Prepared for: Brown and Caldwell

Geotechnical Engineering Investigation Report
Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California

July 2007

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Mr. Lloyd Slezak
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201 N. Civic Drive, Suite 115
Walnut Creek, CA 94596

Subject: Geotechnical Engineering Investigation Report
Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California

Dear Mr. Slezak:

We are pleased to submit to you our geotechnical engineering investigation report for the Sonoma Valley County Sanitation District's (the District) Biosolids Management Upgrade Project. The project consists of the design and construction of a new, single-story, approximately 2,000 square foot, concrete block solids dewatering building near the southwest corner of the District's wastewater treatment plant at 22675 8th Street, north of Highway 12, in Sonoma, California.

This report presents a geotechnical engineering evaluation of subsurface conditions at the dewatering building site and specific conclusions and recommendations for design, construction and long-term performance of the dewatering building. Our geotechnical engineering evaluation and recommendations are based on the findings of two exploratory borings, laboratory test results, geologic and geotechnical information referenced in the report, and our experience as geotechnical engineers.

We appreciate the opportunity to be of service to Brown and Caldwell and the District on this project. If you have any questions regarding this report, please contact us.

Respectfully submitted,

DCM ENGINEERING

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Enclosures

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GEOTECHNICAL ENGINEERING INVESTIGATION REPORT
SONOMA VALLEY COUNTY SANITATION DISTRICT
BIOSOLIDS MANAGEMENT UPGRADE PROJECT
SONOMA, CALIFORNIA

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1.0 INTRODUCTION

This report presents the results of a geotechnical engineering investigation for the Sonoma Valley County Sanitation District's (the District) Biosolids Management Upgrade Project. The project site is located at the District's wastewater treatment plant at 22675 8th Street, just north of Highway 12, in Sonoma, California. A vicinity map showing the location of the project site is presented on Plate 1.

The project consists of the design and construction of a new solids dewatering building near the southwest corner of the wastewater treatment plant. A map showing the location of the new dewatering building is presented on Plate 1. The new dewatering building will be a single-story, approximately 2,000 square foot, at-grade, masonry-block structure housing a screw press, sludge pumps, a polymer storage tank and blending unit, and an electrical room. It is our understanding that the dewatering building will be constructed on spread footing foundations and will have a reinforced concrete floor slab. Machinery within the dewatering building will be supported on reinforced concrete mat foundations which will be isolated from the building footings and floor slab. Immediately outside of the building will be an odor control system (northwest corner of the building) and a dewatered solids storage/loadout area (along the south wall of the building) which will include dual storage/loadout hoppers. The storage/loadout hoppers will be elevated to allow trucks to pass underneath for loadout. It is our understanding that both the odor control system and the storage/loadout hoppers will be supported on reinforced concrete mat foundations.

All references to the project contained herein (e.g., solids dewatering building structure dimensions, components, etc.) are based on information and preliminary drawings provided by project design engineers Brown and Caldwell (2007). Preliminary drawings provided for our information include the Civil General Site Plan (dated 4/17/2007) and the Solids Dewatering Building Alternate 1 Plan (dated 4/17/2007).

2.0 GEOLOGIC RESEARCH

2.1 Geologic Mapping

Near-surface native soils (i.e., soils within the upper approximately 5 feet) at the solids dewatering building site were mapped by Miller (1972) as Huichica loam, 0 to 2 percent slopes (HtA) and Zamora silty clay loam, 0 to 2 percent slopes (ZaA). Selected engineering properties of these soils are presented in Table No. 1.

Table No. 1 - Selected Engineering Properties of Project Site Near-Surface Soils

Depth (in.)	USDA Texture	USCS Class.	% Passing Sieve No.		Atterberg Limits		Corrosion Risk	
			4	200	LL	PI	Uncoated Steel	Concrete
HtA - Huichica loam, 0 to 2 percent slopes								
0-14	Loam	CL-ML	90-100	50-75	20-35	5-15	High	High
14-23	Sandy clay loam	SC-SM	90-100	35-50	20-35	5-15		
23-30	Clay	CL	90-100	75-95	40-50	15-30		
30-57	Cemented	-	-	-	-	-		
ZaA - Zamora Silty Clay Loam, 0 to 2 percent slopes								
0-5	Silty clay loam	CL	100	85-95	20-30	5-20	Moderate	Low
5-29	Clay loam	CL	100	75-85	20-30	5-20		
29-41	Clay loam	CL	100	85-95	20-30	5-20		
41-55	Sandy clay loam	SC	95-100	35-50	20-30	5-20		
55-60	Gravelly clay	CL, GC	55-80	40-55	30-40	20-30		

NOTE: Selected engineering properties taken from Miller (1972).

Geologic mapping of surficial deposits underlying the solids dewatering building site by Witter and others (2006) and by Knudsen and others (2000) include Holocene age stream terrace deposits and Pleistocene age alluvial fan deposits. Holocene age San Francisco Bay Mud deposits are mapped immediately south of the project site.

Detailed descriptions of geologic deposits and a map outlining their general distribution in the project area are presented on Plate 2.

2.2 Previous Geotechnical Investigations

As part of our geotechnical research, we were provided with a copy of a subsurface investigation report prepared for the District's secondary clarifier upgrade project, which took place immediately to the north and east of the project site. The report, which was prepared by Taber Consultants (dated October, 1998), contains project-specific boring logs, as well as boring logs from other geotechnical investigations completed in the vicinity of the project site by Moore and Taber (dated May 1973 and December 1965). The approximate location of the reference geotechnical borings completed as part of these investigations is provided on Plate 1. Copies of the reference geotechnical boring logs are provided in Appendix D.

2.3 Site History

The project site was previously occupied by two sludge storage and decant tanks. The approximate location of these tanks (based on historic plant drawings) is presented on Plate 3. Based on discussions with District staff, these tanks were removed approximately five to ten years ago. It is our understanding that the excavation to remove the tanks was sloped (rather than vertically shored) and was on the order of 10 feet deep. Following removal of the tanks, the excavation was backfilled to present grade with clayey gravel with sand, and covered with a layer of 1½-inch subangular to rounded gravel.

2.4 Seismic Setting

The project site is located near, but not crossed by, active faults (CDMG, 1998). The nearest active faults to the project site and their respective seismic parameters are provided below.

Table No. 2 - Nearby Active Fault Parameters

Fault	Maximum Moment Magnitude	Slip Rate (mm/yr)	Seismic Source Type	Closest Distance to Project Site (km)
Rodgers Creek	7.0	9	A	5
West Napa	6.5	1	B	12
Hayward	7.1	9	A	22.5
Concord-Green Valley	6.9	6	B	25.5

[1] From CDMG (1998).

Paleoseismic studies by the Working Group on California Earthquake Probabilities (WGCEP) conclude that there is a 27% probability of a magnitude 6.7 or greater earthquake on the Rodgers Creek and Hayward Faults and a 4% probability of a magnitude 6.7 or greater earthquake on the Concord-Green Valley Fault (WGCEP, 2003; see Plate 4). The West Napa Fault was not included in the WGCEP 2003 study.

Based on earthquake magnitude-distance attenuation curves, the estimated maximum peak bedrock acceleration in the project area during maximum credible earthquakes in the San Francisco Bay Area will typically be less than 0.7g (Mualchin, 1996). Cao and others (2003) concluded that there is a 10% probability in 50 years that the peak horizontal bedrock acceleration at the project site will exceed 0.4 to 0.5g (see Plate 5). The actual ground surface acceleration that will occur at the project site depends on the engineering characteristics and interaction between the underlying bedrock and overlying unconsolidated soils (where present) to seismic waves. These characteristics and interactions may result in ground shaking amplification at the project site.

Bolt (1993) indicates that when the average peak ground acceleration exceeds about 0.50g, the ground cracks conspicuously and underground pipes are sometimes broken (i.e., damage consistent with Modified Mercalli Intensity IX, see Plate 6). Ground shaking hazard maps by the Association of Bay Area Governments (ABAG) indicate that during large earthquakes on faults in the San Francisco Bay Area, damage will most likely be consistent with Modified Mercalli Intensity VIII at the project site, with the possibility that damage could be one unit higher or lower (i.e., damage could be consistent with Modified Mercalli Intensity VII to IX; ABAG, 2003a). Therefore, it is possible that ground acceleration in the project area could meet or exceed 0.50g during large earthquakes on faults in the San Francisco Bay Area and that damage to the dewatering building and related piping/structures could occur during such events.

Liquefaction is a phenomenon in which soils lose internal strength as a result of increased pore pressure generated by cyclic loading. This behavior is commonly induced by ground shaking during earthquakes. Soils which have historically liquefied have typically been saturated, non-cohesive silts and sands of low to medium density. Regional liquefaction maps indicate a moderate to very low liquefaction hazard at the project site (ABAG, 2003b).

3.0 GEOTECHNICAL FIELD INVESTIGATION

The project geotechnical field investigation program consisted of drilling two exploratory soil borings (B-1 and B-2) within the proposed dewatering building footprint.

3.1 Exploratory Soil Borings

Both project exploratory soil borings (B-1 and B-2) were completed to a depth of 39.5 feet below ground surface on May 10, 2007, using a truck-mounted Mobile B-24 drill rig owned and operated by North Star Drilling of Escalon, CA. The location of Borings B-1 and B-2 are presented on Plate 1. Copies of the boring logs for Borings B-1 and B-2 are presented in Appendix B.

Subsurface conditions (i.e., soil and groundwater) at the boring locations were logged and representative soil samples were obtained from each boring. The groundwater levels observed in the borings at the time of drilling are reported on the logs but do not necessarily represent equilibrium groundwater levels. Equilibrium groundwater levels may be higher or lower than the groundwater levels we measured in the borings at the time of drilling.

Relatively undisturbed soil samples were obtained by driving a 2.5-inch inside diameter, 3.0-inch outside diameter, Modified California Sampler (MCS) containing thin brass liners into the bottom of the boring. Disturbed soil samples were obtained by driving either a 1.4-inch inside diameter, 2.0-inch outside diameter Standard Penetration Test (SPT) sampler (ASTM D1586) or a 2.0-inch inside diameter, 2.5-inch outside diameter Split Spoon Sampler (SSS) into the bottom of the boring. All MCS, SSS and SPT samplers were driven into the bottom of the bore hole using a 140 pound hammer falling 30 inches per blow. The number of blows required to drive the MCS, SSS and SPT samplers the last 12 inches of an 18-inch drive are recorded on the boring logs as penetration resistance (blows/ft).

The penetration resistance values (blows/ft) for the SPT sampler given on the boring logs are actual American Society for Testing and Materials (ASTM) D1586 N-values. The penetration resistance that is given on the boring logs for the other samplers (i.e., MCS and SSS samplers) are field blow counts for the sampler used and have not been correlated to an equivalent SPT N-value.

When the samplers were withdrawn from the bore hole, the soil samples were removed, examined for classification, and sealed to preserve their natural moisture content for laboratory testing. Classification systems used to describe the logged soils are presented in Appendix A on Plate A-1 (2 pages). Descriptions of soils contained in the boring logs are based on observations during drilling and sampling and on the results of laboratory tests (see Section 3.2).

All project borings were backfilled on completion of drilling with lean cement grout as required under our drilling permit (#05270-HMW, issued by the County of Sonoma Department of Health Services - Environmental Health Division).

3.2 Laboratory Testing

Geotechnical laboratory tests were performed on selected undisturbed and disturbed soil samples to evaluate their pertinent physical characteristics and engineering properties. Geotechnical laboratory testing consisted of determinations of the following:

- Moisture Content
- Unit Weight
- Atterberg Limits
- Gradation
- Unconfined Compression
- Direct Shear Strength
- Consolidation
- Corrosivity

The results of geotechnical laboratory tests are presented on the Logs of Borings in Appendix B, and/or on the laboratory test results in Appendix C.

4.0 GEOTECHNICAL FINDINGS

4.1 Subsurface Soil Conditions

Subsurface soil conditions at the dewatering building site, as encountered in our project borings, consisted of variable thicknesses of gravelly fill overlying native clayey, sandy and gravelly soils.

Fill soils were encountered to depths of 5 feet and 11.5 feet below ground surface in Borings B-1 and B-2, respectively. The variation in observed fill thickness is likely related to the presence of historic sludge storage and decant tanks at the project site (see Section 2.3 and Plate 3). Fill soils classified as clayey gravel with sand (GC) under the Unified Soil Classification System (see Appendix A, Plate A-1) and were loose to medium dense and moist to wet.

Underlying the fill, exploratory borings encountered native soils consisting predominantly of lean clay (CL) and clayey sand (SC) within the upper approximately 20 feet. Native clayey (CL) soils within the upper approximately 20 feet were medium stiff to stiff and moist to wet. Native sandy (SC) soils within the upper approximately 20 feet were loose to medium dense and wet.

Below a depth of approximately 20 feet, project borings encountered coarse-grained soils (i.e., sandy and gravelly soils) interlayered with clayey soils. Gravelly soils classified as clayey gravel with sand (GC) and were loose to medium dense. Sandy soils classified as silty/clayey sand with gravel (SM/SC) and were medium dense. In Boring B-1, the coarse-grained soils were interlayered with medium stiff lean clay (CL) soils. In Boring B-2, the coarse-grained soils were interlayered with medium stiff to stiff lean clay (CL) and fat clay (CH) soils.

Fat clay (CH) soils were encountered at the bottoms of both project borings (i.e., from approximately 32 to 39.5 feet below ground surface in Boring B-1 and from approximately 36 to 39.5 feet below ground surface in Boring B-2). Fat clay soils were medium stiff and wet.

For more detailed descriptions of subsurface soil conditions at the dewatering building site, refer to the project boring logs in Appendix B and the results of laboratory testing in Appendix C.

4.2 Subsurface Groundwater Conditions

Groundwater was encountered in both exploratory borings (see Appendix B). In Boring B-1, groundwater was measured at a depth of 13 feet on completion of drilling. In Boring B-2, groundwater was measured at a depth of 9 feet on completion of drilling. Depths to groundwater reported in reference borings ranged between 9.5 and 24 feet (see Appendix D).

The groundwater levels reported above do not necessarily represent static (i.e., equilibrium) groundwater levels. Equilibrium groundwater levels may be higher or lower. Groundwater levels at the dewatering building site should be expected to fluctuate based on factors such as seasonal rainfall, flow in adjacent creeks, construction operations near the project site, and other factors not evident at the time of this geotechnical investigation.

5.0 GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of our geotechnical research and field investigation as presented above, and our understanding of the project as detailed herein, we conclude that the geotechnical conditions at the project site are generally suitable for construction of the proposed dewatering building. The following are the primary geotechnical challenges identified for the design, construction, and long-term performance of the dewatering building:

- Differential fill thickness below the building footprint;
- Foundation subgrade preparation;
- Foundation bearing capacity and settlement; and
- Seismic ground shaking.

The following sections contain our geotechnical recommendations for design and construction of the dewatering building.

5.1 <u>Design Groundwater Level</u>

Groundwater levels within project exploratory borings ranged from 9 to 13 feet below ground surface, while groundwater levels within reference exploratory borings ranged from 9.5 to 24 feet below ground surface. Based on this data, we recommend that the design groundwater level for design of permanent subsurface structures be taken as 5 feet below present ground surface.

