
- W.T. - Water Table

**Received:** May 23, 1989

**Lemco-Miguel**

**References:**

**Str. No.:** 227

**Date:** 5-18-83
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<th>Str. C</th>
<th>Str. D</th>
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<tr>
<td><strong>Description</strong></td>
<td><strong>Sketch</strong></td>
<td><strong>Description</strong></td>
<td><strong>Sketch</strong></td>
</tr>
<tr>
<td>5.4 Ft.</td>
<td>Hard D.G.</td>
<td>5.4 Ft.</td>
<td>Soft to medium HARD D.G.</td>
</tr>
<tr>
<td><strong>Depth</strong></td>
<td>10' 0&quot;</td>
<td><strong>Depth</strong></td>
<td>10' 0&quot;</td>
</tr>
<tr>
<td>3' PAY Rock</td>
<td></td>
<td>3' PAY Rock</td>
<td></td>
</tr>
<tr>
<td><strong>Shaft Finished</strong></td>
<td>5/9/83</td>
<td><strong>Shaft Finished</strong></td>
<td>5/6/83</td>
</tr>
<tr>
<td><strong>Height</strong></td>
<td>in. Bell Height</td>
<td><strong>Height</strong></td>
<td>in. Bell Height</td>
</tr>
<tr>
<td><strong>Rock</strong></td>
<td>3.5 F. Rock</td>
<td><strong>Rock</strong></td>
<td>3.5 F. Rock</td>
</tr>
</tbody>
</table>

REMARKS: All four holes were HARD D.G.

SKETCH LEGEND:
- SA = Sand
- SL = Silt
- CL = Clay
- CR = Gravel
- CO = Cobble
- BO = Boulder
- F.R. = Fractured Rock
- RO = Rock
- W.T. = Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

MAY 10 1983

Received

References:

Str. No. 228

Sta. No. 3042 + 741.447

Str. Type ELT

Date from 6-9-83

LEMCORAMIGLO

LEMCOR REPR. Kay Brightwell
# Foundation Boring Report

**LEMCOR, INC.**

**Project Title:** 500 K.V. H.G. - I.V. SUBSTATION  
**W.O. No.:** 5593870

**Contractor:** COMMONWEALTH (OH)  
**Temperature:**  
**Weather:**  
**Description of Surrounding Area:** MOUNTAINOUS X  
**Hilly**  
**Level**  
**R.O.W. Cleared:** YES  
**Yes*/**NO STR. STAKED:** YES  
**Yes*/**NO CONSTR. ROADS SATISFY:** YES

**Fdn. Type (Spec.):**  ELT 30"  
**ELT 30"**

<table>
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<tr>
<th>Sketch</th>
<th>Description</th>
<th>Sketch</th>
<th>Description</th>
<th>Sketch</th>
<th>Description</th>
<th>Sketch</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D.G. &amp; LARGE BOULDER 2B</td>
<td></td>
<td>D.G. &amp; HARD ROCK</td>
<td></td>
<td>D.G. &amp; HARD ROCK</td>
<td></td>
<td>D.G. &amp; HARD ROCK</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ROCK LAST 3&quot; WASH PAY ROCKS 2&quot;</td>
<td></td>
<td>ROCK LAST 3&quot; WASH PAY ROCKS 2&quot;</td>
<td></td>
<td>ROCK LAST 3&quot; WASH PAY ROCKS 2&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:** PAY ROCK WAS IN BOTTOM OF HOLES

**Sketch Legend:**  
SA - Sand  
SI - Silt  
CL - Clay  
GR - Gravel  
CO - Cobbles  
BO - Boulders  
F.R. - Fractured Rock  
RO - Rock  
W.T. - Water Table

