PRELIMINARY GEOLOGICAL AND GEOTECHNICAL ASSESSMENT REPORT

Big Rock 2 Cluster Solar and Storage Project

Imperial County, California

November 27, 2024

Prepared for:

Imperial County Planning & Development Services Department

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Table of Contents

List of Tables

List of Appendices

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

It is our understanding that the proposed Big Rock 2 Cluster Solar and Storage Project (Project) will consist of the design and construction of utility scale photovoltaic solar energy generation facilities and battery energy storage systems with capacity of up to 500-megawatt solar generation and 500-megawatt of storage. The proposed improvements will be located on approximately 1,569 acres of “new lands” that have not previously been entitled, in addition to up to 867 acres of lands that are currently entitled under active Conditional Use Permits (CUPs) known as Laurel Cluster 3 (587 acres), Laurel Cluster 2 North (120 acres), and Laurel Cluster 2 South (160 acres), totaling 2,436 acres of available land for development. For this report, the parcels have been grouped as CUP #1 (Big Rock 2 Cluster North and Laurel Cluster 2 North, CUP #2 (Big Rock 2 Cluster South), CUP #3 (Big Rock 2 Cluster East/Laurel Cluster South CUP # 21-0013), and CUP # 4 (Big Rock Cluster West). The site location and CUPs are shown on Figure 1, Site Vicinity Map in Appendix A.

1.2 PURPOSE AND SCOPE

The purpose of this preliminary geological and geotechnical study is to review existing geologic/geotechnical data and evaluate preliminary geological and geotechnical hazards for the proposed Project. A subsurface field investigation was not included in the scope for this report. A final design report must be completed prior to construction and after subsurface investigation and laboratory testing has been performed.

Our scope of services for this Project included the following tasks:

Literature Review: HDR reviewed various available published and unpublished geologic and geotechnical documents pertinent to the Project site. Existing geotechnical data including Log of Test Borings (LOTB) and boring logs are presented in Appendix B. A list of references used in preparation of this report is presented in Section 6.0.

Site Reconnaissance: Performed a brief site reconnaissance on November 20, 2024 to observe the existing site conditions including existing on-site surficial soils and potential geologic hazards. Selected photographs from our site reconnaissance are included in Appendix C, Site Photographs.

Preliminary Geologic, Seismic Design, Subsurface Conditions, and Geotechnical Assessment: HDR’s preliminary evaluation included location of known and mapped nearby earthquake faults and seismic zones in relation to the Project site, intensity of ground shaking, potential for liquefaction, ground rupture, landslides, and flooding. Other potential hazards such as expansion, collapse, and corrosivity potentials of on-site soils were also evaluated. Our evaluations were performed based on literature review only. Field and laboratory testing program was not included as a part of our services.

Report Preparation: Relevant geotechnical and geological data were compiled in this preliminary report along with our findings and conclusions for the proposed Project.

1.3 SITE LOCATION AND DESCRIPTION

The proposed Project site is located in unincorporated Imperial County, south of Interstate 8 (I-8), approximately one mile southwest of the town of Seeley, California, and approximately six miles north of the United States International Border with Mexico. In general, the Project site is considered undeveloped with certain portions of the site used for agricultural purposes. In the vicinity of the Project, improvements include I-8, local roads, bridges, irrigation canals, and nearby solar farms. The Project site includes multiple parcels that have been grouped into four areas (CUP #1 through CUP # 4). A Site Vicinity Map is shown in Appendix A, Figure 1. The reference coordinates used for this preliminary geological and geotechnical study are provided below:

Latitude: 32.76084ºN	Longitude: 115.72365ºW

A site reconnaissance was completed on November 20, 2024 to explore the existing conditions at the Project site. Selected photographs from our site reconnaissance are included in Appendix C. A brief description of the explored areas is provided below.

CUP #1 (Big Rock 2 Cluster North): CUP #1 consists of irregular shaped properties bordered to the north by the I-8, south by agricultural fields and existing solar farms, to the west by Westside Road, and east by the New River. Generally, the land surrounding the property is undeveloped and predominately used for agricultural purposes. Based on our site visit, extensive areas of CUP #1 have been planted with alfalfa, bermuda grass, sugar beet, or similar crops. Typically, the top 6 to 12 inches of subgrade soils appear to be in a medium dense condition consisting of silty sands and clays. The Fern Canal, Fig Canal, Wixom Drain and Dixie Drain Three run north to south in the vicinity of CUP #1 with various minor canals running east to west within CUP #1. Surface water was observed within these canals. Additionally, surface water was observed within the New River. Existing paved and unpaved roads along the perimeter of the property were used for access during the site visit. However, construction of new pavement along Derrick Road prevented site reconnaissance east of Derrick Road. Power lines run along a portion of the northern border of the site as well as along Derrick Road. A haybale storage lot is located in the central part of the site just west of Derrick Road as seen in the Photo Location (PL) 25 of Appendix C. The topography within the property is relatively flat with elevations ranging from approximately -41 feet North American Vertical Datum of 1988 (NAVD 88) at the northern limit to -37 feet NAVD 88 at the southern limit. Generally, surface drainage is towards the east into the New River. Localized surface drainage occurs towards the north and middle portion of CUP #1.

CUP #2 and CUP #4 (Big Rock 2 Cluster South and West): CUP #2 and CUP #4 are located on the southern and western portion of the Project, respectively. These CUPs are surrounded by agricultural fields to the north and west, and a solar project to east. The Imperial Irrigation District (IID) Westside Main Canal (Westside Main Canal) is located to the south and west of CUP #4 and south of CUP #2. Additionally, the Foxglove Canal and Dixie Drain Two run north to south along CUP #4 while the Westside Drain and Dixie Lateral One run east to west along CUP #4. Surface water was observed within these canals. Surface water was also observed in the farmed crop area on the southern side of CUP #4 as seen in PL04 in Appendix C. This water flowed into the site from the Westside Main Canal. Although most of the surface soils consisted of dry dense silty sands, the southern portion of CUP #2 had areas of dry soft to stiff lean clays. Generally, the properties are undeveloped with the surface covered with alfalfa, bermuda grass, or similar crops. Access to these CUPs was through unpaved roads, Mandrapa Road, Hyde Road, and W. Vaughn Road. Minor structures at CUP #2 such as an apparent well to the north and a water tank to the south exist as seen in PL09 and PL13 in Appendix C, respectively. Bird activity among various species was noted along the eastern side of CUP #2. Power lines run along the local roads. The topography within the property is relatively flat with elevations ranging from approximately -37 feet NAVD 88 on the north to -29 feet NAVD 88 on the south. Generally, surface drainage is towards the east into the New River and with some localized surface drainage towards the north and middle portion of CUP #1. Generally, surface drainage is towards the north and east. Some localized surface drainage occurs within the middle portion of CUP #2 and CUP #4.

CUP #3 (Big Rock 2 Cluster East/Laurel Cluster 2 South): CUP #3 is located on the eastern end of the Project bounded to the north by agricultural fields, west by Jessup Road, and east and south by Derrick Road and W Diehl Road, respectively. The Wixom Drain located west of the site and Fig Canal located east of the site both run north to south. Additionally, minor unnamed canals run east to west to the north and south of the site. Surface water was observed in all the drains and canals as well as in the farmed crop area to the north of the site. The surface soils encountered at the site were generally moist soft clays with apparent high plasticity. Generally, the property is undeveloped with the surface covered with bermuda grass or similar crops. This property was recently plowed, and agricultural machinery was present onsite. Power lines were observed along W. Diehl Road and Derrick Road. The topography within the property is relatively flat with elevations ranging from approximately -37 feet NAVD 88 on the north to -34 feet NAVD 88 on the south. Generally, surface drainage is towards the north and west.

2.0 GEOLOGY, FAULTING AND SEISMICITY

2.1 REGIONAL GEOLOGIC SETTING

The Project site is located in the Imperial Valley, a part of the Salton Trough, located in the Colorado Desert physiographic province of California. With surface elevations as low as 275 feet below sea level, the Salton Trough formed as a structural depression resulting from tectonic boundary extension between the Pacific and the North American plates. The Salton Trough is bounded on the east and northeast by the San Andreas Fault and on the west by the San Jacinto Fault Zone. The structural trough is filled with more than 15,000 feet of Miocene and younger, marine and non-marine sediments capped by approximately 100 feet of Pleistocene and later lacustrine deposits that have been deposited by intermittent sedimentation derived from periodic flooding from the Colorado River and the filling of Lake Cahuilla (Morton, 1977).

Based on a review of published data by the California Geological Survey (C.W. Jennings, et al, 2010) and the P.K. Morton (1977) geologic map of Imperial County, the Project site sits in a graben valley underlain by lacustrine deposits of ancient Lake Cahuilla comprised of tan and gray fossiliferous clay, silt, sand, and gravel in conjunction with young alluvial deposits of unconsolidated clay, sand, silt, and gravel. West of the Project site are mapped uplands consisting of Pliocene and Pleistocene sandstone, shale, and gravel deposits. A Regional Geologic Map is shown on Figure 2 in Appendix A.

2.2 SUBSURFACE SOIL CONDITIONS

Previous geotechnical investigations have been completed in the vicinity of the Project site along the I-8 and to the south near the Westside Canal. Generally, previous investigations for improvements related to the California Department of Transportation (Caltrans) are located north of CUP #1. According to nearby Caltrans LOTBs (Caltrans, 1962, 1963, 1967a, 1967b, and 1967c), the explored subsurface soils generally consist of fine to coarse sands with interbedded clays and silts to the maximum depth explored of about 110 feet below ground surface (bgs). The granular soils were encountered with relative densities ranging from loose to very dense, increasing in relative density with depth. Generally, soft to stiff clays were encountered in these previous investigations within the upper 10 feet. Additionally, available information from a nearby solar project (NV5, 2018) located southeast of CUP # 2, indicate that the subsurface soils consisted of soft to hard fine-grained soils (lean clay, sandy lean clay, fat clay, and sandy silts) in the upper 25 feet bgs. Below the fine-grained soils, fine to coarse, medium dense to very dense sands with varying amounts of silts were encountered to the maximum depth of 80 feet bgs. The approximate location of the historical borings is shown on Figure 3, Boring Location Map. The selected Log of Test Borings (LOTBs) are provided in Appendix B.

Based on review of the Soil Survey for Imperial County prepared by United States Department of Agriculture Soil Conservation Service (2024) surface soils at the site consist of ten primary groups; 110 Holtville silty clay, 114 Imperial silty clay, 115 Imperial-Glenbar silty clay loam complex, 118 Indo loam, 119 Indo-Vint complex, 122 Meloland very fine sandy loam, 123 Meloland-Holtville, 135 Rositas fine sand, 142 Vint loamy very fine sand, and 144 Vint-Indo very fine sandy loam undifferentiated group. All of the above soil groups are described as wet and are generally limited to a 0 to 2 percent slope. A Soil Survey Map is shown on Figure 4 in Appendix A.

2.3 GROUNDWATER CONDITIONS

Available groundwater information from existing Caltrans LOTB (1962, 1963, 1967a, 1967b, and 1967c) indicate the presence of shallow groundwater near the Project site along the I-8. Generally, groundwater was encountered during these previous investigations at depths ranging from about 1 to 12 feet bgs, corresponding to groundwater elevations ranging from about -41 and -49 feet NAVD 88.

On the southern end of the Project near CUP # 2, groundwater was encountered at depths ranging from about 9 to 19 feet, corresponding to groundwater elevations ranging from about -30 to -37 feet NAVD 88. A review of the online monitoring well database from the California Department of Water Resources (CDWR, 2024a) indicate that there are not monitoring wells with groundwater data within 2-mile radius of the Project site.

Although there is historical groundwater data that is applicable towards the Project, groundwater information needs to be documented during a future subsurface field investigation as part of the design phase of the Project. Seasonal fluctuations of shallow groundwater should be expected during periods of rainfall, irrigation of adjacent properties, and site grading.

2.4 FAULTING

Southern California straddles the boundary between two tectonic plates known as the North American Plate (on the east) and the Pacific Plate (on the west). The main plate boundary is represented by the San Andreas Fault, which extends northwest from the Gulf of California in Mexico, through the desert region of the Imperial Valley, through the San Bernardino region, and into Northern California, where it eventually trends offshore, north of San Francisco (Jennings and Bryant, 2010).

In Southern California, the plate boundary is a complex system of numerous faults known as the San Andreas Fault System (SAFS) that span a 150-mile-wide zone from the main San Andreas Fault in the Imperial Valley westward to offshore of San Diego (Powell et al., 1993 and Wallace, 1990). The major faults east of San Diego (from east to west) include the San Andreas Fault, the San Jacinto Fault, and the Elsinore Fault. The SAFS is a transform plate boundary dominated by right-lateral fault displacement with the Pacific Plate moving northwest relative to the North American Plate (Wallace, 1990 and Weldon and Sieh, 1985). The significance of this lateral faulting is that transform plate interactions typically generate much smaller maximum magnitude earthquakes than convergent or subduction plate boundaries. Thus, in Southern California the expected maximum moment magnitudes for most faults are typically in the M6.5 to M7.5 range, with only a few faults (San Andreas Fault, possibly some thrust faults of the Transverse Ranges) capable of generating earthquakes in the M8 range, such as the 1906 San Francisco and 1857 Fort Tejon earthquakes, on the San Andreas Fault itself.

Most of the seismic energy and associated fault displacement within the SAFS occurs along the fault structures closest to the plate boundary (i.e., on the Elsinore, San Jacinto, and San Andreas faults) (Powell et al. 1993). Approximately 1.9 inches/year (49 millimeters per year, [mm/yr.]) of overall lateral displacement have been measured geodetically and as fault slip across the plate boundary. Combined, the Elsinore, San Jacinto, and San Andreas faults account for up to 1.6 inches/year (41 mm/yr.), or 84 percent, of the total plate displacement. The remaining 16 percent is accommodated across the faults to the west (Bennett et al., 1996).

The Project site is located in the seismically active Southern California region, within the influence of several fault systems that are considered to be active or potentially active. Several active or potentially active faults are located in the vicinity of the Project site. The locations of these faults relative to the site are shown on Figure 5, Fault Map (Appendix A).

Table 2-1 lists faults with a risk contribution greater than 1 percent, along with pertinent data such as distance to fault and maximum magnitude performed by the UCERF3 Fault Model 3.1 (USGS, 2024a). As shown on Figure 5, there is a unnamed fault (Unnamed Creep-Active Fault) in the vicinity of the Project site located approximately 3 miles northwest. USGS (2024a) has classified this unnamed fault as "historic-well constrained" with an age of less than 150 years old.

Table 2-1. Summary of Contributing Faults

Fault Name (1)	R_{Rup} (mi) (2)	Site Location (Latitude and Longitude)	Maximum Magnitude
Imperial [10]	13.8	32.76084 °N 115.72365 °W	7.4
Superstition Hills [5]	8.3		7.3
San Jacinto (Superstition Mountain) [4]	8.7		7.4
Laguna Salada [14]	10.1		6.6
Cerro Prieto [1]	14.3		7.1
San Jacinto (Superstition Mountain) [3]	10.3		7.3

Note:

Listed faults were derived from United States Geologic Survey (USGS, 2024a) Deaggregation online tool and lists faults with a risk contribution greater than 1 percent of the total seismic risk using the UCERF3 Fault Model 3.1. Faults are listed in order of contribution to the probabilistic model. Site Class D was assumed and using the NSHM Conterminous U.S. 2018 dataset with a 2,475-year return period. See USGS (2024a) for details.

(1) Number in parenthesis indicates specific section of specified fault as determined by USGS (2024a).

(2) R_{Rup} is the closest distance from the Site Location to fault rupture plane which is calculated by USGS (2024a) methodology.

2.5 HISTORICAL SEISMICITY

The Project site and vicinity are located in an area characterized by high seismicity. The seismicity of the region surrounding the Project site was evaluated using the earthquake database from USGS website (2024b). Based on the review of the available data, 22 earthquake events with magnitudes equal or greater than 6.0 have occurred within a radius of 60 miles of the site in the last 100 years. Location of the earthquake epicenter, year of occurrence, and earthquake magnitude are summarized in Table 2-2.

Table 2-2. List of Selected Historic Earthquakes

Earthquake Location	Approximate Distance to Site (1) (miles)	Date of Earthquake	Earthquake Magnitude
19 km S of Progreso, Mexico	26.9	1/1/1927	6.0
49 km SSE of Rumorosa, Mexico	42.3	1/1/1927	6.1
5km S of Alberto Oviedo Mota, B.C., MX	51.5	12/31/1934	6.4
16km WSW of Oasis, CA	53.6	3/25/1937	6.0
Imperial Valley, California Earthquake	20.5	5/19/1940	6.9
Fish Creek Mountains, California Earthquake	14.8	10/21/1942	6.6
14km WNW of Tecolots, B.C., MX	36.4	1/24/1951	6.0
San Jacinto Fault, California Earthquake	42.2	3/19/1954	6.4
Borrego Mountain, California Earthquake	36.1	4/9/1968	6.6
Imperial Valley Earthquake, California-Baja California	22.2	10/15/1979	6.4
5km SE of Alberto Oviedo Mota, B.C., MX	52.5	6/9/1980	6.3
Elmore Ranch, California Earthquake	22.6	11/24/1987	6.2
Superstition Hills, California Earthquake	18.7	11/24/1987	6.6
Sierra El Mayor, B.C., Mexico Earthquake	41.4	4/4/2010	7.2

(1) Distance approximated by measuring in Google Earth from CUP #1 (Latitude: 32.76084 ºN Longitude: 115.72365 ºN) to coordinates given in database.

3.0 ASSESSMENT OF POTENTIAL GEOLOGIC AND GEOTECHNICAL HAZARDS

3.1 SEISMIC SHAKING

The Project site is located in the highly seismic Southern California region within the influence of several fault systems that are considered to be active or potentially active. A list of known faults considered capable of producing potentially damaging seismic shaking at the site is presented in Table 2-1. It is anticipated that the Project site will periodically experience ground accelerations and shaking as the result of small to large magnitude earthquakes occurring along these faults and other faults within the Southern California region.

The results of our preliminary seismic hazard analyses indicated that the estimated horizontal peak ground acceleration adjusted for site effects (PGA_M) having a 2 percent probability of exceedance in 50 years and corresponding to the statistical return period of approximately 2,475 years, which is defined as the Maximum Considered Earthquake (MCE), is on the order of 0.53g. This horizontal PGA was calculated using the online ASCE Hazard Tool (2024) and in accordance with the 2022 California Building Code and the American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) (2022) 7-22. The PGA provided herein applies to the building. Additional design parameters are required for seismic analysis of equipment and should be evaluated during future design phases.

3.2 FAULT-RUPTURE HAZARD

Surface rupture usually occurs along traces of known active or potentially active faults. However, many historic seismic events, including the 1994 Northridge Earthquake, have occurred on faults without surface expression (blind faults) that were not previously known to exist or to be active.

The California Geologic Survey (CGS) established criteria for faults as active, potentially active, and inactive. Active faults are those that show evidence of surface displacement within the last 11,000 years (Holocene age). Potentially active faults are those that demonstrate displacement within the past 1.6 million years (Quaternary age). Faults showing no evidence of displacement within the last 1.6 million years may be, in general, considered inactive for most structures, except for critical structures. In 1972 the Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) was passed, which required fault studies within 500 feet of active or potentially active faults. The Alquist-Priolo Act designates “active” and “potentially active” faults utilizing the same age criteria as that used by the CGS.