Design groundwater level for temporary shoring and/or temporary dewatering systems may be taken as 9 feet below present ground surface. Final design of temporary dewatering and shoring systems should be based on actual groundwater levels and flow quantities encountered by the contractor.

Groundwater levels at the project site should be expected to fluctuate based on factors such as seasonal rainfall, flow in adjacent creeks, construction operations near the project site, and other factors not evident at the time of this geotechnical investigation. The timing and effect of these factors on groundwater levels at the project site is beyond the scope of this investigation.

5.2 Site Preparation and Earthwork

The project site was previously occupied by two sludge storage and decant tanks. The approximate location of these tanks (based on historic plant drawings) is presented on Plate 3. Backfill in the area previously occupied by the tanks, as encountered in our project exploratory borings, consists of loose to medium dense clayey gravel with sand (GC). The thickness of the fill fluctuates across the footprint of the dewatering building, ranging from 5 feet thick in Boring B-1 to 11.5 feet thick in Boring B-2.

The variability in density and thickness of existing fill materials below the dewatering building footprint could result in differential settlement of the finished dewatering building. Removal and recompaction of the full depth of fill soils below the dewatering building footprint would minimize variability in the fill density and create a more uniform bearing condition, but would require an excavation on the order of 12 feet deep, which would extend below the groundwater table and require extensive shoring and dewatering.

It is our understanding that the proposed dewatering building can tolerate a limited amount of differential settlement. Therefore, from a practical point of view, full depth removal of the underlying fill soils is unnecessary. The recommendations given in Section 5.2.1 below are intended to create a firm, stable subgrade on which to construct the dewatering building, and at the same time limit differential settlement to within tolerable amounts through limited (i.e., partial depth) overexcavation of existing fill soils and replacement with well compacted engineered fill.

All site preparation and earthwork should be observed by a representative of DCM Engineering as part of our continuing services on this project. It is important that DCM Engineering be present during site preparation and earthwork to observe whether undesirable material is encountered within the construction area and to provide additional recommendations should such materials be encountered.

5.2.1 Dewatering Building Subgrade Preparation

The area below the dewatering building, the exterior odor control system and dewatered solids storage/loadout area, and any appurtenant exterior concrete flatwork should be overexcavated down to 5 feet below the proposed finished grade. The overexcavation should also extend laterally a minimum of 3 feet beyond the perimeter of all foundations (including the odor control system and the dewatered solids storage/loadout area).

Given that the area around the project site is relatively undeveloped, we anticipate that the sidewalls for the overexcavation will be sloped rather than shored. All sloped excavations should be made in accordance with Cal/OSHA guidelines. Existing fill soils, as encountered in our project borings, generally classify as Cal/OSHA Type B soils and should be inclined at slopes of 1:1 (H:V) or flatter.

The overexcavation along the south side of the dewatering building (especially in the area of the storage/loadout hoppers) may come in close proximity to the existing sludge dewatering building. We have no information regarding the foundation for the existing sludge dewatering building at this time. Prior to commencing the overexcavation, the contractor should determine the foundation details for the existing sludge dewatering building. The sidewalls for sloped excavations should not cross an imaginary plane projected downward at an inclination of 1:1

(H:V) from the base of the nearest existing sludge dewatering building foundation. If sidewalls for sloped excavations would cross this plane, the overexcavation must be vertically shored to preserve subjacent lateral support for, and prevent undermining of, the existing dewatering building foundation.

The soils exposed in the bottom of the overexcavation should be scarified a minimum depth of 6 inches, moisture conditioned to a soil moisture content at or above optimum, and compacted to a minimum of 95% relative compaction (ASTM D1557).

Following scarification and compaction of the bottom of the overexcavation, the overexcavated area should be backfilled to the foundation subgrades using engineered fill. Engineered fill should be free from vegetable matter and other deleterious substances should form a firm, stable base when compacted. Engineered fill may consist of on-site or imported material which meets the following minimum criteria:

Table No. 3 - Engineered Fill

Sieve Size	Percent Passing
6"	100
3"	90-100
3/4"	50-100
No. 4	20-70
No. 200	0-20

Plasticity Index (PI) ≤ 30 in accordance with ASTM D4318
Liquid Limit (LL) ≤ 50 in accordance with ASTM D4318
pH > 6
Saturated Resistivity > 2,500 ohm-cm
Total water soluble chloride concentration < 300 mg/kg
Total water soluble chloride concentration < 1,000 mg/kg

Engineered fill should be placed in maximum 8-inch thick loose lifts and compacted to a minimum of 95% relative compaction (ASTM D1557) at a moisture content at or above optimum. Prepared foundation subgrades should be kept moist and should not be disturbed until the foundation is poured.

5.3 Foundations, Allowable Bearing Capacity, and Settlement

It is our understanding that the dewatering building will be constructed on spread footing foundations and will have a reinforced concrete floor slab. Machinery within the dewatering building will be supported on reinforced concrete mat foundations which will be isolated from the building footings and floor slab. It is also our understanding that both the odor control system and the storage/loadout hoppers will be supported on reinforced concrete mat foundations.

5.3.1 Spread Footing Foundations

Assuming the subgrade preparation recommendations given in Section 5.2.1 are followed, spread footings for the dewatering building should be a minimum of 18 inches wide, with a minimum embedment of 24 inches below finished grade. Isolated column footings should be a minimum of 24 inches wide with a minimum embedment of 24 inches below finished grade. Any footings located near utility trenches or other footings should have their bearing surfaces located below an imaginary 1.5:1 (H:V) plane projected upward from the bottom edge of the utility trench or footing.

With the above minimum dimensions, footings may be designed using an allowable bearing capacity not to exceed 2,000 psf for dead plus live loads. This capacity may be increased by one-third for short-term wind and seismic loading. A coefficient of sliding friction of 0.4 may be used at the base of footings where the footing concrete is poured directly on top of engineered fill material as defined in Section 5.2.1.

Assuming applied footing loads do not exceed 2,000 psf as recommended above, settlement of dewatering building footings should be less than 1 inch. Final estimates of settlement can be calculated once the final site grades, dimensions and locations of footings, and applied footing loads are known.

5.3.2 Reinforced Concrete Mat Foundations

Assuming the subgrade preparation recommendations given in Section 5.2.1 are followed, reinforced concrete mat foundations for machinery inside the dewatering building and for the external odor control and storage/loadout hoppers may be designed using an allowable bearing capacity not to exceed 1,000 pounds per square foot for dead plus live loads. This capacity may also be increased by one-third for short-term wind and seismic loading. Mat foundations may also be designed using an average modulus of subgrade reaction of 140 kips per cubic foot for a unit square foot. The structural engineer should modify the modulus of subgrade reaction for the actual mat size. A coefficient of sliding friction of 0.4 may be used at the base of mat foundations where the concrete mat is poured directly on top of engineered fill material as defined in Section 5.2.1.

Assuming applied mat foundation loads do not exceed 1,000 psf as recommended above, settlement of mat foundations should be less than 1.5 inches. Differential settlement between the mat foundations and the dewatering building footings should be less than 1 inch. Final estimates of settlement (total and differential) can be calculated once the final site grades, dimensions and locations of mat foundations, and applied mat foundation loads are known.

5.4 Lateral Earth Pressures

Static lateral earth pressures will be imposed on all below-grade structure elements, including foundations. The following lateral earth pressures, expressed as equivalent fluid densities, are for permanent subsurface structure elements in contact with engineered fill material (see Section 5.2.1), which is composed of cleaned, excavated clayey gravel (GC) soils like those encountered in our project borings.

<u>Table No. 4</u> - Static Lateral Earth Pressures Expressed as Equivalent Fluid Densities

Condition	Earth Pressure (pcf)
Active	30
At Rest	50
Passive	500

In addition to the above discussed static lateral earth pressures, dynamic earth pressures will be imposed on below-grade structure walls during seismic shaking. The structure walls should be designed to resist a uniform (i.e., rectangular distribution) dynamic earth pressure (P_e) equal to the following:

$$P_e = 15 \times H \text{ (psf)}$$

where:

H = depth of wall embedment below grade

The resultant dynamic earth pressure should be applied at a distance of 0.5H to 0.6H from the bottom of the wall. The peak ground acceleration (PGA) of 0.47g assumed for the project site is based on a peak bedrock acceleration of approximately 0.5g (i.e., 10% probability of exceedance in 50 years) factored for the site's soil profile. The effective site acceleration used in the analysis was taken as 80% of the PGA. The dynamic lateral earth pressure was calculated based on a method by Seed and Whitman (1970).

5.5 Exterior Concrete Flatwork and Asphalt Concrete Pavements

5.5.1 Exterior Concrete Flatwork

Exterior concrete flatwork will bear upon compacted and moisture conditioned engineered fill, as recommended in Section 5.2.1. We recommend that exterior concrete flatwork be a minimum of 4 inches thick and reinforced with a minimum of No. 4 bars spaced at 18 inches on center each way.

Reinforcement should be supported so that it is in the middle one-third of the slab. Final concrete flatwork details, thickness and structural reinforcing should be determined by the structural engineer.

5.5.2 Asphalt Concrete Pavements

We anticipate that traffic loads for the paved areas around the dewatering building will consist mainly of truck traffic; however, we have no information relative to the anticipated traffic volume. Assuming a traffic index of 7 (appropriate for low-volume truck traffic areas) and a conservative R-value of 5 for pavement subgrade soils, and using the Caltrans Flexible Pavement Design Method, the pavement sections around the dewatering building should consist of 4 inches of asphalt concrete over 16 inches of compacted aggregate base. Additional recommendations for higher or lower traffic indices and/or pavement subgrade R-values can be provided on request.

Where the areas to receive asphalt concrete pavement have not been previously overexcavated and replaced with compacted engineered fill as specified in Section 5.2.1, the area to receive asphalt concrete pavements should be overexcavated down to the pavement section subgrade. The exposed subgrade soils should be scarified a minimum depth of 12 inches, moisture conditioned to a soil moisture content at or above optimum, and compacted to a minimum of 95% relative compaction (ASTM D1557).

Aggregate base for pavement sections should consist of Class 2 aggregate base. Class 2 aggregate base should be free from vegetable matter and other deleterious substances and should form a firm, stable base when compacted. Class 2 aggregate base should be graded within the gradation requirements given in Table No. 5.

Table No. 5 - Class 2 Aggregate Base

Sieve Size	Percent Passing
1"	100
3/4"	90-100
No. 4	35-60
No. 30	10-30
No. 200	2-9

Class 2 aggregate base should also conform to the quality requirements given in Table No. 6.

Table No. 6 - Class 2 Aggregate Base Quality Requirements

Test	California Method	Requirement
Resistance (R-value)	301	78 min.
Sand Equivalent	217	22 min.

Class 2 aggregate base for pavement sections should be placed in maximum 8-inch thick loose lifts and compacted to a minimum of 95% relative compaction (ASTM D1557) at a moisture content at or above optimum.

5.6 Site Drainage

We recommend that site drainage be carefully designed to carry surface water away from the dewatering building. Water must not be allowed to pond around the building foundation or near pavement areas.

Paved ground surfaces and concrete flatwork should slope away from the dewatering building at a minimum grade of 2 percent. All unpaved ground surfaces should slope away from the dewatering building at a minimum grade of 5 percent. The ground surface sloping away from the perimeter of the building should extend a minimum distance of 5 feet beyond the building. Surface water should then be collected in swales and/or closely-spaced area drains with closed pipe systems that discharge away from the building.

5.7 Soil Corrosivity

Soil corrosivity test results are included in Appendix C on Plate C-6. Based on resistivity measurements, the sampled soils are considered "moderately corrosive" (NACE, 1984). However, sulfate concentrations in the sampled soils were less than 90 ppm and chloride concentrations were less than 21 ppm. According to criteria published in the 1997 UBC (Tables 19-A-4 and 19-A-5), the sulfate and chloride concentrations in the sampled soils would classify them as negligibly corrosive to reinforced concrete.

5.8 Seismic Design

The project site is located near, but not crossed by, active faults (CDMG, 1998). Therefore, the likelihood of damage to the dewatering building by fault offset is remote. In addition, our site-specific subsurface investigation did not encounter significant layers of saturated non-cohesive silts or loose clean sands. A thin (approximately 2 feet thick) layer of loose, saturated clayey sand (SC) was encountered in Boring B-2; however, this layer was found to contain 40% fines and is not considered to pose a liquefaction risk. Therefore, the risk of liquefaction-induced damage to the dewatering building is considered to be low.

The primary seismic hazard at the dewatering building site will therefore be ground shaking. On the basis of historical evidence, it is reasonable to assume that during its lifetime the dewatering building will be subject to at least one moderate to severe earthquake that will cause strong ground shaking. The risk of damage to the dewatering building during seismic events will be similar to those for other structures in the project area.

The effects of ground shaking on the dewatering building may be mitigated by design and construction detailing in accordance with the foundation and seismic provisions of the 1997 Uniform Building Code (UBC) or the latest edition of the UBC adopted by the District. Based on the subsurface conditions encountered during our field investigation, we recommend the following UBC seismic site categorization and design coefficients be used:

Table No. 7 - UBC Seismic Site Categorization and Design Coefficients

Categorization/Coefficient	Design Value
Soil Profile (Table 16-J)	S_D
Seismic Zone (Figure 16-2)	4
Seismic Zone Factor, Z (Table 16-1)	0.40
Seismic Source Type (Map E-15)	A
Distance to Seismic Source (Map E-15)	5 km
Near Source Factor, N_a (Table 16-S)	1.2
Near Source Factor, N_v (Table 16-T)	1.6
Seismic Coefficient, C_a (Table 16-Q)	0.528
Seismic Coefficient, C_v (Table 16-R)	0.1.024

6.0 ADDITIONAL SERVICES AND LIMITATIONS

6.1 Additional Services

We recommend that DCM Engineering be given the opportunity to provide the following additional services through the completion of project construction:

- Review of final (i.e., 100%) plans and specifications prior to bid for conformance with geotechnical conditions and recommendations;
- Review of contractor submittals for conformance with geotechnical findings described herein;
- Review and response to contractor requests for information that relate to geotechnical issues; and
- Periodic construction observations during excavations to verify conformance of exposed surface conditions with the findings of this report.

6.2 Limitations

The findings, conclusions and recommendations of this report are to be used only for the Sonoma Valley County Sanitation District's Biosolids Management Upgrade Project, as described herein.

The conclusions and recommendations in this report may require reevaluation if:

- the dewatering building structure changes in general design, plan or elevation from that as described herein;
- changes of grade, site conditions, and/or groundwater levels occur between issuance of this report and construction;
- construction is delayed and/or immediately surrounding site conditions change; and
- any other change is implemented which materially alters the project from that proposed at the time this report was prepared.

Our investigation was designed based on information provided by Brown and Caldwell (2007) and our understanding of the project, as described herein. Evaluation of environmental contamination at the project site is beyond the scope of this investigation report. Our geotechnical conclusions and recommendations provided in this report were formulated based on the findings of our investigation which included:

- 2 exploratory soil borings logged and sampled by DCM Engineering;
- the results of laboratory tests;
- geotechnical mapping;
- published information referenced in the text; and
- our experience as geotechnical engineers.

Soil types and conditions and/or groundwater levels encountered during project construction could vary from that encountered and reported herein. Additional studies, consultations and possibly design revisions may be required if significant differences in subsurface conditions are encountered during construction.

This report has been prepared in substantial accordance with generally accepted standards of geotechnical engineering practice in the San Francisco Bay Area. No other warranty, expressed or implied, is made.

