November 4, 2013

Mr. Ryan Leong
SRM Development
111 North Post, Suite 200
Spokane, WA 99201

RE: Geotechnical Investigation
4901, 4915, 4919, 4921, 4939, and 4945 Broadway; Parcel No. 013-1136-008-04 (no address); 311 and 313 – 51st Street; 4974, 4970, 4966 and 4964 Desmond Street, Oakland, California

Dear Mr. Leong:

Enclosed is the Geotechnical Investigation Report for the above referenced property. Please review this Report, especially the Recommendations sections.

Thank you for choosing ERS to perform this project. If you have any questions, comments or concerns, please contact me at (408) 496-0801 or kprice@erscorp.us.

Sincerely,

Kendall W. Price CEG, REA
Principal Consultant/Regional Manager

Vien Vo, P.E.
Consultant

# GEOTECHNICAL INVESTIGATION

4901, 4915, 4919, 4921, 4939, and 4945 Broadway; Parcel No. 013-1136-008-04 (no address); 311 and 313 – 51st Street; 4974, 4970, 4966 and 4964 Desmond Street
Oakland, California

November 4, 2013

**Prepared For:**

SRM Development
111 North Post, Suite 200
Spokane, WA 99201

ers
**Environmental Risk Specialties Corporation**

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# APPENDICES

## 1.0 Introduction

The purpose of the Geotechnical Investigation performed by Environmental Risk Specialties Corp (ERS) was to evaluate the design criteria necessary to construct the planned commercial and residential development on 4901, 4915, 4919, 4921, 4939, and 4945 Broadway; Parcel No. 013-1136-008-04 (no address); 311 and 313 – 51st Street; 4974, 4970, 4966 and 4964 Desmond Street, Oakland, Alameda County, California. To establish the design criteria and grading recommendations necessary to construct above-referenced residence, we have determined the nature of the surface and subsurface soil conditions at the site through field and laboratory testing of the soil materials found there. This report presents an explanation of how we conducted our investigation, the results of the testing programs, our conclusions based upon those results, and our recommendations for earth work and foundation design to best suit the proposed structural improvements of the proposed residential building.

## 2.0 Location and Description of Site

The subject property is several parcels occupying the entire eastern and northern portions of a block bound by 51st Street, Broadway, 49th Street, and Desmond Street in Oakland, California. The property addresses are 4901, 4915, 4919, 4921, 4939, and 4945 Broadway; Parcel No. 013-1136-008-04 (no address); 311 and 313 – 51st Street; 4974, 4970, 4966 and 4964 Desmond Street in Oakland, Alameda County, California. The site is Alameda County Assessor's Parcel Number (APN) 013-1136-010, 013-1136-021, 013-1136-022-01, 013-1136-004-02, 013-1136-005-05, 013-1136-008-04, 013-1136-009-02, 013-1136-012, and 013-1136-011. A map showing the property location is included as Figure 1 and a site map showing the boring locations is included as Figure 2.

The property is in a commercial/light industrial area within the City of Oakland, California. The site is currently comprised of four buildings which are vacant and unusable in their current dilapidated condition. Former structures have been demolished in other areas of the site. The paved areas, including some of the former building slabs in the southern and northeastern portions of the site are leased to a car dealership for use as overflow inventory automobile storage and former residential lot areas at the northwestern portion of the site are covered with grass and not currently in use.

It is our understanding the site may be purchased for redevelopment to include residential and commercial uses. A site location map is presented as Figure 1 in Appendix A and a site map showing the lot, proposed building footprint, and the soil boring locations is presented as Figure 2, Appendix A.

## 3.0 Field Investigation

After careful consideration of the nature of the proposed development, review of available data on the area, and discussion with the client, a field investigation was conducted at the project site by ERS. The field investigation included the advancement of five exploratory soil borings to determine the subsurface soil characteristics. A total of 10 borings were drilled but several were for environmental sampling. The geotechnical exploratory borings (SB-1, SB-2, SB-4, SB-6, and SB-9) were drilled on January 14, 2013 and were advanced to a depth of 13 to 30 feet. The approximate location the exploratory soil boring is shown on the Site Plan (Appendix A, Figure 2). The borings were advanced using a truck-mounted drill rig using power driven, 6-inch diameter continuous flight augers. The soils encountered were logged continuously in the field during the drilling operations. Relatively undisturbed soil samples were obtained by the hammering a 2-1/2 inch outside diameter split-tube sampler into the ground with a 140-pound hammer falling 30 inches. Blow counts for the last 12 inches were recorded as an indication of the relative density of the soils. In addition, undisturbed soil samples were collected from each soil boring for laboratory analyses. The soil profile encountered and the depths at which the relatively undisturbed soil samples were obtained are presented in the Geotechnical Boring Logs (Appendix B).