The Project site is not located within a currently delineated State of California Alquist-Priolo Earthquake Fault Zone (Bryant and Hart, 2007 and CGS, 2021). The nearest Alquist-Priolo Earthquake Fault Zones are located at approximately 0.7 mile (Route 247 Fault Zone) and 2.5 miles (Yuha Basin Faults) from CUP #2 and CUP #4, respectively. Based on the published maps, the likelihood of fault rupture at the site is considered low. The location of these Alquist-Priolo Earthquake Fault Zones are shown on Figure 6, Seismic Hazards Map in Appendix A.

3.3 FLOOD HAZARD

Flooding can occur as a result of several factors in developed areas. These factors include: rainfall rates that exceed an area's ability to absorb or control the runoff; impounded water retained behind a flood control structure (upstream-inundation), failure of a flood control structure (downstream-inundation), seiches, and tsunami.

According to Federal Emergency Management Agency (FEMA, 2008) maps, the flood hazard of the Project site varies depending on location. The majority of the project areas fall in Zone X which is designated for areas outside of the 0.2% annual flood chance. The New River bounds the eastern end of Cluster 1 and is designated as Zone A which represents areas of minimal flood hazard, 0.2% annual chance flood hazard, where no base flood elevations are determined. Therefore, natural flooding risks potentially exist at the site and should be further evaluated during the design phase of this Project.

3.4 SEICHE AND TSUNAMI

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Tsunamis are waves generated in large bodies of water by fault vertical displacement or major ground movement.

The Project site is located outside a Tsunami Hazard Area (CGS, 2024). Additionally, the closest enclosed body of water, the Salton Sea, is located at about 23 miles to the north of the Project site. Considering that the Project site is located outside a Tsunami Hazard Area, Project site elevations, and absence of enclosed bodies of water in the immediate vicinity, seiche and tsunami risks at the site are considered negligible.

3.5 EARTHQUAKE-INDUCED FLOODING

Based on review of the California Department of Water Resources (CDWR, 2024b) online Dam Inundation Map GIS database, the site is not located within an identified dam inundation zone.

3.6 LANDSLIDING

Landslides and other forms of mass wasting, including mud flows, debris flows, and soil slips occur as soil moves downslope under the influence of gravity. Landslides are frequently triggered by intense rainfall or seismic shaking. Because the Project site is located in a relatively flat area, we do not consider landslides or other forms of natural slope instability to represent a significant hazard to the Project.

3.7 LIQUEFACTION/SEISMIC SETTLEMENT

The term liquefaction describes a phenomenon in which saturated, cohesionless soils temporarily lose shear strength (liquefy) when subjected to cyclic ground motions. Cyclic loading of saturated soils leads to the build-up of pore water pressure as a result of soil particles being rearranged with a tendency toward closer packing. Under undrained conditions, shaking of loose non-cohesive soils may result in loads being transferred from the soil skeleton to the pore water with consequent reduction in the soil strength and stiffness. Structures founded on or above potentially liquefiable soils may experience bearing capacity failures due to the temporary loss of foundation support, vertical settlements (both total and differential), and/or undergo lateral spreading. The factors known to influence liquefaction potential include soil type, relative density, grain size distribution, confining pressure, depth to groundwater, and the intensity and duration of the seismic ground shaking. Liquefaction is most prevalent in loose- to medium-dense, silty, sandy, and gravelly soils below the groundwater table.

The Project site has not been mapped for liquefaction potential by the California Geological Survey (CGS, 2021). Based on historical explorations, there is a possibility of encountering relatively shallow groundwater (in the upper 50 feet bgs) in zones of loose sands with variable fines content. Therefore, the potential for liquefaction exists at the site and the liquefaction potential should be evaluated during the design phase of the Project, using site-specific information collected from future site-specific exploratory boreholes.

3.8 LATERAL SPREADING

Liquefaction-induced lateral spreading is defined as the lateral displacement of ground as a result of pore pressure build-up or liquefaction in shallow underlying soils during an earthquake. Lateral spreading can occur on sloping ground or where nearby slopes are present. The factors known to influence the magnitude of lateral spreading include earthquake magnitude, peak ground acceleration, distance between the Project site and the seismic event, the slope height and gradient, thickness of the liquefied layer, fines content, soil particle gradation, and residual strength of the liquefied soil.

Based on a preliminary evaluation on site subsurface conditions and based on the general site topography, lateral spreading is not a considered a design consideration. However, in areas where Project elements are planned adjacent to existing channels, there could be potential lateral spreading issues that may require further evaluation in future design phases. A site-specific geotechnical investigation should be performed during future design phases to confirm these assumptions.

3.9 LAND SUBSIDENCE

Subsidence is the sinking of the ground surface caused by the compression of earth materials or the loss of subsurface soil due to underground mining, tunneling, or erosion. The major causes of subsidence include fluid withdrawal from the ground, decomposing organics, underground mining or tunneling, and placing large fills over compressible earth materials. The effective stress on underlying soils is increased resulting in consolidation and settlement. Subsidence may also be caused by tectonic processes. The Project site is not located in an area of known ground subsidence or within any delineated zones of subsidence due to groundwater pumping or oil extraction (USGS, 2024d). However, according to the City of Calipatria 2035 General Plan (2013), natural subsidence occurs in the Salton Trough, averaging two inches per year in the Salton Sea and decreasing outward until it reaches zero near the Mexican border. Therefore, the potential for subsidence exists at the site.

3.10 EXPANSIVE SOILS

Expansive soils are characterized by their ability to undergo significant volume changes (shrink or swell) due to variations in moisture content. Changes in soil moisture content can result from precipitation, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors and may result in unacceptable settlement or heave of structures. Based on available data, the onsite near-surface soil deposits primarily consist of granular soils (clayey sand and silty sands) and fine-grained soils (fat clay, lean clay, and silts). Generally, clays may exhibit moderate to high expansion potential due to variation in moisture content and sands are considered not expansive soils. Clays are expected to be found at the Project site and as such, expansive soils should be anticipated. In future design phases, a site-specific geotechnical investigation should be performed to evaluate soil expansiveness and potential impact, if any, of expansive soil on the Project.

3.11 COLLAPSIBLE SOILS

Collapsible soil is generally defined as soil that will undergo a sudden decrease in volume and its internal support is lost under applied loads when water is introduced into the soil. The internal support is considered to be a temporary strength and is derived from a number of sources including capillary tension, cementing agents, e.g. iron oxide and calcium carbonate, clay-welding of grains, silt bonds, clay bonds and clay bridges. Soils found to be most susceptible to collapse include loess (fine grained wind-deposited soils), valley alluvium deposited within a semi-arid to arid climate, and residual soil deposits. At this time, it is unknown whether collapsible soils are present at the Project site. However, since the area is within an arid region with high winds, the presence of windblown loess materials at the site is possible. As such, the potential for collapsible soils exists at the site. A site-specific geotechnical investigation should be performed to assess the presence of collapsible soils and evaluate potential impact, if any, of collapsible soils on the proposed improvements.

3.12 SOIL CORROSION

A site-specific corrosion study should be performed and mitigation measures should be recommended if the soils are found to be corrosive to concrete or steel. Generally, fine grained soils like clay are more likely to be corrosive. Typical remediation for the corrosive soil conditions consists of using concrete mix with higher cement contents (Type V Portland Cement) and appropriate steel corrosion protection. Because fine grained soils are expected to be encountered at the subject site, corrosion potential should be further evaluated during the design phase of this Project.

3.13 OTHER GEOLOGIC HAZARDS

Volcanic Eruption: The Project site is not located in an area of a recent volcanism. Therefore, the potential for volcanic activity is very low.

Radon Gas: Radon gas is a radioactive product of uranium which can reach high levels depending on the local geology and building construction. According to Environmental Protection Agency (EPA) Map of Radon Zones (EPA, 1993), the Project site, as the entire Imperial County, is located in Zone 3 with predicted average indoor radon screening levels less than 2 picocuries per liter (pCi/L). Since the site is not located within an area of high potential for indoor radon levels (above 4 pCi/L), the potential for radon gas accumulation is considered low.

Naturally Occurring Asbestos: The Project site is not located in an area of known naturally occurring asbestos (CGS, 2011). Therefore, the potential for occurring asbestos is considered low.

Hazardous Materials: The Project site is not located in proximity to any known hazardous materials (methane gas, hydrogen sulfide gas) and the risk of hazardous materials is considered low.

Lithium: A portion of Imperial County has been labeled as “Lithium Valley” as the southern portion of the Salton Sea is believed to be rich in lithium deposits. The county is currently developing a Lithium Valley Specific Plan and Programmatic Environmental Impact Report and have preliminarily developed a Valley Lithium Map. The Project site lies outside the delineated Specific Plan Study Area (Imperial County, 2024). The potential impacts to the Project should be evaluated once more information is known on the lithium deposits and intended mining developments.

Geothermal: The Project site is not located within an area mapped as a Geothermal field by the California Department of Conservation (2000) and the County of Riverside (2024). Therefore, geothermal impacts on the Project site may be considered negligible.

4.0 PRELIMINARY SEISMIC DESIGN RECOMMENDATIONS

To reduce the effects of ground shaking produced by regional seismic events, seismic design should be performed in accordance with the applicable building codes. Preliminary seismic design parameters were calculated using the online ASCE Hazard Tool (2024) and in accordance with the 2022 California Building Code and the American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) (2021) 7-22. The Default Site Class was assumed for preliminary design and must be confirmed prior to final design. Seismic design parameters for Site Class D are provided in Table 4-1.

Table 4-1. Preliminary Seismic Design Parameters

Category	Recommended Value
Risk Category	II (1)
Site Class	D
Latitude	32.76084ºN
Longitude	115.72365ºW
Mapped (5% damped) spectral response acceleration parameter at short period (0.2 sec), S_S	1.5
Mapped (5% damped) spectral response acceleration parameter at long period (1.0 sec), S_1	0.58
Spectral response acceleration parameter at short period (0.2 sec), S_{MS}	1.62
Spectral response acceleration parameter at long period (1.0 sec), S_{M1}	1.39
Design (5% damped) spectral response acceleration parameter at short period (0.2 sec), S_{DS}	1.08
Design (5% damped) spectral response acceleration parameter at long period (1.0 sec) S_{D1}	0.93
Site-adjusted PGA (PGA_M) (g)	0.53
Design Magnitude(2) Mw	6.7

Notes:

(1) Risk category was assumed and should be verified by designer during final design.

(2) Design magnitude based on USGS Probabilistic Disaggregation NSHM Conterminous U.S. 2018 for 2% chance of exceedance in 50 years (2,475 year return interval) (USGS, 2024a).

5.0 CONCLUSIONS AND LIMITATIONS

Our review of available geological and geotechnical literature did not reveal conditions that would preclude development of the proposed Project provided, as mentioned above, a site-specific geotechnical investigation is conducted prior to the Project site development. The proposed Project is considered feasible for development from a geotechnical perspective.

This preliminary geological and geotechnical hazard evaluation report has been prepared for the use of HDR and the Imperial County Planning & Development Services Department for the proposed Big Rock 2 Cluster Solar and Storage Project. The report may not be used by others without the written consent of our client and our firm. The findings, conclusions, and preliminary recommendations presented in this report were prepared in a manner consistent with the standard of care and skill ordinarily exercised by members of its profession, practicing under similar conditions in the geographic vicinity, and at the time the services were performed. No other warranty is either expressed or implied.

Our findings, conclusions and preliminary recommendations presented in this report may be used for preliminary consideration of the feasibility and cost of site development purposes only. They are not intended for the design of the Project. Additionally, a site-specific geotechnical investigation should be performed during the planning process for the proposed Project, in order to develop recommendations for the specific foundation designs and earthwork construction being considered for this Project.

We appreciate the opportunity to provide our services on this Project. Please do not hesitate to contact undersigned if you have questions, comments, or need additional information.

Respectfully submitted,

HDR Engineering, Inc.

REGISTERED PROFESSIONAL ENGINEER
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No. C95409
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M R Flores

Prepared by: Ben Andrews, EIT
Staff Civil – Engineer in Training

Prepared by: Mario Flores, PE
Engineer - Geotechnical

Manuel Guzman

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GEOTECHNICAL
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Review by: Manuel Guzman, PE
Engineer – Geotechnical

Review by: Gary Goldman, PE, GE
Senior Project Manager - Geotechnical

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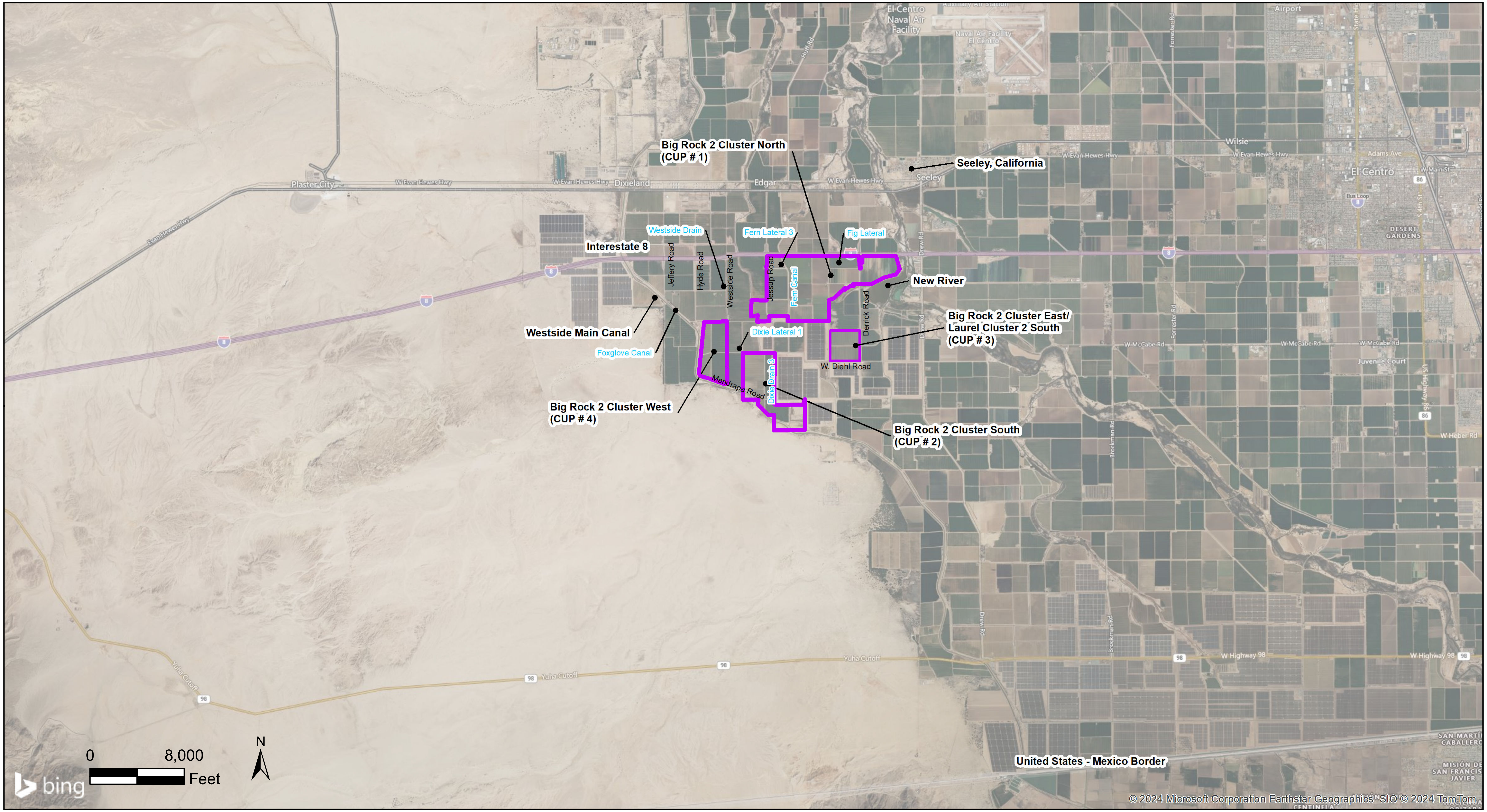
Appendix A