7.0 REFERENCES

Association of Bay Area Governments (ABAG), 2003, Interactive Earthquake Hazard Map for the San Francisco Bay Area (Based on Underlying Geologic Material), Scenario: Earthquake on Rodgers Creek and N. Hayward Fault Segments, http://gis.abag.ca.gov/website/Shaking-Maps/images/pixel.gif.

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Bolt, B.A., 1993, Earthquakes: W.H. Freeman and Company, New York.

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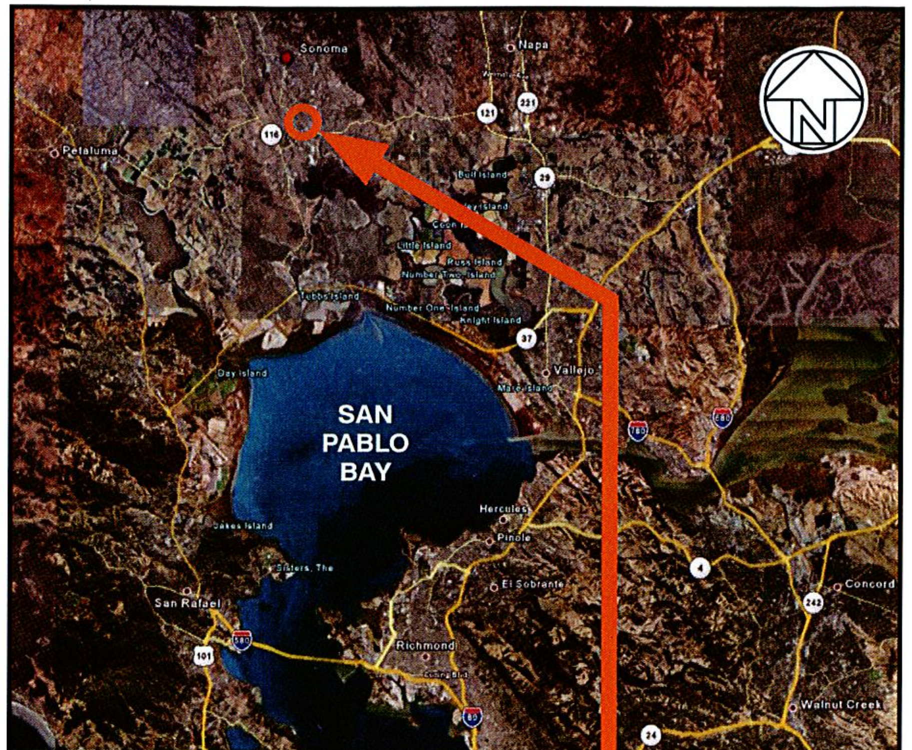
Working Group on California Earthquake Probabilities (WGCEP), 2003, Earthquake Probabilities in the San Francisco Bay Region: 2002-2031 U.S. Geological Survey Open-File Report 03-214.

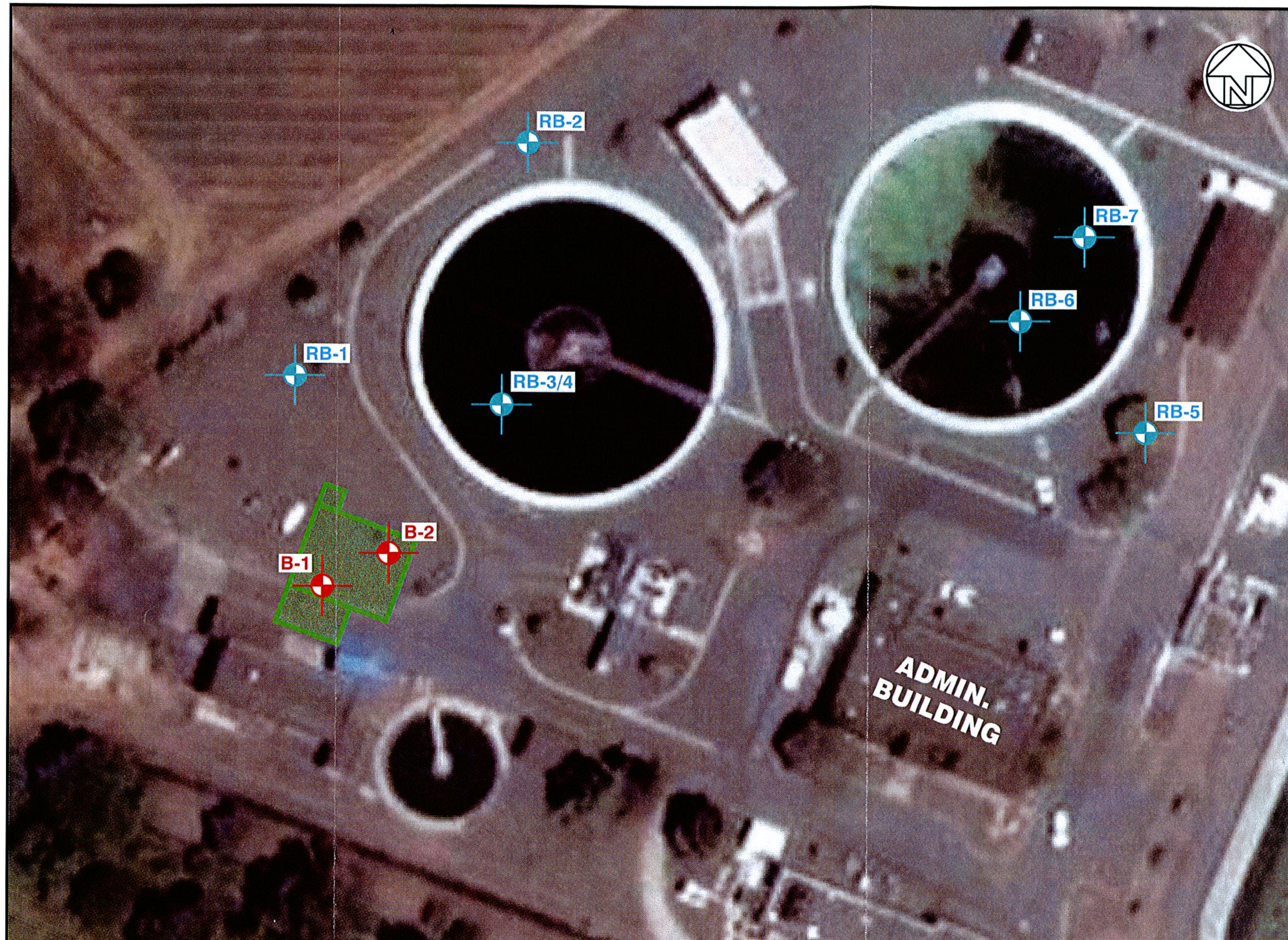
VICINITY MAP



BASE MAP: Google Earth Pro, 2007.

PROJECT SITE
(See Boring Location Map)

BORING LOCATION MAP

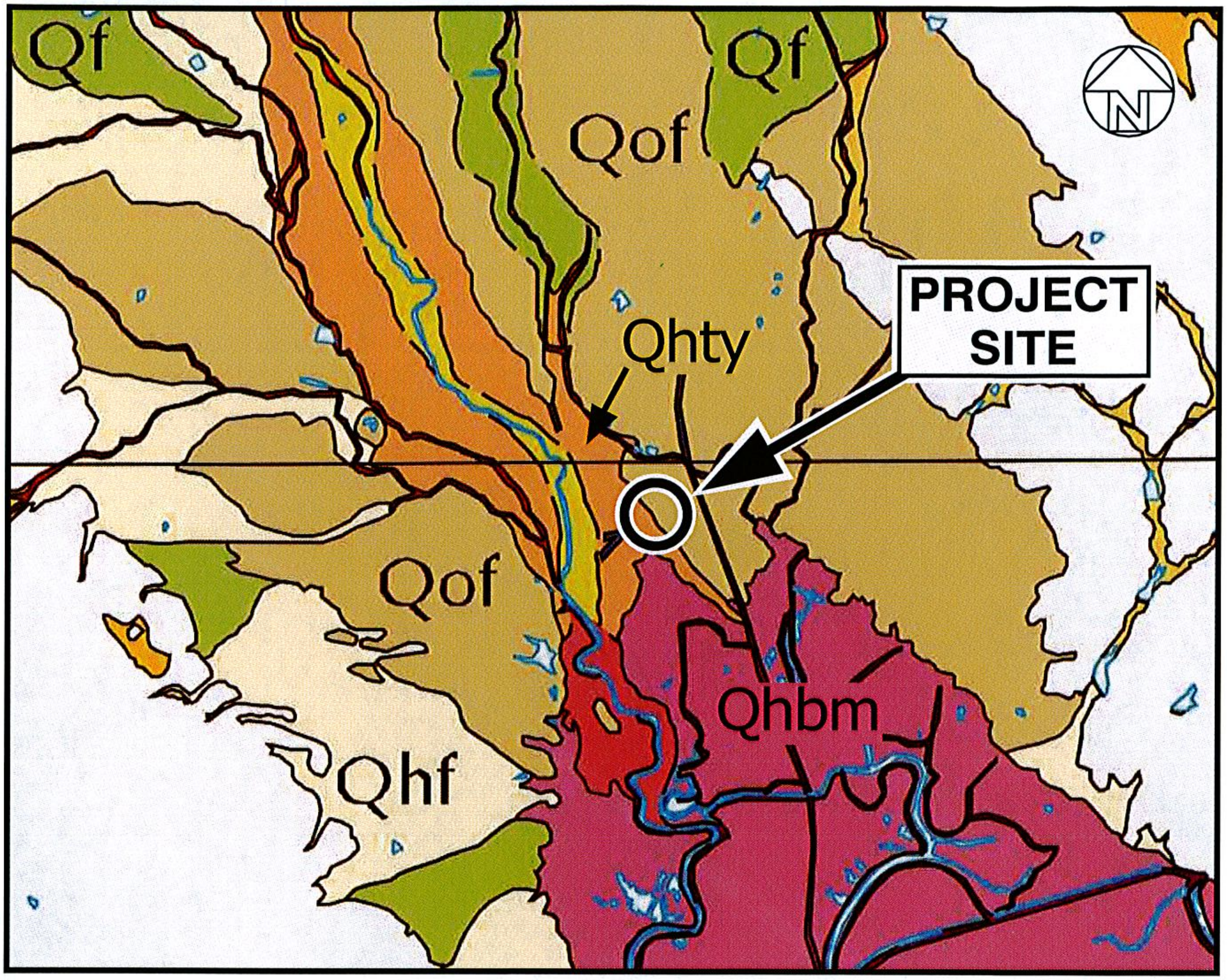


BASE MAP: Google Earth Pro, 2007.

LEGEND:

- B-1 - Project geotechnical boring location and reference number
- RB-1 - Reference geotechnical boring location and reference number
- Approximate location of new solids dewatering building

DCM Engineering		BROWN AND CALDWELL Sonoma Valley County Sanitation District Biosolids Management Upgrade Project Sonoma, California VICINITY AND BORING LOCATION MAPS	PLATE NO. 1 (COLOR PLATE)
FILE NO. J-5038-1	JULY 2007		



DESCRIPTIONS:

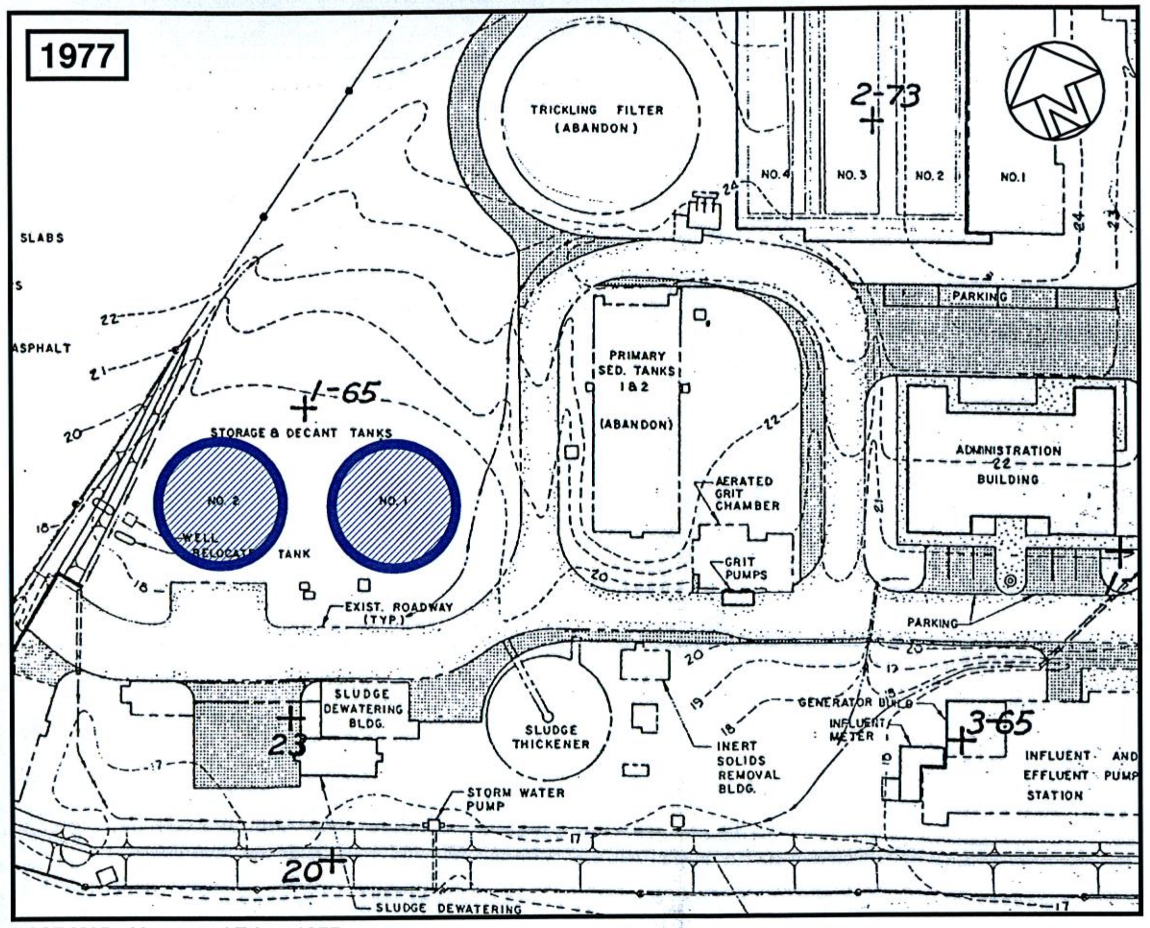
Qhbm **SAN FRANCISCO BAY MUD (Holocene)**
- Sediment deposited at or near sea level in the San Francisco Bay estuary that is presently, or was historically tidal marsh, mud flat or bay bottom. Bay mud sediment typically has low bulk density and includes silt, clay, peat and fine sand.

Qhty **STREAM TERRACE DEPOSITS (Holocene)**
- Stream terraces are deposited as point bar and overbank deposits by major streams. Stream terrace deposits include sand, gravel, silt and minor clay. Is moderately to well sorted and moderately to well bedded.