**Note Drill Rate in Sketch Space if Rock Anchor(s)**

**References:**  
**Str. No.:** 229  
**Sta. No.:** 30052+95  
**Type:** ELT

**Received:**  
**Date:** APR 26 1993  
**By:** LEMCOR, INC.

**Signatures:**  
**Date:** 4-23-93
# Foundation Drilling Report

**LEMCO ENGINEERS, INC.**

**PROJECT TITLE** 500 K.V. H.G-T.V. SUBSTATION

**CONTRACTOR** COMMONWEALTH (OWN)  
**WEATHER**

**DESCRIPTION OF SURROUNDING AREA:** MOUNTAINOUS X HILLY LEVEL

**WOODS/ORCHARD** CULTIVATED OTHER (DESCRIPTION)

**RIGHT-OF-WAY CLEARED** (YES) NO  STR. STAKED (YES) NO  CONSTR. ROADS SATISF. YES NO

---

## Foundation Type

**FDN. TYPE**

**MAY 25 1985 (SPEC.)**

**LEMCO-JAMUL**

<table>
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<th>STR. D</th>
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<tbody>
<tr>
<td>Description</td>
<td>Sketch</td>
<td>Description</td>
<td>Sketch</td>
</tr>
<tr>
<td>1-27-83 Ft.</td>
<td>0.42&quot;</td>
<td>1-27-83 Ft.</td>
<td>0.42&quot;</td>
</tr>
<tr>
<td>Depth</td>
<td></td>
<td>Depth</td>
<td></td>
</tr>
<tr>
<td>Comp 5/17/83</td>
<td></td>
<td>Comp 5/17/83</td>
<td></td>
</tr>
</tbody>
</table>

## Remarks

SKETCH LEGEND:  
- SA - Sand  
- SI - Silt  
- CL - Clay  
- CR - Gravel  
- CO - Cobble  
- BO - Boulders  
- F.R. - Fractured Rock  
- W.T. - Water Table

Note: Drift rate in Sketch space if Rock Anchor(s)

**References**  
**FCO: 60F**  
**Str. No:** 230  
**Sta. No:** 3064 + 55

**Cont. Repr.:**  
Ray Bostwick  
**Date:** 5-20-83
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<td><strong>Description</strong></td>
<td><strong>Sketch</strong></td>
</tr>
<tr>
<td>0' FT. SURFACE SAND AND SOFT D.B. WITH SMALL COBBLES</td>
<td>S.A. D.G. C.O.</td>
<td>0' FT. SAND, D.B. AND SMALL COBBLES</td>
<td>S.A. D.B. C.O.</td>
</tr>
<tr>
<td>FRACTURED ROCK WITH SMALL SEAMS</td>
<td>R.O. HARD ROCK WITH SEAMS</td>
<td>R.O. SEAMS IN HARD ROCK</td>
<td>R.O. ROCK</td>
</tr>
<tr>
<td><strong>R' DEEP</strong></td>
<td><strong>R' DEEP</strong></td>
<td><strong>R' DEEP</strong></td>
<td><strong>R' DEEP</strong></td>
</tr>
</tbody>
</table>

**REMARKS:** ROCK ANCHORS INSTALLED ON 4'-19'-93 4 #12 BARS WERE INSTALLED &

**BID=12.5'**

**B62-1 R63-4**

**SKETCH LEGEND:**
- SA - Sand
- SI - Silt
- CL - Clay
- GR - Gravel
- CB - Cobble
- BO - Boulder
- F.R. - Fractured Rock
- RO - Rock
- W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

**References:** ECO 4F 1PM 4/29/63

**STN. REPR:** Raymond Capps

**LEMCO REPR:** Kay Righthall

**DATE:** 4-21-73
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<tr>
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<td><strong>Sketch</strong></td>
<td><strong>Description</strong></td>
<td><strong>Sketch</strong></td>
</tr>
<tr>
<td>Sand and silt</td>
<td>Ft. SA</td>
<td>Sand and silt</td>
<td>Ft. SA</td>
</tr>
<tr>
<td>Decomposed granite with sandy clay and clayey silt</td>
<td>Ft. A</td>
<td>Decomposed granite and boulders</td>
<td>Ft. A</td>
</tr>
<tr>
<td>Fractured Rock 3'</td>
<td>Ft. R</td>
<td>Fractured Rock 2'</td>
<td>Ft. R</td>
</tr>
<tr>
<td>Rock 1</td>
<td>R.O.</td>
<td>Rock 1</td>
<td>R.O.</td>
</tr>
<tr>
<td>8'2&quot;</td>
<td>4.6.83</td>
<td>8'2&quot;</td>
<td>4.9.83</td>
</tr>
<tr>
<td>4.7.83</td>
<td>1:00 PM</td>
<td>4.7.83</td>
<td>5:00 PM</td>
</tr>
</tbody>
</table>