## 4.0 Laboratory Investigation

A laboratory-testing program was performed to determine the physical and engineering properties of the soils underlying the site. Moisture content and dry density tests were performed on all the relatively undisturbed soil samples in order to determine their consistencies and the moisture variation throughout the explored soil profile. The strength parameters of the foundation soils were determined from a direct shear test performed on one selected relatively undisturbed soil sample. A summary of test results for Moisture/Density and Direct Shear Tests is provided in Table 1. The results of the laboratory testing program for Atterberg limits are presented in the Plasticity Index Chart (Appendix C).

**Table 1.** *Summary of moisture density and direct shear tests.*

| Sample number | Depth in feet | In-place conditions | | Direct shear testing | |
|---|---|---|---|---|---|
| | | Dry density in pounds per cubic foot (pcf) | Moisture content in % Dry weight | Angle of internal friction degrees | Unit cohesion in kips per square foot (ksf) |
| SB-1 | 1.5-2 | 130.4 | 8.5 | Not Analyzed | Not Analyzed |
| SB-1 | 3.5-4 | 120.4 | 11.3 | Not Analyzed | Not Analyzed |
| SB-1 | 10-10.5 | 93.8 | 6.1 | Not Analyzed | Not Analyzed |
| SB-1 | 14 | 89.9* | 5.7 | Not Analyzed | Not Analyzed |
| SB-2 | 2-2.5 | 103.7 | 24.2 | Not Analyzed | Not Analyzed |
| SB-2 | 10.5-11 | 120.2 | 14.4 | Not Analyzed | Not Analyzed |
| SB-4 | 2-2.5 | 114.2 | 26.1 | Not Analyzed | Not Analyzed |
| SB-4 | 5-5.5 | 98.0 | 24.2 | Not Analyzed | Not Analyzed |
| SB-4 | 10-10.5 | 125.0 | 11.1 | Not Analyzed | Not Analyzed |
| SB-6 | 2-2.5 | 118.1 | 9.3 | Not Analyzed | Not Analyzed |
| SB-6 | 5-5.5 | 106.6 | 21.0 | Not Analyzed | Not Analyzed |
| SB-6 | 10-10.5 | 124.9 | 12.0 | 30 | 300 |
| SB-6 | 15-15.5 | 106.3 | 4.4 | Not Analyzed | Not Analyzed |

| | | | | | |
|---|---|---|---|---|---|
| SB-9 | 2-2.5 | 95.5 | 11.1 | Not Analyzed | Not Analyzed |
| SB-9 | 5-5.5 | 99.5 | 24.6 | 18 | 800 |
| SB-9 | 10-10.5 | 119.4 | 15.7 | Not Analyzed | Not Analyzed |
| SB-9 | 15-15.5 | 116.8 | 17.8 | Not Analyzed | Not Analyzed |
| SB-9 | 20-20.5 | 132.7 | 10.4 | Not Analyzed | Not Analyzed |
| SB-9 | 25-25.5 | 121.6 | 16.2 | Not Analyzed | Not Analyzed |

## 5.0 Soil Conditions

The soils/earth materials at the site are variable. Generally speaking the northern reach of the site is underlain by very dense siltstone/sandstone bedrock materials that were initially encountered at about five feet below the ground surface (bgs). Drilling penetration into this material was terminated at a depth of approximately 14 feet. Very high blow counts were encountered as the boring was advanced. The soil borings at the southern end of the site revealed a more valluvial type soil consisting of silty sandy clay materials. Groundwater was not encountered in any of the borings in the northern area and the borings were stopped due to refusal at depths of 13 to 15 feet bgs. The soil in the southern part of the site was silty but softer with a water bearing layer of fine sand with silt encountered at a depth of approximately 20 feet bgs with underlying reddish brown sandstone. The boring collapsed at the saturated zone and could not be advanced past 30 feet bgs. This is the boring (S-B 9) that encountered groundwater. A detailed description of the encountered earth materials is presented in the Geotechnical Boring Logs (Appendix B).

