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BSK Project G19-168-11F

June 19, 2020

City of Corcoran
c/o Mr. Terry Schroepher
W3i Engineering
832 Whitley Avenue
Corcoran, CA 93212

SUBJECT: Geotechnical Investigation Letter Report
Aerated Pond Evaluation – Modifications
City of Corcoran WWTF
Corcoran, California 93212

Dear Mr. Schroepher:

This report presents the results of the geotechnical investigation conducted by BSK Associates (BSK), at the City of Corcoran Wastewater Treatment Facility (WWTF) in Corcoran, California on the Site Vicinity Map, Figure 1. The geotechnical engineering investigation was conducted in general accordance with the scope of services outlined in BSK Proposal GF20-20221, dated May 29, 2020. The proposed improvements and exploratory borings are shown on Figure 2, Site Plan.

Purpose and Scope of Services

The purpose of the geotechnical investigation is to assess soil conditions at the project site and provide geotechnical engineering recommendations for use by the project designers. The scope of the investigation included a field exploration, field testing, laboratory testing, engineering analysis, and preparation of this report.

PROJECT DESCRIPTION

A previous geotechnical engineering investigation was performed at the site (BSK Project G19-168-11F, dated September 10, 2019). BSK understands that the project now includes constructing a dividing embankment across the interior of the west pond. The original design did not include this and therefore the referenced report did not specifically address it. In addition, a concrete pad is proposed for a small single-story metal frame building, housing blower equipment. The embankment will be constructed with soil obtained from within the ponds and from a borrow area in a field west of the site. It is anticipated excavation in the borrow area would not exceed 3 to 4 feet, for approximately 9,000 cubic yards of fill.

In the event that significant changes occur in the design or location of the proposed improvements, this report's conclusions and recommendations will not be considered valid unless the changes are reviewed with BSK and the conclusions and recommendations are modified or verified in writing.

FIELD EXPLORATION AND LABORATORY TESTING

Field Exploration

The field exploration for this investigation was conducted under the oversight of a BSK geotechnical engineer on June 4, 2020. Four (4) borings were drilled to depths of 2 to 4 feet bgs with hand auger equipment. The approximate boring locations are presented on Figure 2. Details of the field exploration and the boring logs are provided in Appendix A.

Laboratory Testing

Laboratory testing of selected soil samples were performed to evaluate certain physical, chemical, and engineering characteristics and properties. The testing program included: in-situ moisture and density; gradation, collapse potential, shear strength, and corrosion potential.

The in-situ moisture and dry density test results are presented on the boring log in Appendix A. Descriptions of the laboratory test methods and test results are provided in Appendix B.

SITE CONDITIONS

The following sections address the site descriptions and surface conditions, subsurface conditions, and groundwater conditions at the Site. This information is based on BSK's field exploration and published maps and reports.

Site Description and Surface Conditions

At the time of the field investigation, the west aeration pond was dry and approximately 14 feet deep and surrounded by levees. The levee roads contained gravel. The eastern levee road appeared to be chip sealed with asphalt. The chip seal extended down along the slope approximately 10 to 13 feet. The pond side slopes appear to have soil cement along the upper portion of slopes approximately 18 to 22 feet. The area containing shotcrete had minimal scattered seasonal weeds. The side slopes lower than the shotcreted zones had moderate growth of seasonal weeds and animal burrows. The pond bottom appeared to be recently graded or disced and contained minimal scattered seasonal weeds. The existing pond was bound to the north and west by open fields, and to the east and south by existing wastewater treatment ponds.

The surface condition at the additional borings was silty sand with gravel at HA-6, seasonal weeds and grass at HA-7 and HA-8, and sluffed dead grass and soil at HA-9. The project site was bounded by crops, and access roads. The site is located in the southeast quarter of the southwest quarter of Section 25, Township 21 South, Range 22 East of the Mount Diablo Meridian. WGS84 GPS coordinates for the center of the site are 36.0683 degrees North latitude and 119.5465 degrees West longitude.

Subsurface Conditions

Based on our soil boring data the site generally consisted of silty sand in the upper 2.75 feet bgs underlain by sandy silt and clay with sand to the maximum explored depth of 2 to 4 feet bgs.

The boring logs in Appendix A provide a more detailed description of the materials encountered, including the applicable Unified Soil Classification System symbols.

Groundwater Conditions

Groundwater was not encountered within the borings. The California Department of Water Resources indicates the historical depth to groundwater is approximately 20 to 150 bgs in the vicinity of the site. However, fluctuations in the groundwater level or the presence of perched groundwater may occur due to variations in rainfall, irrigation, seasonal factors, pumping from wells and other factors that were not evident at the time of our investigation. Groundwater is not anticipated to affect design or construction of the proposed improvements.

