

**GEOTECHNICAL ENGINEERING STUDY
CALAVERAS COUNTY WATER DISTRICT
ARNOLD WASTEWATER TREATMENT FACILITY IMPROVEMENT PROJECT
3294 HIGHWAY 4
ARNOLD, CALIFORNIA**

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TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
2.0	PURPOSE AND SCOPE.....	1
3.0	PROJECT DESCRIPTION	1
4.0	GEOLOGIC AND SEISMIC SETTING	2
4.1	REGIONAL GEOLOGY	2
4.2	SITE GEOLOGY	2
4.3	FAULTING AND REGIONAL SEISMICITY	2
5.0	SUBSURFACE CONDITIONS	2
5.1	EARTH MATERIALS	2
5.2	LOCAL GROUNDWATER CONDITIONS.....	3
5.3	SEISMIC CONSIDERATIONS	3
5.3.1	Ground Shaking	3
5.3.2	Liquefaction Potential.....	3
6.0	CONCLUSIONS AND RECOMMENDATIONS.....	3
6.1	GENERAL.....	3
6.2	GRADING AND EARTHWORK RECOMMENDATIONS.....	4
6.2.1	Site Preparation.....	4
6.2.2	Overexcavation	4
6.2.3	Subgrade Preparation	4
6.2.4	Engineered Fill Materials.....	5
6.2.5	Engineered Fill Placement	5
6.2.6	Excavations	5
6.2.7	Temporary and Permanent Slopes	6
6.3	UNDERGROUND UTILITY TRENCHES	7
6.4	SURFACE DRAINAGE CONTROL.....	7
7.0	FOUNDATION RECOMMENDATIONS.....	7
7.1	GENERAL FOUNDATION RECOMMENDATIONS	7
7.2	FOUNDATIONS	7
7.2.1	Lateral Resistance	8
8.0	SLABS-ON-GRADE.....	8
9.0	RETAINING WALLS	8
9.1	LATERAL EARTH PRESSURES	8
9.2	WALL DRAINAGE	9
10.0	CORROSION POTENTIAL	10
11.0	ADDITIONAL SERVICES.....	10
12.0	LIMITATIONS.....	11
13.0	REFERENCES.....	12



APPENDICES

APPENDIX A – FIGURES

- Figure 1 – Vicinity Map
- Figure 2 – Site Map with Test Pit Locations
- Figure 3 – Geologic Map
- Figure 4 – Regional Fault Map

APPENDIX B

- Test Pit Logs

APPENDIX C

- Laboratory Test Results

APPENDIX D

- U.S. Seismic Design Maps



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1.0 INTRODUCTION

This report includes the results of a Geotechnical Engineering Study (GES) for the Calaveras County Water District (CCWD) Arnold Wastewater Treatment Facility Improvement Project (Site). The site is located at 3294 Highway 4 in Arnold, California. The general location of the site is shown on the Figure 1 – Vicinity Map, and Figure 2 – Site Map with Test Pit Locations, Appendix A. This report was prepared to meet the requirements of 2019 California Building Code (CBC) for Geotechnical Engineering Studies.

2.0 PURPOSE AND SCOPE

This GES was performed to 1) characterize geotechnical conditions at the proposed project site; 2) identify geotechnical or geologic conditions that might impact design or construction at the site; 3) provide geotechnical recommendations to mitigate geotechnical constraints at the site; and 4) provide geotechnical criteria for design of the proposed improvements. Condor completed the following work for this GES:

1. Reviewed available maps and documents relevant to the site geology, seismic setting, and geotechnical conditions.
2. Performed field explorations using backhoe test pits.
3. Analyzed the findings from the field exploration to develop geotechnical recommendations for:
 - a) General earthwork, including site stripping, subgrade preparation, temporary excavations, permanent slopes, trench backfill, import fill, compaction criteria, and site surface drainage;
 - b) Foundation design and construction, including foundation type, allowable bearing capacities, lateral resistance, settlement, and foundation depth;
 - c) 2019 California Building Code (CBC) seismic design criteria;
 - d) Potential geologic and seismic hazards and recommendations for mitigation;
 - e) Lateral earth pressures and retaining wall design criteria; and
 - f) Concrete slabs and exterior flatwork.
4. Prepared this written report summarizing our findings, conclusions, and geotechnical recommendations.

3.0 PROJECT DESCRIPTION

Calaveras County Water District (CCWD) is planning for improvements to the Arnold Wastewater Treatment Facility (WWTF). Figure 2 shows the general layout and locations of existing and proposed improvements and the approximate test pit locations. The proposed improvements include; an effluent pump station extending approximately 12-feet below existing grade, an aerobic digester extending approximately 7-feet below existing grade, a RAS/WAS pump station extending approximately 13-feet below existing grade, a clarifier extending approximately 14-feet below existing grade and a ML Splitter Box and Outlet Structure each extending approximately 3-feet below existing grade.



4.0 GEOLOGIC AND SEISMIC SETTING

4.1 REGIONAL GEOLOGY

The site is located in the Sierra Nevada geomorphic province. The basement rock of the Sierra Nevada consists of steeply dipping metamorphic rocks of Paleozoic and Mesozoic age that have been intruded by Mesozoic granitic plutons of the Sierra Nevada Batholith. Locally, these basement rocks are overlain by the eroded remnants of younger, Tertiary age, continental volcanic and sedimentary rock, and Quaternary alluvium. Uplift and westward tilting of the Sierra Nevada range began along the faults flanking its eastern edge. Erosion by west-flowing streams incised deep canyons and removed much of the Tertiary rock. Several episodes of glaciation during the last 2 million years have exposed basement rock at high elevations. The geologic processes of tectonic uplift and erosion continue to the present.

4.2 SITE GEOLOGY

Based upon the published Geologic Map of the Sacramento Quadrangle, shown on Figure 3, the bedrock consists of marine sedimentary and metasedimentary rocks. Our fieldwork indicates that the area of the WWTF improvements is in a thick residual sandy lean clay soil overlying tuffaceous sandstone of the Mehrten Formation.

4.3 FAULTING AND REGIONAL SEISMICITY

No active faults are known to cross the site, nor is the site located within an Earthquake Fault Hazard Zone, as established by the Alquist-Priolo Earthquake Fault Zoning Act (Bryant and Hart, 2007), therefore, ground rupture from faulting is not considered a significant hazard. Geologically recent (late Pleistocene to Holocene) movement has been identified on only eight faults within the Sierra Nevada block. These recent faults are included in the Foothills Fault Zone shown on Figure 4, approximately 22 miles west of the site.

5.0 SUBSURFACE CONDITIONS

On July 29, 2021, Condor observed the excavation of five (5) exploratory test pits (TP-1 through TP-5) to depths ranging from approximately 3 to 15 feet at the locations shown on Figure 2 – Site Map with Test Pit Locations, Appendix A. The exploratory test pits were excavated by CCWD by use of a CAT 420E backhoe fitted with an 18-inch bucket.

A Condor geologist logged the materials encountered at each test pit and selected sample locations representative of site conditions. The subsurface was classified using the Unified Soil Classification System and applicable rock classification system noting color, moisture, weathering, strength, hardness, texture, fabric, composition, and excavation rate. Selected samples were tested for moisture content, dry density, sieve analysis, and plasticity index at Condor's Materials Testing Laboratory. The test pit logs are provided in Appendix B. Laboratory test reports are provided in Appendix C.

5.1 EARTH MATERIALS

The site generally consists of artificial fill over residual soil over tuffaceous sandstone. The artificial fill encountered in test pit TP-1 consists of sandy lean clay with gravel and is stiff. The artificial fill exposed in test pits TP-2 and TP-3 consists of sandy lean clay with gravel and cobbles and clayey coarse gravel with cobbles which is soft to firm and loose. Some minor caving of the artificial fill occurred in TP-3. The residual soil consists of sandy lean clay with gravel and is generally stiff to hard. The weathered bedrock consists tuffaceous sandstone of the Mehrten Formation, which is massive, friable to weak with low hardness and excavates to silty sand with gravel. These materials were excavatable using a backhoe to the



depths indicated on the test pit logs. A detailed description of the encountered ground conditions is provided in the test pit logs, Appendix B.

5.2 LOCAL GROUNDWATER CONDITIONS

No groundwater was observed during our field work, but ground conditions are typically dry until winter rains. Groundwater seeps are often encountered in similar geology during the winter and spring seasons.

5.3 SEISMIC CONSIDERATIONS

5.3.1 Ground Shaking

Probabilistic values of ground motion corresponding to various levels of seismic hazards are available on-line from professional organizations using the USGS data to retrieve the seismic design data and presents the findings in a report format. The USGS uses a probabilistic model to estimate ground motions corresponding to various levels of seismic hazard. Site soils were classified using the procedures specified in the 2019 CBC, which utilizes ASCE 7-16.

The results for the general seismic analysis using the 2019 CBC for Site Class D (stiff soil) are summarized below and provided in Appendix D. The recommended values for design of the proposed structure are:

- Site Class: D – Stiff Soil
- S_s : 0.390 g (where g is acceleration from gravity)
- S_1 : 0.186 g
- S_{MS} : 0.580 g
- S_{M1} : 0.415 g
- S_{DS} : 0.387 g
- S_{D1} : 0.277 g

5.3.2 Liquefaction Potential

Liquefaction normally occurs when sites underlain by saturated, loose to medium dense, granular soils are subjected to relatively high ground shaking. During an earthquake, ground shaking may cause certain types of soil deposits to lose shear strength, resulting in ground settlement, oscillation, loss of bearing capacity, landsliding, and the buoyant rise of buried structures. The majority of liquefaction hazards are associated with sandy soils, silty soils of low plasticity, and some gravelly soils below groundwater. Cohesive soils are generally not considered to be susceptible to liquefaction. In general, liquefaction hazards are most severe within the upper 50 feet of the surface, except where slope faces, or deep foundations are present (CDMG Special Publication 117, 1997). Given the cohesive surface soil and relatively shallow depth to bedrock beneath the site and the relatively low seismic activity of the project area, the potential for liquefaction is not considered a site risk.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 GENERAL

Based on our findings, it is our professional opinion that the Site should be suitable from a geotechnical standpoint for construction of the proposed improvements provided the recommendations contained herein are incorporated into the project design. Given the site conditions encountered, we conclude that



conventional spread footing foundations supported on native sandy lean clay soil, weathered bedrock or engineered fill should provide adequate support for the anticipated structural loading.