## 6.0 Conclusions

It is our professional opinion that the site is suitable for the proposed commercial and residential construction.

Conditions may vary across the site and final engineering designs shall take into account the varying depths of soil and bedrock. Heavy equipment will be necessary to excavate the garage area to the design depth. It should be noted that as of the writing of this report a grading plan was not submitted for review by ERS. When a grading plan for the project site becomes available ERS recommends that we be given the opportunity to review those plans to definitively evaluate our conclusions and recommendations. Specific recommendations based on our current conclusions are presented below. The engineering geologist should be present during site demolition and future grading, during excavation and construction of the garage retaining walls foundations and drainage systems. It is recommended that the following considerations be included in the final Project design:

## 7.0 Recommendations

### 7.1 Site Grading

- The placement of fill and control of any grading operations at the site should be performed in accordance with the recommendations of this report. These recommendations set forth the minimum standards to satisfy other requirements of this report.

- All existing surface and subsurface structures, if any that will not be incorporated in the final development shall be removed from the project site prior to any grading operations. These objects should be accurately located on the grading plans to assist the field engineer in establishing proper control over their removal. All utility lines, if any, must be removed prior to any grading at the site.

- The depressions left by the removal of subsurface structures should be cleaned of all debris, backfilled and compacted with clean, native soil. This backfill must be engineered fill and should be conducted under the supervision of an ERS representative.

- All organic surface material and debris, including grass and weeds shall be stripped prior to any other grading operations, and transported away from all areas that are to receive structures or structural fills. Soil containing organic material may be stockpiled for later use in landscaping areas only.

- After removing all the subsurface structures, if any, and after stripping the organic material from the soil, the building areas should be scarified by machine to a depth of 12 inches and thoroughly cleaned of vegetation and other deleterious matter.

- After stripping, scarifying and cleaning operations, surface soil should be re-compacted to not less than 90% relative maximum density using ASTM D1557-12 procedure over the entire building pad and 5 feet beyond the perimeter of the pad or as permitted.

- All engineered fill or imported soil should be placed in uniform horizontal lifts of not more than 6 to 8 inches in un-compacted thickness, and compacted to not less than 90% relative maximum density using ASTM D1557-12 procedure. The baserock also should be compacted to not less than 90% relative maximum density. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction by either; 1) aerating the material if it is too wet, or 2) spraying the material with water if it is too dry. Each lift shall be thoroughly mixed before compaction to assure a uniform distribution of water content.

- When fill material includes rocks, nesting of rocks will not be allowed and all voids must be carefully filled by proper compaction. Rocks larger than 4 inches in diameter should not be used for the final 2 feet of building pad.

- ERS should be notified at least two days prior to commencement of any grading operations so that our office may coordinate the work in the field with the contractor. All imported borrow must be approved by ERS before being brought to the site. Import soil must have a plasticity index no greater than 12 and an R-Value greater than 25.

- All grading work shall be observed and approved by a representative from ERS. The geotechnical engineer shall prepare a final report upon completion of the grading operations.

## 7.2 Foundation Design Criteria – Below Grade

- We recommend the proposed basement structure be supported on either a) mat foundation or b) continuous perimeter foundation and isolated interior spread footings. Recommendations are presented in the following paragraphs.

- The mat foundation should have a minimum thickness of 24 inches. For these conditions, the recommended allowable contact pressure is 5,000 p.s.f. The modulus of subgrade reaction can be taken as 200 p.c.i. in the design of the mat foundation.

- The basement concrete mat should be waterproofed to prevent water intrusion with “Paraseal LG” or equivalent.

- When continuous perimeter and isolated interior spread footings are used, they must be founded at a minimum depth of 24 inches below pad subgrade elevation. Under these conditions, the recommended allowable bearing capacity is 5,000 p.s.f. for both continuous perimeter and isolated and interior spread footings. The excavated footing bottoms should be compacted with jumping jack or vibratory plate prior to rebar placement.

- The above bearing values are for dead plus live loads, and may be increased by one-third for short term seismic and wind loads. The design of the structure and the foundations shall meet local building code requirements.
- The project structural engineer responsible for the foundation design shall determine the final design of the foundations and reinforcing required. We recommend that the foundation plans be reviewed by our office prior to submitting to the appropriate local agency and/or to construction.