CONCLUSIONS

Soil Corrosivity

Based on test results, on-site near-surface soils have low soluble sulfate and soluble chloride contents, a moderately low minimum resistivity, and are alkaline. Thus, on-site soils are considered to have a low corrosion potential with respect to buried concrete and a moderate corrosion potential to unprotected metal conduits.

It is recommended that Type I/Type II cement be used in the formulation of concrete and that buried reinforcing steel protection be provided with the minimum concrete cover required by the American Concrete Institute (ACI) Building Code for Structural Concrete, ACI 318-14, Chapter 20.7. Buried metal conduits must have protective coatings in accordance with the manufacturer's specifications. If detailed recommendations for corrosion protection are desired, a corrosion specialist should be consulted.

Site Preparation and Earthwork Construction

The following procedures must be implemented during site preparation for the proposed improvements. It should be noted that references to maximum dry density, optimum moisture content, and relative compaction are based on ASTM D1557 (latest test revision) laboratory test procedures.

1. Prior to any site grading, all miscellaneous surface obstructions must be removed from the improvement area. Near surface soils containing vegetation, roots, organics, or other

objectionable material must be stripped to a depth of at least 3-inches to expose a clean soil surface. Surface strippings must not be incorporated into engineered fill unless the organic content is less than 3 percent by weight (ASTM D2974).

2. Within the area of the planned improvements, remove existing underground utilities and debris to expose a clean soil surface free of deleterious material.

   Existing utilities or irrigation pipes must be removed to a point at least 5-feet horizontally outside the proposed building area. Resultant cavities must be backfilled with engineered fill.

3. Soil disturbed as a result of demolition, undocumented fill, debris, and abandoned underground structures must be excavated to expose undisturbed native soil.

4. Following the required stripping, and/or removal of underground structures, the exposed soil surface in proposed at-grade improvement areas must be over-excavated uniformly to a depth of 12 inches below existing site grade or 12 inches below the bottom of the proposed foundation, whichever is deeper. The over-excavation must extend at least 5 feet laterally beyond the outside edge of the proposed foundation or areas to receive fill, whichever distance is greater. The exposed subgrade must be proof-rolled under the observation of a BSK field representative to detect soft or pliant areas. Soft or pliant areas must be over-excavated to firm native soil. The exposed surface must be scarified at minimum of 8 inches, uniformly moisture conditioned to 2 percent above optimum moisture, and compacted to 90 percent relative compaction.

5. Imported soil or native, non-expansive (EI < 20), excavated soils within the upper 3 feet of the proposed borrow site (west of the existing ponds), free of organic materials or deleterious substances, may be placed as compacted engineered fill in areas of at-grade structures. Engineered fill must be placed in uniform layers not exceeding 8-inches in loose thickness, moisture-conditioned to within 2 percent of optimum moisture content and compacted to at least 90 percent of the maximum dry density. Acceptance of engineered fill placement must be based on both moisture content at time of compaction and relative compaction. Where fill is placed on natural slopes that are steeper than 3H:1V, horizontal benches at least 4 feet wide and minimum height of 2 feet should be cut into the face of natural slopes prior to placing the fill. In addition, fill slopes should be no steeper than 2H:1V and measures should be taken to protect them from erosion.

6. Imported fill materials must be free of deleterious substances and have less than 3 percent organic content by weight. The project specifications must require the contractor to contact BSK for review of the proposed import fill materials for conformance with these recommendations at least two weeks prior to importing to the site, whether from on-site or off-site borrow areas. Imported fill soils must be non-hazardous and be derived from a single, consistent soil type source conforming to the following criteria:

Maximum Particle Size:	3-inches
Percent Passing #4 Sieve:	65 – 100
Percent Passing #200 Sieve:	20 – 45
Plasticity Index:	less than 12

Expansion Index:	< 20
Low Corrosion Potential:	
Soluble Sulfates:	< 1,500 mg/kg
Soluble Chlorides:	< 300 mg/kg
Soil Resistivity:	> 3,000 ohm-cm

Grading operations must be scheduled as to avoid working during periods of inclement weather. Should these operations be performed during or shortly following periods of inclement weather, unstable soil conditions may result in the soils exhibiting a "pumping" condition. This condition is caused by excess moisture, in combination with compaction, resulting in saturation and near zero air voids in the soils. If this condition occurs, the affected soils must be over-excavated to the depth at which stable soils are encountered and replaced with suitable soils compacted as engineered fill. Alternatively, the Contractor may proceed with grading operations after utilizing a method to stabilize the soil subgrade, which must be subject to review by BSK prior to implementation.

Foundation Recommendations

Provided the recommendations contained in this and the referenced report are implemented during design and construction, it is our opinion that the proposed structures can be supported on shallow foundations. A structural engineer must evaluate reinforcement and embedment depth based on the requirements for the structural loadings.