**Remarks:**

**Sketch Legend:**
- SA - Sand
- SI - Silt
- CL - Clay
- GR - Gravel
- CO - Cobbles
- DO - Boulders
- FR - Fractured Rock
- RO - Rock
- W.T. - Water Table

*Note: Drill Rate in Sketch Space if Rock Anchor(s)*

**References:**

*Cont. Rep.:* David Clay
*Lemco Rep.:* Harold T. Chappell
<table>
<thead>
<tr>
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<th>STR. D</th>
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<tbody>
<tr>
<td>Description</td>
<td>Sketch</td>
<td>Description</td>
<td>Sketch</td>
</tr>
<tr>
<td>Sand and</td>
<td>Fractured</td>
<td>Sand and</td>
<td>Fractured</td>
</tr>
<tr>
<td>Rock Boulders</td>
<td>Rock Boulders</td>
<td>Rock Boulders</td>
<td>Rock Boulders</td>
</tr>
<tr>
<td>3'</td>
<td>B.0</td>
<td>B.0</td>
<td>B.0</td>
</tr>
<tr>
<td>8'</td>
<td>8'3&quot;</td>
<td>8'1&quot;</td>
<td>8'</td>
</tr>
<tr>
<td>Depth</td>
<td>Depth</td>
<td>Depth</td>
<td>Depth</td>
</tr>
<tr>
<td>4.7.83</td>
<td>N. 6.83</td>
<td>4.5.83</td>
<td>4.5.83</td>
</tr>
<tr>
<td>1:00 A.M.</td>
<td>3:30 P.M.</td>
<td>4:30 P.M.</td>
<td>4:30 P.M.</td>
</tr>
</tbody>
</table>

Remarks: B.C. 6" Sand, 7'4" of some Hard Rock Boulders and Fractured Rock A: Lee Blasted Last 2'

Sketch Legend: SA - Sand  SI - Silt  CL - Clay  CR - Gravel
CO - Cobbles  BO - Boulders  F.R. - Fractured Rock
RO - Rock  W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References 4-11-93  Str. No. 233
Str. No. 3188  Sta. No. 1072
Str. Type F. L. T.

Cont. Rep. Robb

LEPCO Ref. 8-28-79

DATE 4-4-93 to 4-7-93
## Foundation Boring Report

**LENEO ENGINEERS, INC.**

**PROJECT TITLE** 500 K.V. H.G - E.V. SUBSTATION, W.O. NO. 5583970

**CONTRACTOR** COMMONWEALTH (C/W)

**DESCRIPTION OF SURROUNDING AREA:** MOUNTAINOUS X HILLY LEVEL OTHER (DESCRIPTION)

**RIGHT-OF-WAY CLEARED** YES NO **STR. STAKED** YES NO **CONSTR. ROADS SATISF.** YES NO

**FEM. TYPE** (SPEC.): AAA3 AAA3 2/3 AAA3 2/3 AAA3 8/10 AAA3 2/3

<table>
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<th>STR. D</th>
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<tbody>
<tr>
<td><strong>Description</strong></td>
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<td><strong>Description</strong></td>
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<tr>
<td>Depth 9'</td>
<td></td>
<td>Depth 9'</td>
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</tr>
<tr>
<td>Rock Anchor</td>
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<td>Rock Anchor</td>
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</tr>
<tr>
<td>Bell Height</td>
<td></td>
<td>Bell Height</td>
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</table>

**REMARKS:**

---

**SKETCH LEGEND:**
- SA - Sand
- SI - Silt
- CL - Clay
- GR - Gravel
- CO - Cobbles
- BO - Boulders
- F.R. - Fractured Rock
- RO - Rock
- W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