## 7.3 Foundation Design Criteria – Above Grade

- We recommend the proposed structure be supported on continuous perimeter foundation and isolated interior spread footings, if any at grade (near existing ground elevation). Recommendations are presented in the following paragraphs.

- When continuous perimeter and isolated interior spread footings are used, they must be founded at a minimum depth of 48 inches below rough soil pad. Under these conditions, the recommended allowable bearing capacity is 4,500 p.s.f. for both continuous perimeter and isolated and interior spread footings. The excavated footing bottoms should be compacted with jumping jack or vibratory plate prior to rebar placement.

- The above bearing values are for dead plus live loads, and may be increased by one-third for short term seismic and wind loads. The design of the structures and the foundations shall meet local building code requirements.
- The project structural engineer responsible for the foundation design shall determine the final design of the foundations and reinforcing required. We recommend that the foundation plans be reviewed by our office prior to submitting to the appropriate local agency and/or to construction.

### 7.4 2010 CBC Seismic Values

Site Latitude: 37.834244 Degrees North
Site Longitude: 122.253136 Degrees West
Site Class: D (Table 1613.5.2 CBC 2010)

Mapped Spectra Acceleration for short periods $S_S$ = 1.819g*
Mapped Spectra Acceleration for 1-second period $S_1$ = 0.682g*

Designed Spectra Acceleration for short periods $S_{DS}$ = 1.213g*
Designed Spectra Acceleration for 1-second period $S_{D1}$ = 0.682g*

(* USGS Seismic Hazard Curves and Uniform Hazard Response Spectra for 2010 CBC analysis)

Site Coefficient $F_a$ = 1.0 (Table 1613.5.3(1) CBC 2010)
Site Coefficient $F_v$ = 1.5 (Table 1613.5.3(2) CBC 2010)

Maximum considered earthquake spectral response accelerations for short period $S_{MS}$ = 1.819g ($S_{MS} = F_aS_S$ - Equation 16-37 CBC 2010)

Maximum considered earthquake spectral response accelerations for 1-second period $S_{M1}$ = 01.023g ($S_{M1} = F_vS_1$ – Equation 16-38 CBC 2010)

### 7.5 Concrete Slab Construction (Below Grade)

- We recommend the basement concrete slab should have a minimum thickness of 6 inches and reinforced with No. 4 rebar with maximum spacing of 18 inches on-center both ways.

- The basement concrete slab should be underlain minimum of 5 inches of ¾ inch crushed rock (recycled crushed asphalt concrete is not acceptable). The basement concrete slab should be waterproofed to prevent water intrusion with "Paraseal LG" or equivalent.
- The subgrade should be compacted to not less than 95% relative maximum density according to ASTM D1557-12. The pad subgrade should be compacted prior to placement of the crushed rock and after installation of any under utility pipes and footing excavation with smooth drum roller and/or heavy vibratory plate equipment.

## 7.6 Concrete Slab Construction (Above Grade)

- We recommend the concrete slab should have a minimum thickness of 6 inches and reinforced with No. 4 rebar with maximum spacing of 18 inches on-center both ways.
- A minimum of 5 inches of ¾ inch crushed rock (recycled crushed asphalt concrete is not acceptable) and moisture barrier membrane (20 mil) should be placed between the finished grade and the concrete slab. The moisture barrier should be taped at the seams and/or mastic sealed at the protrusions.
- The subgrade should be compacted to not less than 95% relative maximum density according to ASTM D1557-12. The pad subgrade should be compacted prior to placement of the crushed rock and after installation of any under utility pipes and footing excavation with smooth drum roller and/or heavy vibratory plate equipment.
- Use of a moisture barrier membrane under the concrete slab is required if a floor covering would be applied. If the slab would not receive a floor covering, the moisture barrier membrane can be eliminated.
- Prior to placing the vapor membrane and/or pouring concrete, the slab subgrade shall be moistened with water to reduce the swell potential, if deemed necessary, by the field engineer at the time of construction.

## 7.7 Basement Excavation

- It is our understanding that the excavation for the underground parking structure will be approximately 16 feet below the existing ground elevation. Some harder rock type materials will be encountered at the northern end the site. However, conventional earth moving equipment should be adequate for this project.
- Any vertical cuts deeper than 5 feet must be properly shored. The temporary minimum cut slope for excavation to the desired elevation is one horizontal to one vertical (1:1). The

cut slope should be increased to 2:1 if the excavation is conducted during the rainy season or when the soil is highly saturated with water.