Shallow Foundations

The proposed at-grade structures may be supported on reinforced concrete spread footings bearing on engineered fill. Footing design must follow the criteria listed below:

The allowable bearing pressure applies to the dead load plus live load (DL + LL) condition. Footing design must follow the criteria listed below:

Allowable Bearing Pressure				
Footing Embedment(2) (inches)	Minimum Footing Width (inches)		Allowable Bearing Capacity(1) (psf)	
	Continuous Footing	Isolated Spread Footing	Continuous Footing	Isolated Spread Footing
12	12	24	2,200	2,500

Note (1) – The bearing pressure can be increased one-third for transient loading such as wind or seismic.
(2) – Measure with respect to the lowest adjacent subgrade surface.

The estimated total and differential settlement for the recommended spread footings is shown below:

Anticipated Post-Construction Settlement			
Footing Type	Post-Construction Settlement (inches)	Differential Settlement (inches)	Angular Distortion
Continuous	1.0	--	0.025
Isolated	1.0	0.5	--

Isolated footing differential settlement is based on adjacent similarly loaded footings spaced at 30-feet. The settlement values given above are applicable to the maximum loading conditions. For loads, other than the design maximum loads, the settlements can be decreased proportionally.

Lateral Earth Pressures and Frictional Resistance

Lateral loads applied against foundations may be resisted by a combination of passive resistance against the vertical faces of the foundations and friction between the foundation bottom and the supporting subgrade. An unfactored coefficient of friction of 0.67 may be used between soil subgrade and the foundation bottom. The unfactored passive pressure is presented in the table below. The coefficient of friction and passive earth pressure values given above represent ultimate soil strength values. BSK recommends that a safety factor consistent with the design conditions be included in their usage. For resistance against lateral sliding that is countered solely by the passive earth pressure against footings or friction along the bottom of footings, a minimum safety factor of 1.5 is recommended. For stability against lateral sliding that is resisted by combined passive pressure and frictional resistance, a minimum safety factor of 2.0 is recommended. For lateral resistance against seismic loading conditions, a minimum safety factor of 1.2 is recommended. We based these lateral resistance values on the assumption that the concrete for the foundations is either placed directly against undisturbed soils or that the voids created from the use of forms are backfilled with engineered fill or other approved materials, such as lean concrete. Passive resistance in the upper foot of soil cover below finished grades should be neglected unless the ground surface is confined by concrete slabs, pavements, or other such positive protection.

The following earth pressure parameters may be used for designing earth retaining structures and foundations.

Lateral Earth Pressures	
Lateral Pressure Conditions	Equivalent Fluid Pressure (pcf)
Active Pressure	30
At-Rest Pressure	50
Passive Pressure	350

Parameters are shown in the above table for drained conditions of select engineered fill or prepared native soil. In addition, the drained condition assumes that positive drainage will be provided away from the structure improvements and that water does not accumulate around the structure and cause a build-up of hydrostatic pressure.

Concrete Slabs-on-Grade

Non-structural concrete slab-on-grade must be a minimum of 4-inches thick and must be supported on a compacted subgrade prepared in accordance with the "Site Preparation and Earthwork Construction" section of this report. Existing onsite surface soils are considered to have a low expansion potential for design purposes. In order to regulate cracking of the slabs, construction joints and/or saw-cut control joints must be provided in each direction at a maximum spacing of 10 feet on centers along with steel reinforcement as recommended by the project's Structural Engineer. Control joints must have a minimum depth of one-quarter of the slab thickness. It is recommended that steel reinforcement used in concrete slabs-on-grade consist of steel rebar.

Interior concrete slabs must be successively underlain by: 1-½ inches of washed concrete sand; a durable vapor retarder; and a smooth, compacted subgrade surface. The vapor retarder must meet the requirements of ASTM: E1745 Class A and have a water vapor transmission rate (WVTR) of less than or equal to 0.012 Perms as tested by ASTM: E96. Examples of acceptable vapor retarder products include: Stego Wrap (15-mil) Vapor Barrier by STEGO INDUSTRIES LLC; W.R. Meadows Premoulded Membrane with Plasmatic Core; and Zero-Perm by Alumiseal. Because of the importance of the vapor barrier, joints must be carefully spliced and taped.

If migration of subgrade moisture through the slab is not a concern, then the vapor retarder and overlying sand may be omitted. The slab subgrade must be kept in a moist condition until the vapor retarder or concrete slab is placed. BSK's representative must be called to the site to review soil and moisture conditions immediately prior to placing the vapor barrier or concrete slab.