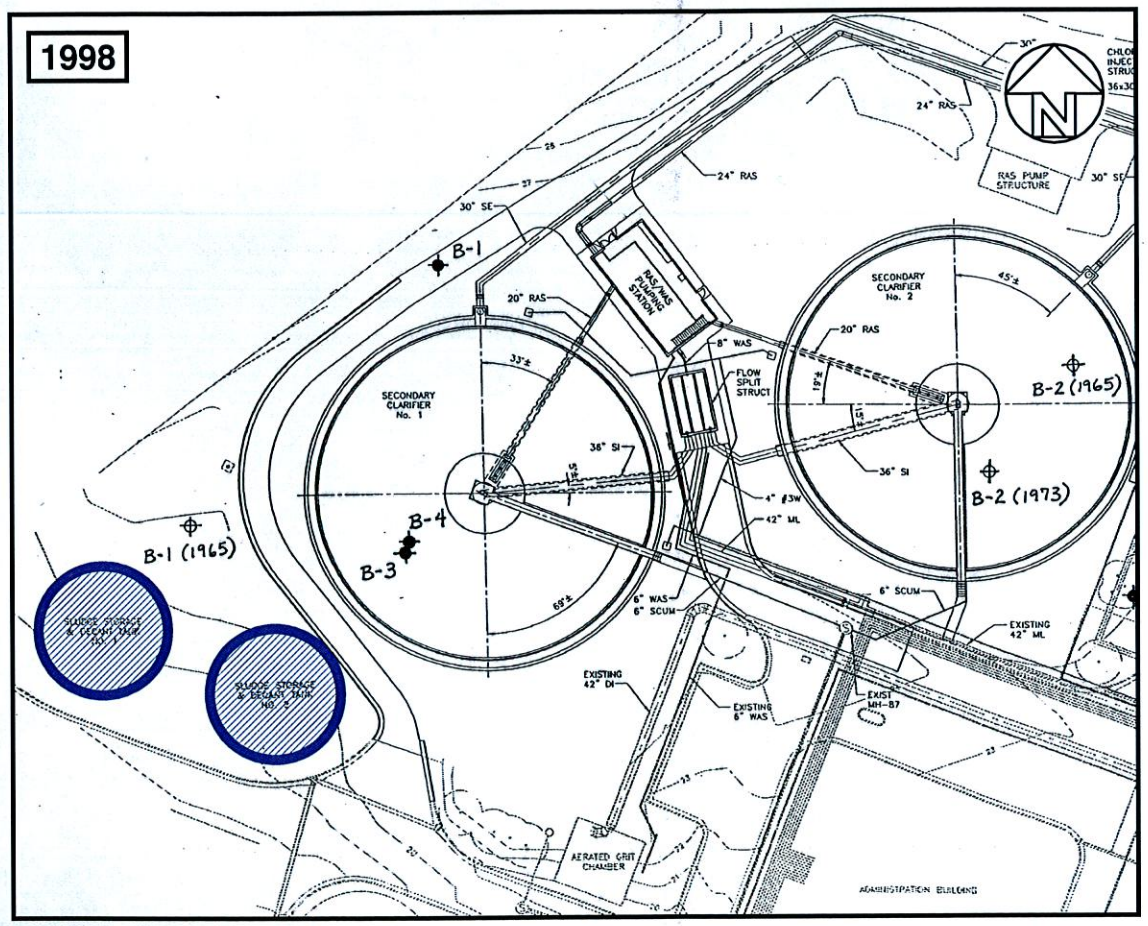
Qof **ALLUVIAL FAN DEPOSITS (Pleistocene)**
- Moderately to deeply dissected alluvial sediment deposited by streams emanating from mountain canyons onto alluvial valley floors or alluvial plains. Alluvial fan deposits typically include sand, gravel, silt, and clay. Is moderately to poorly sorted and moderately to poorly bedded.

MAP SOURCE: Witter and Others, 2006, U.S. Geological Survey Open-File Report 2006-1037
DESCRIPTION SOURCES: Witter and Others, 2006, U.S. Geological Survey Open-File Report 2006-1037
Knudsen and Others, 2000, U.S. Geological Survey Open-File Report 00-444

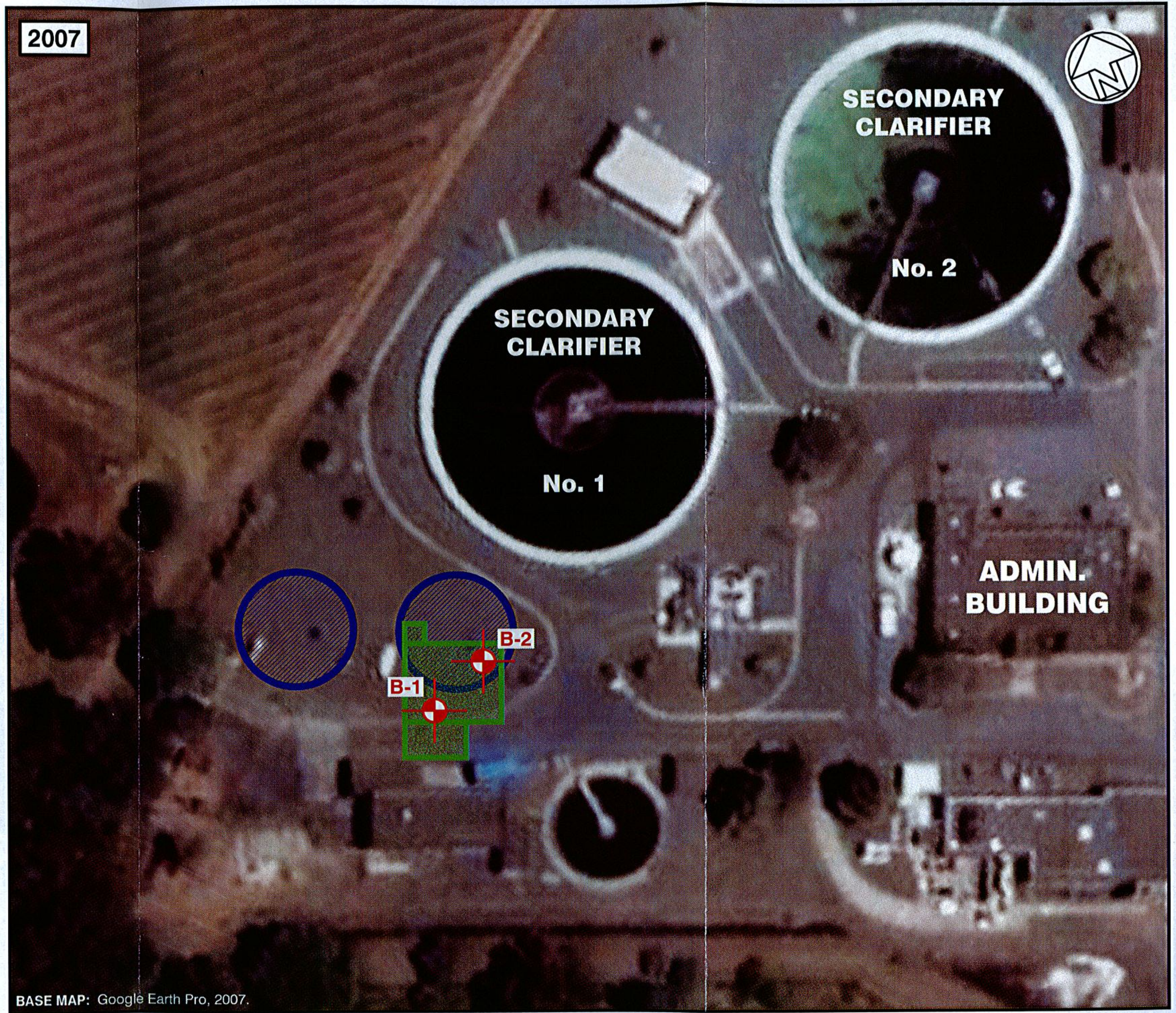
DCM Engineering	BROWN AND CALDWELL Sonoma Valley County Sanitation District Biosolids Management Upgrade Project Sonoma, California GEOLOGY MAP	PLATE NO. 2 (COLOR PLATE)
FILE NO. J-5038-1 — JULY 2007		



BASE MAP: Moore and Taber, 1977.



BASE MAP: Taber Consultants, 1998.

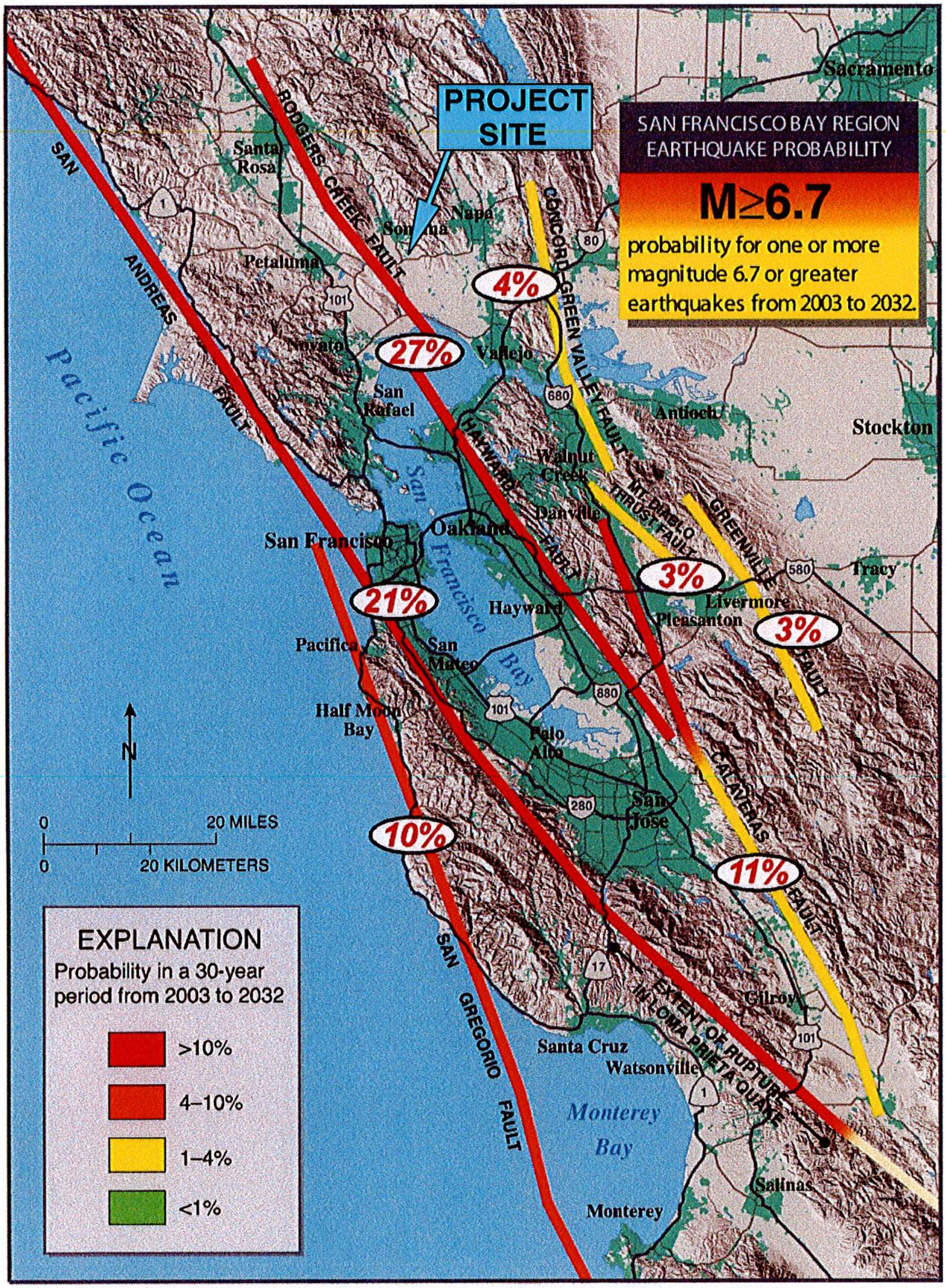


BASE MAP: Google Earth Pro, 2007.

LEGEND:

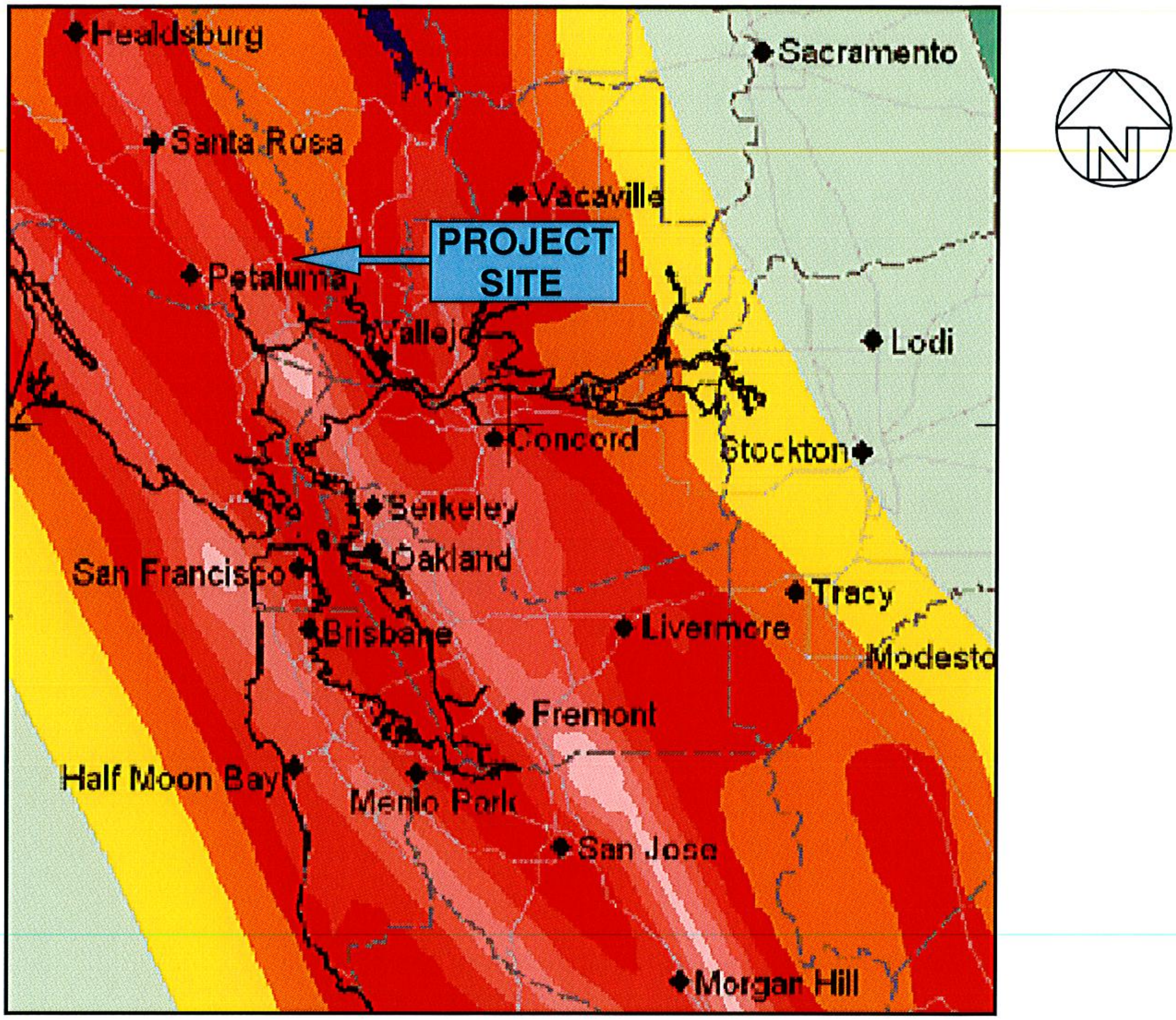
- B-1 - Project geotechnical boring location and reference number
- Approximate location of historic sludge storage and decant tanks
- Approximate location of new solids dewatering building

DCM Engineering		BROWN AND CALDWELL Sonoma Valley County Sanitation District Biosolids Management Upgrade Project Sonoma, California HISTORIC SITE STRUCTURES	PLATE NO. 3 (COLOR PLATE)
FILE NO. J-5038-1	JULY 2007		



Source: Modified from WGCEP (2003)

DCM Engineering		BROWN AND CALDWELL Sonoma Valley County Sanitation District Biosolids Management Upgrade Project Sonoma, California BAY AREA FAULT MAP	PLATE NO. 4 (COLOR PLATE)
FILE NO. J-5038-1	JULY 2007		



SHAKING (%g)
Pga (Peak Ground Acceleration)

FIRM ROCK

<10%	30-40%	60-70%
10-20%	40-50%	70-80%
20-30%	50-60%	>80%

(The unit "g" is acceleration due to gravity)

Probabilistic seismic hazard map for peak horizontal acceleration on firm-rock site conditions and for 10% probability exceedance in 50 years, based on the USGS/CGS Probabilistic Seismic Hazards Assessment Model, 2002 (Cao, T., and others, 2003).