**REFERENCES:**

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<th>Str. Type</th>
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<td>234</td>
<td>31199 + 98.07</td>
<td>ELT</td>
<td>4-10-83</td>
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**LENEO REPR.** Ray Brightwell
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<tbody>
<tr>
<td>Granite Rock</td>
<td>R.O.</td>
<td>Granite Rock</td>
<td>R.O.</td>
<td>Granite Rock</td>
<td>R.O.</td>
</tr>
<tr>
<td>3'</td>
<td>Decomposed Granite</td>
<td>3'</td>
<td>Decomposed Granite</td>
<td>3'</td>
<td></td>
</tr>
<tr>
<td>3'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30° dia.</td>
<td>10' depth</td>
<td>30° dia.</td>
<td>10' depth</td>
<td>30° dia.</td>
<td>10' depth</td>
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<tr>
<td>3.30 to 23</td>
<td>1:00 PM</td>
<td>10.6</td>
<td>10' depth</td>
<td>4.3</td>
<td>10' depth</td>
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<tr>
<td>10.3</td>
<td>3.30 to 23</td>
<td>1:00 PM</td>
<td>30° dia.</td>
<td>10' depth</td>
<td></td>
</tr>
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</table>

REMARKS:
- First Rock is Hard Boulders. B. 6' diameter granite boulder. 6'
- Hard Boulders. D. 6' diameter granite boulder. 6'

SKETCH LEGEND:
- Sand (S)
- Silt (S)
- Clay (C)
- Granite (G)
- Cobble (C)
- Boulders (B)
- Fractured Rock (F.R.)
- Rock (R)
- Water Table (W.T.)

Note: Drill Rate in Sketch Space if Rock Anchor(s)

References:
- Str. No. 235
- Sta. No. 34717.3675
- Str. Type F17

Date: 4-15-83

Cont. Rep.: David Camp
LEEDO Rep.: Roy Bondnik
FOUNDATION BORING REPORT

PROJECT TITLE: 500 K.V. H.G - 1.F. SUBSTATION

CONTRACTOR: COMMON WEALTH (OWN) TEMPERATURE: WEATHER:

DESCRIPTION OF SURROUNDING AREA: MOUNTAINOUS X HILLY LEVEL

RIGHT-OF-WAY CLEARED: YES NO STR. STaked: YES NO CONSTR. ROADS SATISFY: YES NO

FDN. TYPE (SPEC.): AAA2 30/10

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<th>STR. D</th>
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<td><strong>Sketch</strong></td>
<td><strong>Description</strong></td>
<td><strong>Sketch</strong></td>
</tr>
<tr>
<td>D.B. Boulders</td>
<td>5'6&quot;</td>
<td>D.B. Boulders</td>
<td>5'6&quot;</td>
</tr>
<tr>
<td>D.E. Boulders</td>
<td>5'6&quot;</td>
<td>Rock with Fractured Rock</td>
<td>R.O.</td>
</tr>
<tr>
<td>Depth: 10'6&quot;</td>
<td>Depth: 10'6&quot;</td>
<td>Depth: 9'4&quot;</td>
<td>Depth: 10'2&quot;</td>
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</tbody>
</table>

REMARKS: 898-15.0' Bk=1 Pk=1

SKETCH LEGEND: SA - Sand  SI - Silt  CL - Clay  CR - Gravel
00 - Cobbles  RO - Boulders  F.R. - Fractured Rock
RO - Rock  W.T. - Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

References: LEGS A B D E CO 597 E Str. No. 236
LEGS C E CO 497 E Str. No. 314/33.18

CANT. REP. DADWIN CRAY Str. Type ELT
LEMCO REPR. RAY BRIGHTWELL

DATE: 9-19-83
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<tr>
<td>A</td>
<td>Soil</td>
<td>10.0</td>
<td>Sandy soil</td>
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<tr>
<td>B</td>
<td>Rock</td>
<td>20.0</td>
<td>Weathered B.r.</td>
</tr>
<tr>
<td>C</td>
<td>Sand</td>
<td>30.0</td>
<td>Fine sand</td>
</tr>
<tr>
<td>D</td>
<td>Clay</td>
<td>40.0</td>
<td>Clayey soil</td>
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</table>