Specific conclusions and recommendations addressing these geotechnical considerations, as well as general recommendations regarding the geotechnical aspects of design and construction, are presented in the following sections.

6.2 GRADING AND EARTHWORK RECOMMENDATIONS

The grading and site work should be performed in accordance with the 2019 CBC, Title 24, Chapter 33 (Safeguards During Construction), Appendix J (Grading), and Chapter 18 (Soil and Foundations), and with the recommendations of the Geotechnical Engineer of Record during construction. Where the recommendations of this report and the cited sections of the CBC are in conflict, the owner should request clarification from the Geotechnical Engineer of Record. The recommendations of this report should not be waived without the consent of the Geotechnical Engineer of Record for the project. Recommendations for additional work and construction monitoring are contained in later sections of this report.

6.2.1 Site Preparation

The ground surface in the area of the proposed improvements should be stripped of all vegetation, debris, organic topsoil, or any other unsuitable material or soil. Stripping should extend at least 5 feet beyond the limits of the proposed improvements, where possible. Soils containing more than 2 percent organic material by weight over baseline conditions should be considered organic. Roots remaining greater than ½-inch in diameter should be removed by either mechanical means or by hand during grading operations. Actual stripping depths should be determined at the time of grading by the geotechnical engineer or a qualified representative. Site strippings may be stockpiled for later use in landscape areas.

6.2.2 Overexcavation

Approximately 3-feet of loose and soft artificial fill was exposed in Test Pits 2 and 3. This material is not suitable for support of structures. Condor recommends that all areas required to support shallow structures and engineered fill should be overexcavated and replaced with engineered fill in accordance with Section 6.2.5 – Engineered fill Placement. Overexcavation should remove unsuitable fill materials and should extend to provide at least 1 foot of engineered fill below footings and within zones extending 2 feet horizontally from the edges of improvements.

Additional overexcavation may be required depending on conditions observed by the Geotechnical Engineer of Record or qualified representative during construction. The depth and extent of required overexcavations should be approved in the field by the Geotechnical Engineer of Record or qualified representative prior to placement of fill.

6.2.3 Subgrade Preparation

In all areas to receive fill material, the exposed subgrade consisting highly weathered bedrock should be scarified to a depth of 8 inches, uniformly moisture conditioned to between 2 and 4 percentage points above optimum moisture content and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density. Field density tests should be taken to verify compaction of the prepared subgrade in these areas.

The subgrade conditions exposed in cut bedrock areas will not warrant scarification and recompaction. If highly to moderately weathered bedrock is exposed as anticipated in these areas, we recommend that the



exposed surface be thoroughly moisture conditioned and track walked with a dozer to break up the oversize material and provide a workable and dense surface. The Geotechnical Engineer or qualified representative should observe this operation to verify that the oversize material has been properly broken down and the surface is firm and unyielding.

6.2.4 Engineered Fill Materials

Engineered fill used for the project should be either 1) select import engineered fill, or 2) general on-site materials with less than 2 percent organic content and a maximum particle size of 6 inches. However, the site colluvial soil and bedrock will likely be difficult to process into workable fill, and consideration should be given to using import fill.

Select import or onsite material used for engineered fill should be inorganic, have an R-value of at least 30, a liquid limit less than 30, and plasticity index less than 7. Engineered fill should also meet the following particle-size gradation:

<u>Sieve Opening</u>	<u>Percent Passing, by Dry Weight</u>
6-inch square	100
3/4-inch square	70 minimum
U.S. No. 4	60 minimum
U.S. No. 200	50 maximum

Samples of any proposed imported fill material should be submitted to the Laboratory of Record for testing and approved by the Geotechnical Engineer of Record prior to being brought to the site. If certified testing has been performed on any proposed imported fill material, the Geotechnical Engineer of Record or a qualified professional may approve its use based on the test results.

General on-site engineered fill should be inorganic, contain no rocks greater than 6 inches in least dimension, and be free of deleterious materials. Soils containing more than 2 percent by weight of organic material should be considered organic. Grading contractors should anticipate that processing of the soils and weathered bedrock generated from cuts may be necessary to meet the gradation requirements. This may include track walking with a dozer, screening, crushing, or other processing methods. The required amount of processing and the excavation difficulty will generally increase with increasing depth of cut. Additional discussion regarding excavations is provided in Section 6.2.6.

6.2.5 Engineered Fill Placement

Engineered fill should be placed in a series of horizontal layers not exceeding 8 inches in loose thickness, uniformly moisture-conditioned to between 2 and 4 percentage points above optimum moisture content and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D1557 maximum dry density. Additional fill lifts should not be placed if the previous lift did not meet the required relative compaction or if soil conditions are not stable. Discing, tilling, and/or blending may be required to uniformly moisture-condition soils used for engineered fill.

6.2.6 Excavations

Construction site safety generally is the sole responsibility of the Contractor who shall also be solely responsible for the means, methods, and sequencing of construction operations. The Contractor should be aware that slope height, slope inclination, or excavation depths (including foundation excavations) should in no case exceed those specified in local, state, and/or federal safety regulations (e.g., OSHA Health and



Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations). Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed within a lateral distance equal to one-third the slope height from the top of any excavation. During wet weather, earthen berms or other methods should be used to prevent runoff water from entering all excavations. Runoff water, seepage, and/or groundwater encountered within excavations should be collected and disposed of outside the construction limits.

Open temporary trenches and cuts should be monitored for evidence of incipient instability and should follow applicable OSHA regulations (California Construction Safety Orders, Title 8). The contractor is responsible for final determination of safe slopes for all temporary cuts and trenches.

The presence of resistant bedrock within the estimated excavation depths for the building pads, terraces and foundations should be considered when planning site grading. We anticipate that resistant bedrock encountered within the proposed cut areas may be rippable with large equipment without the aid of blasting but may generate over-sized rock. However, in small excavations, such as utility trenches, impact mechanical excavation (jackhammer) will likely be required.

Resistant rock requiring percussion excavation or blasting is known to occur for developments in the area, particularly for excavations deeper than 5 feet, or narrow utility trenches. If blasting is necessary, Condor recommends that this work be performed by a certified state licensed blaster. If blasting is conducted, water sprays and/or blasting mats should be employed to reduce the potential for any environmental impact or accidents. Over-sized rock may require mechanical treatment to meet the requirements of maximum particle size stated in Section 6.2.4.

6.2.7 Temporary and Permanent Slopes

It is our opinion that temporary unbraced cut slopes up to 10 feet high in the native stiff clay and weathered rock may be 1/2H:1V, provided that the rock is not fissured and will remain intact while exposed. Existing fill may require flatter slopes. If the rock is wet or seepage is encountered, or if the ground is subject to other instability factors, the inclination of the slope should be flattened to maintain safe conditions. The soil and colluvium mantle exposed by temporary cut slopes should be flattened to no steeper than 1-1/2H to 1V (horizontal to vertical) provided there is no evidence of saturation or seepage. Excavation deeper than 4 feet should be reviewed by a competent person at the time of exploration where the excavation cannot be sloped to 1-1/2H:1V or flatter.

Permanent cut slopes in engineered fill should have an inclination no steeper than 2H:1V. Permanent cut slopes in moderately weathered rock should be made no steeper than 1-1/2H:1V. Permanent cut slopes in competent rock may be made as steep as 1H:1V upon approval of the Geotechnical Engineer.

Interceptor drains should be provided along the tops of slopes where the tributary area flowing toward the slope has a drainage path greater than 40 feet, measured horizontally. The interceptor drains should be sloped to a suitable drainage device and disposed off-site well below the toe of the slope. The permanent cut slopes should be inspected periodically for erosion, and if detected, repaired immediately. Interceptor drains should be cleaned before the start of each rainy season, and if necessary, after each rainstorm. To minimize erosion and gulling/rilling, disturbed areas should be planted with erosion-resistant vegetation suited to the area. As an alternative, jute netting or geotextile erosion control mats can be installed per the manufacturer's recommendations.



6.3 UNDERGROUND UTILITY TRENCHES

Unless concrete bedding is required around utilities, pipe bedding should consist of sand with a sand equivalent of at least 30 or the pipe manufacturer's requirements, whichever is more restrictive. The pipe bedding should extend from 6 inches below the invert of the pipe to 1 foot above the crown of the pipe. The pipe bedding material should be compacted to a minimum of 90 percent relative compaction or the manufacturer's recommendations if more stringent. Trench backfill above the pipe bedding zone should be placed in the same manner as required in Section 6.2.5, Engineered Fill Placement. On-site fill soils and "non-organic" native soils may be used as backfill in trenches above the pipe bedding. Utility trench backfill should be placed in layers not exceeding a loose lift thickness of 8 inches, uniformly moisture conditioned, and compacted to a minimum of 90 percent relative compaction.