DCM Engineering		BROWN AND CALDWELL Sonoma Valley County Sanitation District Biosolids Management Upgrade Project Sonoma, California SEISMIC SHAKING MAP	PLATE NO. 5 (COLOR PLATE)
FILE NO. J-5038-1	JULY 2007		

AVERAGE PEAK VELOCITY (CENTIMETERS PER SECOND)	MODIFIED MERCALLI INTENSITY VALUE AND DESCRIPTION	AVERAGE PEAK ACCELERATION ("g" is gravity - 9.80 metres per second squared)
	I. Not felt except by a very few under especially favorable circumstances.	
	II. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.	
	III. Felt quite noticeable indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing vehicles may rock slightly. Vibration like passing of a truck. Duration estimated.	
1-2	IV. During the day felt indoors by many, outdoors by few. At night some awakened. Rattling of dishes, windows, and doors; walls make creaking sounds. Hanging objects swing. Sensation like a heavy truck passing. Standing vehicles rocked noticeably.	0.015g-.02g
2-5	V. Felt by nearly everyone, many awakened. Some dishes, windows and so on broken; cracked plaster in a few places; unstable objects overturned. Disturbances of trees, poles and other tall objects sometimes noticeable. Pendulum clocks may stop. Buildings trembled throughout.	0.03g-0.04g
5-8	VI. Felt by all, many frightened and run outdoors. Some moderately heavy furniture moved; a few instances of fallen plaster and damaged chimneys. Trees, bushes, shaken slightly to moderately. Damage slight in poorly constructed buildings. Broken dishes, glassware and some windows. Moved furnishings and overturned furniture.	0.06g-0.07g
8-12	VII. Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; chimneys cracked to considerable extent. Noticed by persons driving vehicles. Waves on ponds, lakes, running water. Broke numerous windows, heavy furniture overturned. Dislodged bricks and stones.	0.10g-0.15g
20-30	VIII. Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving vehicles disturbed.	0.25g-0.30g
45-55	IX. Damage considerable in specially designed structures; well-designed frame structures thrown out-of-plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken. Reservoirs threatened.	0.50g-0.55g
More than 60	X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Railroad rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed, slopped over banks. Reservoirs greatly damaged. Open cracks in cement pavements and asphalt road surfaces.	More than 0.60g
	XI. Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly. Dams, dikes, embankments severely damaged. Destroyed large well-built bridges.	
	XII. Damage total. Practically all works of construction damaged greatly or destroyed. Landslides, falls of rock, slumping of river banks extensive. Fault slips in firm rock, with notable horizontal vertical off-set displacements. Water channels, surface and underground disturbed and modified greatly. Waves seen on ground surfaces.	

REFERENCE: Compiled from "Earthquakes & Volcanoes," Volume 21, Number 1, 1989, and "Earthquakes A Primer," Bruce A. Bolt, W.H. Freeman and Company, San Francisco, Copyright 1993.

DCM Engineering	BROWN AND CALDWELL Sonoma Valley County Sanitation District Biosolids Management Upgrade Project Sonoma, California MODIFIED MERCALLI SCALE	PLATE NO. 6
FILE NO. J-5038-1 — JULY 2007		

APPENDIX A

KEY TO BORING LOG

Shelby tube sample

Grab sample

1.4" I.D./2" O.D. Standard Penetration Test (ASTM D1586) sampler (SPT)

2.5" I.D./3" O.D. Modified California sampler (MCS) with brass liners

2" I.D./2.5" O.D. Split Spoon sampler (SSS)

NSR No sample recovery

PP Pocket Penetrometer (tsf = tons per square foot)

Groundwater level observed in boring at end of drilling unless noted otherwise. Not to be interpreted as the equilibrium groundwater level.

Groundwater seepage encountered during drilling

Planned pipeline I.D. (projected to boring)

RELATIVE DENSITY		CONSISTENCY		
SANDS AND GRAVELS	SPT, N	SILTS AND CLAYS	SPT, N	UNCONFINED COMPRESSIVE STRENGTH, tsf
VERY LOOSE	0-4	VERY SOFT	0-2	0-0.25
LOOSE	4-10	SOFT	2-4	0.25-0.50
MEDIUM DENSE	10-30	MEDIUM STIFF	4-8	0.50-1.00
DENSE	30-50	STIFF	8-15	1.00-2.00
VERY DENSE	50+	VERY STIFF	15-30	2.00-4.00
		HARD	30+	>4.00

Reference: Terzaghi, K. and Peck, R., SOIL MECHANICS IN ENGINEERING PRACTICE, 2nd ed., John Wiley and Sons, New York, 1967. Page 341 Table 45.1 and pp. 347 Table 45.2.

MOISTURE CONDITION

DESCRIPTION	CRITERIA
DRY	Absence of moisture, dusty, dry to the touch
MOIST	Damp but no visible water
WET	Visible free water, usually soil is below water table

Reference: ASTM D2488, Table 3 - Criteria for Describing Moisture Condition

CONSTITUENT DESCRIPTIONS

DESCRIPTION	CRITERIA
TRACE	less than 5%
FEW	5% to 10%
LITTLE	15% to 25%
SOME	30% to 45%
MOSTLY	50% to 100%

Reference: ASTM D2488, Note 15

NOTES:

1. Lines separating strata in the logs represent approximate boundaries only and are dashed where strata change depth is less certain and queried where strata change depth is not known. Actual strata change may be gradual. No warranty is provided as to the continuity of strata between borings. Logs represent the subsurface section observed at the boring location on the date of drilling only.
2. Penetration Resistance (blows/ft.) are the last 12" of an 18" drive or the middle 12" of a 24" drive using a 140-pound hammer falling 30 inches per blow unless noted otherwise. The Penetration Resistance values noted on the logs are actual blows per foot of penetration for the respective sampler type (i.e., MCS and SSS sampler Penetration Resistance has not been correlated to an equivalent SPT sampler "N" value).
3. All soil borings were completed using a truck-mounted Mobile B-24 drill rig using a 4-inch diameter continuous-flight solid stem augers unless otherwise indicated.
4. Where noted on the boring logs, slough is defined as material from the bore hole walls which collapses into and partially fills the open bore hole on removal of the solid flight augers for sampling. The presence of slough within the borehole can contaminate the sampled soils or render drive sampling impossible (samplers fill entirely with slough).

UNIFIED SOIL CLASSIFICATION SYSTEM

CRITERIA FOR ASSIGNING GROUP SYMBOLS AND GROUP NAMES[A]				GROUP SYMBOL	GROUP NAME[B]
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve	**GRAVELS** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels** < 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]	**GW**	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]	**GP**	Poorly graded gravel[F]
		Gravels with Fines > 12% fines[C]	Fines classify as ML or MH	**GM**	Silty gravel[F,G,H]
			Fines classify as CL or CH	**GC**	Clayey gravel[F,G,H]
	SANDS 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands** < 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]	**SW**	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3$[E]	**SP**	Poorly graded sand[I]
		Sands with Fines > 12% fines[D]	Fines classify as ML or MH	**SM**	Silty sand[G,H,I]
			Fines classify as CL or CH	**SC**	Clayey sand[G,H,I]
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve	**SILTS AND CLAYS** Liquid limit ≤ 50	Inorganic	PI > 7 plots on or above "A" line[J]	**CL**	Lean clay[K,L,M]
			PI < 4 plots below "A" line[J]	**ML**	Silt[K,L,M]
		Organic	$\frac{\text{Liquid limit-oven dried}}{\text{Liquid limit-not dried}} < 0.75$	**OL**	Organic Clay[K,L,M,N]
					Organic Silt[K,L,M,O]
	SILTS AND CLAYS Liquid limit > 50	Inorganic	PI plots on or above "A" line	**CH**	Fat clay[K,L,M]
			PI plots below "A" line	**MH**	Elastic silt[K,L,M]
		Organic	$\frac{\text{Liquid limit-oven dried}}{\text{Liquid limit-not dried}} < 0.75$	**OH**	Organic Clay[K,L,M,P]
					Organic Silt[K,L,M,Q]
HIGHLY ORGANIC SOILS		**Primarily organic matter, dark color and organic odor**		**PT**	Peat

NOTES:

A Based on the material passing the 3-in. (75mm) sieve.

B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

C Gravels with 5% to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

D Sands with 5% to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

E $Cu = \frac{D_{60}}{D_{10}}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

F If soil contains ≥ 15% sand, add "with sand" to group name.

G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

H If fines are organic, add "with organic fines" to group name.

I If soil contains ≥ 15% gravel, add "with gravel" to group name.

J If Atterberg limits plot in hatched area, soil is a CL-ML (silty clay).

K If soil contains 15% to 29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.

L If soil contains ≥ 30% plus No.200, predominantly sand, add "sandy" to group name.

M If soil contains ≥ 30% plus No.200, predominantly gravel, add "gravelly" to group name.

N PI ≥ 4 and plots on or above "A" line.

O PI < 4 or plots below "A" line.

P PI plots on or above "A" line.

Q PI plots below "A" line.

DCM Engineering		BROWN AND CALDWELL Sonoma Valley County Sanitation District Biosolids Management Upgrade Project Sonoma, California BORING LOG LEGEND	PLATE NO. A-1 (2 of 2)
FILE NO. J-5038-1	JULY 2007		

APPENDIX B

LOG OF BORING B-1

LOCATION: Southwest corner of proposed new solids dewatering building site (see Plate 1).

DEPTH (feet)	SAMPLE NO.	TYPE	PENETRATION RESISTANCE (blows/ft.)	GROUNDWATER	DESCRIPTION ①	MOISTURE (%)	DRY DENSITY (lbs./ft.³)	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE: Gravel (>#4 sieve) %	GRAIN SIZE: Sand (#4 to #200 sieve) %	GRAIN SIZE: Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH (kips/ft.²)	DIRECT SHEAR: Cohesion (p.s.f.)	DIRECT SHEAR: Internal Friction Angle
					GROUND SURFACE - 1½ inch, subangular to rounded gravel overlying a geotextile fabric										
	1		10		**FILL - CLAYEY GRAVEL WITH SAND (GC)** - multicolored gravel - dark grayish brown clay - predominantly 1-inch and larger gravel - some sand - medium plasticity fines - loose to medium dense - moist	20	104	48	25						
5	2		15												
					LEAN CLAY (CL) - brown - little silt - medium plasticity fines - stiff - moist										
	3		21		**SANDY LEAN CLAY (CL)** - olive brown - trace gravel at ~9.5 feet - sand grades coarser with depth - medium plasticity fines - stiff - moist	27	96			CORROSION TEST Sample B1-3 See Plate C-6					
10	4		8												
					LEAN CLAY (CL) - light olive brown - medium plasticity fines - medium stiff to stiff - moist										
	5		9		**SANDY LEAN CLAY (CL)** - light olive brown - fine grained sand - medium plasticity fines - medium stiff - wet	30	90							440	26°
15	6		7							0	45	55 (FINES: 24% Silt, 31% Clay)			
	7	②	13		**CLAYEY SAND (SC)** - dark yellowish brown with very dark brown staining - trace to few gravel - medium to fine grained sand - medium plasticity fines - medium dense - wet										
20	8		30			20									
	9		15		**INTERLAYERED LEAN CLAY WITH SAND (CL) AND CLAYEY GRAVEL WITH SAND (GC)** - relative thickness of interlayers unknown LEAN CLAY - olive brown - fine grained sand - medium plasticity fines - medium stiff - wet CLAYEY GRAVEL - multicolored gravel - dark olive brown clay - fine to coarse gravel - fine to coarse sand - medium plasticity fines - loose - wet Borehole sloughing below 22' (see table on Plate B-2, 2 of 2)	36									
25	10		9												

CONTINUED AT 27 FEET ON PLATE B-1 (2 of 2)

REMARKS: ① Boring drilled on May 10, 2007. See Plate A-1 in Appendix A for definitions of terms.
② Sample 7 fell out of the sample barrel while being removed from the bore hole and could not be recovered.

DCM Engineering

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BROWN AND CALDWELL
Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California
LOG OF BORING B-1

PLATE NO. B-1 (1 of 2)

LOG OF BORING B-1 (Continued)

LOCATION: Southwest corner of proposed new solids dewatering building site (see Plate 1).

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	GROUNDWATER	DESCRIPTION ①	MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE: Gravel (>#4 sieve) %	GRAIN SIZE: Sand (#4 to #200 sieve) %	GRAIN SIZE: Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH kips/ft.²	DIRECT SHEAR: Cohesion p.s.f.	DIRECT SHEAR: Internal Friction Angle
				②	CONTINUED FROM 27 FEET ON PLATE B-1 (2 of 2)										
					LEAN CLAY (CL) - olive brown - little to some silt - medium plasticity fines - medium stiff - wet										
	11		9			41	80	CONSOLIDATION TEST SAMPLE 11 $C_r = 0.03$ $P_C = 3.19$ ksf					0.94		
30	12		6												
					FAT CLAY (CH) - dark greenish gray mottled with dark yellowish brown veins - high plasticity fines - medium stiff - wet										
	13		11			56	66						3.97		
35	14		5					100	59						
	15		9		- few to little sand and silt	37									
40					**BOTTOM OF BORING AT 39.5 FEET**										
45															
50															

SLOUGH DEPTHS ON SAMPLING

Sample No.	Slough Depth*
1-9	1.5'
1-10	1'
1-12	6"

*- slough depth measured from intended sample depth

REMARKS: ① Boring drilled on May 10, 2007. See Plate A-1 in Appendix A for definitions of terms.
② See groundwater notes on Plate 1 of 2.