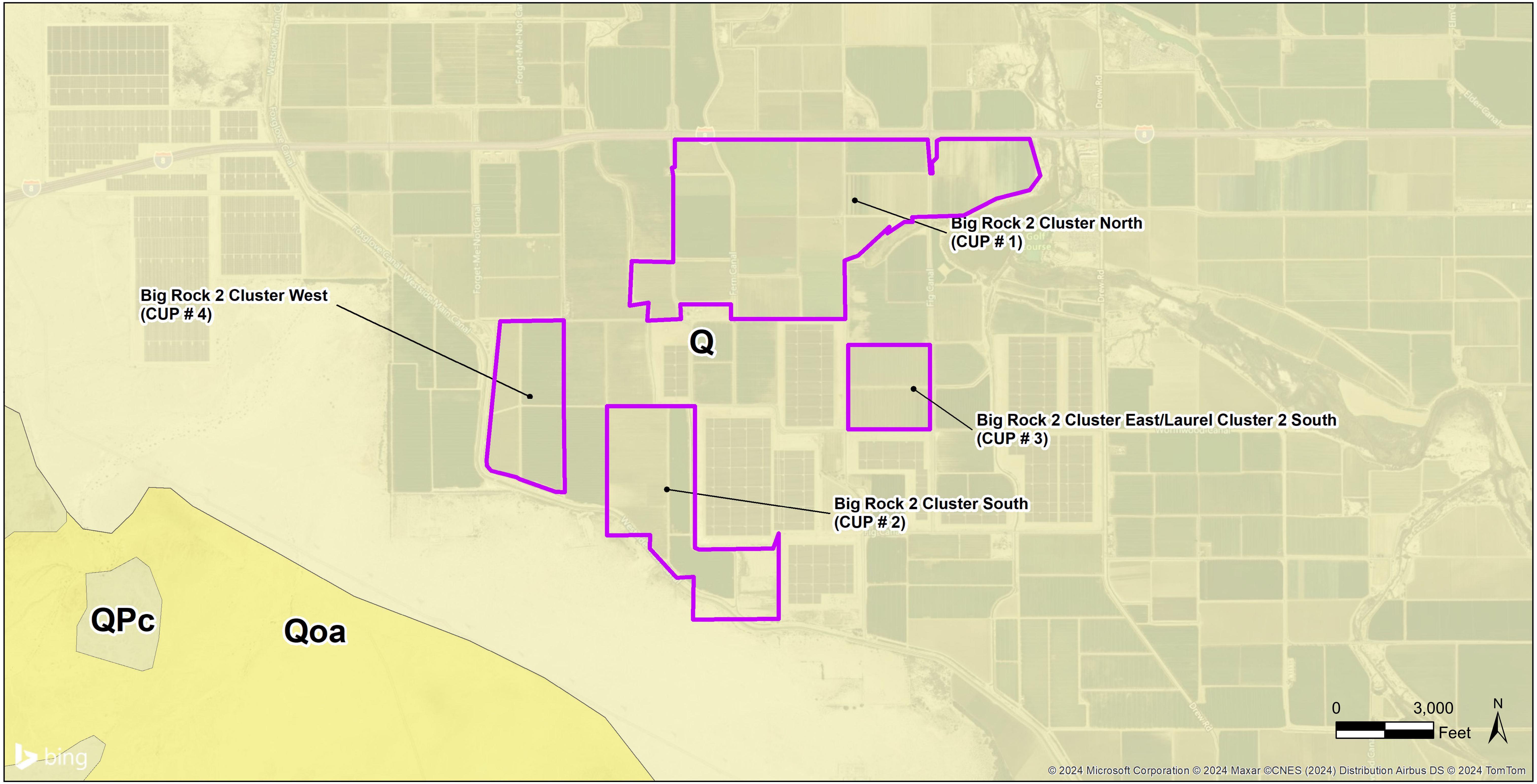
Figures



▭ Project Limits (Approximate) - CUP # 1, 2, 3, 4

SITE VICINITY MAP
BIG ROCK 2 CLUSTER SOLAR & STORAGE PROJECT
IMPERIAL COUNTY, CALIFORNIA

Figure 1



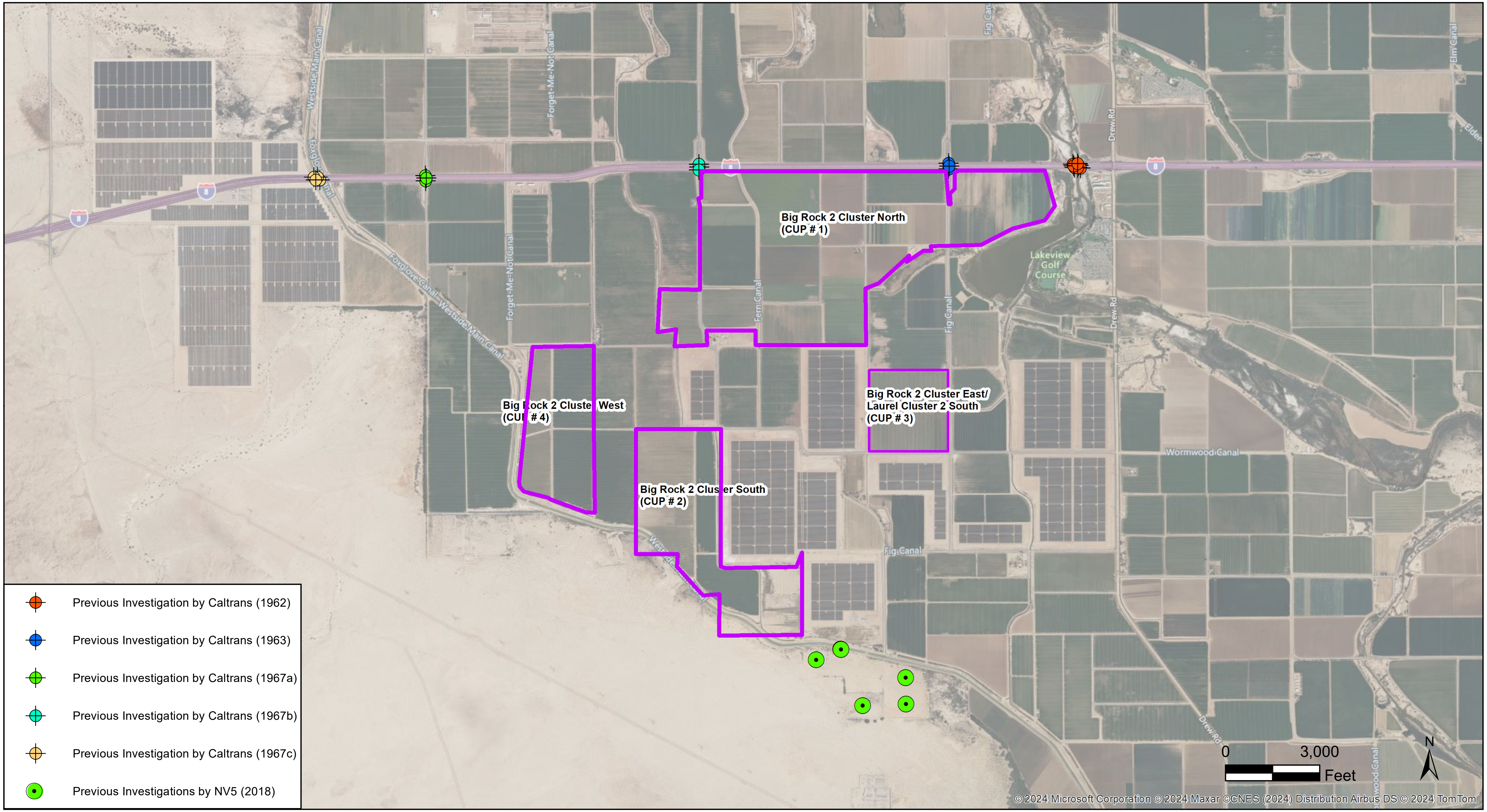
Reference: C. W. Jennings, with modifications by C. Gutierrez, W. Bryant, G. Saucedo and C. Wills, 2010.

Q - Alluvium, lake, laya, and terrace deposits; unconsolidated and semi-consolidated. Mostly nonmarine, but includes marine deposits near the coast.
Qoa - Older alluvium, lake, playa, and terrace deposits.
QPc - Pliocene and Pleistocene sandstone, shale, and grabel deposits; mostly loosely consolidated.

▭ Project Limits (Approximate) - CUP # 1, 2, 3, 4

GEOLOGIC MAP
BIG ROCK 2 CLUSTER SOLAR & STORAGE PROJECT
IMPERIAL COUNTY, CALIFORNIA

Figure 2

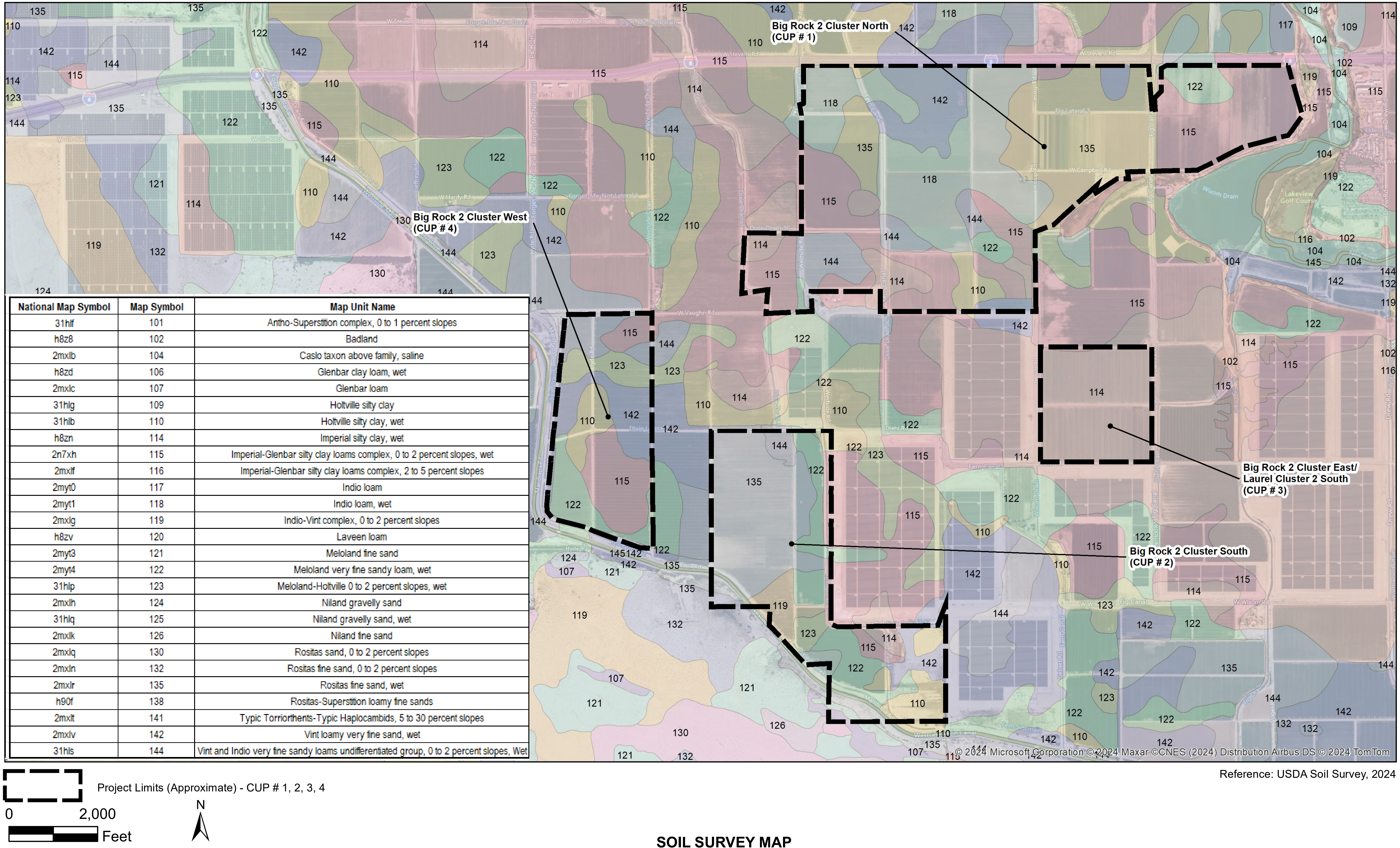


For specific boring names and approximate location of previous investigations refer to Appendix B in report.

▭ Project Limits (Approximate) - CUP # 1, 2, 3, 4

BORING LOCATION MAP
BIG ROCK 2 CLUSTER SOLAR & STORAGE PROJECT
IMPERIAL COUNTY, CALIFORNIA

HDR
Figure 3

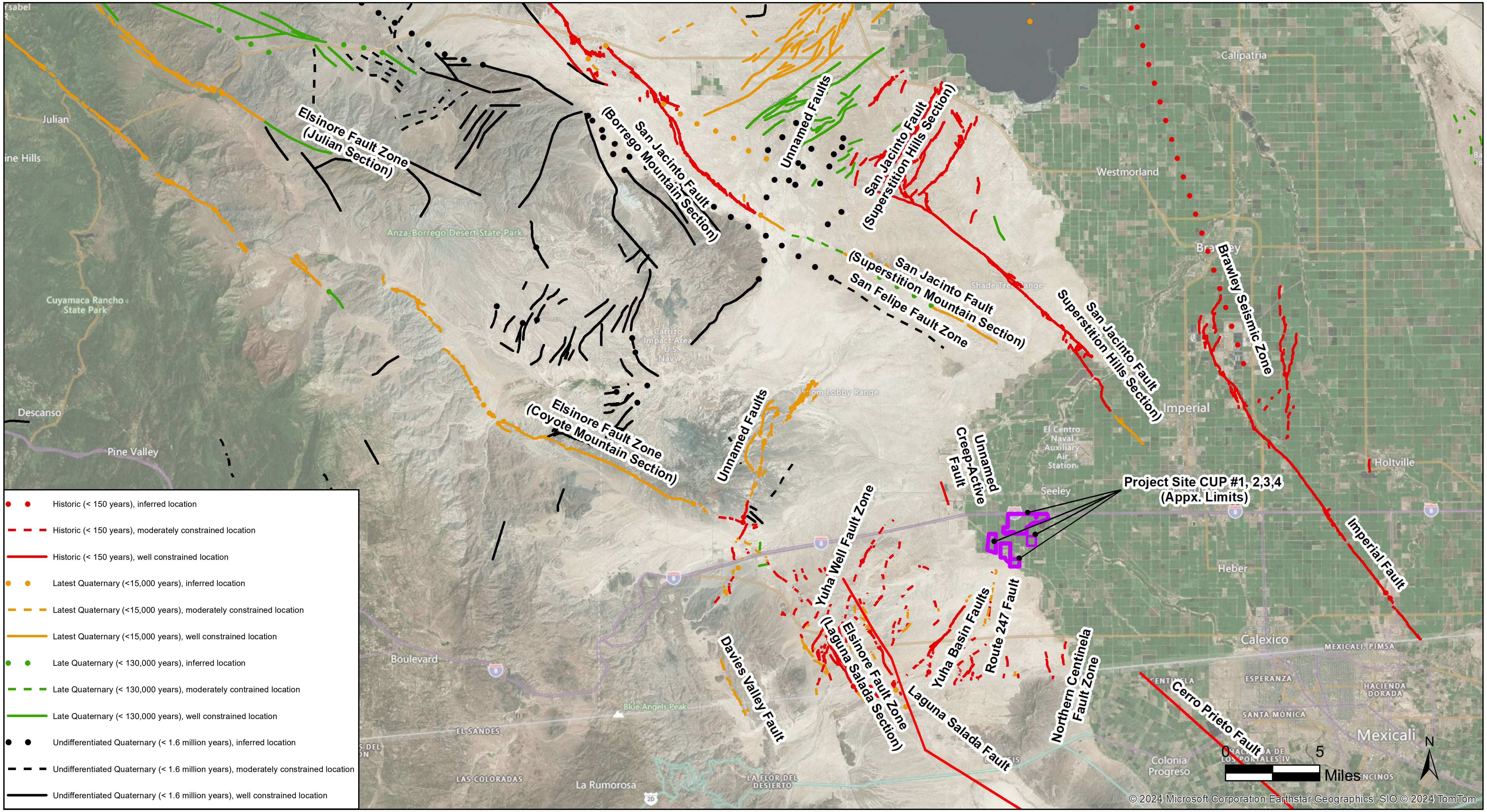


National Map Symbol	Map Symbol	Map Unit Name
31hlf	101	Antho-Superstition complex, 0 to 1 percent slopes
h8z8	102	Badland
2mxlb	104	Caslo taxon above family, saline
h8zd	106	Glenbar clay loam, wet
2mxlc	107	Glenbar loam
31hlg	109	Holtville silty clay
31hlb	110	Holtville silty clay, wet
h8zn	114	Imperial silty clay, wet
2n7xh	115	Imperial-Glenbar silty clay loams complex, 0 to 2 percent slopes, wet
2mxlf	116	Imperial-Glenbar silty clay loams complex, 2 to 5 percent slopes
2myt0	117	Indio loam
2myt1	118	Indio loam, wet
2mxlg	119	Indio-Vint complex, 0 to 2 percent slopes
h8zv	120	Laveen loam
2myt3	121	Meloland fine sand
2myt4	122	Meloland very fine sandy loam, wet
31hlp	123	Meloland-Holtville 0 to 2 percent slopes, wet
2mxlh	124	Niland gravelly sand
31hlq	125	Niland gravelly sand, wet
2mxlk	126	Niland fine sand
2mxlq	130	Rositas sand, 0 to 2 percent slopes
2mxln	132	Rositas fine sand, 0 to 2 percent slopes
2mxlr	135	Rositas fine sand, wet
h90f	138	Rositas-Superstition loamy fine sands
2mxlt	141	Typic Torriorthents-Typic Haplocambids, 5 to 30 percent slopes
2mxlv	142	Vint loamy very fine sand, wet
31hls	144	Vint and Indio very fine sandy loams undifferentiated group, 0 to 2 percent slopes, Wet

Reference: USDA Soil Survey, 2024

SOIL SURVEY MAP
BIG ROCK 2 CLUSTER SOLAR & STORAGE PROJECT
IMPERIAL COUNTY, CALIFORNIA

HDR
Figure 4



Reference: USGS, 2023, ARCGIS Online Database

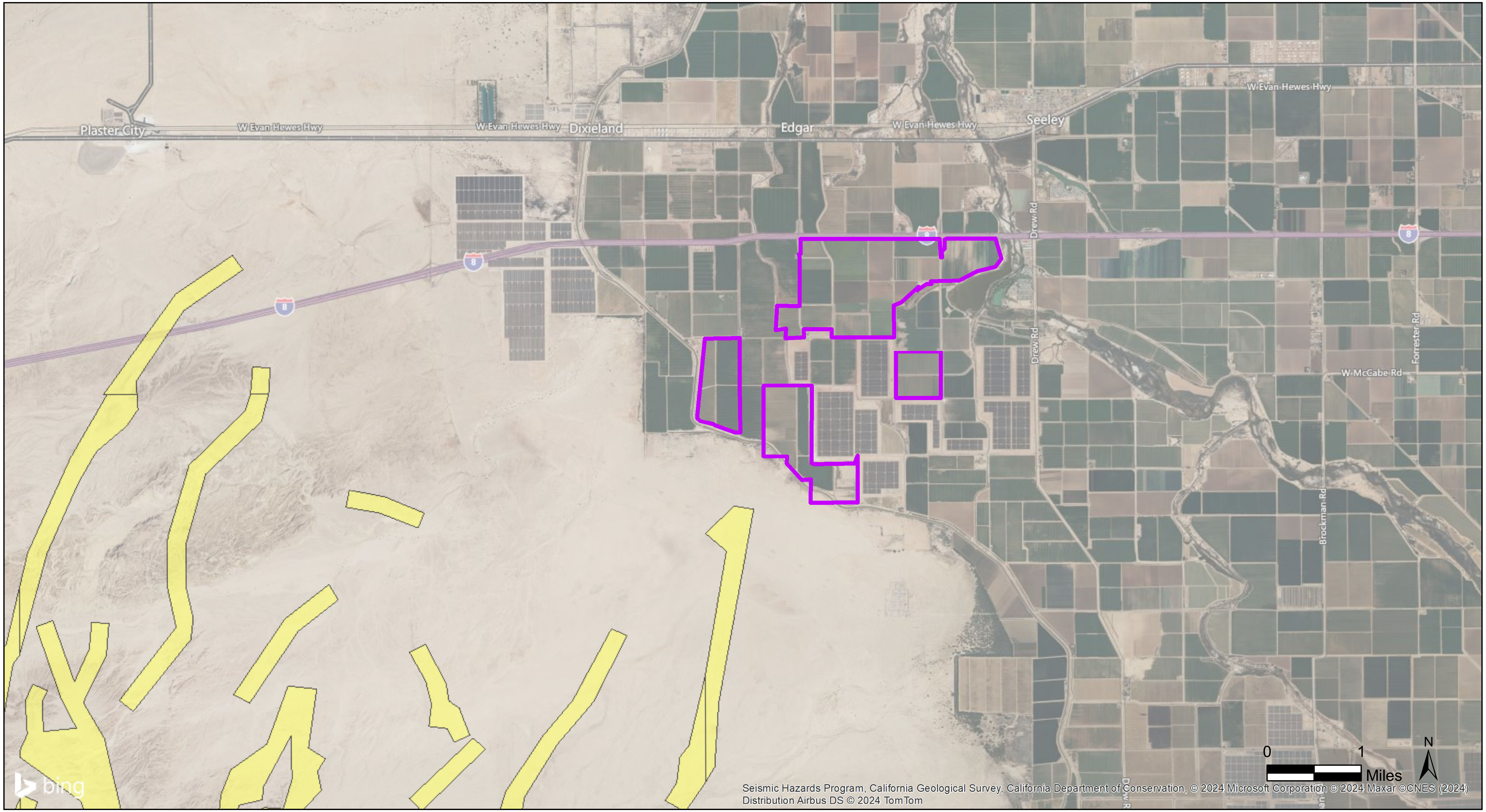
* Fault Age classifications are based on geologic evidence to determine the youngest faulted unit and the oldest unfaulted unit along each fault or fault section (Jennings, C.W., and Bryant, W.A., 2010)

▭ Project Limits (Approximate) - CUP # 1, 2, 3, 4

FAULT MAP
BIG ROCK 2 CLUSTER SOLAR & STORAGE PROJECT
IMPERIAL COUNTY, CALIFORNIA

HDR

Figure 5



Seismic Hazards Program, California Geological Survey, California Department of Conservation, © 2024 Microsoft Corporation © 2024 Maxar ©CNES (2024) Distribution Airbus DS © 2024 TomTom

Reference: CGS, 2024

▭ Project Limits (Approximate) - CUP # 1, 2, 3, 4

🟨 Alquist-Priolo Fault Hazard Zone

SEISMIC HAZARDS MAP
BIG ROCK 2 CLUSTER SOLAR & STORAGE PROJECT
IMPERIAL COUNTY, CALIFORNIA

HDR

Figure 6

Appendix B

Historical Boring Logs

FED. ROAD DIV. No.	STATE	F. A. PROJECT No.	SHEET No.	TOTAL SHEETS
7	CALIF.			