Compaction criteria for trench backfill above the bedding zone may be decreased to 85 percent relative compaction in landscape areas at least 5 feet beyond structural improvements, except in areas overlain by pavements, sidewalks, or other hardscapes. In landscape areas overlain by pavements, sidewalks, or other hardscapes, we recommend that the trench backfill be compacted to a minimum of 90 percent relative compaction to within 1 foot of the finished subgrade surface. The upper 1 foot should be compacted to 95 percent relative compaction.

6.4 SURFACE DRAINAGE CONTROL

Surface drainage should be designed to prevent ponding and to drain surface water away from foundations, slabs-on-grade, tops of retaining walls, and cut slope faces. Under no circumstances should concentrated surface water be allowed to run over slope faces. Surface runoff should be directed toward suitable collection and discharge facilities. A positive surface drainage of at least 5 percent should be provided within 10 feet of building foundations and tops of retaining walls. Elsewhere, positive surface drainage of at least 2 percent is recommended to allow for rapid removal of surface water or as recommended by the site development civil engineer. Roof drainage should be directed away from building foundations and retaining walls where bare ground is exposed. A detailed drainage plan is outside the scope of this report but should be included in the preparation of the grading plans for new construction.

7.0 FOUNDATION RECOMMENDATIONS

7.1 GENERAL FOUNDATION RECOMMENDATIONS

Foundation improvements should be designed and constructed in accordance with the 2019 CBC, Title 24, Chapter 17 (Structural Tests and Special Inspections), Chapter 18 (Soil and Foundations), and all other sections applicable to the proposed structural improvements.

7.2 FOUNDATIONS

The proposed construction may be supported on shallow, reinforced concrete spread footings founded on engineered fill, native stiff clay, or weathered bedrock prepared in accordance with Section 6.2. Some structures will be constructed on a mat or "box" type foundation. Continuous and isolated spread footings should have minimum widths of 12 and 24 inches, respectively. Footings should be embedded at least 18 inches below the lowest final adjacent subgrade. Spread footings may be designed using a net allowable bearing pressure of 3,000 pounds per square foot (psf) for dead plus sustained live loading. Mat foundations may be designed for 1,500 psf. A one-third increase in the allowable bearing pressures may be applied when considering short-term loading due to wind or seismic forces.



Total settlement of the foundation will vary depending on the plan dimensions of the foundation and the actual load supported. Based on the assumed foundation dimensions and loads, we estimate maximum total and differential foundation settlements should be on the order of 1 inch and ½ inch or less, respectively.

Prior to placing steel or concrete, footing excavations should be cleaned of all debris, loose or soft soil, and water. All footing excavations should be observed by the project Geotechnical Engineer just prior to placing steel or concrete to confirm the recommendations contained herein are implemented during construction.

The structural engineer should evaluate footing configurations and reinforcement requirements to account for loading, shrinkage, and temperature stresses. As a minimum, continuous footings should be reinforced with at least two No. 4 reinforcement bars, one top and one bottom, to provide structural continuity and permit spanning of local subgrade irregularities.

7.2.1 Lateral Resistance

Resistance to lateral loads (including those due to wind or seismic forces) may be determined using the friction between the bottom of concrete foundations and the underlying soil and the passive soil pressure acting against the vertical face of the footings. These two modes of resistance can be combined.

For planning purposes only, we anticipate that sliding resistance to lateral forces may be calculated using a coefficient of friction of 0.3. We anticipate that passive resistance pressure available in the engineered fill may be calculated using an allowable equivalent fluid weight of 500 pounds per cubic foot (pcf), assuming that the ground adjacent the foundation is level. This allowable value includes a reduction factor of 1.5 to limit the foundation movement required to mobilize the ultimate passive resistance. Passive resistance contributed by soils within 1 foot of the ground surface should be neglected unless the ground is covered and confined by a slab-on-grade or pavement. To mobilize passive pressure, gaps between the footing and adjacent ground should be completely backfilled using engineered fill, concrete, or lean cement sand slurry with a 28-day unconfined compressive strength of at least 500 psi.

8.0 SLABS-ON-GRADE

Slabs-on-grade should be constructed on ground prepared in accordance with Section 6.2. Slabs should be cast using concrete with a maximum slump of 4 inches or less. Excessive water content is the major cause of concrete cracking. To reduce concrete shrinkage, a water reducing agent or plasticizer may be utilized in the concrete to increase slump while maintaining an appropriate water/cement ration. Hot reinforcing steel should be cooled prior to concrete placement to help prevent concrete shrinkage at the bar location. Where there is potential for moisture accumulation under the slab, special consideration should be given to allow gravity drainage of any water that could migrate into the subgrade of the slab or rock cushion.

Exterior concrete slabs (i.e., sidewalks, concrete aprons, concrete driveways, etc.,) may be constructed directly over subgrade prepared as discussed in Section 6.2. when covered with 4 inches of clean rock, aggregate base, or other granular material. Exterior slabs-on-grade should be a minimum of 4 inches in thickness. All exterior slabs should be reinforced or jointed and scored to limit cracking from shrinkage.

9.0 RETAINING WALLS

9.1 LATERAL EARTH PRESSURES

The following geotechnical criteria may be used for preliminary design of earth-retaining structures constructed on site. Active earth pressures may be used for design of unrestrained retaining walls where the top of the wall is free to translate or rotate. To develop active earth pressures, the walls should be capable of deflecting



by at least $0.004H$ (where H is the height of the wall). At-rest earth pressures should be used for design of retaining walls where the wall top is restrained such that the deflections required for development of active soil pressures cannot occur or are undesirable. Cantilever walls retaining engineered fill may be designed for active or at-rest lateral earth pressures for various backfill slopes using the following equivalent fluid unit weights. The lateral earth pressures presented in the table below assume that the unit weight of the soil is 100 pounds pcf, the soils internal angle of friction is 30 degrees, based upon laboratory testing of the soil samples, and that the wall backfill is drained (no hydrostatic forces acting on the wall), and no traffic or other surcharge loads are applied within a distance of one-half the wall height.

Equivalent Fluid Unit Weight (pcf)

Backfill Slope	Active Conditions	At-Rest Conditions
Level	35	60
3H:1V	45	75
2H:1V	55	90

The lateral earth pressures should be applied to a plane extending vertically upward from the base of the heel of the retaining wall to the ground surface. Lateral pressures for backfill slopes other than those given above can be estimated by interpolation.

Where the wall backfill will be subject to traffic loading within a distance of $H/2$ (where H is the wall height) from the top of the wall, the wall should be designed to resist an additional uniform lateral pressure of 65 psf applied to the back of yielding walls (active conditions), or 110 psf applied to the back of non-yielding walls (at-rest conditions). The surcharge load should extend from the top of the wall down to 10-feet below the top of wall. Surcharge loads imposed by greater loads or unusual loads within a distance of H of the back of the wall should be considered on a case-by-case basis.

Retaining walls should be designed to resist additional seismic earth pressures due to earthquake loading for walls that exceed 10 feet. The additional seismic pressure increment may be calculated using an inverted equivalent fluid pressure of 10 pcf. The seismic increment should be a pressure that increases linearly from the base of the wall to the top of the wall as an inverted, triangular distribution. The resultant force of the seismic increment should act at a distance of $0.6H$ (where H is the height of the wall) above the base of the wall. Under the combined effects of static and dynamic loading, a factor of safety of 1.1 against sliding or overturning is acceptable. Use of the seismic increment assumes that sufficient wall deformation will occur during seismic loading to develop active earth pressure conditions.

9.2 WALL DRAINAGE

The above lateral earth pressures are based on fully drained conditions. For these conditions, we recommend that the retaining wall backfill be free-draining and provisions are made to collect and dispose of excess water away from the wall. Wall drainage may be provided by either a minimum 1-foot-wide layer of clean drain rock/gravel enclosed by geosynthetic filter fabric or by prefabricated drainage panels (such as Miradrain, Enkadrain, or an equivalent substitute) installed per the manufacturer’s recommendations. In either case, drainage should be collected by perforated pipes and directed to a sump, storm drain, weep holes, or other suitable location for disposal. The drain rock should conform to Class One, Type B permeable material as specified in Section 68 of the California Department of Transportation (Caltrans) Standard Specifications, current edition. A typical 1-inch x No. 4 concrete coarse aggregate mix approximates this specification. A clean pea-gravel is also acceptable. The geosynthetic filter fabric should conform to the requirement in Section 88, “Engineering Fabrics” of the Caltrans Standard Specifications, current edition. A 4-inch diameter perforated pipe at least Schedule 40 PVC, or similar, should be placed



“holes down” near the bottom of the section of permeable material and directed to discharge by gravity to a suitable outlet. The upper 18 inches of engineered backfill above the wall drainage should consist of native material, concrete, asphaltic concrete, or similar backfill to reduce surface drainage into the wall drainage system.

10.0 CORROSION POTENTIAL

Chemical tests were performed on a sample of soil anticipated to be in contact with foundation improvements. Test results yielded a pH of 7.08, chloride ion concentration reflects none detected, sulfate ion concentration reflects none detected, and soil redox potential of 400-mV.

Resistivity test results of 11,000 ohm-centimeter indicate that the soil is “negligibly corrosive”. A commonly accepted correlation between soil resistivity and corrosivity towards ferrous metals is provided in the following table developed by the National Association of Corrosion Engineers (NACE).

Soil Resistivity	Corrosivity
Less than 500 ohm-cm	Very corrosive
500 to 1,000 ohm-cm	Corrosive
1,000 to 2,000 ohm-cm	Moderately corrosive
2,000 to 10,000 ohm-cm	Mildly corrosive
Over 10,000 ohm-cm	Progressively less corrosive

Appendix C contains the results of the corrosivity tests performed, as well as a brief evaluation letter by our laboratory subcontractor. The brief evaluation provides general recommendations regarding protecting buried metals. If warranted, a corrosion expert should be consulted to develop specific recommendations.