- The bottom subgrade of the underground basement structure will be approximately 16 feet below ground surface elevation. The groundwater table at the time of our investigation was not encountered during the excavating operation. Based on the State guidelines and CGS Seismic Hazard Zone Report 081 [*Seismic Hazard Evaluation of the Oakland West 7.5-Minute Quadrangle, Alameda County, California*. 2005 (revised 10/10/05). Department Of Conservation. Division of Mines and Geology], the highest expected groundwater level is 13 feet below ground surface. Therefore, the dewatering may be required during basement excavation.
- If there are space constraints for open excavation, we recommend the following procedure be implemented for shoring of the underground parking structure excavation.

### 7.8 Shoring Support for the Basement Excavation

- The basement will be excavated to the approximate depth of 16 feet below existing ground surface. Therefore, we recommended the excavation be supported with steel "H" beams and a 4 x 12 wood lagging. Prior to any excavation, the steel "H" beams should be placed in pre-drilled minimum 24-inch diameter holes to a minimum depth of 32 feet. The holes should be filled with concrete to one foot below the bottom of the excavation. At this point, excavation can begin. As the excavation operation proceeds, the 4 x 12 wood lagging should be placed between the steel "H" beams. The "H" beams should be placed a maximum distance of 8 feet apart. There should be no voids between the soil wall excavation and wood lagging. However, if a void occurs, the void should be filled with sand slurry or pressure grouted especially at the area below each lagging bench (last lagging board). Proper attention should be considered during the construction. Introduction of any heavy equipment on the top of the vertical cut may damage the excavated slope. The lateral soil pressure acting on the shoring system is shown in Figure 4. The passive pressure of 300 pounds equivalent fluid pressure can be used for short-term shoring purposes. The shoring should be designed by the structural engineer or shoring design engineer and our office should review the shoring plan for approval.

### 7.9 Basement Retaining Walls

- The basement retaining wall shall be designed for active lateral earth pressure (static & seismic) as shown in Figure 3. These values assume a drained condition and moisture content compatible with those encountered during our investigation.

- A friction coefficient of 0.3 shall be used for retaining wall design. This value may be increased by 1/3 for short-term seismic loads.
- The basement walls should be waterproofed with "Paraseal LG" or equivalent.
- If there are constraints with the installation of the subdrain system, AquaDrain 100BD or equivalent can be used in conjunction with standard drain mat and side-outlet discharge pipes at the base of the wall. The discharge pipes should be sloped to a discharge facility.
- We recommend a thorough review by our office of all designs pertaining to facilities retaining a soil mass.

### 7.10 General Retaining Walls

- Any facilities that will retain a soil mass, shall be designed for a lateral earth pressure (active) equivalent to 50 pounds equivalent fluid pressure for horizontal backfill, 55 pounds equivalent fluid pressure for 3:1 sloped backfill, 60 pounds for 2:1 sloped backfill, and 65 pounds for 1½:1 slope backfill. If the retaining walls are restrained from free movement at both ends, they shall be designed for the earth pressure resulting from 60 pounds equivalent fluid pressure, to which shall be added surcharge loads. The structural engineer shall discuss the surcharge loads with the geotechnical engineer prior to designing the retaining walls.
- In designing for allowable resistive lateral earth pressure (passive), a value of 250 pounds equivalent fluid pressure may be used with the resultant acting at the third point. The top foot of native soil shall be neglected for computation of passive resistance.
- A friction coefficient of 0.3 shall be used for retaining wall design. This value may be increased by 1/3 for short-term seismic loads.
- The retaining walls should be waterproofed to prevent water intrusion with "Paraseal LG" or equivalent.
- Drainage should be provided behind the retaining wall. The drainage system should consist of perforated pipe placed at the base of the retaining wall and surrounded by ¾ inch drain rock wrapped in a filter fabric. The drain rock wrapped in fabric should be at least 12 inches wide and extend from the base of the wall to within 1.5 feet of the ground surface. The upper 1.5 feet of backfill should consist of compacted native soil. The retaining wall drainage system should be sloped to outfall to a discharge facility.

- As an alternative to the drain rock and fabric. Miradrain 2000 or approved equivalent drainmat may be used behind the retaining wall. The Miradrain 2000 should extend from the base of the wall to the ground surface. A perforated pipe (subdrain system) should be placed at the base of the wall in direct contact with the Miradrain 2000. The pipe should be sloped to outfall to an appropriate discharge facility.