DIST.	COUNTY	ROUTE	SECTION	SHEET No.	TOTAL SHEETS
XI	Imp	12	C		

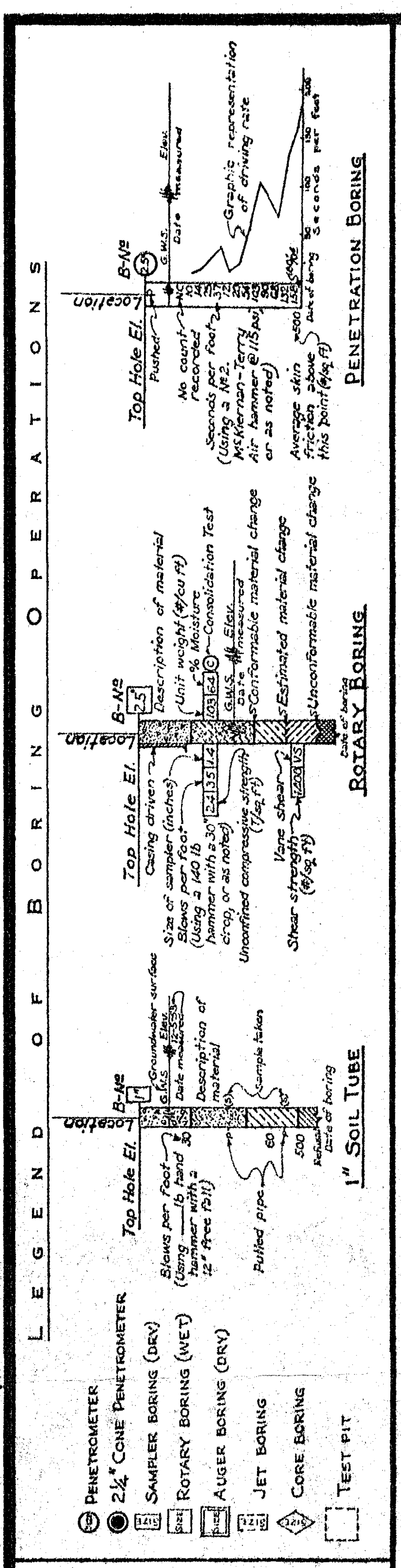
BRIDGE ENGINEER CIVIL ENGINEER—LICENSE 5989

DATE APPROVED

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

FIELD STUDY	By J. Eagen	12-6-62
DRAWN	By K. Tochino	12-10-62
CHECKED	By J T Eagen	12-21-62

Approval Recommended by Chas. E. Ward
Engineering Geologist



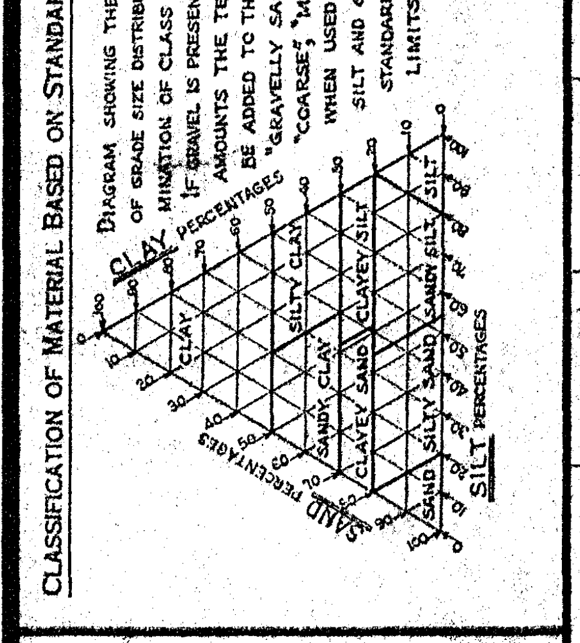
LEGEND OF EARTH MATERIALS

▨ Gravel	▨ Silty Clay or Clayey Silt
▨ Sand	▨ Peat and/or Organic Matter
▨ Silt	▨ Fill Material
▨ Clay	▨ Igneous Rock
▨ Sandy Clay or Clayey Sand	▨ Sedimentary Rock
▨ Sandy Silt or Silty Sand	▨ Metamorphic Rock

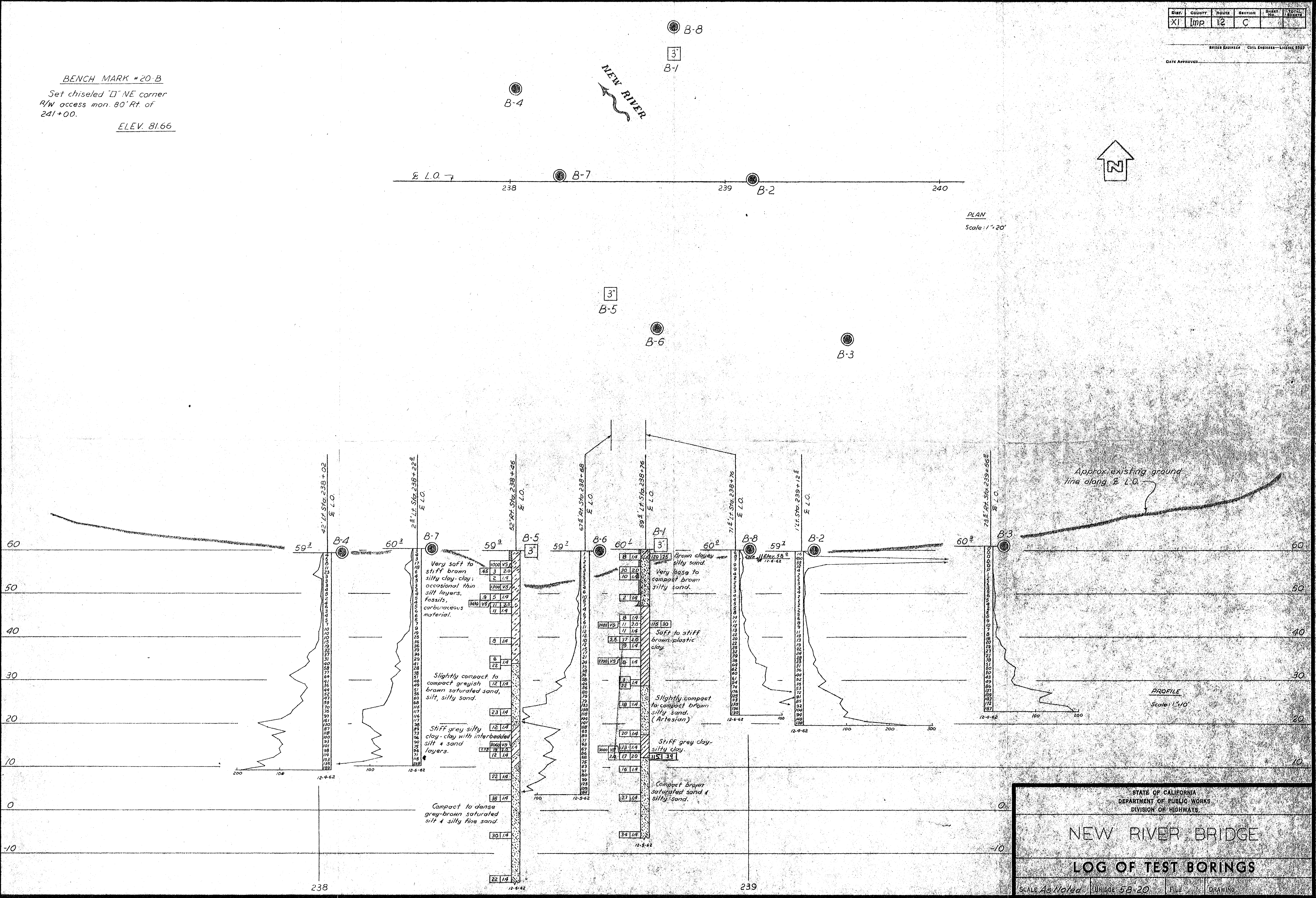
CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

Diagram showing the basis for estimates of grade size distribution used in determination of class names.

If gravel is present in appreciable amounts the term "gravelly" may be added to the class name, viz. "gravelly sand." The terms "coarse", "medium" and "fine" when used to describe sand, silt and gravel refer to standard grade size limits.



NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

NEW RIVER BRIDGE

LOG OF TEST BORINGS

SCALE As Noted | BRIDGE 58-20 | FILE | DRAWING

Disregard prints bearing earlier numbers → PREL. DRAWING No. PR-

FED. ROAD DIV No	STATE	PROJ. No.	FISCAL YEAR	SHEET No.	TOTAL SHEETS
7	CAL.				

DIST	COUNTY	ROUTE	SECTION	SHEET No.	TOTAL SHEETS
XI	IMP	12	C		

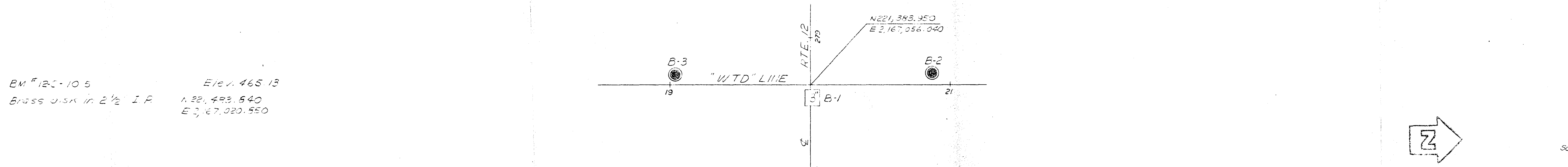
(New-XI-IMP-8)

BRIDGE ENGINEER

CIVIL ENGINEER—LICENSE 5585

DATE APPROVED

BRIDGE DEPARTMENT



PLAN
Scale: 1"=40'

B-1

Very soft to soft reddish-brown to black clayey silt and very fine sand with abundant decayed vegetative material

Very loose to loose reddish-brown very fine to fine sand and partially bedded silty to clayey very fine sand with occasional silt to clayey silt

Loose to slightly compact reddish-brown fossiliferous very fine to medium sand and silty to clayey very fine to fine sand intermixed with soft to stiff partially bedded clayey silt to silty clay

Slightly compact tan fossiliferous fine sand and silty fine sand with some intermixed reddish-brown silty clay

Compact light gray to olive green fossiliferous very fine to coarse micaceous sand with some intermixed silt and clayey silt

Dense tan fossiliferous fine to coarse sand with occasional pebbles and intermixed reddish-brown clayey silt

Stiff to very stiff reddish-brown clayey silt to silty clay with some intermixed brown to gray clayey very fine to coarse sand

Compact to very dense dark gray to brown very fine to fine sand and clayey sand with some interbedded silt and clayey silt to silty clay

FIELD STUDY	By D.B. Crawford 12-23-63
DRAWN	By V.J. Ryan 1-3-64
CHECKED	By

Approval Recommended by

Engineering Geologist

Advance Planning Engineer

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

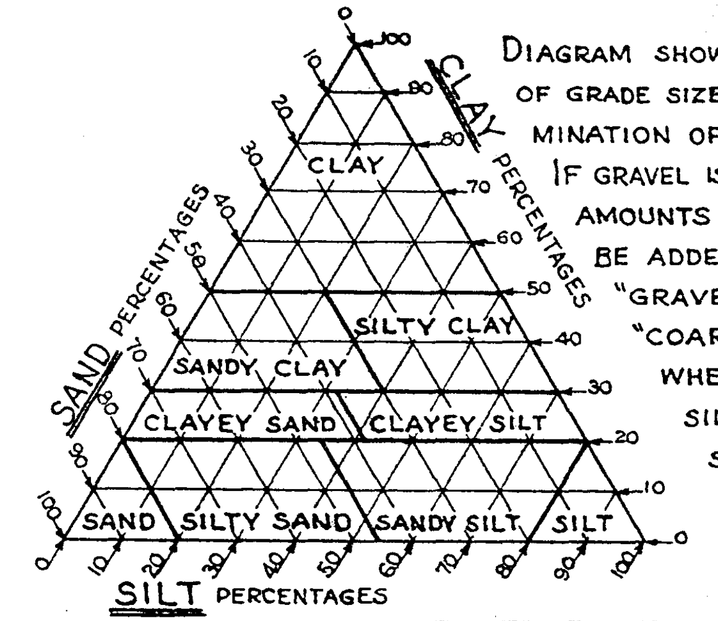


DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES.

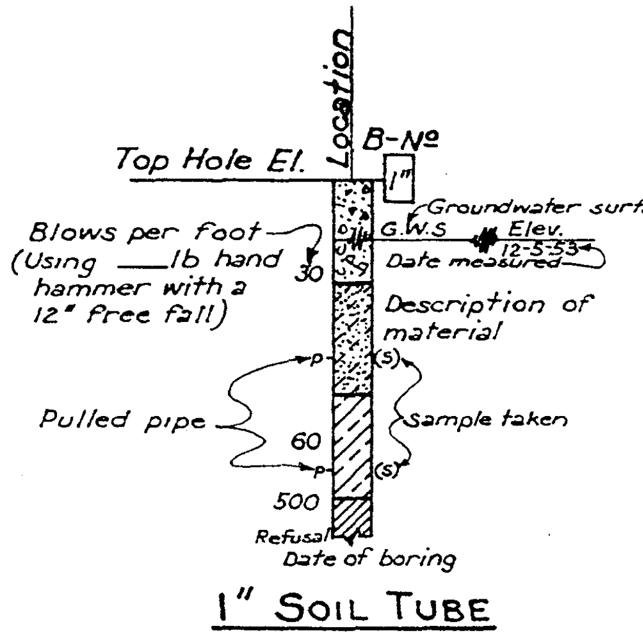
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND." THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE SAND, SILT AND GRAVEL REFER TO STANDARD GRADE SIZE LIMITS.

LEGEND OF EARTH MATERIALS

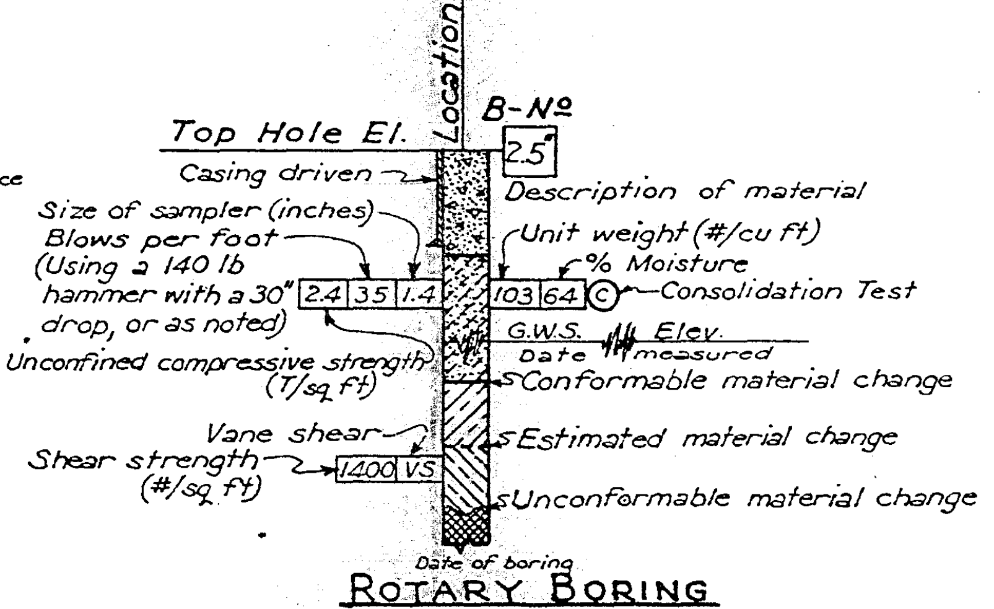
▨	GRAVEL	▨	SILTY CLAY OR CLAYEY SILT
▨	SAND	▨	PEAT AND/OR ORGANIC MATTER
▨	SILT	▨	FILL MATERIAL
▨	CLAY	▨	IGNEOUS ROCK
▨	SANDY CLAY OR CLAYEY SAND	▨	SEDIMENTARY ROCK
▨	SANDY SILT OR SILTY SAND	▨	METAMORPHIC ROCK

LEGEND OF BORING OPERATIONS

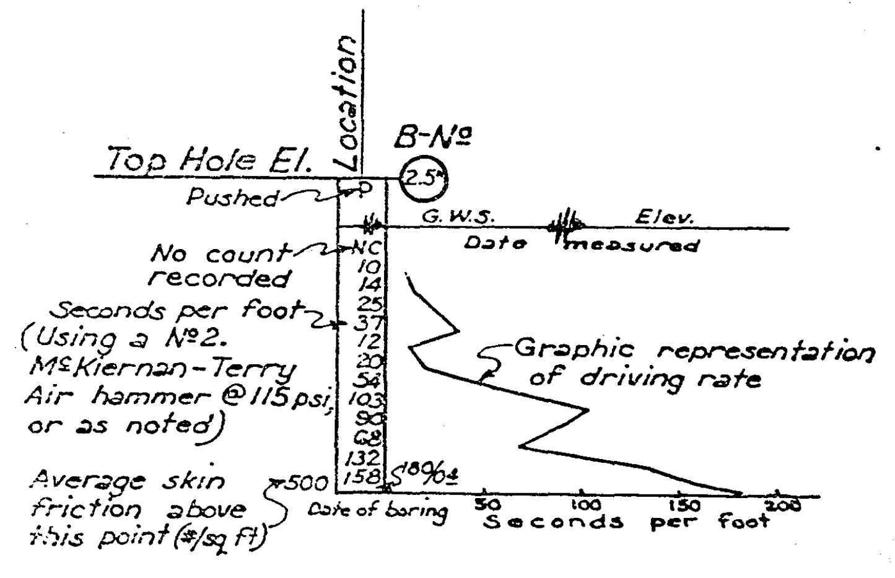
- ● PENETROMETER
- ● 2¼" CONE PENETROMETER
- ▯ SAMPLER BORING (DRY)
- ▯ ROTARY BORING (WET)
- ▯ AUGER BORING (DRY)
- ▯ JET BORING
- ◇ CORE BORING
- ⬚ TEST PIT



1" SOIL TUBE



ROTARY BORING



PENETRATION BORING

NOTE

Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

AS BUILT

DERRICK ~~WILLIAM~~ ROAD OVERCROSSING

LOG OF TEST BORINGS

SCALE As Noted	BRIDGE 58-244	FILE	DRAWING

PRINTED ON CLEARPRINT 1000H

FED. ROAD DIV. No	STATE	PROJ. No.	FISCAL YEAR	SHEET No.	TOTAL SHEETS
7	CAL.				