11.0 ADDITIONAL SERVICES

The geotechnical recommendations and design criteria in this report are sensitive to the location, design details, and any special requirements of the new construction. Condor should review the geotechnical elements of project grading, foundation plans and specifications prior to construction bidding to check that the intent of our recommendations have been incorporated into these project documents. If Condor does not review the geotechnical elements of the plans and specifications, the reviewing geotechnical engineer or qualified professional civil engineer should thoroughly review this report and concur with its conclusions and recommendations or provide alternative recommendations.

Because conditions may vary across the site, geotechnical recommendations used as a basis for construction contracting are sensitive to the possible need for adjustment in the field. The adjustments are dependent upon conditions revealed during construction that could previously only be assumed based upon site exploration. Since the intent of the recommendations given in this report are best understood by a Condor representative, we recommend that field observations and testing during earthwork and construction be performed by Condor. If Condor does not provide the field observations and testing, the Geotechnical Engineer of Record should thoroughly review this report and concur with its conclusions and recommendations or provide alternative recommendations.

A representative of the Geotechnical Engineer of Record or a qualified professional civil engineer should be on-site to observe and advise during site preparation, grading and earthwork, and construction of foundations and slabs-on-grade. These observations should be supplemented with periodic compaction testing of subgrade and engineered fills to evaluate conformance with the recommendations contained in



this report. It is important that foundation excavations be checked after cleaning and immediately prior to concrete placement to verify their suitability.

12.0 LIMITATIONS

The geotechnical conclusions and recommendations presented in this report are intended for planning of the structural improvements as described in this report. These conclusions and recommendations may be invalid if:

- the land use assumptions change;
- the report is used for another site or project;
- the encountered soil or groundwater conditions are different than those anticipated in this report;
- the recommendations contained in this report are not followed; or
- any other change is implemented that materially alters the project.

This report was prepared in accordance with the generally accepted standards of geotechnical engineering practice existing in Calaveras County at the time it was written. No other warranty, expressed or implied, is made. It is the owner's responsibility to see that all parties to the project, including the designer, contractors, subcontractors, etc., are made aware of this report in its entirety.

The analyses and geotechnical recommendations submitted herein are based upon the data obtained from five (5) test pits, located as shown on Figure 2 – Site Map with Test Pit Locations, Appendix A, and on general field observations made during site exploration. Subsurface exploration of any site is necessarily confined to selected locations and conditions may, and often do, vary between and around these locations.

It should be noted that changes in the standards of practice in the field of geotechnical engineering, changes in site conditions (such as new excavations or fills), new agency regulations, or modifications to the proposed project are grounds for this report to be professionally reviewed. In light of this, there is a practical limit to the usefulness of this report without critical professional review. It is suggested that two years be considered a reasonable time for the usefulness of this report.

We trust this report provides the information required at this time. Please call with any questions.

Respectfully submitted,

CONDOR EARTH



Ronald L. Skaggs GE No. 2295
Vice President, Engineering Services



13.0 REFERENCES

Bieniawski, Z.T. (1989) Engineering Rock Mass Classifications, John Wiley & Sons

Bryant, W.A., and Hart, E.W., (2007), Fault Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zone Maps, California Division of Mines and Geology, Special Publication 42.

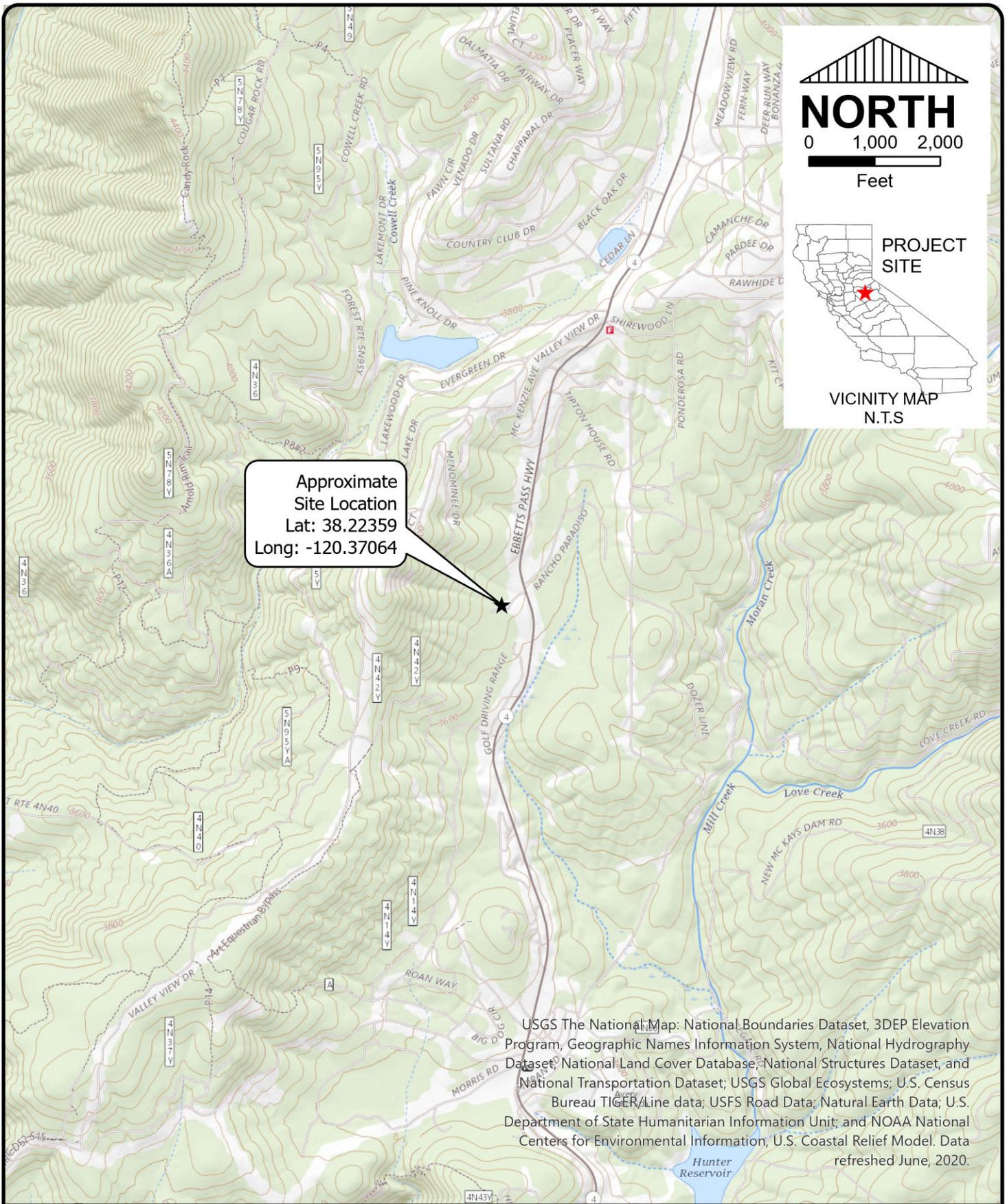
California Building Code, 2019, California Building Standards Commission, and International Conference of Building Officials, 2012.

Jennings, C.W., Fault Activity Map of California and Adjacent Areas, California Geological Survey (formerly California Division of Mines and Geology), 1994

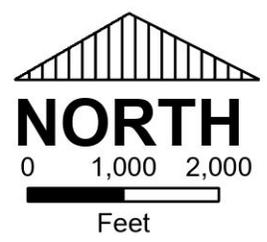


APPENDIX A
Figures





Approximate
Site Location
Lat: 38.22359
Long: -120.37064



USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed June, 2020.