As indicated in the PCA Engineering Bulletin 119, Concrete Floors and Moisture, and applicable ACI Committee reports (see ACI 360R-06, Design of Slabs-on-Ground, dated October 2006 and ACI 302.1R-04, Guide for Concrete Floor and Slab Construction, dated June 2004), the sand layer between the vapor retarder and concrete floor slab may be omitted. The advantage of this option is that it can reduce the amount of moisture that can be transmitted through the slab (especially if the sand layer becomes moist or wet prior to placing the concrete); however, the risk of slab "curling" is much greater. The "curling" may result from a sharp contrast in moisture-drying conditions between the exposed slab surface and the surface in contact with the membrane. As recommended in the referenced ACI Committee reports, measures must be taken to reduce the risk of "curling" such as reducing the joint spacing, using a low shrinkage mix design, and reinforcing the concrete slab. In order to regulate cracking of the slab, we recommend that full depth construction joints and control joints be provided in each direction with slab thickness and steel reinforcing recommended by the structural engineer.

Excessive landscape water or leaking utility lines could create elevated moisture conditions under concrete slabs, which could result in adverse moisture or mildew conditions in floor slabs or walls. Accordingly, care must be taken to avoid excess irrigation around the structures, as well as to periodically monitor for leaking utility lines. Likewise, positive surface drainage must be provided around the perimeter of the structures as discussed in the "Surface Drainage Control" section.

The adverse effects of moisture vapor transmission on flooring materials can be substantially reduced by the use of a low porosity concrete. This can be achieved by specifying a low water-cement ratio (0.45 or less by weight) a minimum compressive strength of 4,000 psi at 28 days, and a minimum of 7 days wet-curing.

Surface Drainage Control

Final grading around site improvements must provide for positive and enduring drainage. Ponding of water must not be allowed on or near the building or paved surfaces. Saturation of the soils immediately adjacent to or below the building area must not be allowed. Irrigation water must be applied in amounts not exceeding those required to offset evaporation, sustain plant life, and maintain a relatively uniform moisture profile around and below, site improvements.

LIMITATIONS

The analyses and recommendations submitted in this report are based upon the data obtained from the Borings performed at the locations shown on the Boring Location Map, Figure 2. The report does not reflect variations which may occur between or beyond the Borings. The nature and extent of such variations may not become evident until construction is initiated. If variations then appear, a re-evaluation of the recommendations of this report will be necessary after performing on-Site observations during the excavation period and noting the characteristics of the variations.

The validity of the recommendations contained in this report is also dependent upon an adequate testing and observation program during the construction phase. BSK assumes no responsibility for construction compliance with the design concepts or recommendations unless it has been retained to perform the testing and observation services during construction as described above.

The findings of this report are valid as of the present. However, changes in the conditions of the Site can occur with the passage of time, whether caused by natural processes or the work of man, on this property or adjacent property. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation, governmental policy or the broadening of knowledge.

BSK has prepared this report for the exclusive use of the Client and members of the project design team. The report has been prepared in accordance with generally accepted geotechnical engineering practices which existed in Kings County at the time the report was written. No other warranties either expressed or implied are made as to the professional advice provided under the terms of BSK's agreement with Client and included in this report.

CLOSING

BSK appreciates the opportunity to be of service to you on this project. If you have any questions, or would like additional information, please call us at (559) 497-2880.

Respectfully submitted,
BSK ASSOCIATES

Corinne Goodwin, PE
Project Engineer

On Man Lau, PE, GE
South Valley Regional Manager

Distribution: Mr. Terry Schroepfer, W3i Engineering (pdf)
Mr. Joe Faulkner, City of Corcoran (joe.faulkner@cityofcorcoran.com)

Attachments:

Figures

Figure 1: Site Vicinity Map
Figure 2: Boring Location Map

Appendix A: Field Exploration

Figure A-1: Soil Classification Chart and Log Key
Boring Logs: Borings HA-6 through HA-9

Appendix B: Laboratory Testing

Table B-1: Summary of Corrosion Test Results
Table B-2: Summary of Minus #200 Wash Test Results
Figure B-1: Direct Shear Test
Figure B-2: Collapse Potential Test

FIGURES

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REFERENCE IMAGE: Google Earth

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SITE VICINITY MAP

Proposed City of Corcoran WWTF
West Aerated Pond
Plymonth Avenue and King Avenue
Corcoran, California

FIGURE 1

JOB NO. G19-168-11F
DATE September 6, 2019
DR. BY TG
CH. BY NP
SCALE AS SHOWN
SHEET NO. 1
OF 1 SHEETS

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LEGEND:
- B-4 APPROXIMATE BORING LOCATIONS
- HA-5 APPROXIMATE HAND AUGER LOCATIONS
- HA-9 APPROXIMATE NEW HAND AUGER LOCATIONS

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BORING LOCATION MAP

Proposed City of Corcoran WWTF
West Aerated Pond
Plymonth Avenue and King Avenue
Corcoran, California

FIGURE 2

JOB NO.	G19-168-11F
DATE	June 15, 2020
DR. BY	TG
CH. BY	NP
SCALE AS SHOWN	
SHEET NO.	1
OF	1 SHEETS

APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

The field exploration for this investigation was conducted under the oversight of a BSK geotechnical engineer on June 4, 2020. Four (4) borings were drilled to depths of 2 to 4 feet bgs with hand auger equipment.