DIST	COUNTY	ROUTE	SECTION	SHEET No.	TOTAL SHEETS
11	IMP	8	23.8 25.4	245	258

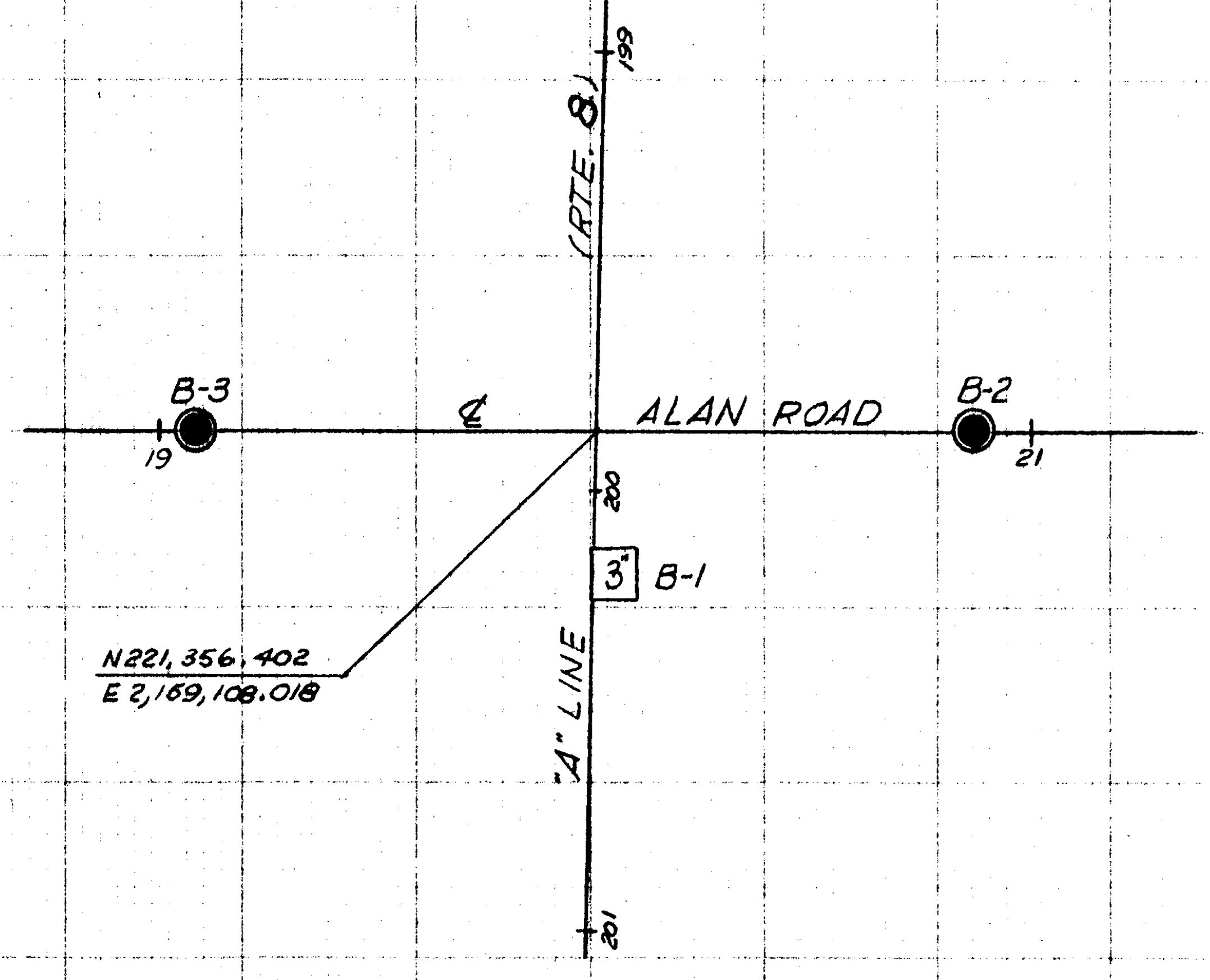
BRIDGE ENGINEER

CIVIL ENGINEER—LICENSE 5585

DATE APPROVED May 29, 1967

BM 12C-7.5 Elev. 461.73

From the intersection of US. 80 and Old Rte 202 in Seeley, go W 1.5 mi on US. 80 to gravel road on left. Turn left (South) and go 1.1 mi to AS Line. Turn right (West) on dirt road and go 1.0 mi to Mon 12C-7.5, located in center of P.M.S road Set "Survey Mon" Paddle 28'± W of Man. is flush with P.M.S. surface



PLAN
Scale: 1"=40'

NO CHANGES
AS BUILT
CORRECTIONS BY M. N. Seeger
CONTRACT NO. 11-038014
DATE 7-8-69

PROFILE
Scale: 1"=10'

AS BUILT

BRIDGE DEPARTMENT

FIELD STUDY	By S.L. Champlin 1-3-64
DRAWN	By V.J. Ryan 1-17-64
CHECKED	By K. Tochino 2-14-64

Approval Recommended by
Engineering Geologist
Advance Planning Engineer

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

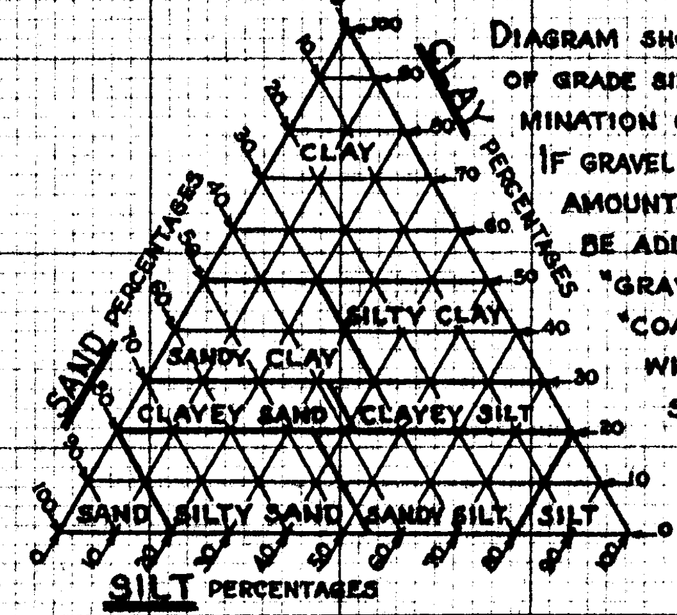


DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES.

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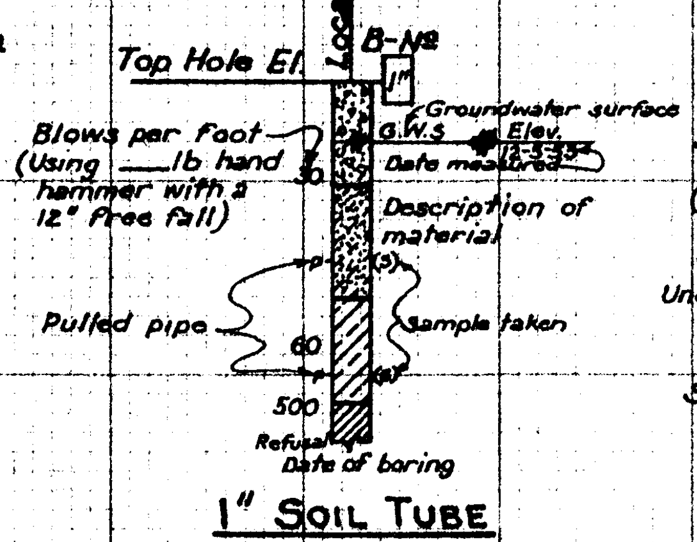
LEGEND OF EARTH MATERIALS

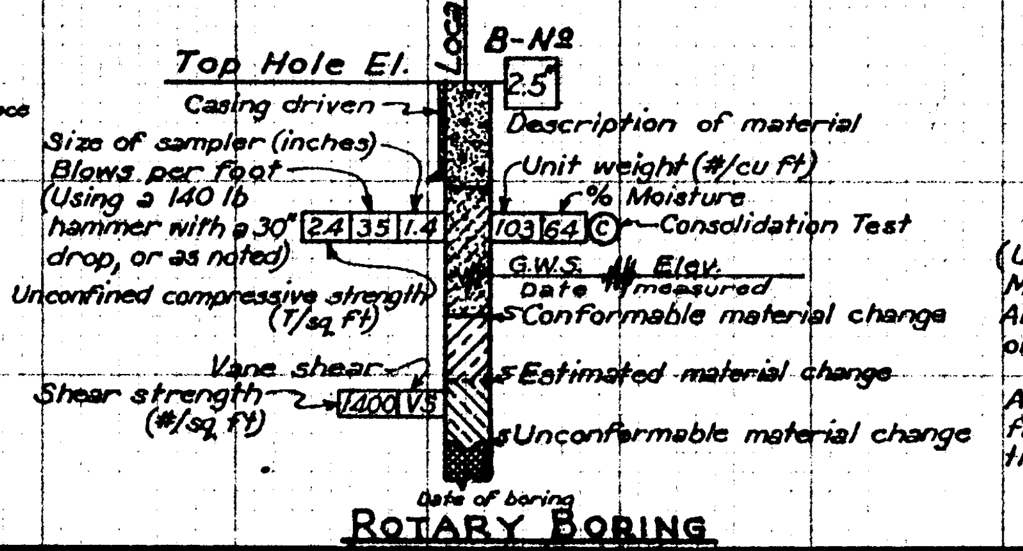
- ▨ GRAVEL
- ▨ SAND
- ▨ SILT
- ▨ CLAY
- ▨ SANDY CLAY OR CLAYEY SAND
- ▨ SANDY SILT OR SILTY SAND
- ▨ SILTY CLAY OR CLAYEY SILT
- ▨ PEAT AND/OR ORGANIC MATTER
- ▨ FILL MATERIAL
- ▨ IGNEOUS ROCK
- ▨ SEDIMENTARY ROCK
- ▨ METAMORPHIC ROCK

LEGEND OF BORING OPERATIONS

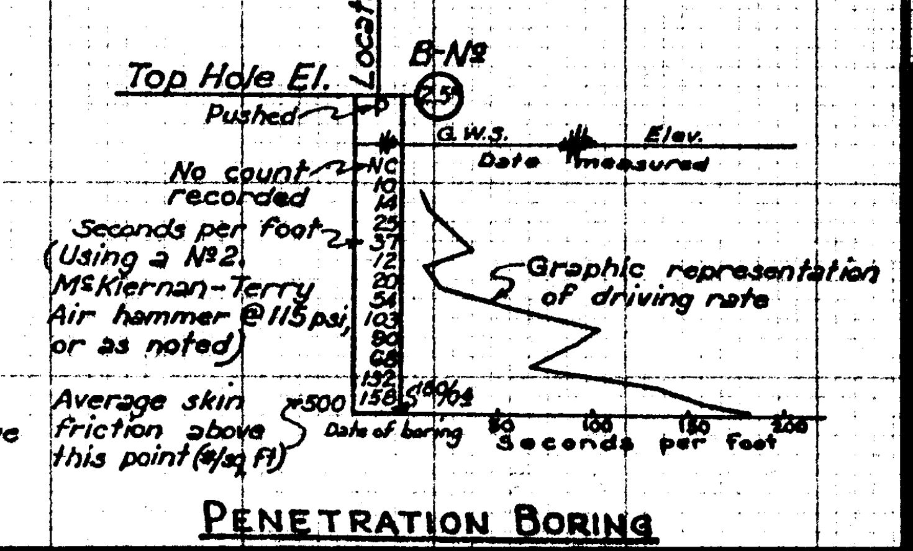
- ⊖ PENETROMETER
- ● 2¼" CONE PENETROMETER
- ▯ SAMPLER BORING (DRY)
- ▭ ROTARY BORING (WET)
- ▣ AUGER BORING (DRY)
- ▯ JET BORING
- ◇ CORE BORING
- ⬚ TEST PIT



1" SOIL TUBE



ROTARY BORING



PENETRATION BORING

NOTE

SHEET	OF
13	13

Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

WESTSIDE ROAD OVERCROSSING

LOG OF TEST BORINGS

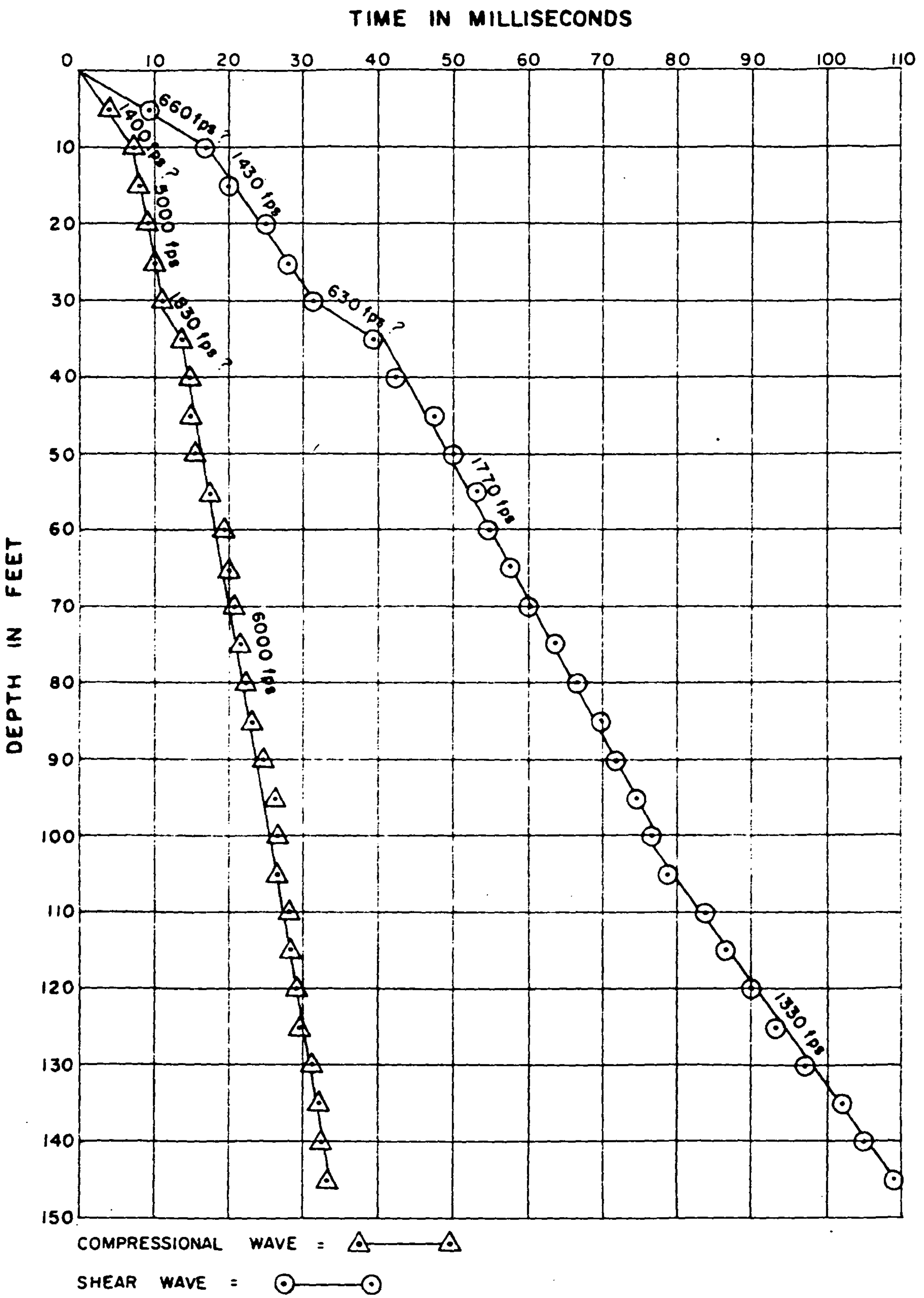
SCALE As Noted | BRIDGE 58-243 | Post MILE 27.4 | DRAWING 58243-8