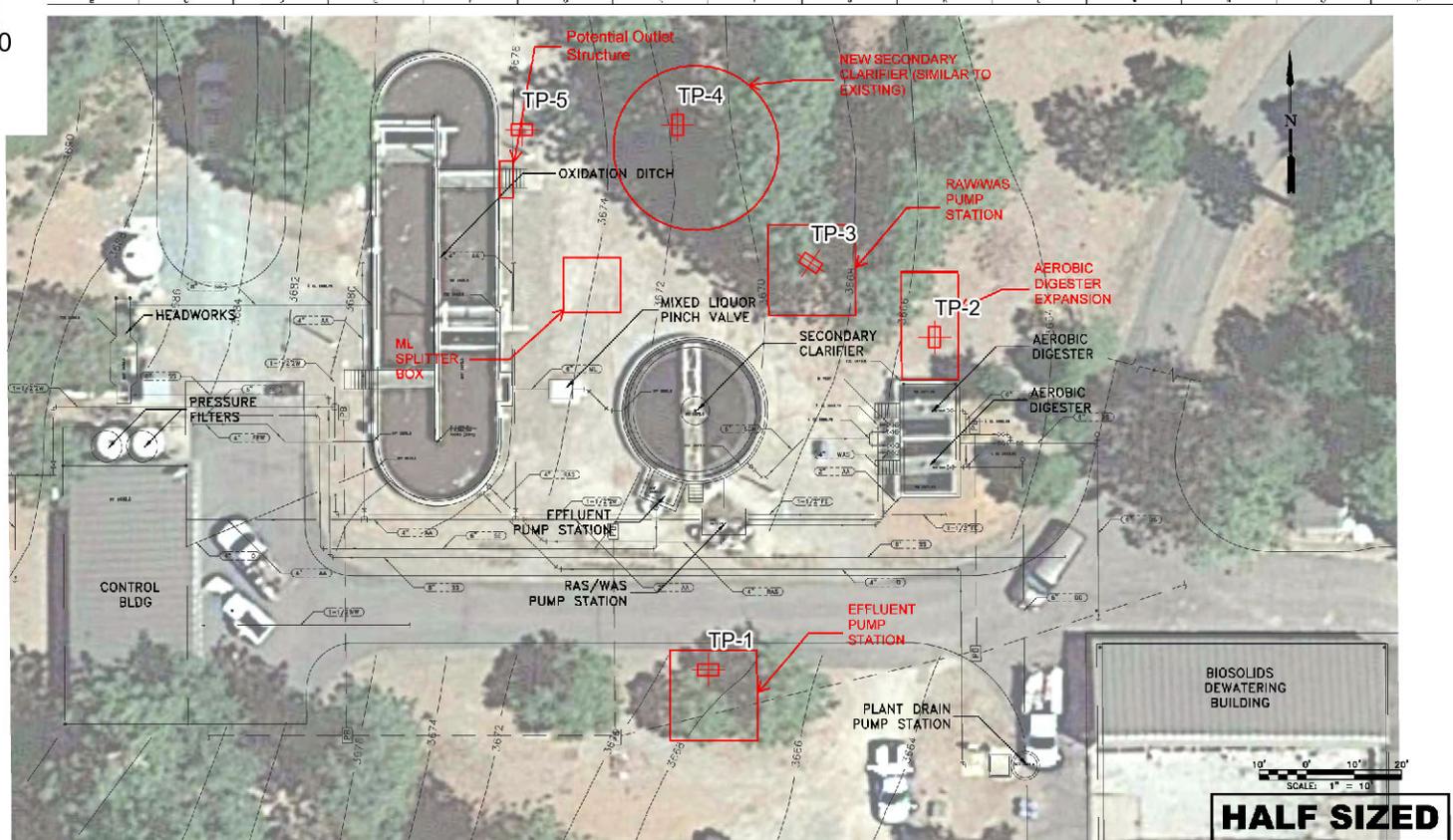
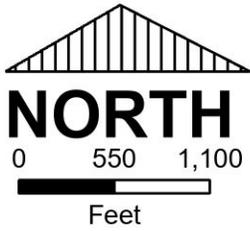
CONDOR EARTH
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(209) 532-0361
fax (209) 532-0773
www.condorearth.com

Job No.	8513
Date	04 Aug 2021
Scale	AS SHOWN
Drawn	JW
Chk'd	CB

**VICINITY MAP
CCWD ARNOLD WWTF
IMPROVEMENT PROJECT
ARNOLD, CALIFORNIA**

**FIGURE
1**

8513_GES.aprx



DESIGNED BY:	REVISION	DESCRIPTION	DATE	BY
J. GARDNER				
DRAWN BY:				
R. GODWIN				
CHECKED BY:				
DATE:				
12/2/20				
SCALE:				
1" = 100'-0"				
BAR LENGTH ONE INCH OR SCALED DRAWING				



**CALAVERAS COUNTY
WATER DISTRICT**

120 TOWN COURT
PLANT OFFICE BOX 606
SAN ANDREAS, CALIFORNIA 95249
PHONE (209) 751-3813

EXISTING FACILITY
SITE PLAN
PHASE 1 IMPROVEMENT PROJECT
ARNOLD WASTEWATER TREATMENT FACILITY

15095
PROJECT NUMBER C101
DRAWING NUMBER ---
SHEET NUMBER ---

Legend

Approximate Test Pit Locations

8513_GES.aprx

FIGURE

2

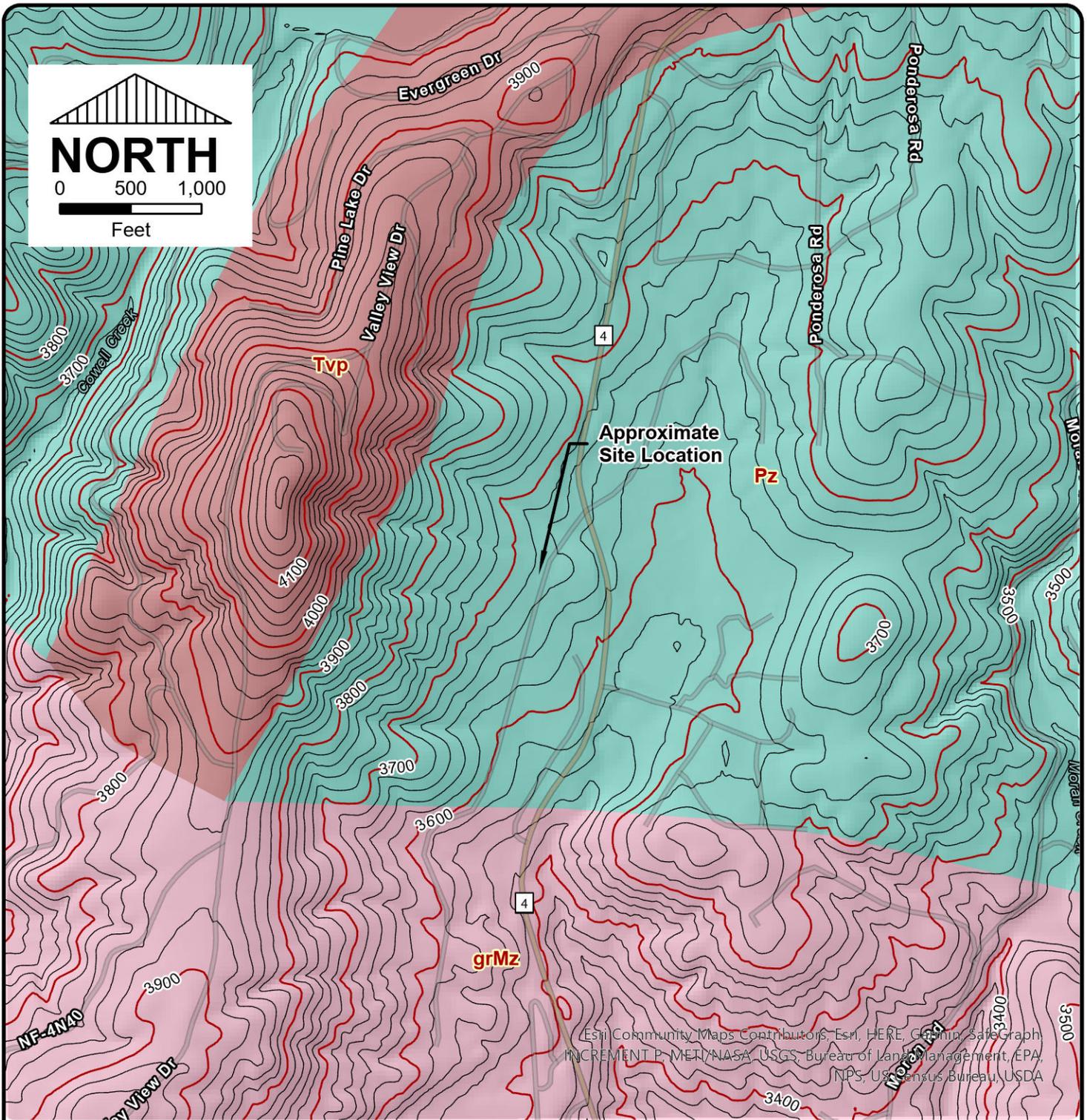


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Job No.	8513
Date	04 Aug 2021
Scale	AS SHOWN
Drawn	Chk'd
JW	CB

**SITE MAP WITH APPROXIMATE TEST PIT LOCATIONS
CCWD ARNOLD WWTF
IMPROVEMENT PROJECT
ARNOLD, CALIFORNIA**



LEGEND

- TVP: VOLCANIC ROCKS
- PZ: MARINE SEDIMENTARY AND METASEDIMENTARY ROCKS
- GRMZ: PLUTONIC ROCKS

Source:
California Geological Survey, C.W. Jennings, Carlos Gutierrez,
William Bryant, George Saucedo, Chris Wills, 1977