**Remarks:**
- **Soil:** Sandy soil
- **Rock:** Weathered B.r.
- **Sand:** Fine sand
- **Clay:** Clayey soil

**Note:** Refer to the detailed geological survey for more information.
## Foundation Boring Report

**Project Title:** 500 K.V. 4375 E.V. Substation  
**Contractor:** Commonwealth (CW)  
**Weather:**  
**Description of Surrounding Area:** Mountainous X  
**Woods/Orchard:** Cultivated  
**Right-of-Way Cleared:** Yes  
**Set Str. Staked:** Yes  
**Roads Satisfy:** Yes  
**Finish Type:** AAA 3-3/4  
**Spec.:** AAA 3-3/4  
**Str. A:** AAA 3-3/4  
**Str. B:** AAA 3-3/4  
**Str. C:** AAA 3-3/4  
**Str. D:** AAA 3-3/4

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<th>Description</th>
<th>Sketch</th>
<th>Description</th>
<th>Sketch</th>
</tr>
</thead>
<tbody>
<tr>
<td>2' of Hard Blue Granet + Pay Rock</td>
<td>Depth 11-0</td>
<td>9' of Decomposed Granet with Layers of Sand Mixed with Clay</td>
<td>Depth 11-0</td>
<td>9' of Hard Blue Granet + Pay Rock</td>
<td>Depth 11-0</td>
<td>11' of Hard Blue Granet with SEAMS and FRACT. ROCK</td>
<td>Depth 11-0</td>
</tr>
<tr>
<td>3-32-83</td>
<td></td>
<td></td>
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</table>

**Bell Height:** 11-0  
**Bell Dia. In.:** 11-0  
**Bell Dia. In:** 11-0  
**Bell Dia. In:** 11-0  
**Bell Dia. In:** 11-0  
**Bell Dia. In:** 11-0  
**Bell Dia. In:** 11-0  
**Bell Dia. In:** 11-0  
**Bell Dia. In:** 11-0  
**Bell Dia. In:** 11-0  
**Bell Dia. In:** 11-0

**Remarks:**  

**Sketch Legend:**  
SA - Sand  
SI - Silt  
CL - Clay  
GR - Gravel  
CO - Cobble  
BO - Boulders  
F.R. - Fractured Rock  
RO - Rock  
W.T. - Water Table  

**Note:** Drill Rate in Sketch Space if Rock Anchor(s)

**References:** ECO 7-4-F  
**Sta. No.:** 3183 + 4910  
**Str. No.:** 238  
**Str. Type:** E  
**Date:** 5-9-83

**Received:**  
**Date:** 5-1-83  
**Lemco-Miguel:**  
**Cmpt. Rep.:** David Lee  
**Lemco Repr.:** Ray Brightwell
**FOUNDATION BORING REPORT**

**PROJECT TITLE:** 500 K.V. A-G-I-V SUBSTATION W.O. NO. 583970

**CONTRACTOR:** COMMONWEALTH (C.W.)

**DESCRIPTION OF SURROUNDING AREA:** MOUNTAINOUS

**WEATHER:**

**WOODS/ORTHARD:** CULTIVATED

**RIGHT-OF-WAY CLEARED:** YES

**LEVEL:**

**STRAIGHT STAKED:** NO

**CONSTRUCTION ROADS SATISFIED:** YES

**MAY 25 1969**

**FON. TYPE (SPEC.):** AAR2 5 1/3' AAR2 5 1/3' AAR2 AAR2

**LEMC-0-JAMUL**

**STR. A**

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<tbody>
<tr>
<td>4-22' Ft.</td>
<td>5 1/3'</td>
<td>4-22' Ft.</td>
<td>5 1/3'</td>
<td>0-5' Rock</td>
<td>RO</td>
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<tr>
<td>0-3' Soft</td>
<td>D.G.</td>
<td>0-6' Soft</td>
<td>D.G.</td>
<td>0-6' Rock</td>
<td>RO</td>
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<tr>
<td>To Medium</td>
<td>Rock</td>
<td>To Medium</td>
<td>Rock</td>
<td>6-11' Comp.</td>
<td>5-3-83</td>
</tr>
<tr>
<td>HARD D.G.</td>
<td></td>
<td>HARD D.G.</td>
<td></td>
<td>5-0' Comp.</td>
<td>5-3-83</td>
</tr>
<tr>
<td>3' Rock</td>
<td>RO</td>
<td>3' Rock</td>
<td>RO</td>
<td>5-11-83</td>
<td>Depth</td>
</tr>
<tr>
<td>9-13 Rock</td>
<td>RO</td>
<td>11-13' Med.</td>
<td>D.G.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>HARD D.G.</td>
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<td></td>
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<tr>
<td>13' Complete</td>
<td></td>
<td>13' COMP</td>
<td>4-28-83</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REMARKS:**