The soil materials encountered in the test borings were visually classified in the field, and the logs were recorded during the drilling and sampling operations. Visual classification of the materials encountered in the test borings was made in general accordance with the Unified Soil Classification System (ASTM D 2488). A soil classification chart is presented herein. Boring logs are presented herein and should be consulted for more details concerning subsurface conditions. Stratification lines were approximated by the field staff based on observations made at the time of drilling, while the actual boundaries between soil types may be gradual and soil conditions may vary at other locations.

Subsurface samples were obtained at the successive depths shown on the boring logs by driving samplers which consisted of a 2.5-inch inside diameter (I.D.) California Sampler and a 1.4-inch I.D. Standard Penetration Test (SPT) Sampler. The samplers were driven 18 inches using a 140-pound hammer dropped from a height of 30 inches by means of either an automatic hammer or a down-hole safety hammer. The number of blows required to drive the last 12 inches was recorded as the blow count (blows/foot) on the boring logs. The relatively undisturbed soil core samples were capped at both ends to preserve the samples at their natural moisture content. Soil samples were also obtained using the SPT Sampler lined with metal tubes or unlined in which case the samples were placed and sealed in polyethylene bags. At the completion of the field exploration, the test borings were backfilled with the excavated soil cuttings.

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS More than Half >#200	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL- SAND MIXTURES
		GRAVELS WITH OVER 15% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 15% FINES	SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS More than Half <#200 sieve	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS , MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

Note: Dual symbols are used to indicate borderline soil classifications.

	Pushed Shelby Tube		Water Level measured at time of Drilling (with date noted)
	Standard Penetration Test (2-inch outside diameter)		Water Level measured after Drilling (with date noted)
	Modified California (3-inch outside diameter)		Hand Auger Cuttings
	Split Barrel Sampler (2 ½-inch outside diameter)		Grab Sample
	Undisturbed Sample		Sample Attempt with No Recovery
	Continuous Core Sample		

SOIL CLASSIFICATION CHART AND LOG KEY
Unified Soil Classification System (ASTM D 2487)
Figure A-1

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Project: City of Corcoran WWTF Aerated Pond
Location: Corcoran, CA
Project No.: G19-168-11F
Logged By: S. Jue
Checked By: N. Popenoe

Boring: **HA-6**

Depth (Feet)	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS
0–0.5								SM	**Silty SAND with Gravel** - (surface) brown, moist, hard, fine to coarse grained gravel	hard 0-0.5'
0.5–2		Bulk						SM	**Silty SAND** - brown, moist, fine to medium grained sand	
2–4	Sample			106.8	13.6			CL	**Lean CLAY with Sand** - brown, moist, fine to medium grained sand	Fig B-1: Direct Shear phi = 34°, c = 0 psf
4									Boring terminated at approximately 4 feet bgs. Borehole backfilled with soil cuttings. No groundwater encountered.	

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9

Drilling Contractor: BSK Associates
Drilling Method: Hand Auger
Drilling Equipment: N/A
Date Started: 6/4/20
Date Completed: 6/4/20

Surface Elevation:
Sample Method: Shelby Tube
Groundwater Depth: Not Encountered
Completion Depth: 4 Feet
Borehole Diameter: 4"

* See key sheet for symbols and abbreviations used above.

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Location: Corcoran, CA
Project No.: G19-168-11F
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Checked By: N. Popenoe

Boring: **HA-7**

Depth (Feet)	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS
									Seasonal Weeds and Grasses - (surface)	
								SM	**Silty SAND** - brown, moist, fine to medium grained sand	
								SM		
								CL	**CLAY** - grayish brown, moist, trace fine grained sand	
1				99.9	12.1					
2									Boring terminated at approximately 2 feet bgs. Borehole backfilled with soil cuttings. No groundwater encountered.	
3										
4										
5										
6										
7										
8										
9										

Drilling Contractor: BSK Associates
Drilling Method: Hand Auger
Drilling Equipment: N/A
Date Started: 6/4/20
Date Completed: 6/4/20

Surface Elevation:
Sample Method: Shelby Tube
Groundwater Depth: Not Encountered
Completion Depth: 2 Feet
Borehole Diameter: 4"

* See key sheet for symbols and abbreviations used above.