DCM Engineering

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BROWN AND CALDWELL
Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California
LOG OF BORING B-1

PLATE NO. B-1 (2 of 2)

LOG OF BORING B-2

LOCATION: Northeast corner of proposed new solids dewatering building site (see Plate 1).

DEPTH feet	SAMPLE NO.	PENETRATION RESISTANCE blows/ft.	DESCRIPTION ①	MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (>#4 sieve) %	GRAIN SIZE Sand (#4 to #200 sieve) %	GRAIN SIZE Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH kips/ft.²	DIRECT SHEAR Cohesion p.s.f.	DIRECT SHEAR Internal Friction Angle
0			**GROUND SURFACE** - approximately 1½ to 2-inch diameter subangular to rounded, clean gravel overlying a geotextile fabric										
	1	16	**FILL - CLAYEY GRAVEL WITH SAND (GC)** - multicolored gravel - dark yellowish brown clay - predominantly 1-inch and larger gravel - some sand - medium plasticity fines - medium dense - moist to wet	18	106			64	22	14	1.27		
5	2	14										420	42°
	3	18		18	102						1.63		
	4	21											
	5	11	**CLAYEY SAND (SC)** - dark brown with very dark brown spots - fine grained sand - medium plasticity fines - loose - wet	33	90			0	60	40			
	6	6				39	17						
15			**SANDY LEAN CLAY (CL)** - dark brown - fine grained sand - medium plasticity fines - medium stiff - wet										
	7	8	**LEAN CLAY WITH SAND (CL)** - olive brown - fine grained sand - medium plasticity fines - medium stiff - wet	31	96								
	8	5											
20													
	9	29	**CLAYEY GRAVEL WITH SAND (GC)** - locally may classify as a gravelly lean clay (CL) - olive brown and dark yellowish brown clay - clay color grades to very dark gray with depth - multicolored gravel - medium plasticity fines - loose to medium dense (gravel) - medium stiff (clay) - wet	15	120			62	25	13			
	10	9											
25			**FAT CLAY (CH)** - dark greenish gray mottled with trace dark yellowish brown staining - high plasticity fines - medium stiff - wet										

Groundwater symbols shown at approximately 8 to 10 feet.

Borehole sloughing below 11.5' (see table on Plate B-1, 2 of 2)

CORROSION TEST
Sample B2-1B
See Plate C-6

REMOLDED DIRECT SHEAR
Using screened fill (No. 4 sieve) from samples 1 through 4 → 420 p.s.f., 42°

CONSOLIDATION TEST
SAMPLE 7
C_r = 0.03
P_C = 4.07 ksf

CONTINUED AT 26 FEET ON PLATE B-2 (2 of 2)

REMARKS: ① Boring drilled on May 10, 2007. See Plate A-1 in Appendix A for definitions of terms.

DEPTH feet	SAMPLE NO.	TYPE	PENETRATION RESISTANCE blows/ft.	GROUNDWATER	LOG OF BORING B-2 (Continued) LOCATION: Northeast corner of proposed new solids dewatering building site (see Plate 1). DESCRIPTION ①	% MOISTURE %	DRY DENSITY lbs./ft.³	LIQUID LIMIT	PLASTICITY INDEX	GRAIN SIZE Gravel (>#4 sieve) %	Sand (#4 to #200 sieve) %	Fines (<#200 sieve) %	UNCONFINED COMPRESSIVE STRENGTH kips/ft.²	DIRECT SHEAR Cohesion p.s.f.	Internal Friction Angle
				②	**CONTINUED FROM 26 FEET ON PLATE B-1 (2 of 2)**										
30	11		35		**SILTY/CLAYEY SAND WITH GRAVEL (SM/SC)** - multicolored gravel - dark brown clay - fine to coarse sand - medium plasticity fines - medium dense - wet	19	107			33	52	15	0.25	FINES 9% Silt 6% Clay	
35	12		10		**INTERLAYERED FAT CLAY (CH) AND CLAYEY SAND WITH GRAVEL (SC)** - relative thickness of interlayers unknown FAT CLAY: - dark greenish gray - high plasticity fines - stiff - wet CLAYEY SAND WITH GRAVEL: - dark greenish gray - fine gravel - fine to coarse sand - medium plasticity fines - loose to medium dense - wet										
	13		6		**FAT CLAY (CH)** - dark greenish gray - high plasticity fines - medium stiff - wet	46									
40					**BOTTOM OF BORING AT 39.5 FEET**										
45															
50															

SLOUGH DEPTHS ON SAMPLING

Sample No.	Slough Depth*
2-6	2'
2-7	1'
2-9	1'
2-10	2.5'
2-11	1'
2-12	1.5'

*- slough depth measured from intended sample depth

REMARKS: ① Boring drilled on May 10, 2007. See Plate A-1 in Appendix A for definitions of terms.
② See groundwater notes on Plate 1 of 2.

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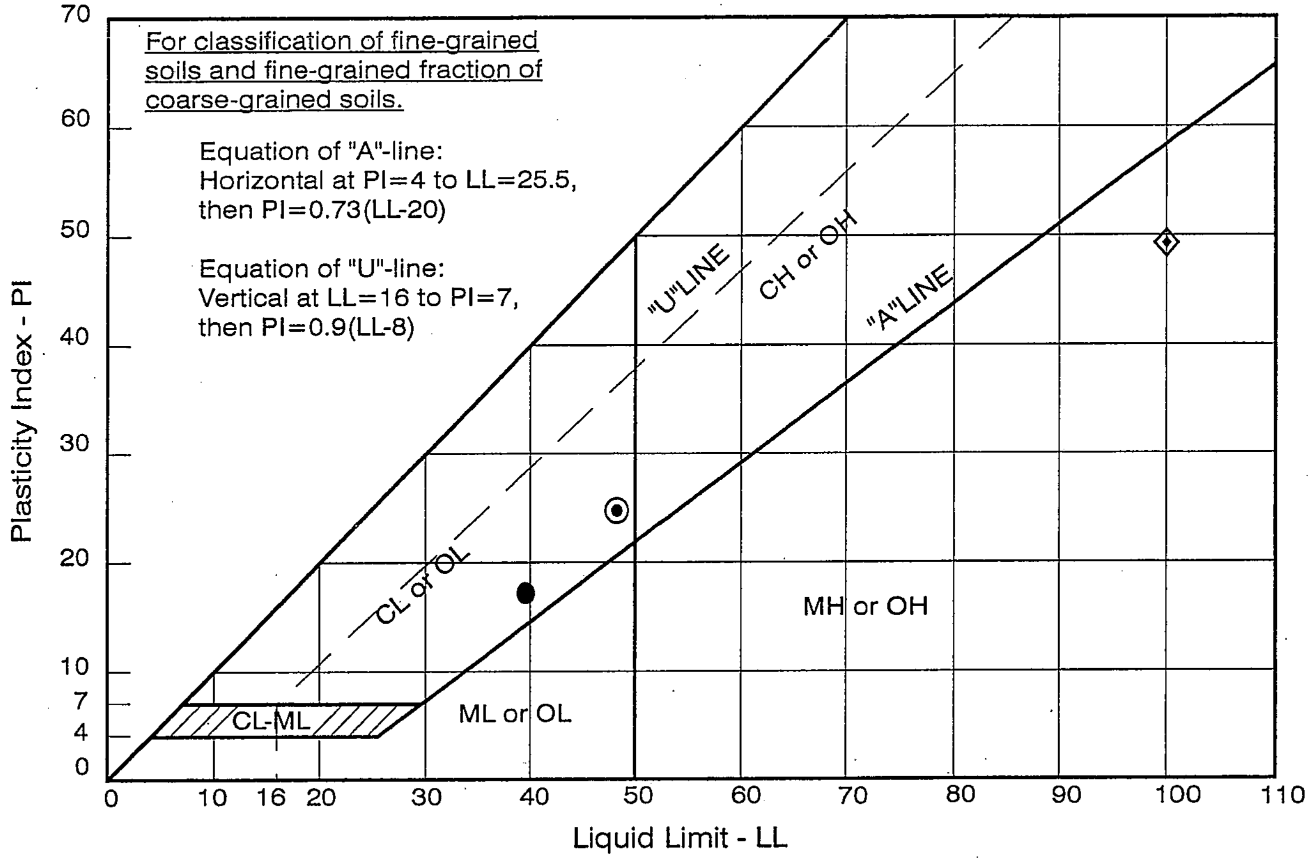
BROWN AND CALDWELL
Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California
LOG OF BORING B-2

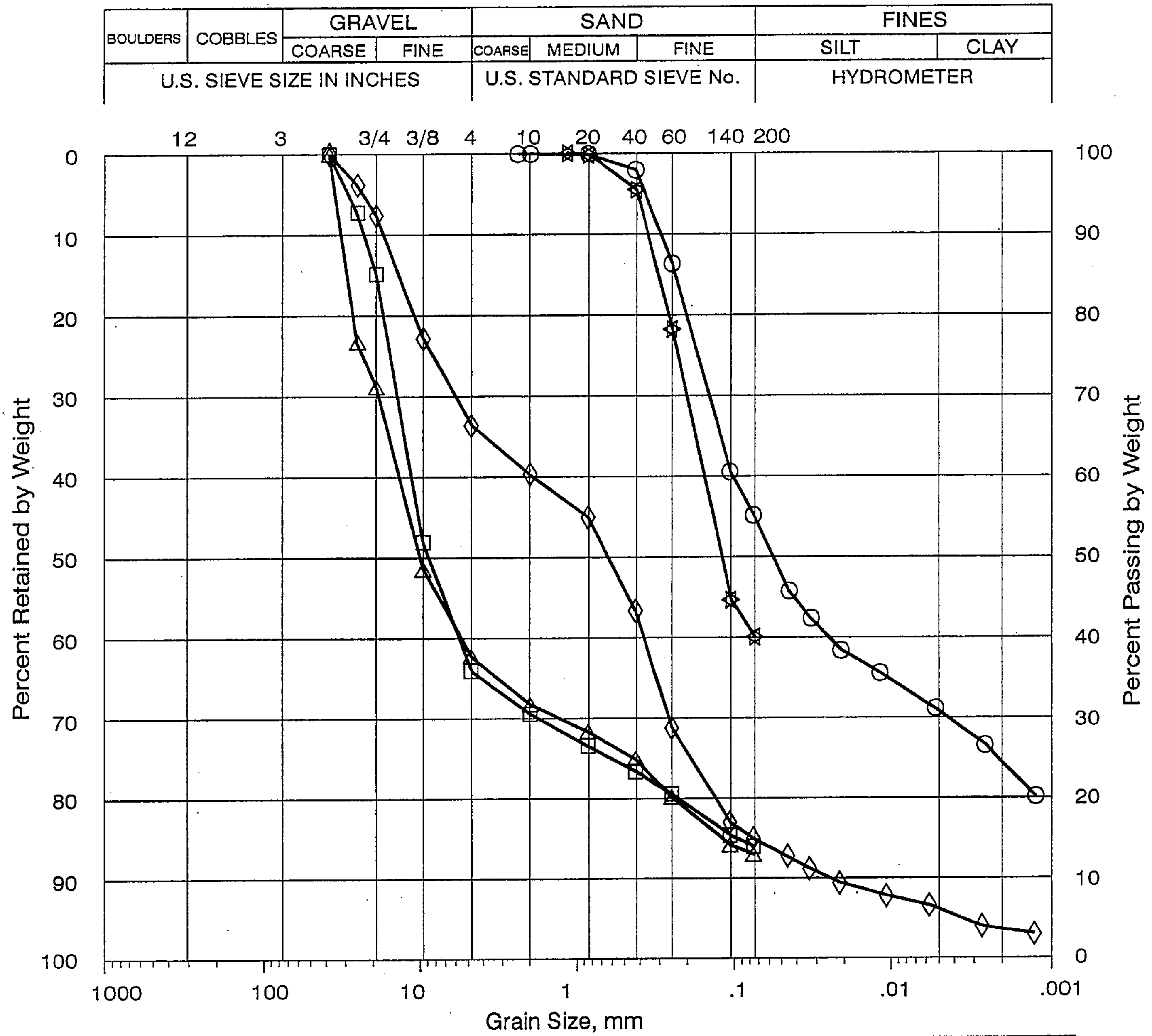
PLATE NO. B-2 (2 of 2)

APPENDIX C



TEST SYMBOL	BORING SAMPLE NO.	DEPTH (ft)	LIQUID LIMIT - LL	PLASTICITY INDEX - PI	GROUP SYMBOL*
⦿	B-1-1	4-4½	48	25	CL
◈	B-1-14	34½-36	100	59	CH
●	B-2-6	13½-15	39	17	CL

* Classification of fines < 0.425mm



TEST SYMBOL	BORING SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL	DESCRIPTION (based on grain size)
○	B-1-6	14½-16	CL	sandy lean clay
□	B-2-1	2½-3	GC	clayey gravel with sand
✡	B-2-5	13-13½	SC	clayey sand
△	B-2-9	23-23½	GC	clayey gravel with sand
◇	B-2-11	28-29	SM/SC	silty/clayey sand with gravel

NOTE: The largest particle (grain) size that could have been sampled from our borings by our sample barrels is a function of the inside diameter of the sample barrels used (see Plate A-1). Therefore, there may be larger particles (e.g., coarse gravel, cobbles or boulders) in the soils sampled than reflected on the boring logs and grain size distribution curves provided in this report.