- The above values assume a drained condition and moisture content compatible with those encountered during our investigation.

- We recommend a thorough review by our office of all designs pertaining to facilities retaining a soil mass.

### 7.11 Drainage

- It is considered essential that positive drainage be provided during construction and be maintained throughout the life of the proposed structure.

- The final exterior grade adjacent to the proposed structure should be such that the surface drainage will flow away from the structures. Rainwater discharge at downspouts should be directed onto pavement sections, splash blocks, or other acceptable facilities, which will prevent water from collecting in the soil adjacent to the foundations.

- Utility lines that cross under or through perimeter footings should be completely sealed to prevent moisture intrusion into the areas under the slab and/or footings. The utility trench backfill should be of impervious material and this material should be placed at least 4 feet on either side of the exterior footings.

- Consideration should be given to collection and diversion of roof runoff and the elimination of planted areas or other surfaces, which could retain water in areas adjoining the building. In unpaved areas, it is recommended that protective slopes be stabilized adjoining perimeter building walls. These slopes should be extended to a minimum of 5 feet horizontally from building walls. They must have a minimum outfall of 2 percent.

- If the subgrade in the landscaping area is moderately to highly expansive, proper drainage should be provided in the landscaping area adjacent to the building foundation. A drip irrigation system is preferable. If the sprinkler system is located adjacent to the building foundation or concrete walkway, a moisture cut-off barrier should be provided.

- Based on laboratory test results of the near surface soil at the subject site, we estimated that the percolation rate is approximately 5 inch per hour. This rate can be used in the design of the retention system for on-site storm drainage.

### 7.12 On-Site Utility Trenching

- All on-site utility trenches must be backfilled with native on-site material or import fill and compacted to at least 90% relative maximum density in accordance with ASTM D1557-12. The final lift (top 12 inches) of backfill should be compacted to at least 95% relative maximum density. Backfill should be placed in 6 to 8 inch lifts and compacted. Jetting of trench backfill is not recommended. An engineer from our firm should be notified at least 48 hours before the start of any utility trench backfilling operations.

- The utility trenches running parallel to the building foundation should not be located in an influence zone that will undermine the stability of the foundation. The influence zone is defined as the imaginary line extending at the outer edge of the footing at a downward slope of 1:1 (one unit horizontal distance to one unit vertical distance). If the utility trenches were encroaching the influence zone, the encroached area should be stabilized with cement sand slurry.

- If utility trench excavation is to encounter groundwater, our office should be notified for dewatering recommendations.

## 8.0 Construction Observation

- All grading and earthwork should be performed under the observation of our representative to check that the site is properly prepared, that selected fill materials are satisfactory, and that placement and compaction of fills is performed in accordance with our recommendations and the project specifications. Sufficient notification to us prior to earthwork is essential. The project plans and specifications should incorporate all recommendations contained in this report.

- Variations in soil conditions are possible and may be encountered during construction. In order to confirm correlation between soil data obtained during this investigation and subsurface conditions encountered during construction, and to observe conformance with the plans and specifications, it is essential that we be retained to perform continuous or intermittent review during the earthwork, excavation, and foundation construction.