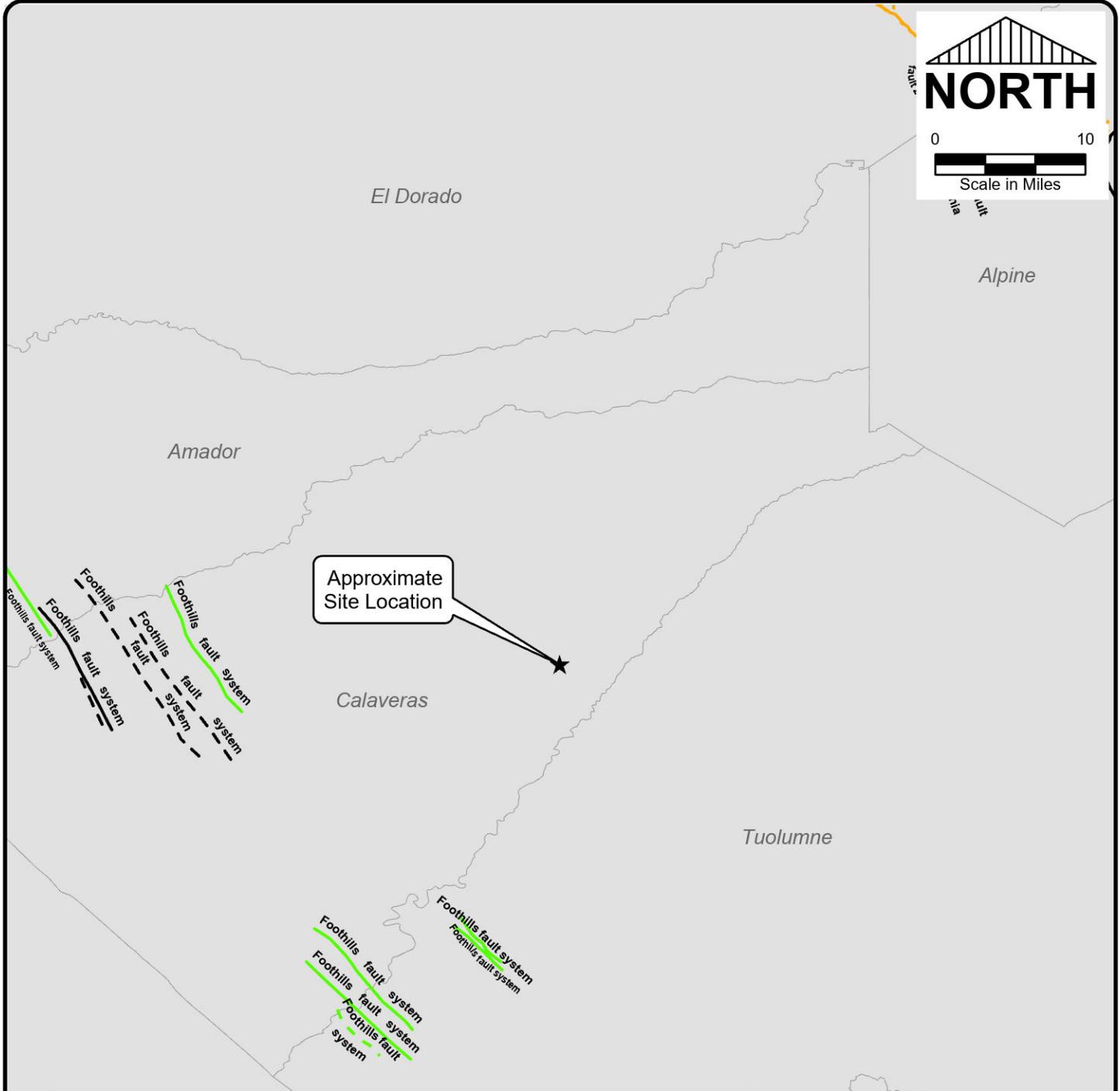
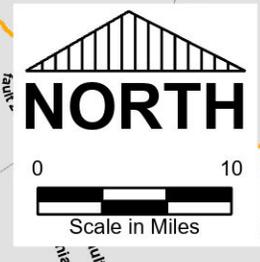
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Job No.	8513
Date	04 Aug 2021
Scale	AS SHOWN
Drawn	Chk'd
JW	CB

**GEOLOGIC MAP
CCWD ARNOLD WWTF
IMPROVEMENT PROJECT
ARNOLD, CALIFORNIA**

**FIGURE
3**

8513_GES.aprx



Legend

Fault Classification

- "Historical" (evidence of movement over the last 150 years)
- "Latest Quaternary" (evidence of movement over the last 150 to 15,000 years)
- "Late Quaternary" (evidence of movement over the last approximately 15,000 to 130,000 years)
- "Middle and Late Quaternary" (evidence of movement over the last approximately 130,000 to 750,000 years)
- "Undifferentiated Quaternary" (evidence of movement over the last 750,000 to 1.6 million years)
- Unspecified age
- Class B (various age)

US GEOLOGICAL SURVEY
 QUARTEARNARY FAULTS OF
 CALIFORNIA, 2017



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Date	04 Aug 2021
Scale	AS SHOWN
Drawn	Chk'd
JW	CB

**REGIONAL FAULT MAP
 CCWD ARNOLD WWTF
 IMPROVEMENT PROJECT
 ARNOLD, CALIFORNIA**

**FIGURE
 4**

8513_GES.aprx

APPENDIX B
Test Pit Logs



CONDOR EARTH

21663 Brian Lane, PO Box 3905, Sonora, CA 95370
188 Frank West Circle, Suite I, Stockton, CA 95206
1739 Ashby Road, Suite B, Merced, CA 95347

(209) 532-0361 FAX (209) 532-0773
(209) 234-0518 FAX (209) 234-0538
(209) 388-9601 FAX (209) 388-1778

• **Engineering** • **Geotechnical** • **Environmental** • **Mapping** •

TEST PIT LOG

Project No: 8513

Client: Hydrosience Engineers

Project Location: CCWD Arnold WWTF

Equipment: CAT 450E backhoe w/ 18-inch bucket

Test Pit Location: proposed effluent pump station

Test Pit No: TP – 1

Total Depth: 15 feet

Date Excavated: 7/29/2021

Elevation: 3,668 feet

Logged by: C. Borean



DEPTH	USCS	DESCRIPTION
0-3'	CL	Artificial Fill; Sandy Lean Clay with Gravel, trace cobbles, brown, stiff, dry to moist.
3-8'	CL	Sandy Lean Clay with Gravel and cobbles, reddish brown, stiff, moist.
8-15'	SM	Mehrten Formation; Highly weathered tuffaceous sandstone, massive, friable to weak, low hardness, excavates to Silty Sand with Gravel, light gray with reddish yellow mottles, moist.

Notes: No groundwater encountered. Bulk sample collected from 3-8 feet. Test pit backfilled with cuttings and loosely compacted.



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(209) 234-0518 FAX (209) 234-0538
(209) 388-9601 FAX (209) 388-1778

• **Engineering** • **Geotechnical** • **Environmental** • **Mapping** •

TEST PIT LOG

Project No: 8513
Client: Hydrosience Engineers
Project Location: CCWD Arnold WWTF
Equipment: CAT 450E backhoe w/ 18-inch bucket
Test Pit Location: proposed aerobic digester expansion

Test Pit No: TP – 2
Total Depth: 7.5 feet
Date Excavated: 7/29/2021
Elevation: 3,665 feet
Logged by: C. Borean



DEPTH	USCS	DESCRIPTION
0-2.5'	CL	Artificial Fill. Sandy Lean Clay with Gravel, light reddish brown, soft to firm, dry, thins to the north.
2.5-7.5'	CL	Sandy Lean Clay with Gravel and Cobbles, reddish brown, stiff, moist.

Notes: No groundwater encountered. Bulk sample collected from 2.5-7.5 feet. Test pit backfilled with cuttings and loosely compacted.



CONDOR EARTH

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• **Engineering** • **Geotechnical** • **Environmental** • **Mapping** •

TEST PIT LOG

Project No: 8513

Client: Hydrosience Engineers

Project Location: CCWD Arnold WWTF

Equipment: CAT 450E backhoe w/ 18-inch bucket

Test Pit Location: proposed RAW/WAS Pump Station

Test Pit No: TP – 3

Total Depth: 13 feet

Date Excavated: 7/29/2021

Elevation: 3,669 feet

Logged by: C. Borean



DEPTH	USCS	DESCRIPTION
0-3'	GC	Artificial Fill, Clayey Course Gravel with Cobbles, brown, loose, dry, some caving.
3-9'	CL	Sandy Lean Clay with Gravel, reddish brown, stiff, moist.
9-13'	SM	Mehrten Formation; Highly weathered tuffaceous sandstone, massive, friable to weak, low hardness, excavates to Silty Sand with Gravel, light gray with reddish yellow mottles, moist.

Notes: No groundwater encountered. Test pit backfilled with cuttings and loosely compacted.



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(209) 388-9601 FAX (209) 388-1778

• **Engineering** • **Geotechnical** • **Environmental** • **Mapping** •

TEST PIT LOG

Project No: 8513

Client: Hydrosience Engineers

Project Location: CCWD Arnold WWTF

Equipment: CAT 450E backhoe w/ 18-inch bucket

Test Pit Location: proposed new secondary clarifier

Test Pit No: TP – 4

Total Depth: 14.5 feet

Date Excavated: 7/29/2021

Elevation: 3,671 feet

Logged by: C. Borean



DEPTH	USCS	DESCRIPTION
0-6'	CL	Sandy Lean Clay with Gravel and Cobbles, dark reddish-brown firm to very stiff, dry to moist.
6-7.5'	SM	Mehrten Formation; Highly weathered tuffaceous sandstone, massive, friable to weak, low hardness, excavates to Silty Sand with Gravel, light gray with reddish yellow mottles, moist.

Notes: No groundwater encountered. Test pit backfilled with cuttings and loosely compacted.



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(209) 234-0518 FAX (209) 234-0538
(209) 388-9601 FAX (209) 388-1778

• **Engineering** • **Geotechnical** • **Environmental** • **Mapping** •

TEST PIT LOG

Project No: 8513

Client: Hydrosience Engineers

Project Location: CCWD Arnold WWTF

Equipment: CAT 450E backhoe w/ 18-inch bucket

Test Pit Location: potential outlet structure

Test Pit No: TP – 5

Total Depth: 3 feet

Date Excavated: 7/29/2021

Elevation: 3,676 feet

Logged by: C. Borean



DEPTH	USCS	DESCRIPTION
0-3'	CL	Sandy Lean Clay, red, moist, hard (PP >4.5 TSF).