PREL. DRAWING NO. P- 5/20

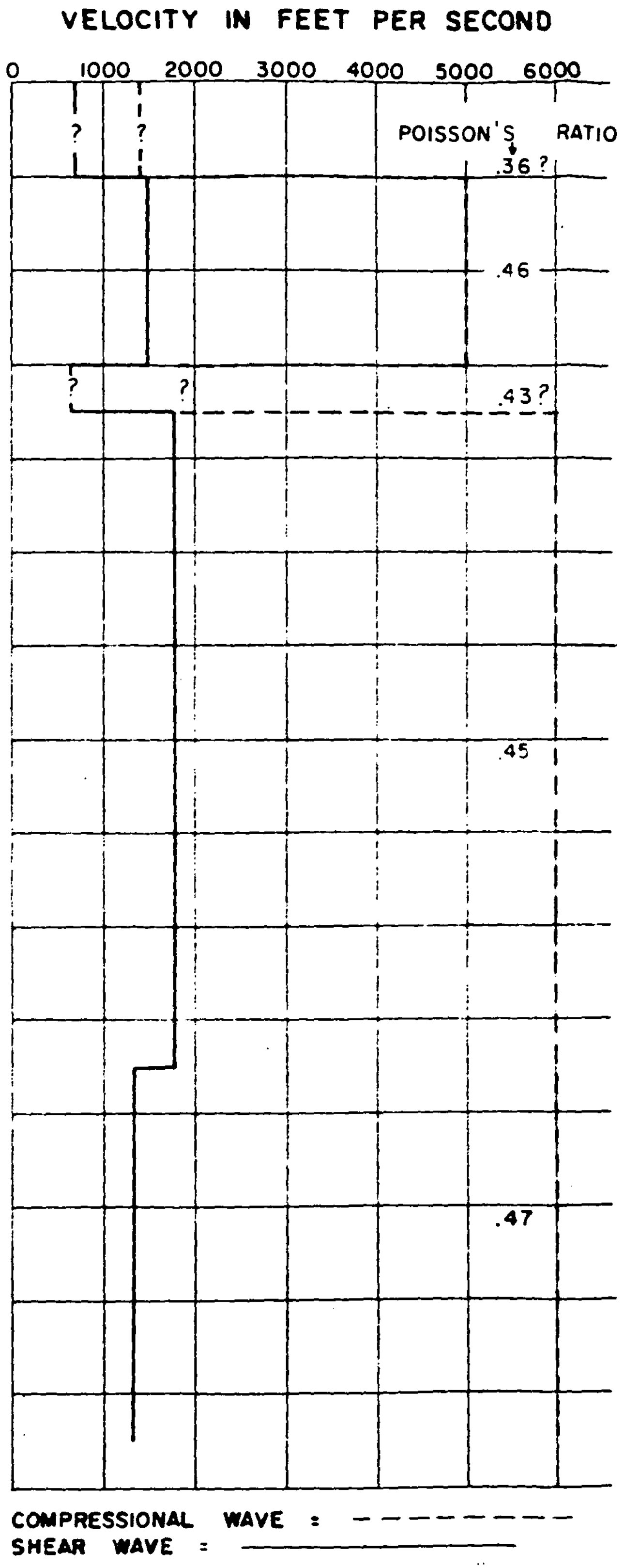
245

STATE OF CALIFORNIA—DEPARTMENT OF TRANSPORTATION—OFFICE OF STRUCTURES

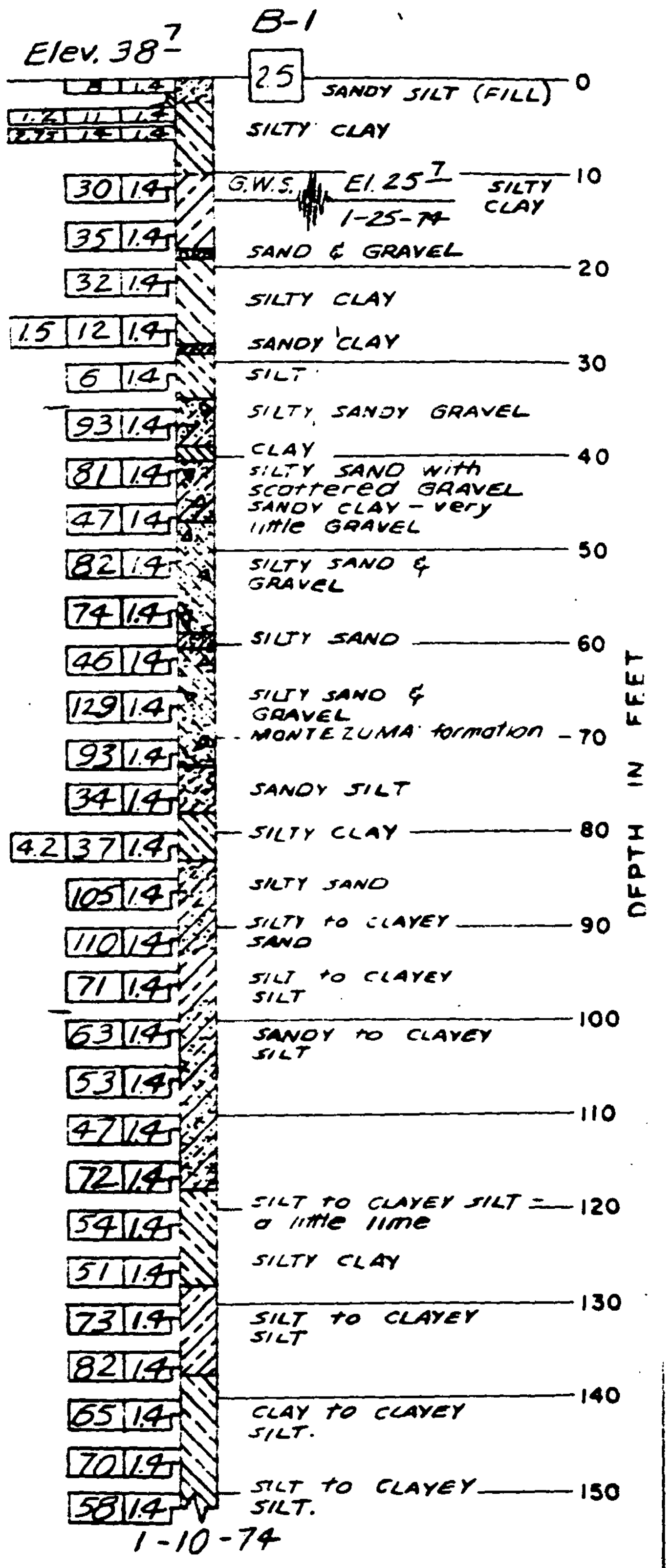
DIST.	COUNTY	ROUTE	POST MI
04	CC	242	



TIME — DISTANCE GRAPH



VELOCITY — DEPTH GRAPH



LOG OF TEST BORING

DESIGNED BY	DATE 2-28-74	ENGINEERING GEOLOGY SECTION	ROUTE 4/242 INTERCHANGE
DRAWN BY S. T. KAWAMURA	DATE 2-28-74		DOWNHOLE VELOCITY SURVEY
CHECKED BY	DATE 2-28-74		BRIDGE NO. 28-243 / CU 04205
APPROVED R. W. Reynolds	DATE 2-28-74		SCALE: / WO 110401

FED. ROAD DIV. No.	STATE	PROJ. No.	FISCAL YEAR	SHEET No.	TOTAL SHEETS
7	CAL.				

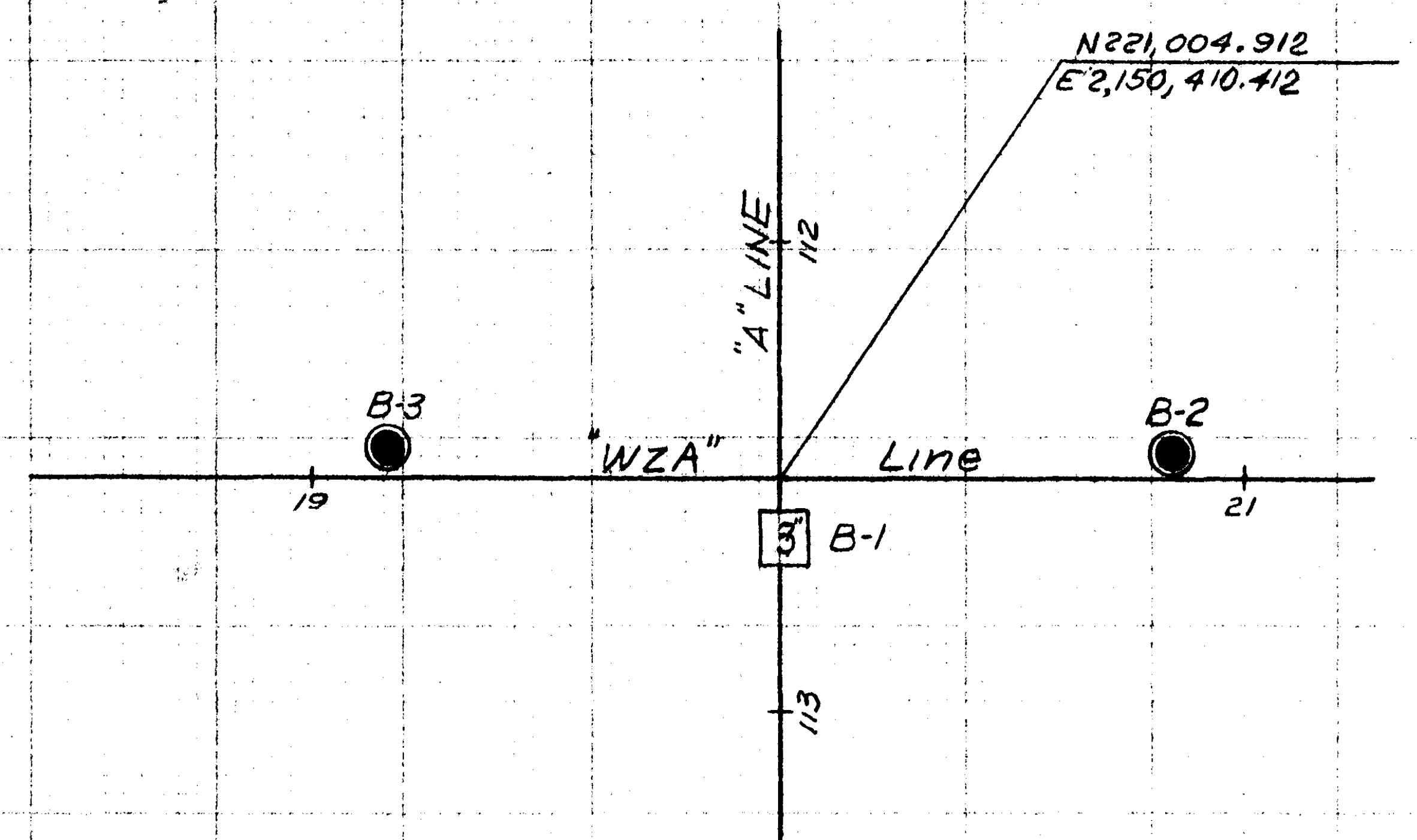
DIST	COUNTY	ROUTE	SECTION	SHEET No.	TOTAL SHEETS
11	IMP	8	R 24.9 R 31.4	232	258

BRIDGE ENGINEER — CIVIL ENGINEER — LICENSE 5505

DATE APPROVED May 29, 1967

BM 12C 4 Elev. 459.06

From the intersection of US 80 & old Rte 202 in Seeley, go W 1.5 Mi. on US 80 to gravel road. Turn left (South) 1.1 mi and go 1.1 mi to A.S. Line. Turn right (West) and go 1.8 Mi to end of road, turn right (North) and go 0.1 mi, turn left (West) and go 1.0 mi, then South 0.1 mi, to Mon. in center of dirt road (Mon. buried 6")



PLAN
Scale: 1"=40'

NO CHANGES
AS BUILT
CORRECTIONS BY m.n. [illegible]
CONTRACT NO. 11-038014
DATE 1-8-69

BRIDGE DEPARTMENT

Soft gray brown fossiliferous silty clay with occasional layers of loose very fine sand with some clay binder

Slightly compact wet brown medium sand with occasional sandy clay layers

Stiff red-brown slightly silty clay and clay with scattered clayey silt layers and inclusions of fine to medium sand

Dense tan to brown fine to coarse sand

Stiff red-brown slightly silty clay and clay with scattered sand inclusions

Compact tan, fine to coarse sand grading to compact very fine sand with some silty clay layers

Dense tan and oxide brown fine sand

Compact gray brown to oxide brown interbedded very fine sand and silty very fine sand

Very dense tan clean fine to medium sand

PROFILE
Scale: 1"=10'

FIELD STUDY	By S.L. Champlin	1-4-64
DRAWN	By V.J. Ryan	1-22-64
CHECKED	By K. Tochino	2-14-64

Approval Recommended by — Engineering Geologist

Advance Planning Engineer

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

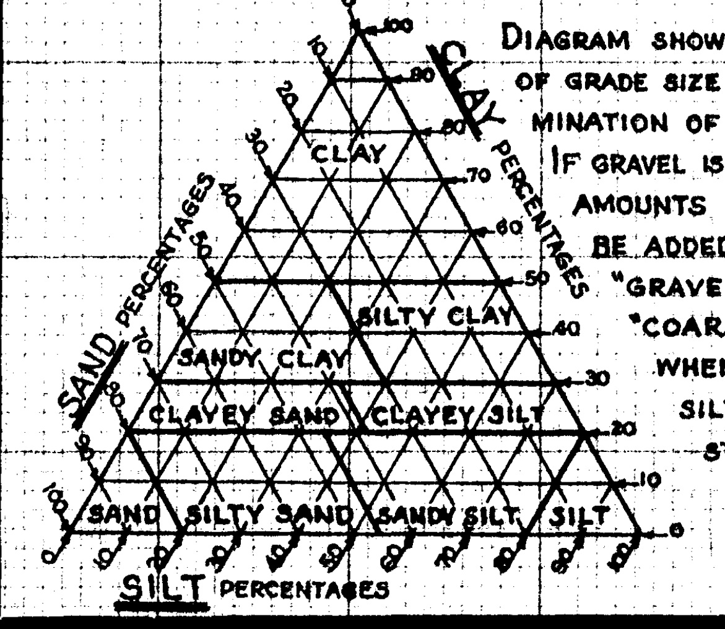


DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES.

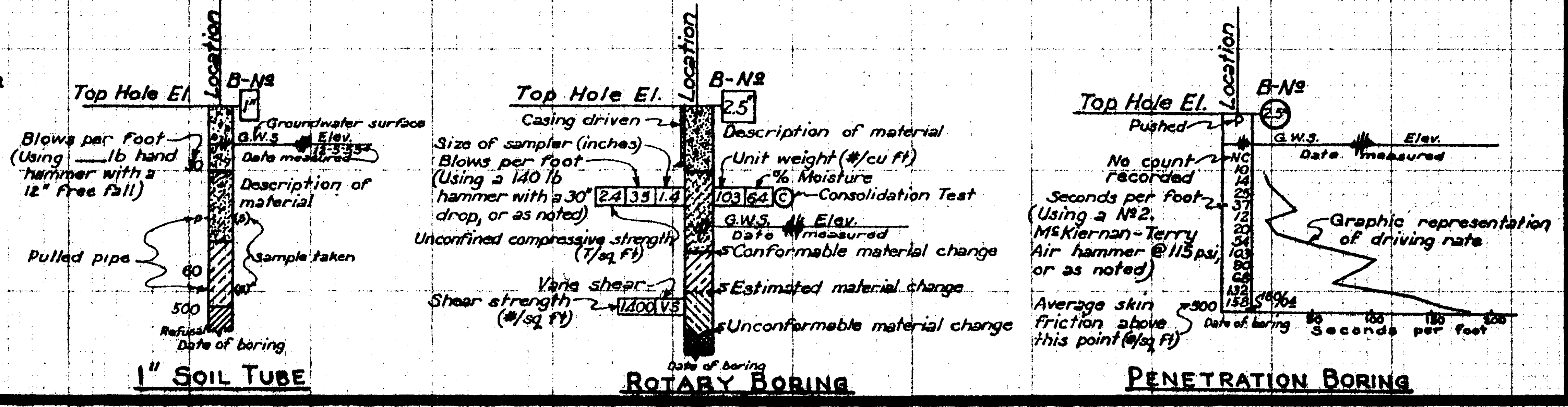
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND." THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE SAND, SILT AND GRAVEL REFER TO STANDARD GRADE SIZE LIMITS.

LEGEND OF EARTH MATERIALS

- ▨ GRAVEL
- ▨ SAND
- ▨ SILT
- ▨ CLAY
- ▨ SANDY CLAY OR CLAYEY SAND
- ▨ SANDY SILT OR SILTY SAND
- ▨ SILTY CLAY OR CLAYEY SILT
- ▨ PEAT AND/OR ORGANIC MATTER
- ▨ FILL MATERIAL
- ▨ IGNEOUS ROCK
- ▨ SEDIMENTARY ROCK
- ▨ METAMORPHIC ROCK

LEGEND OF BORING OPERATIONS

- ⊕ PENETROMETER
- ● 2¼" CONE PENETROMETER
- ▯ SAMPLER BORING (DRY)
- ▯ ROTARY BORING (WET)
- ▯ AUGER BORING (DRY)
- ▯ JET BORING
- ◇ CORE BORING
- ⬚ TEST PIT



NOTE

SHEET	OF
13	13

Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

JEFFREY ROAD OVERCROSSING

LOG OF TEST BORINGS

SCALE As Noted | BRIDGE 58-241 | POST MILE 25.1 | DRAWING 58241-8

PREL. DRAWING NO. P-

FED. ROAD DIV No	STATE	PROJ. No.	FISCAL YEAR	SHEET No.	TOTAL SHEETS
7	CAL.				

DIST	COUNTY	ROUTE	SECTION	SHEET No.	TOTAL SHEETS
XI	IMP	12	C		

(New-XI-Imp-8)

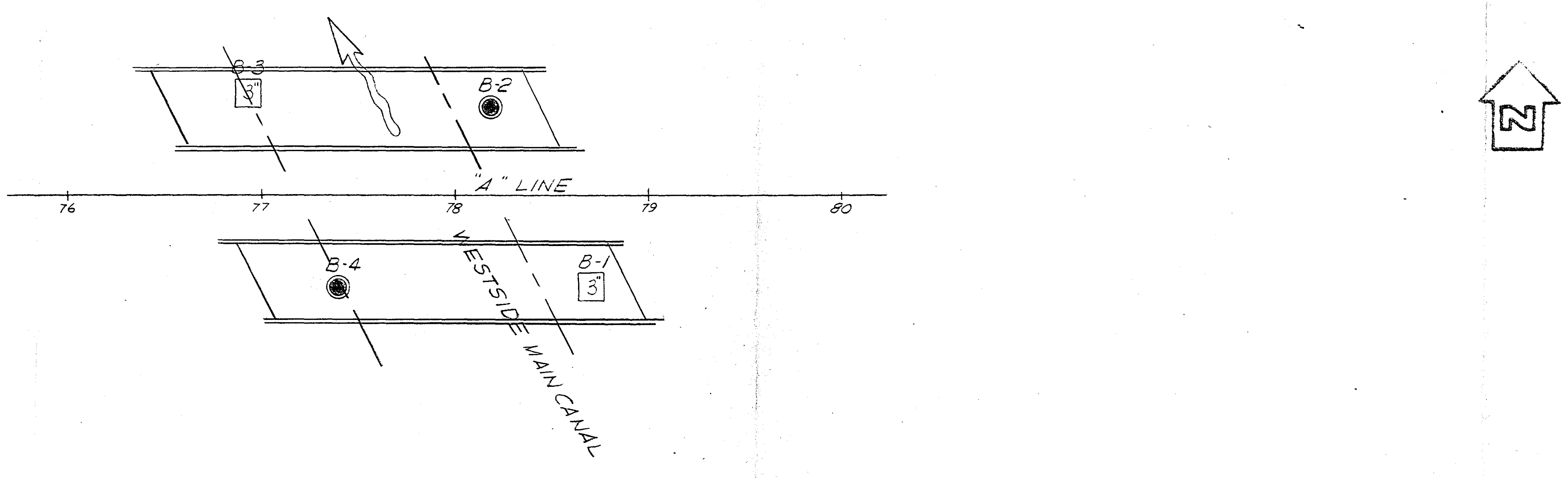
BRIDGE ENGINEER
CIVIL ENGINEER—LICENSE 5585

DATE APPROVED

BRIDGE DEPARTMENT

BM 12C-1 Elev. 469.39

From the intersection of US 80 and Old Rte. 202 in Seeley, go West on US 80 4.9 Mi to Westside Main Canal. Turn left (South and follow dirt road thru yard then along West bank of canal for 1.2 Mi to AS. line Turn left (West) and go 0.1 Mi to Mon.



PLAN
Scale: 1"=50'

B-3: Loose to slightly compact light gray to brown slightly fossiliferous gravelly fine sand and silt with occasional small pebbles

Loose reddish-brown very fine sand, silt and clayey silt.

Stiff to very stiff reddish-brown clayey silt, silty clay, and clay with intermixed very fine to fine sand

Dense to very dense tan fine to coarse sand with scattered pebbles, occasional gravel stringers, and interbedded reddish-brown to brown clayey silt, silty clay, and clayey very fine to fine sand

B-1: Loose to slightly compact, tan silt and clayey silt with intermixed very fine to fine sand

Slightly compact brown very fine sand and silt

Stiff reddish-brown clayey silt, silty clay to clay, and intermixed clayey very fine to fine sand with occasional layers of very fine to coarse sand.

Compact, tan fine to coarse sand with some interbedded silty clay to clay

Dense to very dense tan fine to coarse sand with some interbedded reddish-brown silty clay to clay, scattered small pebbles, and occasional gravel stringers

PROFILE
Scale: 1"=10'

FOOTING @ EL. 447
BPF = 24 qu = 2.4

COHESIVE MATERIAL

B = 5
L = 16

$q_a = 0.95 q_u (1 + 0.3 \frac{B}{L})$
$= (.95)\, 2.4 (1 + 0.3) \frac{5}{16}$
$= (2.28)(1.09) = 2.5$ TONS

FIELD STUDY	By S.L. Champlin 1-6-64
DRAWN	By V.J. Ryan 1-17-64
CHECKED	By J. L. Champlin 3-2-64

Approval Recommended by
Engineering Geologist
Advance Planning Engineer

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

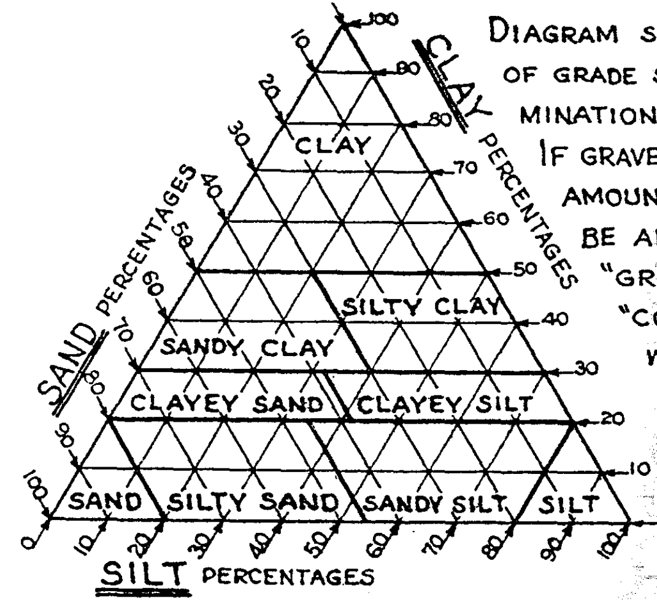


DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES.