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Project: City of Corcoran WWTF Aerated Pond
Location: Corcoran, CA
Project No.: G19-168-11F
Logged By: S. Jue
Checked By: N. Popenoe

Boring: **HA-8**

Depth (Feet)	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS
0									**Seasonal Weeds and Grasses** - (surface)	
								SM	**Silty SAND** - brown, moist, fine to medium grained sand	
								SM CL	**CLAY** - brown, moist, trace fine grained sand, weakly cemented	
1										
2	■			109.9	7.8					Fig B-2: Collapse Potential = 0.29% @ 2000 psf
3									Boring terminated at approximately 2.5 feet bgs. Borehole backfilled with soil cuttings. No groundwater encountered.	
4										
5										
6										
7										
8										
9										

Drilling Contractor: BSK Associates
Drilling Method: Hand Auger
Drilling Equipment: N/A
Date Started: 6/4/20
Date Completed: 6/4/20

Surface Elevation:
Sample Method: Shelby Tube
Groundwater Depth: Not Encountered
Completion Depth: 2.5 Feet
Borehole Diameter: 4"

* See key sheet for symbols and abbreviations used above.

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Project: City of Corcoran WWTF Aerated Pond
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Project No.: G19-168-11F
Logged By: S. Jue
Checked By: N. Popenoe

Boring: **HA-9**

Depth (Feet)	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	USCS	MATERIAL DESCRIPTION	REMARKS
									Sluff and Dead Grass and Roots - (surface)	
								SM	**Silty SAND** - brown, moist, fine to medium grained sand	
								SM		
1					10.0	33				
2										
3								ML	**Sandy Silt** - brown, moist, fine grained sand, slight plasticity	
									Boring terminated at approximately 3 feet bgs. Borehole backfilled with soil cuttings. No groundwater encountered.	
4										
5										
6										
7										
8										
9										

Drilling Contractor: BSK Associates
Drilling Method: Hand Auger
Drilling Equipment: N/A
Date Started: 6/4/20
Date Completed: 6/4/20

Surface Elevation:
Sample Method: Shelby Tube
Groundwater Depth: Not Encountered
Completion Depth: 3 Feet
Borehole Diameter: 4"

* See key sheet for symbols and abbreviations used above.

APPENDIX B

LABORATORY TESTING

APPENDIX B

LABORATORY TESTING RESULTS

The results of laboratory testing performed in conjunction with this project are contained in this Appendix. The following laboratory tests were performed on soil samples in general conformance with applicable standards.

In-Situ Moisture and Density

The field moisture content and in-place dry density determinations were performed on relatively undisturbed samples obtained from the test borings. The field moisture content, as a percentage of dry weight of the soils, was determined by weighing the samples before and after oven drying in accordance with ASTM D2216 test procedures. Dry densities, in pounds per cubic foot, were also determined for undisturbed core samples in accordance with ASTM D2937 test procedures. Test results are presented on the boring logs in Appendix A.

Direct Shear Test

One (1) direct shear test was performed on a test specimen trimmed from a selected soil sample. The three-point shear test was performed in general accordance with ASTM Test Method D3080, Direct Shear Test for Soil under Consolidated Drained Conditions. The test specimens were remolded into specimens, each 2.42 inches in diameter and 1 inch in height, were subjected to shear along a plane at mid-height after allowing for pore pressure dissipation. The results of the test are presented on Figure B-1.

Collapse Potential Test

One (1) Collapse Potential Test was performed on a relatively undisturbed soil sample to evaluate collapse potential characteristics. The test was performed in general accordance with ASTM D 5333. The sample was initially loaded under as-received moisture content to a selected stress level, loaded up to a maximum load of 1300 psf and was then saturated. The test results are presented on Figure B-2.

Soil Corrosivity

One (1) Corrosivity Evaluation was performed on bulk soil samples obtained at the time of drilling in the area of planned construction. The soil was evaluated for minimum resistivity (ASTM G57), sulfate ion concentration (CT 417), chloride ion concentration (CT 422), and pH of soil (ASTM D4972). The test results are presented in Table B-1.

Table B-1: Summary of Corrosion Test Results				
Sample Location	pH	Sulfate, ppm	Chloride, ppm	Minimum Resistivity, ohm-cm
HA-9 @ 0-3 feet bgs	8.9	9.9	5.7	4,560

Minus #200 Wash Tests

One (1) #200 Wash Test was performed on a selected soil sample obtained at the time of drilling in the area of planned construction. The test was performed to determine the amount of fine material present in the subsurface material. The test was performed in general accordance with ASTM Test Method D1140. The test results are presented in Table B-2 and the boring logs in Appendix A.