- B.L. 18'-2" P.I.D. 99.01

**SKETCH LEGEND:** SA = Sand SI = Silt CL = Clay CR = Gravel

CO = Cottles BO = Boulders F.R. = Fractured Rock

RO = Rock W.T. = Water Table

Note Drill Rate in Sketch Space if Rock Anchor(s)

**REFERENCES:**

FCO 72 E

FCO 73 E

**CONTR. REPR.:** James Walsh

**LEMC REPR.:**

**DATE:** 5-16-83

**STRAIGHT NO.:** 240

**STA. NO.:** 3201+20.44

**STR. TYPE:** EMT
### Foundation Boring Report

**Project Title:** 500 kV H.V. - E.V. Substation

**Contractor:** Common Wealth

**O.N. No.:** 559,3970

**Weather:**

- **Description of Surrounding Area:** Mountainous
- **Woods/Orchard:**
- **Cultivated:**
- **Other (Description):**

**Right-of-Way Cleared:** Yes

**Str. Staked:** No

**Constr. Roads Satisf.:** Yes

**Found. Type (Spec.):**

<table>
<thead>
<tr>
<th>STR. A</th>
<th>STR. B</th>
<th>STR. C</th>
<th>STR. D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td><strong>Sketch</strong></td>
<td><strong>Description</strong></td>
<td><strong>Sketch</strong></td>
</tr>
<tr>
<td>4/19 Ft.</td>
<td>SA + Ro</td>
<td>4/19 Ft.</td>
<td>SA + Ro</td>
</tr>
<tr>
<td>4/19</td>
<td>with 4&quot; to 8&quot;</td>
<td>4/19</td>
<td>with 4&quot; to 8&quot;</td>
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<td>Comp</td>
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<tr>
<td></td>
<td>5/3</td>
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</tr>
<tr>
<td><strong>Depth in:</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>18&quot;</td>
<td>18&quot;</td>
<td>18&quot;</td>
<td>18&quot;</td>
</tr>
</tbody>
</table>

**Bell Height:** 42" in.

**Remarks:** Rock was cut before ruling area on A leg.

---

**Received:**

**Sketch Legend:**
- SA - Sand
- SI - Silt
- CL - Clay
- CR - Gravel
- CO - Cobble
- BO - Boulders
- F.R. - Fractured Rock
- RO - Rock
- W.T. - Water Table

**Note Drill Rate in Sketch Space if Rock Anchor(s):**

**Field Change Order # 52F**

**Str. No.:** 241

**Sta. No.:** 3220.45

**Str. Type:** EMT

**Date:** 5/18/93
**Description**: SAND

**Depth**: 4-29

**Sketch**: SA

---

**Description**: SAND

**Depth**: 4-29

**Sketch**: SA

---

**Description**: SHAFT & BELL

**Complete**: 5-11-83

**DIA**: 78 IN.

**Bell Height**: 42 IN.

**Photo**: L.F. Rock

---

**Description**: SHAFT & BELL

**Complete**: 5-18-83

**DIA**: 78 IN.

**Bell Height**: 42 IN.

**Photo**: L.F. Rock

---

**Description**: SHAFT & BELL

**Complete**: 5-10-83

**DIA**: 78 IN.

**Bell Height**: 42 IN.

**Photo**: L.F. Rock

---

**Remarks**: HAND DUG HOLES

---

**Sketch Legend**: SA - Sand  SI - Silt  CL - Clay  Gr - Gravel

**Cr - Cobbles**  BO - Boulders  F.R. - Fractured Rock

**RD - Rock**  W.T. - Water Table

---

**Remarks**: Note Drill Rate in Sketch Space if Rock Anchor(s)