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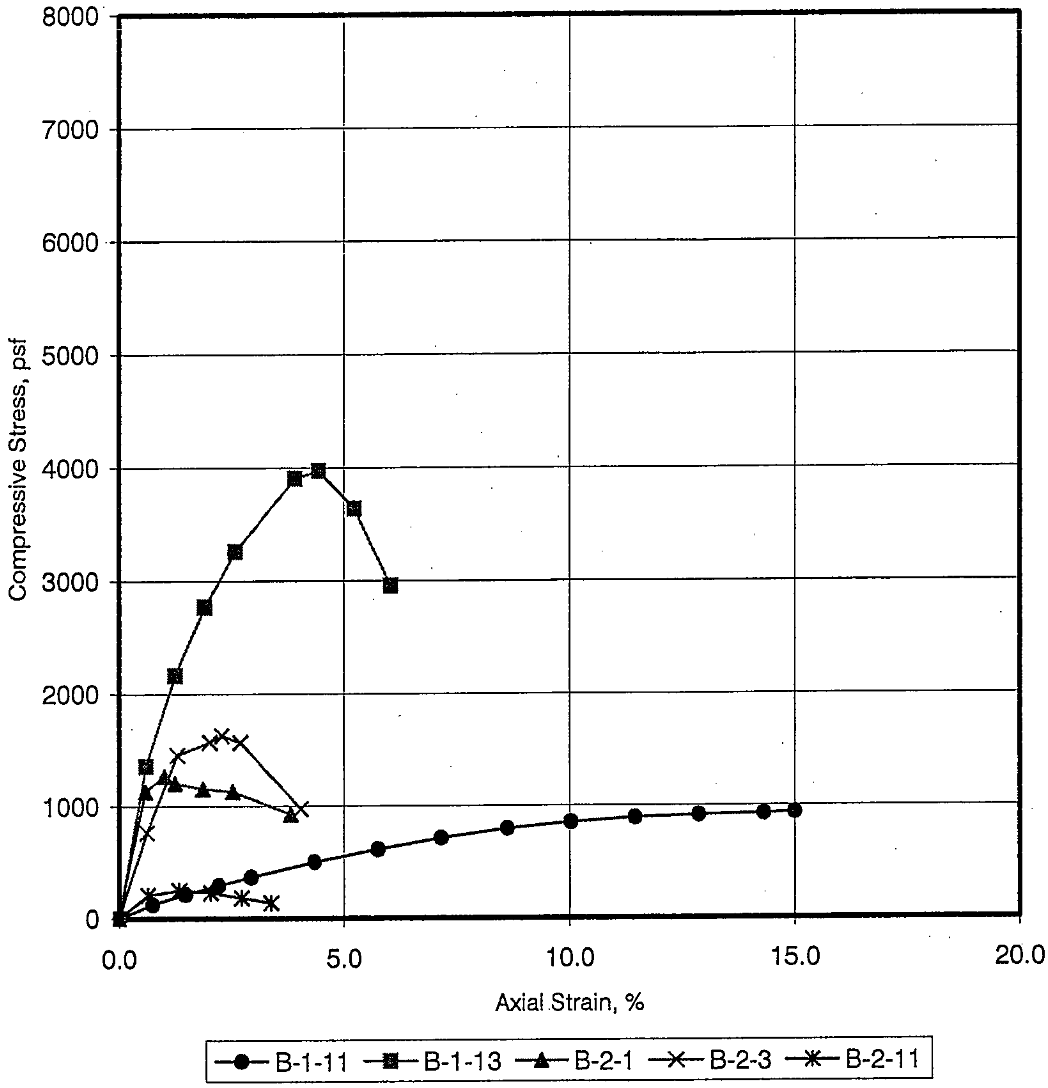
Biosolids Management Upgrade Project
Sonoma, California

GRAIN SIZE ANALYSIS

PLATE NO. C-2

FILE NO. J-5038-1 | JULY 2007

UNCONFINED COMPRESSION TEST



BORING SAMPLE NO.	B-1-11	B-1-13	B-2-1	B-2-3	B-2-11
MAXIMUM UNCONFINED STRESS, psf	937	3971	1268	1628	250
% STRAIN @ PEAK STRESS	15	4.4	1.0	2.3	1.3
DEPTH, ft.	28½-29	34-34½	2½-3	8-8½	28-28½
WATER CONTENT, %	41	56	18	18	19
DRY DENSITY, pcf	80	66	106	102	107
SATURATION, %	99	97	81	73	90

Maximum Unconfined Stress cut-off = 15% strain
Average Strain Rate = 0.07 in/min.

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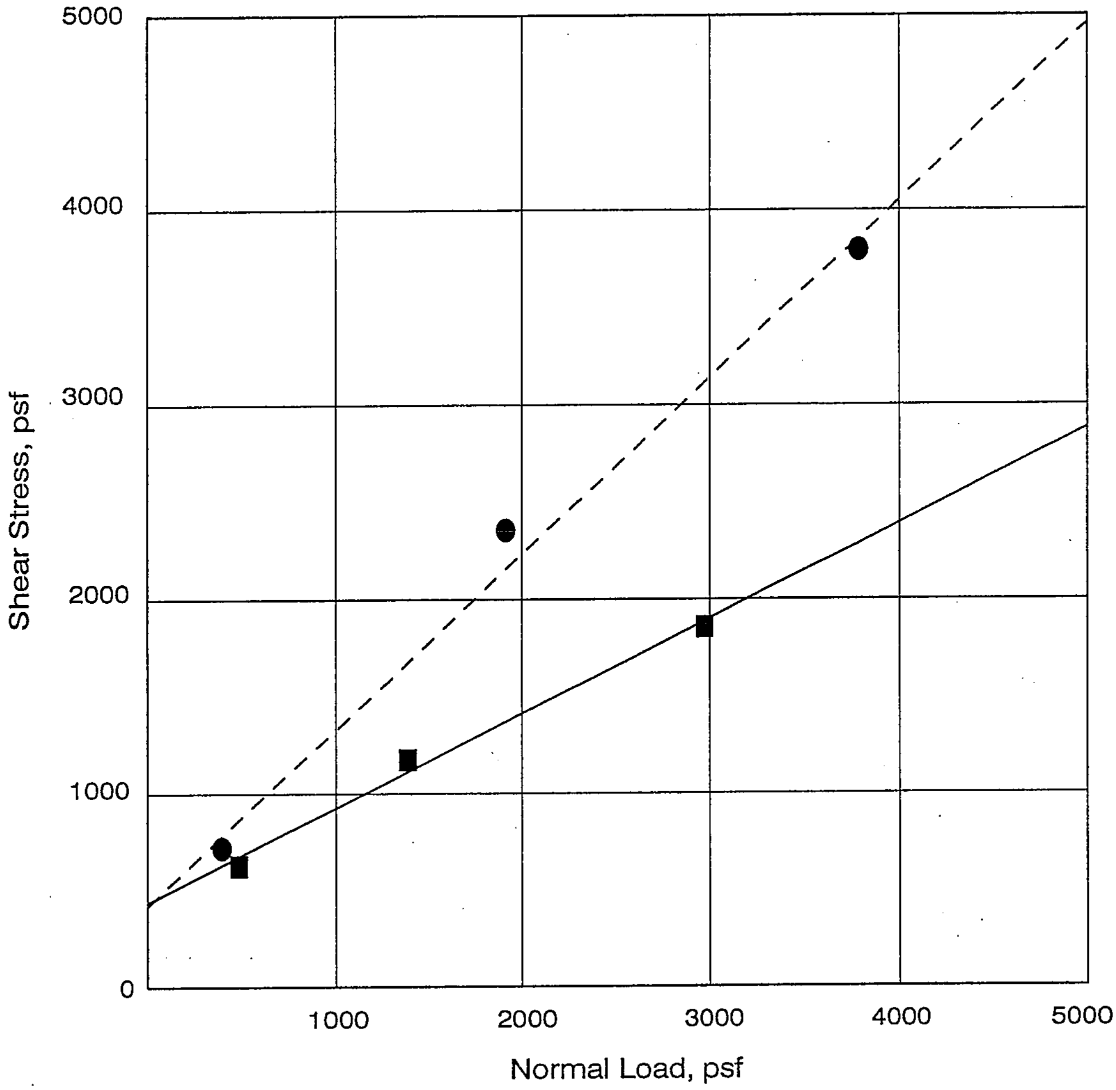
BROWN AND CALDWELL
Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California
UNCONFINED COMPRESSION

PLATE NO.
C-3



TEST SYMBOL	GRAPH LINE	BORING SAMPLE NO.	DEPTH (ft)	COHESION (p.s.f.)	INTERNAL FRICTION ANGLE (degrees)	AVE. DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	
						BEFORE TEST	AFTER TEST
■	———	B-1-5	14-14½	440	26	90/30	93/30
●	- - - -	B-2-1 to 4 *	3-10	420	42	92/22	88/30

* remolded, composite sample with gravels removed

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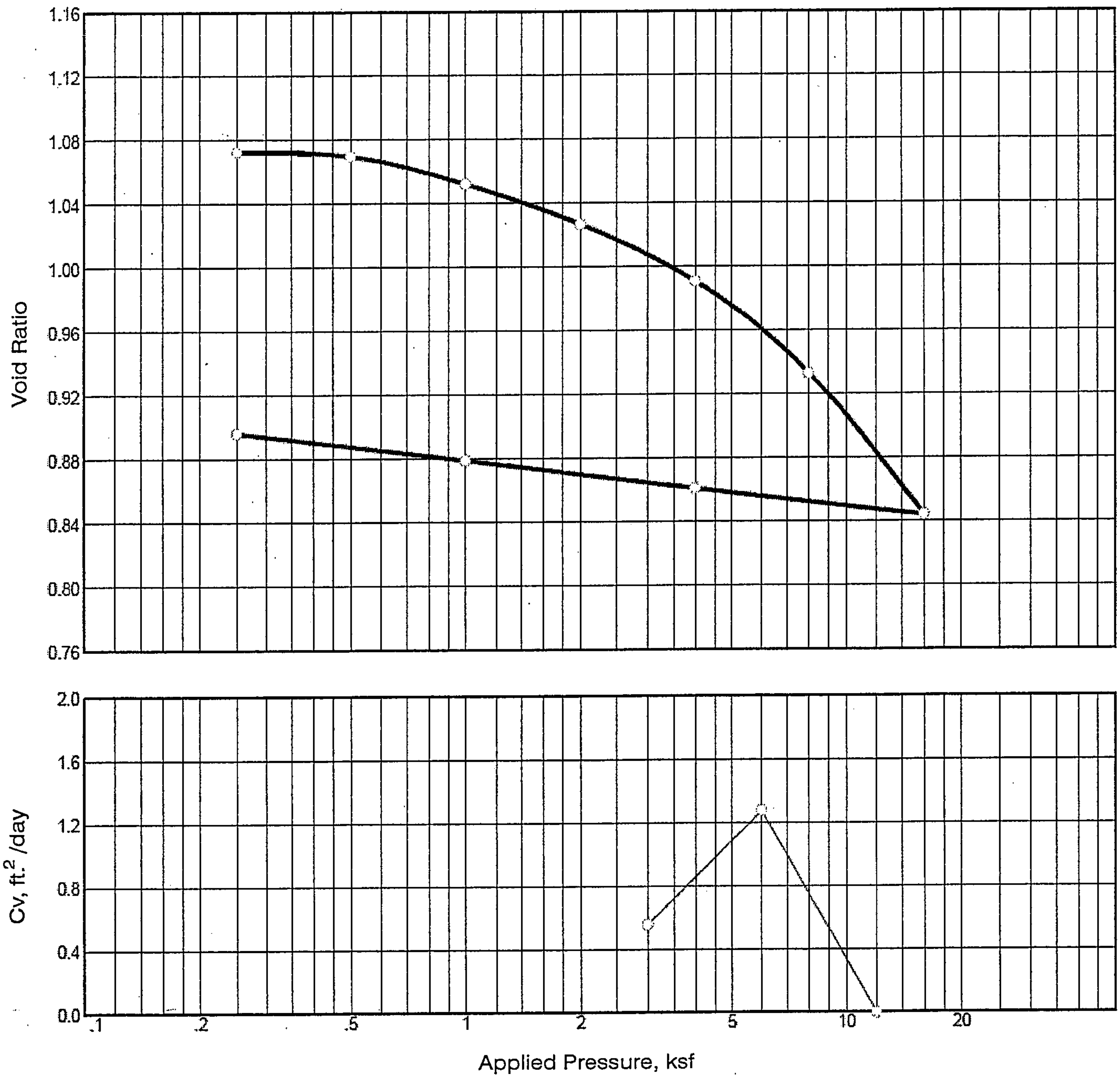
FILE NO. J-5038-1 | JULY 2007

BROWN AND CALDWELL
Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California
DIRECT SHEAR

PLATE NO. C-4



TEST SYMBOL	BORING SAMPLE NO.	DEPTH (ft)	BEFORE TEST CONDITIONS			ESTIMATED PRECONSOLIDATION PRESSURE (ksf) *	C_r*	e_o
			SATURATION (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)			
—o—	B-1-11	29-29½	97	39	82	3.2	0.03	1.08

* - values have been corrected to account for sample disturbance effects.

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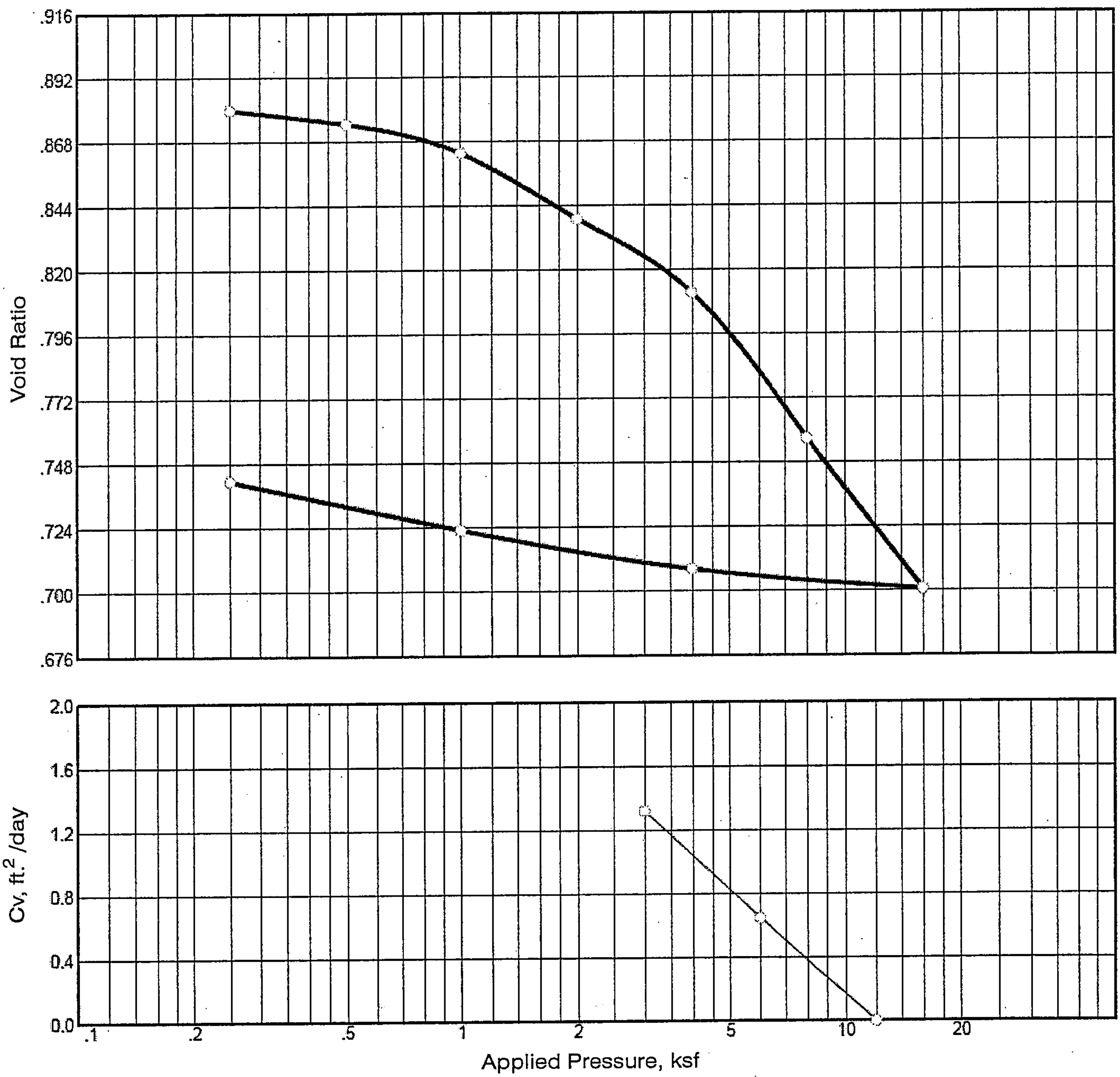
Biosolids Management Upgrade Project
Sonoma, California
CONSOLIDATION

PLATE NO.
C-5
(1 of 2)

FILE NO. J-5038-1 | JULY 2007



TEST SYMBOL	BORING SAMPLE NO.	DEPTH (ft)	BEFORE TEST CONDITIONS			ESTIMATED PRECONSOLIDATION PRESSURE (ksf) *	C_r*	e_o
			SATURATION (%)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)			
——o——	B-2-7	17½-18	96	31	90	4.1	0.03	0.88

* - values have been corrected to account for sample disturbance effects.