Table B-2: Summary of Minus #200 Wash Test Results	
Test Location	Percent Fines
HA-9 @ 0-35 feet bgs	33

FIGURE B-1

550 W. Locust
Fresno, CA 93650
Ph: (559) 497-2880
Fax: (559) 497-2886

Direct Shear Test

ASTM D-3080

Project Name:	City of Corcoran WWTF West Aerated Pond	**Sampled By:**	S. Jue	**Sample Date:**	6/4/2020
		Tested By:	J. Leu	**Test Date:**	6/11/2020
Project Number:	G19 - 168 - 11F	**Lab Tracking ID:**	N/A	**Report Date:**	6/12/2020
Sample Location:	HA-6 @ 2'	**Sample Description:**	Lean CLAY with Sand (CL): brown, moist, fine to medium grained sand		

SHEAR STRENGTH DIAGRAM

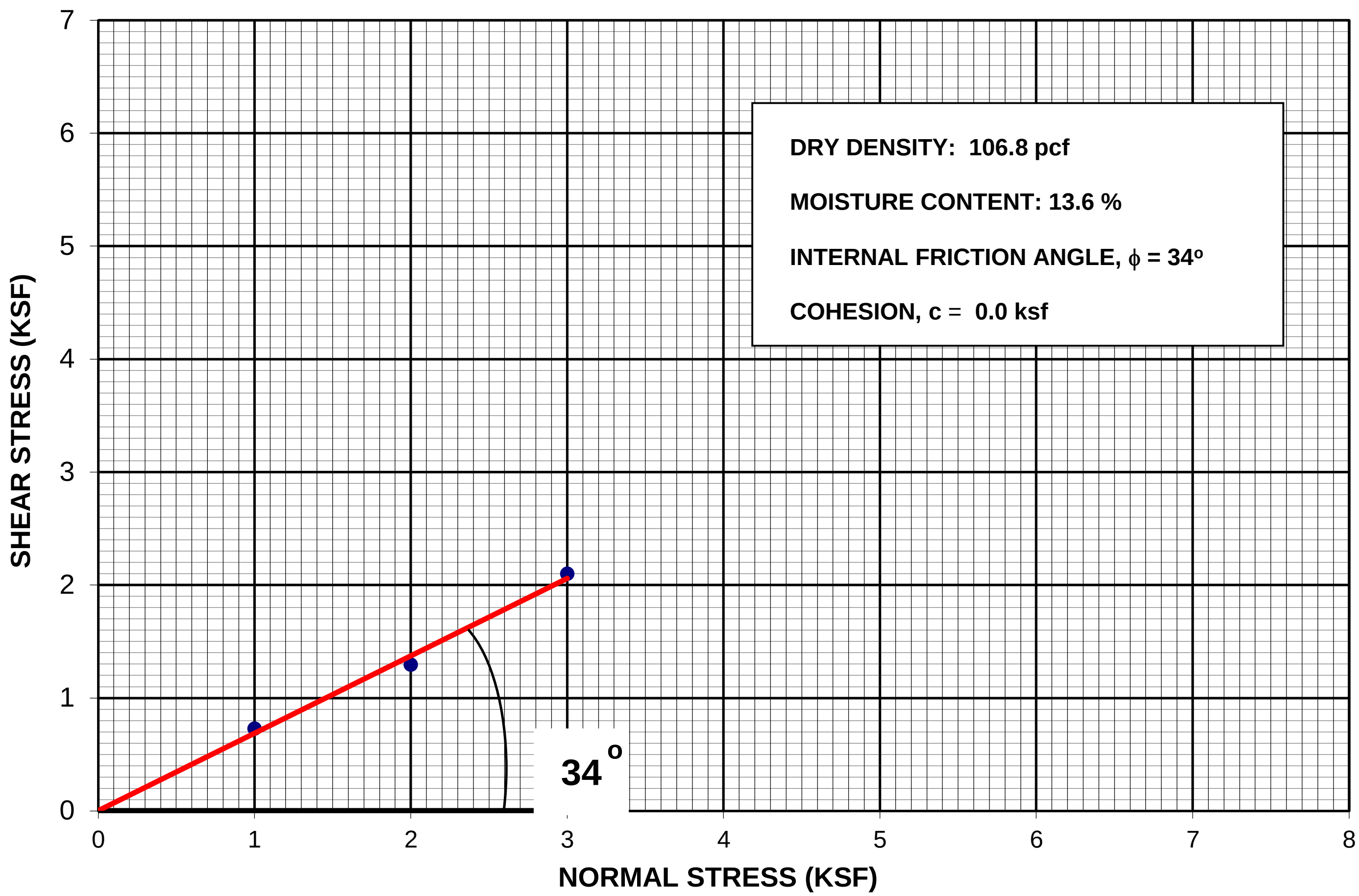
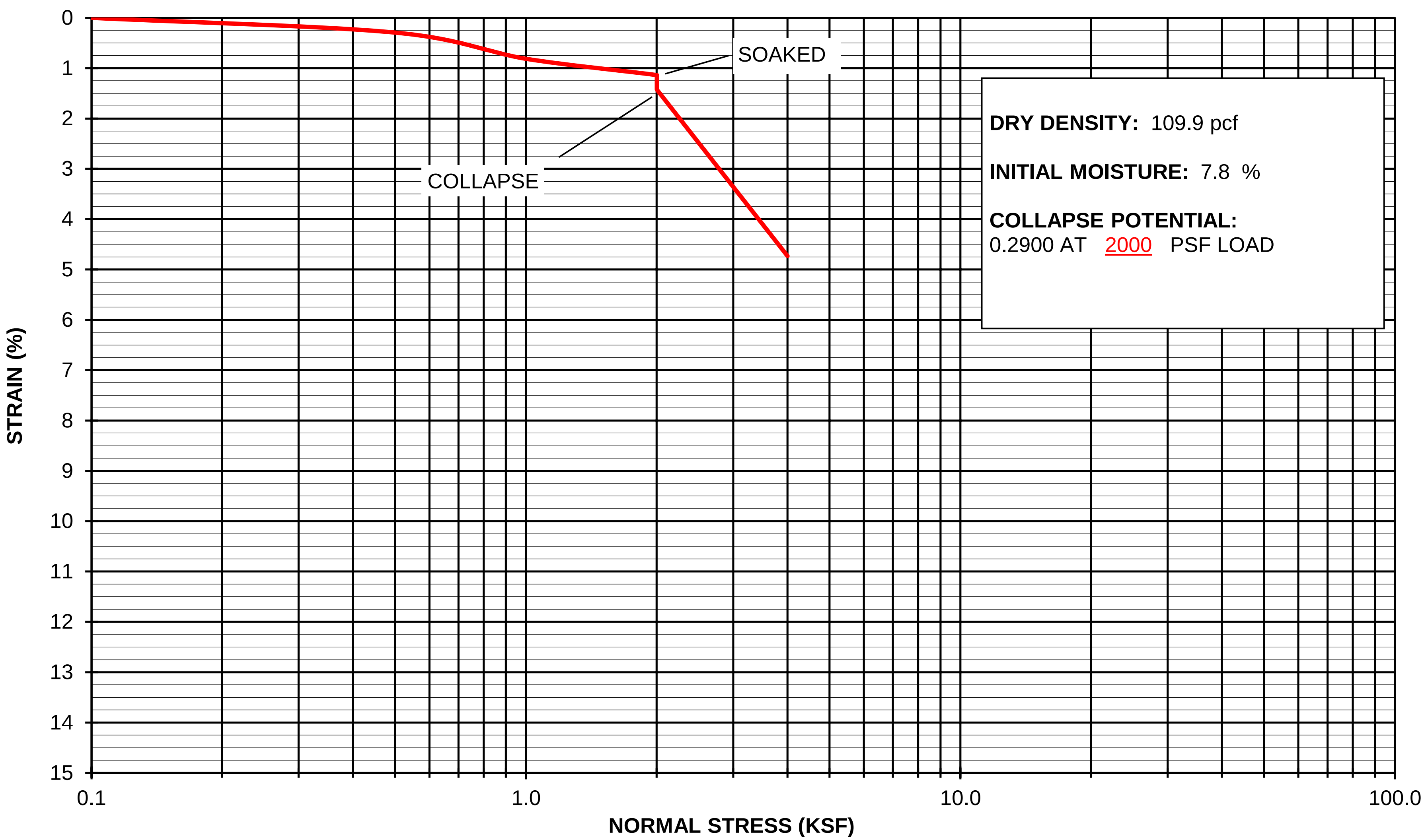


FIGURE B-2

550 W. Locust Ave.
Fresno, CA 93650
Ph: (559) 497-2880
Fax: (559) 497-2886

COLLAPSE POTENTIAL
ASTM D-5333

Project Name:	City of Corcoran WWTF Aerated Pond	**Sampled By:**	S.Jue	**Sample Date:**	6/4/20
		Tested By:	J. Leu	**Test Date:**	6/8/20
Project Number:	G19 - 168 -11F	**Lab Tracking ID:**	N/A	**Report Date:**	6/10/20
Sample Location:	HA - 8 @ 2'	**Sample Description:**	Clay (CL) - Brown, moist, trace fine grained sand, weakly cemented		



DRY DENSITY: 109.9 pcf

INITIAL MOISTURE: 7.8 %

COLLAPSE POTENTIAL:
0.2900 AT 2000 PSF LOAD