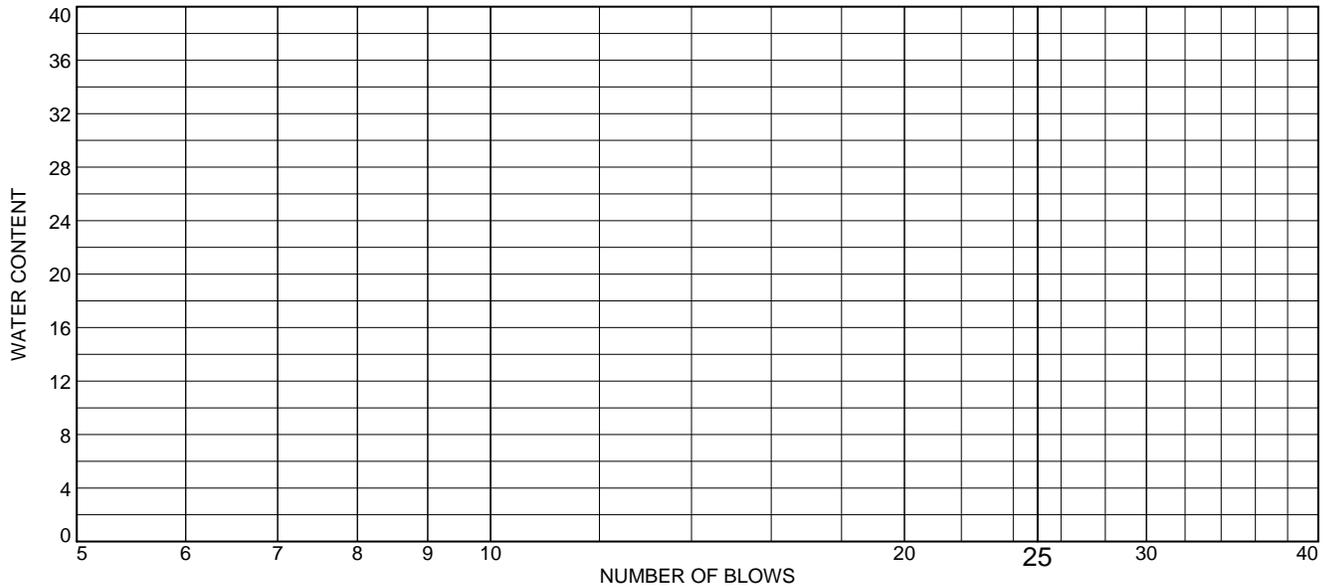
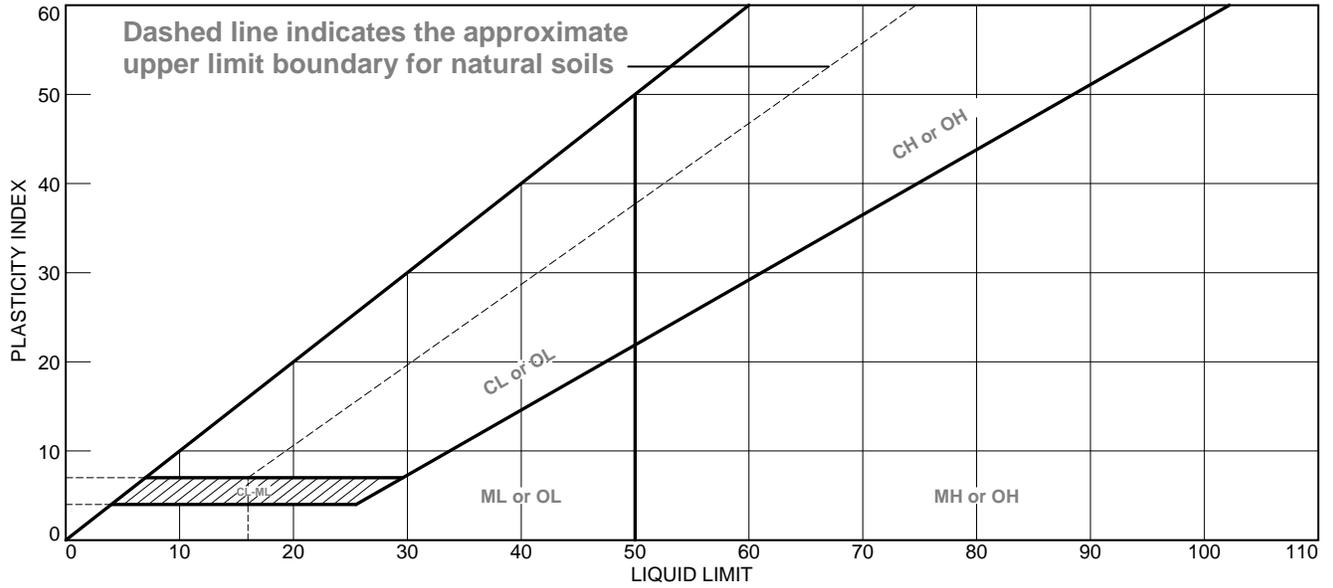
Notes: No groundwater encountered. Test pit backfilled with cuttings and loosely compacted.



APPENDIX C
Laboratory Test Results



LIQUID AND PLASTIC LIMITS TEST REPORT

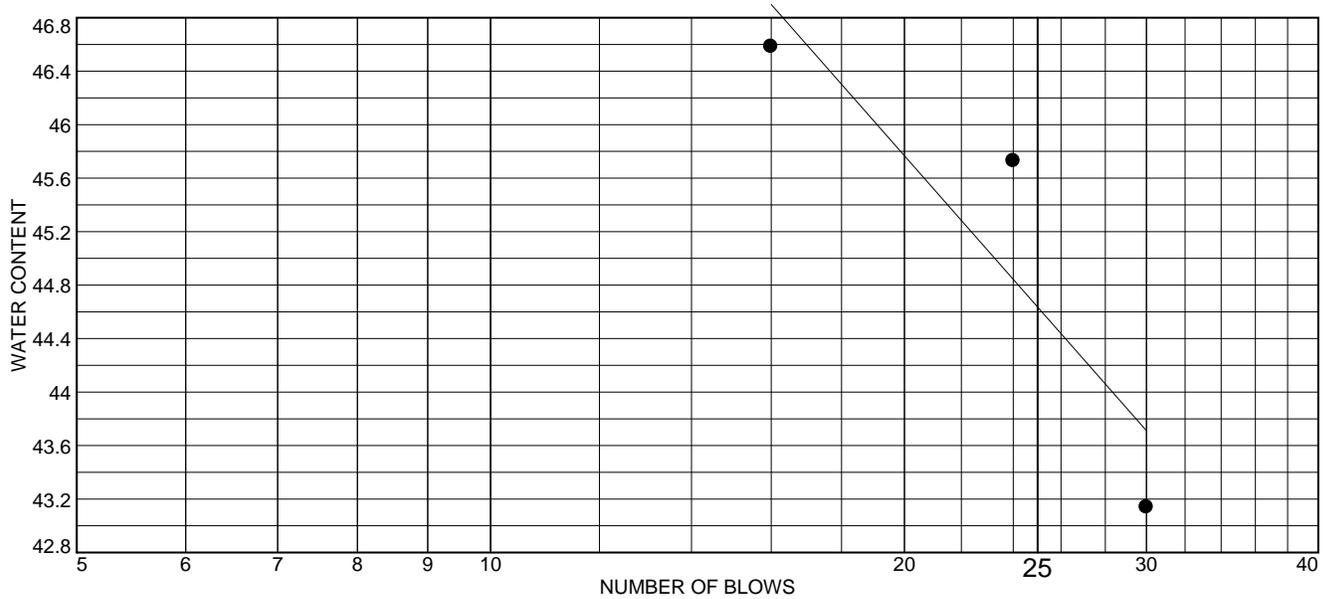
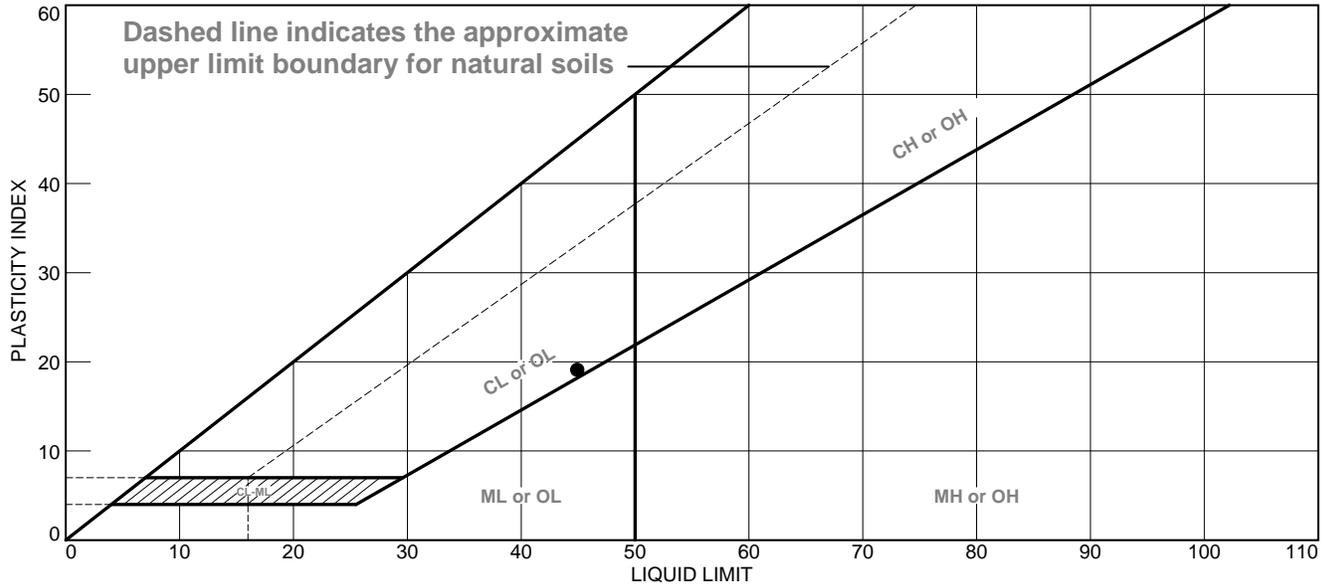


MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
● Mottled Yellowish Orange Light Gray Silty Sand with Gravel		NP		34.8	21.5	