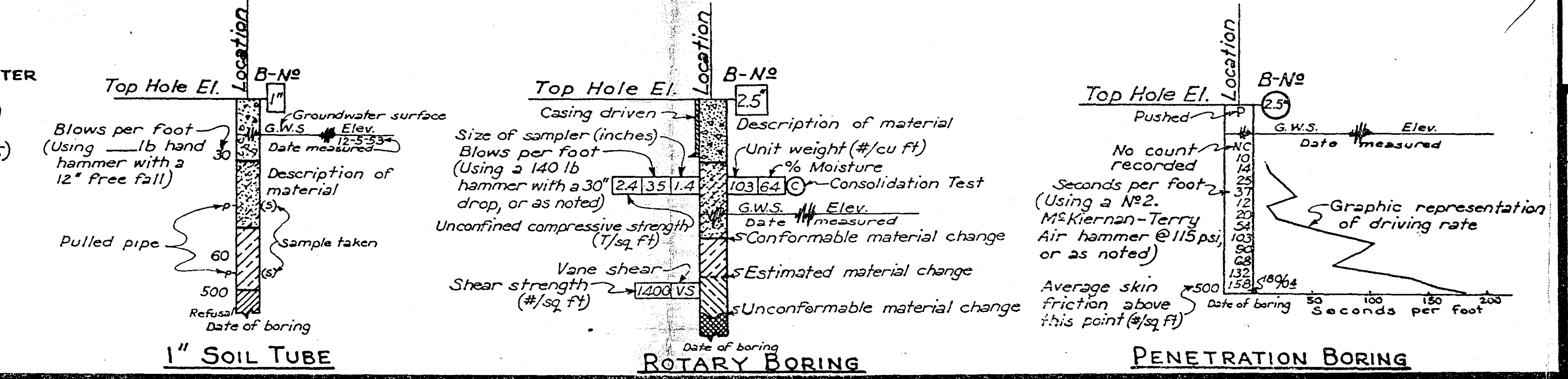
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND." THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE SAND, SILT AND GRAVEL REFER TO STANDARD GRADE SIZE LIMITS.

LEGEND OF EARTH MATERIALS

▨ GRAVEL	▨ SILTY CLAY OR CLAYEY SILT
▨ SAND	▨ PEAT AND/OR ORGANIC MATTER
▨ SILT	▨ FILL MATERIAL
▨ CLAY	▨ IGNEOUS ROCK
▨ SANDY CLAY OR CLAYEY SAND	▨ SEDIMENTARY ROCK
▨ SANDY SILT OR SILTY SAND	▨ METAMORPHIC ROCK

LEGEND OF BORING OPERATIONS

- ⊖ PENETROMETER
- ● 2¼" CONE PENETROMETER
- ▯ SAMPLER BORING (DRY)
- ▭ ROTARY BORING (WET)
- ▣ AUGER BORING (DRY)
- ▯ JET BORING
- ◇ CORE BORING
- ⬚ TEST PIT



1" SOIL TUBE
ROTARY BORING
PENETRATION BORING

NOTE

Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

AS BUILT

WESTSIDE MAIN CANAL

LOG OF TEST BORINGS

SCALE As Noted	BRIDGE 58-240 R/L	FILE	DRAWING

SAMPLE/SAMPLER TYPE GRAPHICS

▯ AUGER SAMPLE

◪ STANDARD PENETRATION SPLIT SPOON SAMPLER

▱ BULK / GRAB SAMPLE

■ MODIFIED CALIFORNIA SAMPLER

▥ SHELBY TUBE SAMPLER

▮ HQ ROCK CORE SAMPLE

▯ NQ ROCK CORE SAMPLE

GROUNDWATER LEVEL GRAPHICS

▼ WATER LEVEL (during drilling operations)

▽ WATER LEVEL (immediately after drilling completion)

▼ WATER LEVEL (additional levels after drilling completion)

≈ OBSERVED SEEPAGE

NOTES

- The report and graphics key are an intergral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions my be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System (USCS) designationspresented on the logs were based on visual classification in thefield and were modified where appropriate based on gradation andindex property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5 and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then Y/X indicates Y number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of materials is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu≥4 and 1≤Cc≤3	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu<4 and/or 1>Cc>3	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5 TO 12% FINES	Cu≥4 and 1≤Cc≤3	GW-GM	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
			Cu<4 and/or 1>Cc>3	GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu<4 and/or 1>Cc>3	GP-GM	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GP-GC	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH >12% FINES		GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu≥6 and 1≤Cc≤3	SW	WELL GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu<6 and/or 1>Cc>3	SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SAND WITH 5 TO 12% FINES	Cu≥6 and 1≤Cc≤3	SW-SM	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu>6 and/or 1<Cc>3	SP-SM	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH >12% FINES		SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SITLY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit greater than 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

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San Diego, CA 92128
Tel: (858) 385-0500, Fax: (858) 385-0400

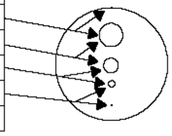
Project No: **1076**
Drawn: **SB**
Date: **September 2018**

Title: **Boring Log Legend**
Project: **Sempra Renewables**
Westside Canal Energy Center
Imperial Valley, California

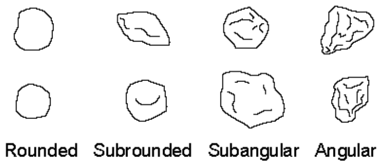
Chart 1

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12 in.	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles		3 - 12 in.	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse	3/4 - 3 in.	3/4 - 3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine	#4 - 3/4 in.	0.19 - 0.75 in. (4.75 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.75 mm.)	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017 in. (0.074 - 0.43 mm.)	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029 in. (0.074 mm.)	Flour-sized and smaller



ANGULARITY

DESCRIPTION	CRITERIA	
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces	
Subangular	Particles are similar to angular description but have rounded edges	
Subrounded	Particles have nearly plane sides but have well-rounded edges	
Rounded	Particles have smoothly curved sides and no edges	

MUNSELL COLOR

NAME	ABBR
Red	R
Yellow Red	YR
Yellow	Y
Green Yellow	GY
Green	G
Blue Green	BG
Blue	B
Purple Blue	PB
Purple	P
Red Purple	RP
Black	N

PLASTICITY

DESCRIPTION	CRITERIA
Non-plastic	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

MOISTURE CONTENT

DESCRIPTION	CRITERIA
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below groundwater table

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	CRITERIA
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violet reaction, with bubbles forming immediately

APPARENT/RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N_{60} (#blows/ft)	MODIFIED CALIFORNIA SAMPLER (#blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<5	0 - 15
Loose	4 - 10	6 - 15	15 - 35
Medium Dense	11 - 30	16 - 40	35 - 65
Dense	31 - 50	41 - 70	65 - 85
Very Dense	>50	>71	85 - 100

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT-N_{60} (#blows/0.3m)	CRITERIA
Very Soft	<2	Thumb will penetrate soil more than 1 in. (25 mm.)
Soft	2 - 4	Thumb will penetrate soil about 1 in. (25 mm.)
Medium Stiff	5 - 8	Thumb will indent soil about 1/4-in. (6 mm.)
Stiff	8 - 15	Can be imprinted with considerable thumbnail pres.
Very Stiff	15 - 30	Thumb will not indent soil but readily indented with thumbnail
Hard	>30	Thumbnail will not indent soil

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. (6 mm.) thick, note thickness
Laminated	Alternating layers of varying material or color with layers less than 1/4-in. (6 mm.) thick, note thickness
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into smaller angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness
Homogeneous	Same color and appearance throughout

CEMENTATION

DESCRIPTION	CRITERIA
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

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15092 Avenue of Science, Suite 200
San Diego, CA 92128
Tel: (858) 385-0500, Fax: (858) 385-0400

Project No: **1076**
Drawn: **SB**
Date: **September 2018**

Title: **Soil Classification**
Project: **Sempra Renewables**
Westside Canal Energy Center
Imperial Valley, California

Chart 2

Boring Log

Sheet 1 of 1

Date
Started: 9/17/18
Completed: 9/18/18
Hammer Efficiency: 93 %

Project Number
1076

Rig Type: Unimog M-5 (Pacific)

Project
Westside Canal Energy Center

Boring No.
B-1

Surface Elevation: -21.0'

Logged By: S. Burford

Latitude: 32.731764

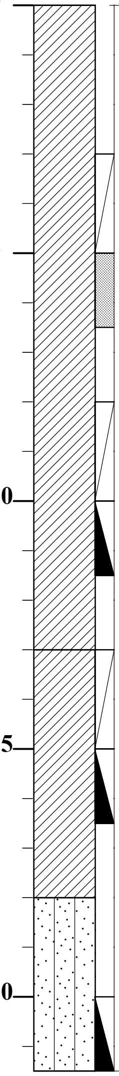
Longitude: -115.718873

Location: Near canal

Sample Type
G - Bulk / Grab Sample
SPT - 2" O D. 1.5" I.D. Tube Sample
MC - 3 " O.D. 2.4" I D. Ring Sample
NR - No Recovery
* - Uncorrected Blow Counts

Groundwater

Depth (ft)	Hour	Date
9.5	8:40am	9/17/2018



Groundwater Depth (ft.)	Depth (ft.)	Sample ID	Penetration Resistance (Blows per 6 in.)	Moisture Content (%)	Dry Weight (pcf)	Other Tests and Remarks	USCS Class.	Visual Classification
	0							[ALLUVIUM (Qa-Qc)] Lean CLAY with Sand (CL): Tan, dry to moist, stiff
		G- 1		20 1		Moisture Content Sieve Analysis Expansion Index		
	5	MC- 1	3 8 10	26 1	97 7	Moisture / Density		Stiff, Pocket Penetrometer: 1.75 ton/ft^2
							CL	
▼		G- 2						
	10	SPT- 1	3 11 14	25 8		Moisture Content		Very stiff
								13.0' El. -34.0'
								Sandy Lean CLAY (CL): moist, hard
		G- 2				Sieve Analysis		
	15	SPT- 2	6 13 23	22 1		Moisture Content	CL	
								18.0' El. -39.0'
								Silty SAND (SM): Tan, moist, medium dense
							SM	
	20	SPT- 3	2 5 8	21 8		Moisture Content		
								21.5' El. -42.5'

Notes: Drilled using 6" O.D. Hollow Stem Auger. Boring terminated at depth of (21.5'). Backfilled with neat cement. Groundwater measured at 9.5' bgs.

Boring Log

Sheet 1 of 3

Date Started: 10/2/18 Completed: 10/2/18	**Project Number** 1076	**Project** Westside Canal Energy Center	**Boring No.** B-1a
Hammer Efficiency: 80 %	**Rig Type: Diedrich D50 (Pacific)**	**Surface Elevation: -21.0'**	**Logged By: S. Burford**
Latitude: 32.731760	**Longitude: -115.718833**	**Location: Near canal**	

Sample Type

G - Bulk / Grab Sample
SPT - 2" O D. 1.5" I.D. Tube Sample
MC - 3 " O.D. 2.4" I D. Ring Sample
NR - No Recovery
* - Uncorrected Blow Counts

Groundwater

Depth (ft)	Hour	Date
9	8:20am	10/2/2018

Groundwater Depth (ft.)	Depth (ft.)	Graphical Log	Sample Taken	Sample ID	Penetration Resistance (Blows per 6 in.)	Moisture Content (%)	Dry Weight (pcf)	Other Tests and Remarks	USCS Class.	Visual Classification
	0									[ALLUVIUM (Qa-Qc)] Lean CLAY with Sand and Sandy Lean CLAY (CL): Tan, dry to moist
	5									Free drilled down to 15' BGS for first sample
▼									CL	
	10									
	15		▲	SPT- 1	3 5 7	24 3		Moisture Content		Stiff
										18.0' El. -39.0'
										Silty SAND (SM): Tan, moist
	20		▲	SPT- 2	3 7 11	24 8		Moisture Content Sieve (20-26 5)		Medium dense. Switched from Hollow Stem to Mud-Rotary at 20' BGS
									SM	
	25		▲	SPT- 3	16 17 20	22 5		Moisture Content		Dense
	30									30.0' El. -51.0'

Boring Log

Sheet 2 of 3

Date		Project Number	Project	Boring No.
	Started: 10/2/18	1076	Westside Canal Energy Center	B-1a
	Completed: 10/2/18			
	Hammer Efficiency: 80 %	Rig Type: Diedrich D50 (Pacific)	Surface Elevation: -21.0'	Logged By: S. Burford

Latitude: 32.731760 **Longitude: -115.718833** **Location: Near canal**

Sample Type

G - Bulk / Grab Sample
SPT - 2" O D. 1.5" I.D. Tube Sample
MC - 3 " O.D. 2.4" I D. Ring Sample
NR - No Recovery
* - Uncorrected Blow Counts

Groundwater

Depth (ft)	Hour	Date
9	8:20am	10/2/2018

Groundwater Depth (ft.)	Depth (ft.)	Graphical Log	Sample Taken	Sample ID	Penetration Resistance (Blows per 6 in.)	Moisture Content (%)	Dry Weight (pcf)	Other Tests and Remarks	USCS Class.	Visual Classification
	30		◣	SPT- 4	15 21 23	22 1		Moisture Content Sieve (30-51 5)		Poorly-graded SAND with Silt (SP-SM): Tan, moist to wet, dense to very dense
	35		◣	SPT- 5	13 16 22	22 7		Moisture Content		
	40		◣	SPT- 6	13 19 28	22 4		Moisture Content		
	45		◣	SPT- 7	18 33 50/5 5	21 4		Moisture Content	SP-SM	
	50		◣	SPT- 8	16 21 25	22 4		Moisture Content		
	55		◣	SPT- 9	20 33 50/6"	22 0		Moisture Content Sieve (55-76 5)		
	60									

NV5 GEOTECH (SD CQA) \ NV5 LIBRARY_SAN DIEGO.GLB \ WESTSIDE CANAL LOGS.GPJ

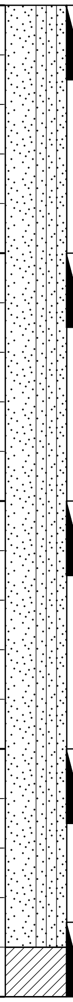
Boring Log

Date **Started: 10/2/18** **Completed: 10/2/18**	**Project Number** **1076**	**Project** **Westside Canal Energy Center**	**Boring No.** **B-1a**
Hammer Efficiency: 80 %	**Rig Type: Diedrich D50 (Pacific)**	**Surface Elevation: -21.0'**	**Logged By: S. Burford**
Latitude: 32.731760	**Longitude: -115.718833**	**Location: Near canal**	

Sample Type
G - Bulk / Grab Sample
SPT - 2" O D. 1.5" I.D. Tube Sample
MC - 3 " O.D. 2.4" I D. Ring Sample
NR - No Recovery
* - Uncorrected Blow Counts

Groundwater

Depth (ft)	Hour	Date
9	8:20am	10/2/2018



Groundwater Depth (ft.)	Depth (ft.)	Sample ID	Penetration Resistance (Blows per 6 in.)	Moisture Content (%)	Dry Weight (pcf)	Other Tests and Remarks	USCS Class.	Visual Classification
	60	SPT- 10	13 20 26	23 1		Moisture Content	SP-SM	Poorly-graded SAND with Silt (SP-SM): Tan, moist to wet, dense to very dense
	65	SPT- 11	17 30 38	22 0		Moisture Content		
	70	SPT- 12	18 30 46	21 3		Moisture Content		Traces of gravel encountered from 72-75' BGS
	75	SPT- 13	22 32 39	21 2		Moisture Content		
								79.0' El. -100.0'
		SPT- 14	16 20 22				CL	Lean CLAY (CL): Brown, moist, hard
	80							80.0' El. -101.0'

Notes: Drilled using 6" O.D. Hollow Stem Auger. Boring terminated at depth of (80.0'). Switched to Mud-Rotary drilling at 20' BGS. Backfilled with neat cement. Groundwater measured at 9.0' bgs.

Boring Log

Sheet 1 of 1

Date Started: 9/17/18 Completed: 9/17/18	**Project Number** **1076**	**Project** **Westside Canal Energy Center**	**Boring No.** **B-2**
Hammer Efficiency: 93 %	**Rig Type: Unimog M-5 (Pacific)**	**Surface Elevation: -21.0'**	**Logged By: S. Burford**
Latitude: 32.730861	**Longitude: -115.721389**	**Location: Northwest corner**	

Sample Type

G - Bulk / Grab Sample
SPT - 2" O D. 1.5" I.D. Tube Sample
MC - 3 " O.D. 2.4" I D. Ring Sample
NR - No Recovery
* - Uncorrected Blow Counts

Groundwater

Depth (ft)	Hour	Date
12	2:00pm	9/17/2018

Groundwater Depth (ft.)	Depth (ft.)	Sample ID	Penetration Resistance (Blows per 6 in.)	Moisture Content (%)	Dry Weight (pcf)	Other Tests and Remarks	USCS Class.	Visual Classification
	0						CL	[ALLUVIUM (Qa-Qc)] Sandy Lean CLAY (CL) to Clayey Sand (SC): Tan, dry to moist 3.0' El. -24.0'
		G- 1				Expansion Index Thermal Resistivity		Fat CLAY (CH): Brown, dry to moist, very stiff
	5	MC- 1	11 19 32	5 1	102 1	Moisture / Density	CH	8.0' El. -29.0'
		G- 2						Lean CLAY (CL): Brown, moist to wet, orange-brown laminations, thinly bedded, stiff
	10	SPT- 1	4 5 7	27 2		Moisture Content	CL	
▼								
		G- 3						15.0' El. -36.0'
	15	SPT- 2	5 6 8	27 0		Moisture Content		Sandy SILT (ML): Tan, moist to wet, stiff to hard
							ML	
		SPT- 3	11 21 28	21 5		Moisture Content		20.0' El. -41.0'
	20							

Notes: Drilled using 6" O.D. Hollow Stem Auger. Boring terminated at depth of (20.0'). Backfilled with neat cement. Groundwater measured at 12.0' bgs.