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BROWN AND CALDWELL
Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California

CONSOLIDATION

PLATE NO.

C-5

(2 of 2)

CORROSION TESTS and RESULTS

BORING SAMPLE NO.	RESISTIVITY (ohm-cm)		REDOX (mv)	pH	SULFIDES	SULFATES (ppm)	CHLORIDES (ppm)
	as-received	saturated					
B-1-3	1,615	1,615	+192	6.95	Nil	40	12
B-2-1	1,041	1,041	+219	7.26	Trace	90	21

Test Notes:

1. Appendix A of ANSI/AWWA C105/A215, TABLE A, provides soil test methods and evaluation for conditions corrosive to gray or ductile-cast iron pipe and fittings.
2. The above tests (excluding redox and sulfides) were performed in accordance with the following Caltrans Test Methods:
   a. California Test 643 (1993): METHOD FOR ESTIMATING THE SERVICE LIFE OF STEEL CULVERTS
   b. California Test 532 (1993): METHOD FOR ESTIMATING THE TIME TO CORROSION OF REINFORCED CONCRETE SUBSTRUCTURES
   c. California Test 422 (1978): METHOD OF TESTING SOILS AND WATERS FOR CHLORIDE CONTENT
   d. California Test 417 (1986): METHOD OF TESTING SOILS AND WATERS FOR SULFATE CONTENT
3. ASTM D4568: METHOD OF TESTING SOILS FOR SULFIDE CONTENT.
4. Testing provided by Conceco/Matcor Engineering, Inc.

APPENDIX D

MOORE & TABER NORTHERN CALIFORNIA
CONSULTING ENGINEERS AND GEOLOGISTS

TEST BORING LOG

TYPE 3" Rotary Drill ELEVATION 20.8 BORING Nº 1

Unconfined Compressive Strength (TSF)		DRY DENSITY (lbs/cu.ft.)	MOISTURE (%)	BLOWS/FOOT 350 ft-lb	SAMPLE SIZE (INCHES)	SAMPLE Nº	DEPTH IN FEET	UNIFIED SOIL CLASSIFICATION	Description
							5	GC	Semicompact brown clayey sandy very fine to coarse gravel with several clay layers and scattered small cobbles.
1.6		104	20	19	1.4	1			
GWS el=13.3 ▼ 12/27/65									
				25/8	1.4	2	10		
	S	85	38		2.5	3B	15	CL	Soft gray-brown sandy clay with several clayey sand layers.
0.6		89	32	6	1.4	3			
	CS	94	28		2.5	3A			
				4	2.5	4	20		
				26	1.4	5	25	SC	Compact brown clayey gravelly very fine to very coarse sand.
								CL	Soft brown sandy clay.
0.4/1.7		83/93	37/28	6/15	1.4	6	30		
								SC	Semicompact brown clayey very fine to fine sand.
				17	1.4	7	35		
								ML	Soft blue-gray clayey silt.
									T.D.=40 ft

MATERIAL SYMBOL

Logged By ADB Date 12/23,24/65

Figure 1a

REMARKS: ① Boring log source: "Subsurface Investigation, Sonoma County Water Agency, Secondary Clarifier Upgrade Project, Schellville, California", by Taber Consultants, Dated October 1998.

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FILE NO. J-5038-1 | JULY 2007

BROWN AND CALDWELL
Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California
LOG OF REFERENCE BORING RB-1

PLATE NO. D-1

Taber Consultants
Engineers and Geologists
536 Galveston Street
West Sacramento, CA 95691
(916) 371-1690 Fax (916) 371-7265
Since 1954

TEST BORING LOG

1P2/598/63

TYPE: 4-Inch Solid Stem Auger

ELEVATION: 26.6

BORING No. 1

UNCONFINED COMPRESSIVE STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	BLOWS/FOOT 350 ft-lb	SAMPLE SIZE (inches)	SAMPLE No.
1.0		114	16	15	1.4	1
		112	11	58	1.4	2
	S				Bag	A
		125	15	43	2.5	3
0.6		90	31	13	1.4	4
					Bag	B
		100	22	75	2.5	5
3.9		79	55	41	1.4	6
	S	95	27	77	2.5	7
3.2		85	32	44	1.4	8
1.9		92	26	31	1.4	9
				44	1.4	10

DEPTH IN FEET: 5, 10, 15, 20, 25, 30, 35, 40

UNIFIED SOIL CLASS	Description
ML	Stiff brown slightly CLAYEY fine SANDY SILT
GW	Dense/hard brown SILTY and CLAYEY fine-medium SANDY fine-coarse GRAVEL and fine-coarse GRAVELLY SANDY CLAYEY SILT
CL / SM	Stiff brown very fine SANDY SILTY CLAY and CLAYEY very fine-fine SAND
▼ 6-29-98 ML	Hard light brown very fine SANDY CLAYEY SILT
▽ 6-29-98 CL	Hard light brown to brown SILTY CLAY
CL	Very stiff brown SILTY CLAY
CL	Hard brown very fine SANDY SILTY CLAY

Groundwater encountered at 20.0ft. depth during drilling. Groundwater measured at 16.5ft. depth before backfilling. Boring grout backfilled 6-29-98.

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

LOGGED BY: H.C.V. | DATE: 6-29-98

Figure – 1 Page 1 of 4

REMARKS: ① Boring log source: "Subsurface Investigation, Sonoma County Water Agency, Secondary Clarifier Upgrade Project, Schellville, California", by Taber Consultants, Dated October 1998.

DCM Engineering

BROWN AND CALDWELL
Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California
LOG OF REFERENCE BORING RB-2

PLATE NO. D-2

FILE NO. J-5038-1 | JULY 2007

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Taber Consultants
Engineers and Geologists
536 Galveston Street
West Sacramento, CA 95691
(916) 371-1690 Fax (916) 371-7265

CONE PENETROMETER

1P2/598/63

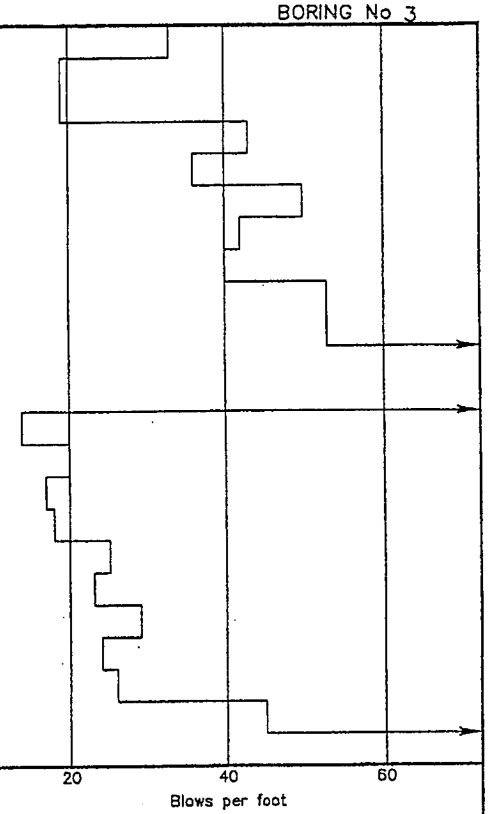
TYPE: 2.5-Inch Cone Penetrometer

ELEVATION: 22.4

BORING No 3

Blows/Foot 350 ft-lb
33
19
19
43
36
50
42
40
53
53
72
73
14
20
17
18
25
23
29
24
26
45
107

Depth in feet: 5, 10, 15, 20, 25, 30, 35, 40



Boring grout backfilled 6-29-98.

Columns: UNCONFINED COMPRESSIVE STRENGTH (tsf) | OTHER TESTS | DRY DENSITY (lbs/cu. ft.) | Moisture (%) | BLOWS/FOOT 350 ft-lb | SAMPLE SIZE (inches) | SAMPLE No. | DEPTH IN FEET | MATERIAL SYMBOL | UNIFIED SOIL CLASS

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

LOGGED BY: H.C.V. | DATE: 6-29-98

Figure – 1 Page 3 of 4

REMARKS: ① Boring log source: "Subsurface Investigation, Sonoma County Water Agency, Secondary Clarifier Upgrade Project, Schellville, California", by Taber Consultants, Dated October 1998.

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Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California
LOG OF REFERENCE BORING RB-3

PLATE NO. D-3

FILE NO. J-5038-1 | JULY 2007

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TEST BORING LOG

1P2/598/63

TYPE: 4-Inch Solid Stem Auger

ELEVATION: 22.6

BORING No 4

Depth in feet	Blows/foot 350 ft-lb	Sample size (inches)	Sample No.	Unified soil class	Description
0–3				ML	(Stiff) brown CLAYEY SILT with scattered fine GRAVEL
3–12				ML	(Stiff to very stiff) brown fine GRAVELLY CLAYEY SILT (water level 6-29-98 at ~9.3 ft; 6-29-98 at 12 ft)
12–20	16	2.5	1A	CL	(Soft to stiff) brown SILTY CLAY
	16	2.5	1B		
	57	2.5	2		
20–22.5				CL	(Stiff to hard) brown SILTY CLAY
22.5–23.5				CL	(Hard) brown very fine–fine SANDY GRAVELLY CLAY

Groundwater measured at 12.0ft. depth during drilling. Groundwater measured at 9.3ft. depth after completion. Boring grout backfilled 6-29-98.

Column headings: UNCONFINED COMPRESSIVE STRENGTH (tsf); OTHER TESTS; DRY DENSITY (lbs/cu. ft.); Moisture (%); BLOWS/FOOT 350 ft-lb; SAMPLE SIZE (inches); SAMPLE No.; DEPTH IN FEET; MATERIAL SYMBOL; UNIFIED SOIL CLASS

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

LOGGED BY: H.C.V. | DATE: 6-29-98

Figure – 1 Page 4 of 4

REMARKS: ① Boring log source: "Subsurface Investigation, Sonoma County Water Agency, Secondary Clarifier Upgrade Project, Schellville, California", by Taber Consultants, Dated October 1998.

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Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California

LOG OF REFERENCE BORING RB-4

PLATE NO. D-4

FILE NO. J-5038-1 | JULY 2007

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TEST BORING LOG

1P2/598/63

TYPE: 4-Inch Solid Stem Auger

ELEVATION: 24.0

BORING No 2

UNCONFINED COMPRESSIVE STRENGTH (tsf)	OTHER TESTS	DRY DENSITY (lbs/cu. ft.)	Moisture (%)	BLOWS/FOOT 350 ft-lb	SAMPLE SIZE (inches)	SAMPLE No.	DEPTH IN FEET	UNIFIED SOIL CLASS	DESCRIPTION
							0	ML	0.4ft. coarse GRAVEL on visqueen over very fine SANDY CLAYEY SILT
								ML / SM	(Very stiff) fine GRAVELLY SANDY CLAYEY SILT and (compact) brown CLAYEY very fine SAND with scattered fine-coarse GRAVEL
		87	30	37	1.4	1	5		
								CL / GC	Very stiff/compact fine GRAVELLY SANDY CLAY and CLAYEY SANDY fine GRAVEL
	G				Bag	C	10		
		102	24	34	1.4	2		CL	(Very stiff to stiff) brown SILTY CLAY
					Bag	D	15		
0.6		83	36	19	1.4	3			
							20	CL	Hard brown SILTY CLAY and very fine SANDY SILTY CLAY with thin interbeds of CLAYEY very fine SAND
4.3		93	30	39	1.4	4			▽ 6-29-98; ▼ 6-29-98
							25		
4.3		103	23	47	1.4	5			
							30		
							35		
							40		

Groundwater measured at 23.0ft. depth during drilling. Groundwater measured at 24.0ft. depth after completion. Boring grout backfilled 6-29-98.

THE BORING LOGS SHOW SUBSURFACE CONDITIONS AT THE DATES AND LOCATIONS INDICATED AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

LOGGED BY: H.C.V. | DATE: 6-29-98

Figure – 1 Page 2 of 4

REMARKS: ① Boring log source: "Subsurface Investigation, Sonoma County Water Agency, Secondary Clarifier Upgrade Project, Schellville, California", by Taber Consultants, Dated October 1998.

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Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California
LOG OF REFERENCE BORING RB-5

PLATE NO. D-5

FILE NO. J-5038-1 | JULY 2007

MOORE & TABER · Engineers · Geologists

TEST BORING LOG

TYPE 4" Auger | ELEVATION 23.8 | BORING No 2

DRY DENSITY (lbs/cu.ft.)	MOISTURE (%)	BLOWS / FOOT	SAMPLE SIZE (INCHES)	SAMPLE No	DEPTH IN FEET	UNIFIED SOIL CLASSIFICATION	Description
						CL	Brown sandy CLAY with GRAVEL
91.0	21.9	17	1.4	1		SC	Semi-compact to dense brown clayey fine to coarse SAND & GRAVEL
					5		
95.3	16.3	30	1.4	2		GC	
					10		
93.0	21.1	49	1.4	3			
						CL	Hard brown silty CLAY with numerous seams of SILT
88.7	25.4	55	1.4	4	15	ML	
		47	1.4	5	20	ML	Hard brown clayey SILT

Notes

1. Minor caving of boring walls.
2. Ground water surface:

Date	Time	Depth (feet)
8 May 73	1130	11.7
9 May 73	1200	11.3
10 May 73	1415	11.2
30 May 73	1030	12.3

Logged By T.D.H. | Date 7 May 1973

Job No. 573/55F - 26 June 1973

Figure 31b

REMARKS: ① Boring log source: "Subsurface Investigation, Sonoma County Water Agency, Secondary Clarifier Upgrade Project, Schellville, California", by Taber Consultants, Dated October 1998.

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FILE NO. J-5038-1 | JULY 2007

BROWN AND CALDWELL
Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California
LOG OF REFERENCE BORING RB-6

PLATE NO. D-6

MOORE & TABER NORTHERN CALIFORNIA
CONSULTING ENGINEERS AND GEOLOGISTS

TEST BORING LOG

TYPE 16" Auger ELEVATION 27.0 BORING Nº 2

	Dry Density (lbs/cu.ft.)	Moisture (%)	Blows/Foot	Sample Size (inches)	Sample Nº	Depth in Feet	Unified Soil Classification	Description
							SC	Very loose black organic clayey very fine to fine sand.
S	95	24		2.5	1	5	CL	Soft to stiff brown sandy clay.
	94	24		2.5	2	10	GC	Semicompact brown clayey sandy very fine to coarse gravel with few small cobbles.
S	99	24		2.5	3	15		
		GWS	el=10.7 12/27/65					
						20	CL/SC	Interbedded stiff and very stiff gray-brown sandy clay, clayey very fine sand and silty sand with a few soft layers and hard cemented layers.
S	88	32		2.5	4	25		
				2.5	5			

T.D.=30 ft

Logged By ADB Date 12/23, 24/65

REMARKS: ① Boring log source: "Subsurface Investigation, Sonoma County Water Agency, Secondary Clarifier Upgrade Project, Schellville, California", by Taber Consultants, Dated October 1998.

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FILE NO. J-5038-1 | JUNE 2007

BROWN AND CALDWELL
Sonoma Valley County Sanitation District
Biosolids Management Upgrade Project
Sonoma, California
LOG OF REFERENCE
BORING RB-7

PLATE NO.
D-7