Project No. 8513 Client: Calaveras County Water District Project: Arnold WWTP Improvement Project Location: TP-1 Sample Number: PI-1 (SA-1) Depth: 8'-15' <div style="text-align: center;">CONDOR EARTH TECHNOLOGIES INC.</div> <div style="text-align: center;">Stockton, California</div>	Remarks: ● 8/5/2021 <div style="text-align: right;">Figure</div>
--	--

Tested By: E. Carrasco **Checked By:** R. Skaggs

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light Brown Sandy Lean Clay	45	26	19	77.7	53.8	CL

Project No. 8513 Client: Calaveras County Water District Project: Arnold WWTP Improvement Project Location: TP-2 Sample Number: PI-2 (SA-2) Depth: 2.5'-7.5' CONDOR EARTH TECHNOLOGIES INC. Stockton, California	Remarks: ●8/5/2021
---	------------------------------

Tested By: E. Carrasco **Checked By:** R. Skaggs

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	28.6	19.5	17.1	13.3	21.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	99.2		
3/8"	95.8		
#4	71.4		
#8	54.5		
#16	45.1		
#30	37.9		
#50	31.8		
#100	26.1		
#200	21.5		

Material Description

Mottled Yellowish Orange Light Gray Silty Sand with Gravel

Atterberg Limits

PL= NP LL= PI=

Coefficients

D₉₀= 7.7491 D₈₅= 6.7570 D₆₀= 3.1563
D₅₀= 1.7507 D₃₀= 0.2424 D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

F.M.=3.37

* (no specification provided)

Location: TP-1 Sample Number: SA-1 (PI-1) Depth: 8'-15' Date: 8/5/2021

CONDOR EARTH TECHNOLOGIES, INC. Stockton, California	Client: Calaveras County Water District Project: Arnold WWTP Improvement Project Project No: 8513
Figure	

Tested By: E. Carrasco Checked By: R. Skaggs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	8.6	3.3	10.4	23.9	53.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	97.0		
3/8"	94.8		
#4	91.4		
#8	88.9		
#16	85.1		
#30	80.5		
#50	73.8		
#100	63.0		
#200	53.8		

Material Description

Light Brown Sandy Lean Clay

Atterberg Limits

PL= 26 LL= 45 PI= 19

Coefficients

D₉₀= 3.1480 D₈₅= 1.1625 D₆₀= 0.1220
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(8)

Remarks

F.M.=1.22

* (no specification provided)

Location: TP-2 Sample Number: SA-2 (PI-2) Depth: 2.5'-7.5' Date: 8/5/2021

CONDOR EARTH TECHNOLOGIES, INC. Stockton, California	Client: Calaveras County Water District Project: Arnold WWTP Improvement Project Project No: 8513
Figure	

Tested By: E. Carrasco Checked By: R. Skaggs



1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

11 August, 2021

Job No. 2108005
Cust. No. 12016

Mr. Chad Borean
Condor Earth Technologies, Inc.
P.O. Box 3905
Sonora, CA 95370

Subject: Project No.: 8513
Project Name: Arnold WWTF Improvement Project
Corrosivity Analysis – ASTM Test Methods

Dear Mr. Borean:

Pursuant to your request, CERCO Analytical has analyzed the soil sample submitted on August 05, 2021. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurement, this sample is classified as “mildly corrosive”. All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentration reflects none detected with a reporting limit of 15 mg/kg.

The sulfate ion concentration reflects none detected with a reporting limit of 15 mg/kg.

The pH of the soil is 7.08 which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potential is 400-mV and is indicative of potentially “slightly corrosive” soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc.* at (925) 927-6630.

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

Shrew Moore
for J. Darby Howard, Jr., P.E.
/ President

JDH/jdl
Enclosure



1100 Willow Pass Court, Suite A
 Concord, CA 94520-1006
 925 462 2771 Fax. 925 462 2775
 www.cercoanalytical.com

Client: Condor Earth Technologies, Inc.
 Client's Project No.: 8513
 Client's Project Name: Arnold WWTF Improvement Project
 Date Sampled: 29-Jul-21
 Date Received: 5-Aug-21
 Matrix: Soil
 Authorization: Signed Chain of Custody

Date of Report: 11-Aug-2021

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
2108005-001	TP-2, 2.5'-7.5'	400	7.08	-	11,000	-	N.D.	N.D.

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	9-Aug-2021	9-Aug-2021	-	10-Aug-2021	-	9-Aug-2021	9-Aug-2021

* Results Reported on "As Received" Basis
 N.D. - None Detected

Cheryl McMillen
 Cheryl McMillen
 Laboratory Director

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

Chain of Custody



Job No. 2108005	CU# 12016	Client Project I.D. 8513	Schedule Analyte	Date Sampled	Date Due
---------------------------	---------------------	-----------------------------	---------------------	--------------	----------

Full Name
Chad Borean

Phone 209-601-1430 X
Fax

Company and/or Mailing Address
Condor Earth, 21663 Brian Lane, Sonoma, CA 95370

Sample Source
Arnold WWTF Improvement Project

Lab No.	Sample I.D.	Date	Time	Matrix	Contain.	Size	Preserv.	Qty.	ANALYSIS					ASTM							
									Redox Potential	pH	Sulfate	Chloride	Resistivity-100% Saturated	Brief Evaluation							
	TP-2, 2.5'-7.5'	7/29/21		s				1	X	X	X	X	X		X						

MATRIX	DW - Drinking Water	ABBREVIATIONS	HB - Hosebib	SAMPLE RECEIPT	Total No. of Containers	<input type="text"/>
	GW - Ground Water		PV - Petcock Valve		Rec'd Good Cond/Cold	<input type="text"/>
	SW - Surface Water		PH - Pump House		Conforms to Record	<input type="text"/>
	WW - Waste Water		RR - Restroom		Temp. at Lab -°C	<input type="text"/>
Water	GL - Glass	Sampler	<input type="text"/>			
SL - Sludge	PL - Plastic					
S - Soil	ST - Sterile					
Product						

Relinquished By: Chad Borean	Date: 8/3/2021	Time: 0840
Received By: <i>Sherril Moore</i>	Date: 8/5/21	Time: 1000
Relinquished By:	Date:	Time:
Received By:	Date:	Time:
Relinquished By:	Date:	Time:
Received By:	Date:	Time:

Comments:
THERE IS AN ADDITIONAL CHARGE FOR EXTRUDING SOIL FROM METAL TUBES

Email Address: cborean@condorearth.com

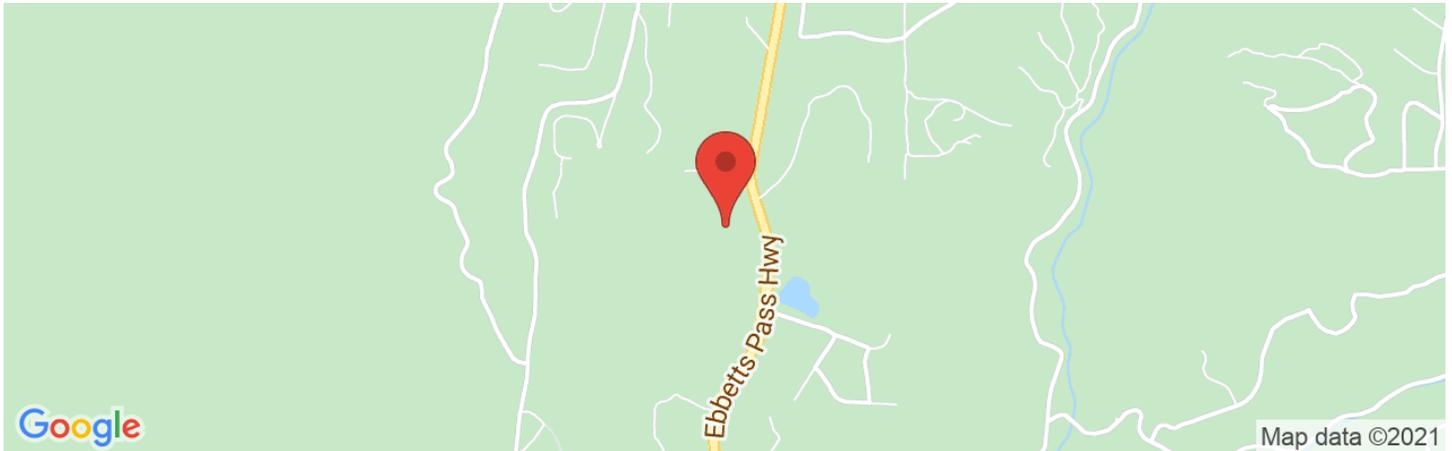
APPENDIX D
U.S. Seismic Design Maps





Arnold WWTF Improvement Project

Latitude, Longitude: 38.22362, -120.37064



Date	8/18/2021, 2:54:17 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	0.39	MCE_R ground motion. (for 0.2 second period)
S_1	0.186	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.58	Site-modified spectral acceleration value
S_{M1}	0.415	Site-modified spectral acceleration value
S_{DS}	0.387	Numeric seismic design value at 0.2 second SA
S_{D1}	0.277	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1.488	Site amplification factor at 0.2 second
F_v	2.227	Site amplification factor at 1.0 second
PGA	0.165	MCE_G peak ground acceleration
F_{PGA}	1.47	Site amplification factor at PGA
PGA_M	0.242	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
$SsRT$	0.39	Probabilistic risk-targeted ground motion. (0.2 second)
$SsUH$	0.41	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
$S1RT$	0.186	Probabilistic risk-targeted ground motion. (1.0 second)
$S1UH$	0.195	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
$S1D$	0.6	Factored deterministic acceleration value. (1.0 second)
$PGAd$	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.952	Mapped value of the risk coefficient at short periods
C_{R1}	0.957	Mapped value of the risk coefficient at a period of 1 s

DISCLAIMER

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