Boring Log

Sheet 1 of 1

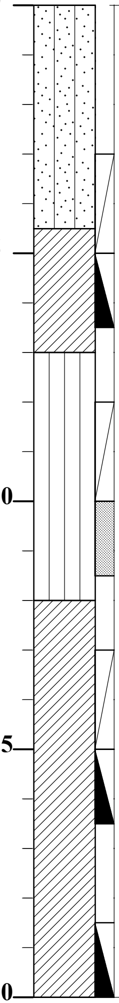
Date Started: 9/18/18 Completed: 9/18/18	**Project Number** 1076	**Project** Westside Canal Energy Center	**Boring No.** B-3
Hammer Efficiency: 93 %	**Rig Type: Unimog M-5 (Pacific)**	**Surface Elevation: -18.0'**	**Logged By: S. Burford**
Latitude: 32.729953	**Longitude: -115.717017**	**Location: North center**	

Sample Type

G - Bulk / Grab Sample
SPT - 2" O D. 1.5" I.D. Tube Sample
MC - 3 " O.D. 2.4" I D. Ring Sample
NR - No Recovery
* - Uncorrected Blow Counts

Groundwater

Depth (ft)	Hour	Date
19 1	1:30pm	9/18/2018



Groundwater Depth (ft.)	Depth (ft.)	Sample ID	Penetration Resistance (Blows per 6 in.)	Moisture Content (%)	Dry Weight (pcf)	Other Tests and Remarks	USCS Class.	Visual Classification
	0						SM	[ALLUVIUM (Qa-Qc)] Silty SAND (SM): Tan, dry to moist
		G- 1				Expansion Index No 200 Sieve R Value Thermal Resistivity Corrosivity		4.5' El. -22.5'
	5	SPT- 1	15 9 11	8 4		Moisture Content	CL	Lean CLAY (CL): Brown, dry to moist, very stiff 7.0' El. -25.0'
		G- 2					ML	Clayey SILT (ML): Tan, moist
	10	MC- 1	19 8 12	20 8	104 2	Moisture / Density		Stiff, Pocket Penetrometer: 1.75 ton/ft^2 12.0' El. -30.0'
		G- 3						Lean CLAY (CL): Brown, moist, stiff
	15	SPT- 2	3 5 8	28 8		Moisture Content	CL	
▼		SPT- 3	3 3 6	26 0		Moisture Content		
	20							20.0' El. -38.0'

Notes: Drilled using 6" O.D. Hollow Stem Auger. Boring terminated at depth of (20.0'). Backfilled with neat cement. Groundwater measured at 19.1' bgs.

NV5

Boring Log

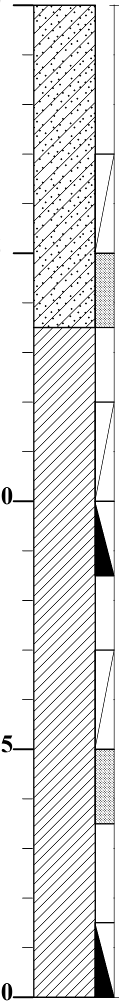
Sheet 1 of 1

Date		Project Number	Project	Boring No.
	Started: 9/18/18	**1076**	**Westside Canal Energy Center**	**B-4**
	Completed: 9/18/18			
	Hammer Efficiency: 93 %	**Rig Type: Unimog M-5 (Pacific)**	**Surface Elevation: -9.0'**	**Logged By: S. Burford**
	Latitude: 32.726831	**Longitude: -115.716616**	**Location: South center**	

Sample Type
G - Bulk / Grab Sample
SPT - 2" O D. 1.5" I.D. Tube Sample
MC - 3 " O.D. 2.4" I D. Ring Sample
NR - No Recovery
* - Uncorrected Blow Counts

Groundwater

Depth (ft)	Hour	Date



Groundwater Depth (ft.) Depth (ft.)	Graphical Log	Sample Taken	Sample ID	Penetration Resistance (Blows per 6 in.)	Moisture Content (%)	Dry Weight (pcf)	Other Tests and Remarks	USCS Class.	Visual Classification
0									[ALLUVIUM (Qa-Qc)] Clayey SAND (SC): Tan, moist
								SC	
			G- 1				Expansion Index Thermal Resistivity		
5			MC- 1	8 13 20	22 3	96 4	Moisture / Density		
									6.5' El. -15.5'
									Lean CLAY (CL): Brown, moist
			G- 2						
10			SPT- 1	5 7 9	26 3		Moisture Content		Stiff
								CL	
			G- 3						
15			MC- 2	15 15 16	16 6	104 8	Moisture / Density		Very stiff, Pocket Penetrometer: 3.25 ton/ft^2
			SPT- 2	4 4 7	22 9		Moisture Content		Stiff
20									20.0' El. -29.0'

Notes: Drilled using 6" O.D. Hollow Stem Auger. Boring terminated at depth of (20.0'). Backfilled with neat cement. Groundwater not encountered.

NV5

Boring Log

Sheet 1 of 1

Date		Project Number	Project	Boring No.
	Started: 10/1/18	**1076**	**Westside Canal Energy Center**	**B-5**
	Completed: 10/1/18			
	Hammer Efficiency: 80 %	**Rig Type: Diedrich D50 (Pacific)**	**Surface Elevation: -20.0'**	**Logged By: S. Burford**
Latitude: 32.729244		**Longitude: -115.712156**	**Location: Northeast corner**	

Sample Type

G - Bulk / Grab Sample
SPT - 2" O D. 1.5" I.D. Tube Sample
MC - 3 " O.D. 2.4" I D. Ring Sample
NR - No Recovery
* - Uncorrected Blow Counts

Groundwater

Depth (ft)	Hour	Date
14	12:40pm	10/1/2018

Groundwater Depth (ft.)	Depth (ft.)	Graphical Log	Sample Taken	Sample ID	Penetration Resistance (Blows per 6 in.)	Moisture Content (%)	Dry Weight (pcf)	Other Tests and Remarks	USCS Class.	Visual Classification
	0									[ALLUVIUM (Qa-Qc)] Silty SAND (SM): Tan, dry
									SM	
				G- 1		4 6		Moisture Content Expansion Index No 200 Sieve		
	5									5.0' El. -25.0'
				MC- 1	1 8 15	11 2	107 9	Moisture / Density		Lean CLAY (CL): Brown, moist
				G- 2						
									CL	
	10			SPT- 1	4 5 8	22 2		Moisture Content		Stiff
▼										14.0' El. -34.0'
										Sandy SILT (ML): Tan, wet
	15			MC- 2	3 5 7			No Recovery		
				G- 3					ML	
										Hard
				SPT- 2	11 16 25	22 6		Moisture Content		
	20									20.0' El. -40.0'

Notes: Drilled using 6" O.D. Hollow Stem Auger. Boring terminated at depth of (20.0'). Backfilled with neat cement. Groundwater measured at 14.0' bgs.

Boring Log

Sheet 1 of 2

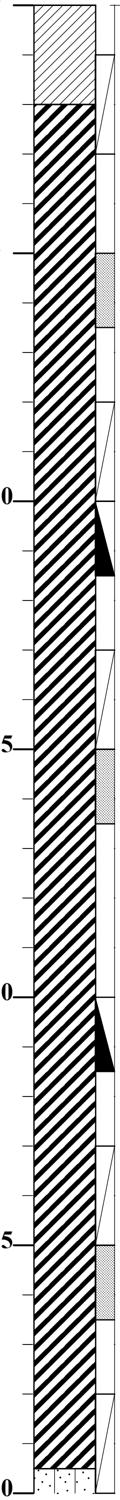
Date Started: 10/1/18 Completed: 10/1/18	**Project Number** **1076**	**Project** **Westside Canal Energy Center**	**Boring No.** **B-6**
Hammer Efficiency: 80 %	**Rig Type: Diedrich D50 (Pacific)**	**Surface Elevation: -17.0'**	**Logged By: S. Burford**
Latitude: 32.726936	**Longitude: -115.712139**	**Location: Southeast corner**	

Sample Type

G - Bulk / Grab Sample
SPT - 2" O D. 1.5" I.D. Tube Sample
MC - 3 " O.D. 2.4" I D. Ring Sample
NR - No Recovery
* - Uncorrected Blow Counts

Groundwater

Depth (ft)	Hour	Date
18	9:55am	10/1/2018



Groundwater Depth (ft.)	Depth (ft.)	Sample ID	Penetration Resistance (Blows per 6 in.)	Moisture Content (%)	Dry Weight (pcf)	Other Tests and Remarks	USCS Class.	**Visual Classification**
	0							[ALLUVIUM (Qa-Qc)] Sandy Lean CLAY (CL): Tan, dry
							CL	
		G- 1		8 8		Expansion Index Thermal Resistivity R-Value Corrosivity Moisture Content		2.0' El. -19.0' Fat CLAY (CH): Brown, moist to wet
	5	MC- 1	7 11 17	24 1	99 5	Moisture / Density Direct Shear		
		G- 2						
	10	SPT- 1	3 6 8	25 4		Moisture Content Atterberg Limit		Stiff
		G- 3						
	15	MC- 2	2 4 12	29 1	94 3	Moisture / Density	CH	
▼								
	20	SPT- 2	6 8 9	29 3		Moisture Content Atterberg Limit		Very stiff
		G- 4						
	25	MC- 3	2 2 6	28 1		CAL-3 Disturbed Moisture Content		
		G- 5						29.5' El. -46.5'
	30						SM	

Boring Log

Sheet 2 of 2

Date		Project Number	Project	Boring No.
	Started: 10/1/18 Completed: 10/1/18	1076	Westside Canal Energy Center	B-6
	Hammer Efficiency: 80 %	Rig Type: Diedrich D50 (Pacific)	Surface Elevation: -17.0'	Logged By: S. Burford

Latitude: 32.726936

Longitude: -115.712139

Location: Southeast corner

Sample Type

G - Bulk / Grab Sample

SPT - 2" O D. 1.5" I.D. Tube Sample

MC - 3 " O.D. 2.4" I D. Ring Sample

NR - No Recovery

* - Uncorrected Blow Counts

Groundwater

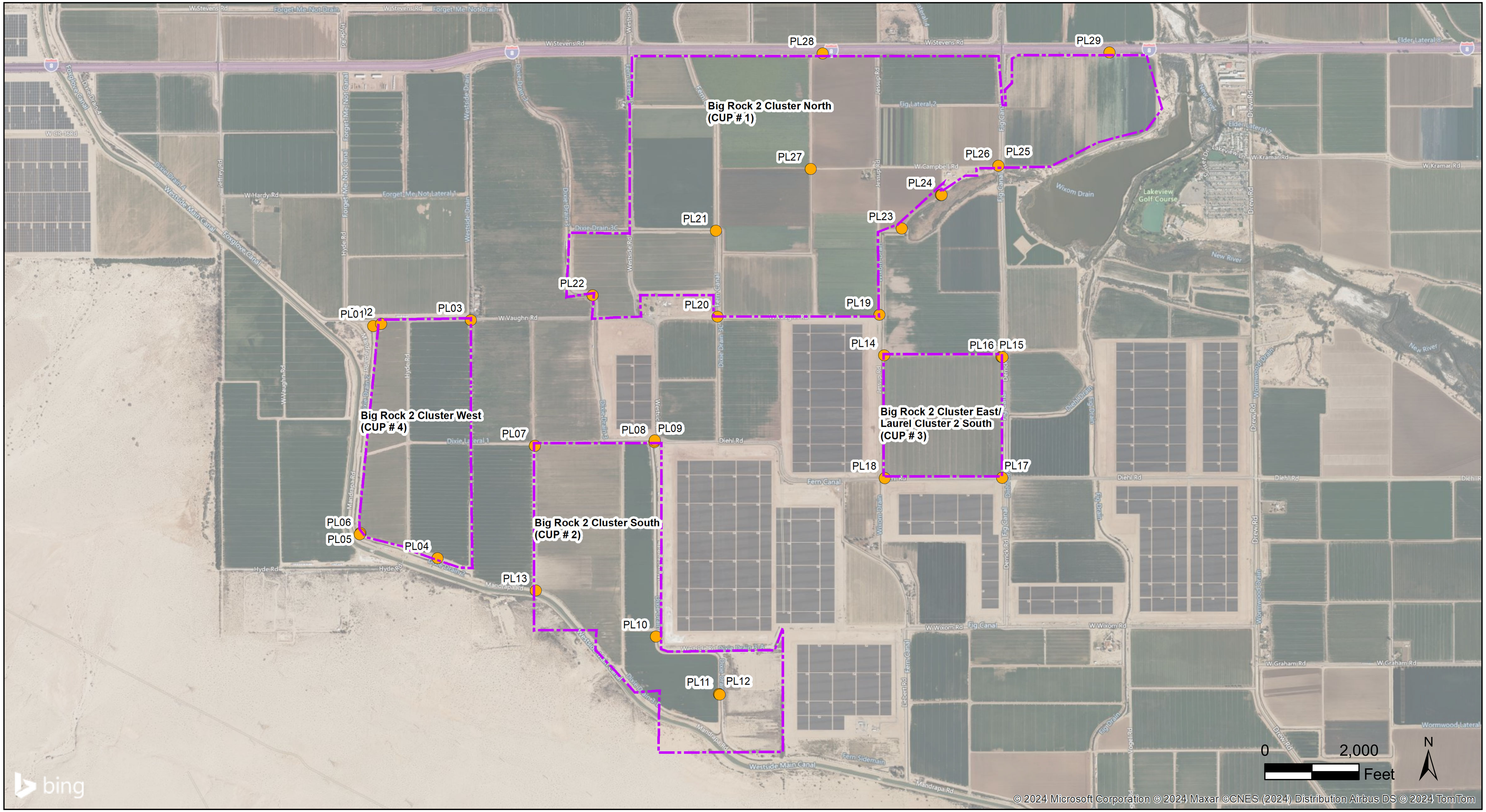
Depth (ft)	Hour	Date
18	9:55am	10/1/2018

Groundwater Depth (ft.)	Depth (ft.)	Graphical Log	Sample Taken	Sample ID	Penetration Resistance (Blows per 6 in.)	Moisture Content (%)	Dry Weight (pcf)	Other Tests and Remarks	USCS Class.	Visual Classification
	30			SPT- 3	8 14 24	16 8		Moisture Content	SM	Silty SAND (SM): Tan, moist, dense. Water added to borehole at 30' to maintain stability
	35			SPT- 4	3 6 7	24 7		Moisture Content Atterberg Limit		36.0' El. -53.0'
									CL	Lean CLAY with Sand (CL): Brown, moist to wet, stiff 39.0' El. -56.0'
									ML	Sandy SILT (ML): Tan, wet, very stiff
	40			SPT- 5	5 9 9	33 1		Moisture Content		41.0' El. -58.0'
									CL	Lean CLAY (CL): Brown, moist to wet 43.0' El. -60.0'
										Sandy Lean CLAY (CL): Brown, moist to wet
	45			SPT- 6	6 10 11	26 7		Moisture Content Atterberg Limit		Very stiff
									CL	
	50			SPT- 7	9 18 31	25 2		Moisture Content		Hard 51.5' El. -68.5'

Notes: Drilled using 6" O.D. Hollow Stem Auger. Boring terminated at depth of (51.5'). Backfilled with neat cement. Groundwater measured at 18.0' bgs.

Appendix C

Site Photographs



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Legend

● Photo Location

☐ Project Limits (Approximate) - CUP # 1, 2, 3, 4

PHOTO LOCATION MAP
BIG ROCK 2 CLUSTER SOLAR & STORAGE PROJECT
IMPERIAL COUNTY, CALIFORNIA

Figure C-1

PL01

PL02

PL03

PL04

PL05

PL06

PL07

PL08

PL09

PL10

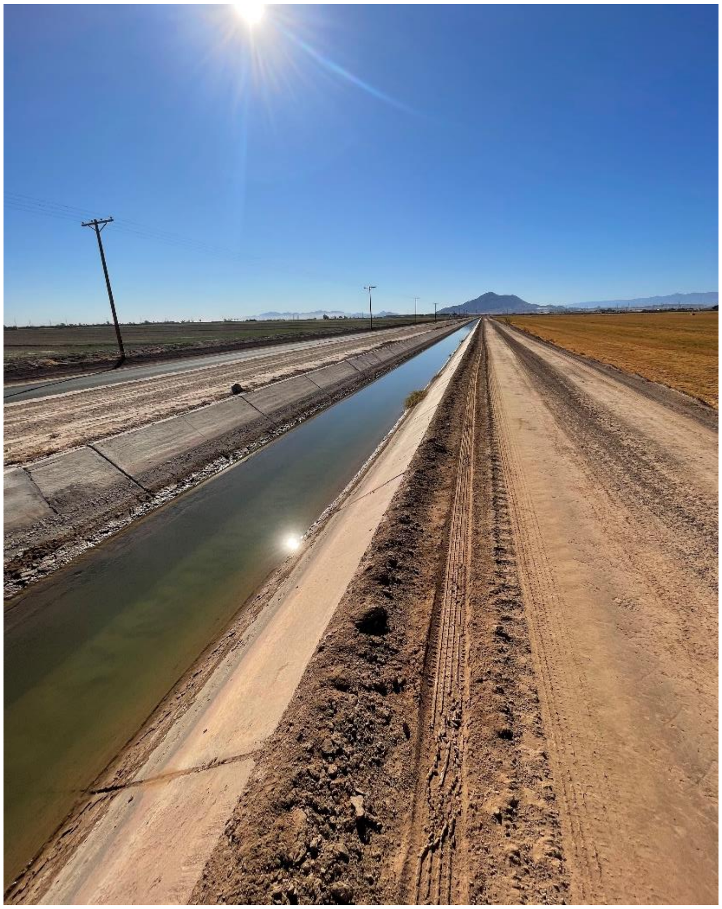
PL11

PL12

PL13

PL14

PL15

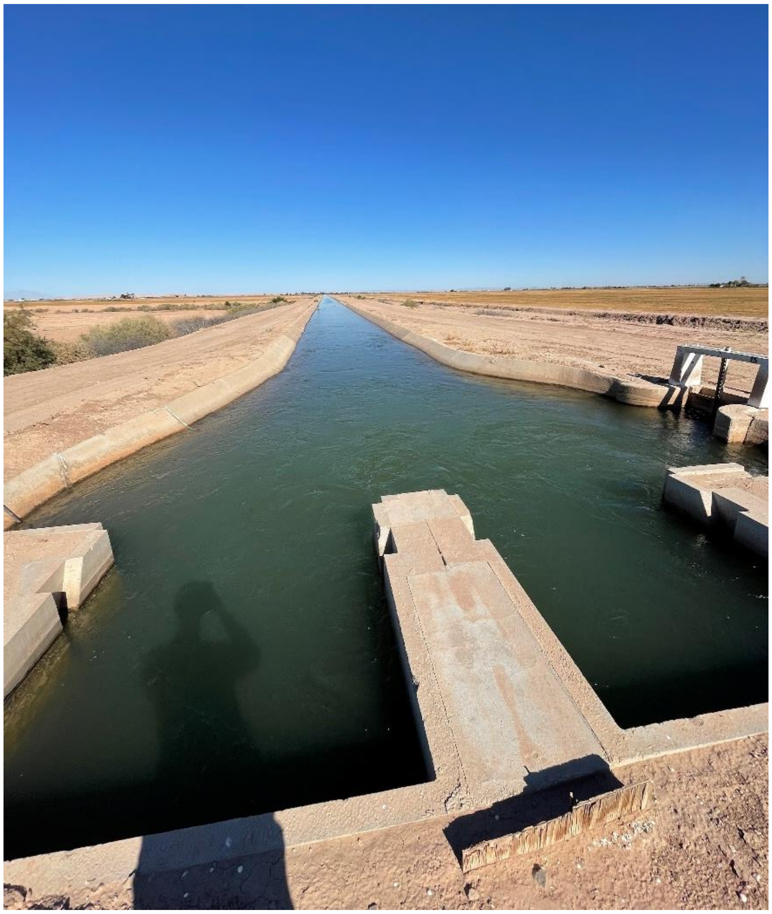


PL16

PL17

PL18

PL19



PL20

PL21

PL22

PL23

PL24

PL25


NO TRESPASSING
NO HUNTING
IT IS A FOOD SAFETY VIOLATION
ORGANIC FARM
DO NOT SPRAY
NO TRESPASSING
NO DUMPING
NO TRESPASAR
NO TIRAR BASURA

PL26

PL27

PL28

PL29