## 9.0 Limitations

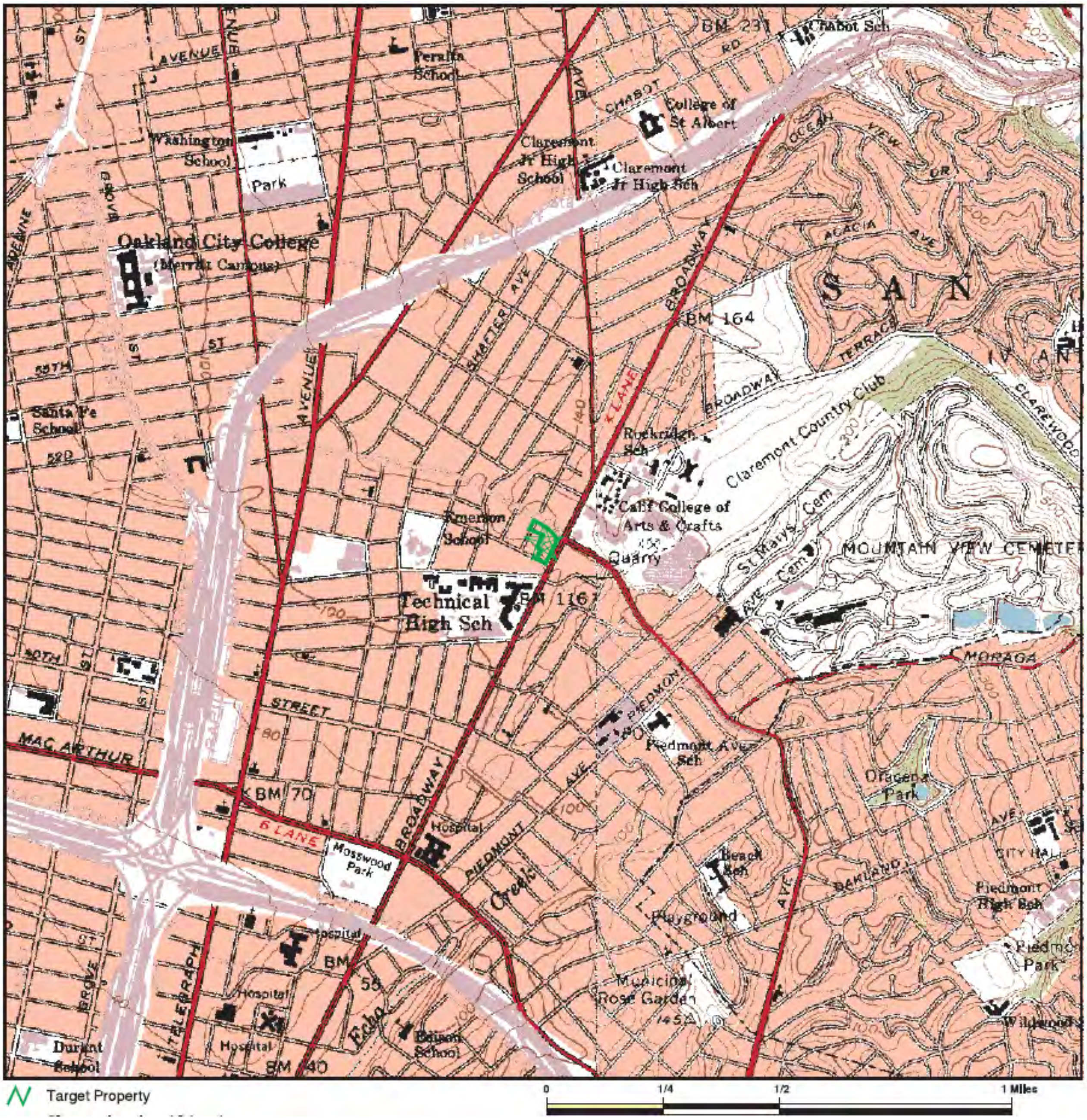
This report has been prepared for the sole use of SRM, specifically for the design and reconstruction of the foundation elements and associated improvements of the development at 4901, 4915, 4919, 4921, 4939, and 4945 Broadway; Parcel No. 013-1136-008-04 (no address); 311 and 313 – 51st Street; 4974, 4970, 4966 and 4964 Desmond Street, Oakland, California. The opinions presented in this report have been formulated in accordance with generally accepted geotechnical engineering practices that exist in the San Francisco Bay Area at the time this report was prepared. No other warranty, expressed or implied, is made or should be inferred. We are not responsible for data presented by others.

The options, conclusions and recommendations contained in this report are based upon information obtained from explorations at widely separated locations, site reconnaissance, review of data made available to us, and upon local experience and engineering judgment. The recommendations presented in this report are based on the assumption that soil and geologic condition at or between borings not deviate substantially from those encountered. In addition, geotechnical issues may arise that are not apparent at this time.

The geotechnical engineer should be retained to review final plans and specifications when they are available to verify these documents are consistent with this report are based on the assumption that we will be retained to provide observation and testing services during construction in order to evaluate compliance with our recommendations. If we are not retained for these services, ERS cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of the ERS report by others. Furthermore, ERS will cease to be the Geotechnical-Engineer-of-Record at the time another consultant is retained for follow-up service to this report.

The opinions presented in this report are valid as of the present date for the property evaluated. Changes in the condition of a property can occur with the passage of time, whether due to natural processes or the works of man.

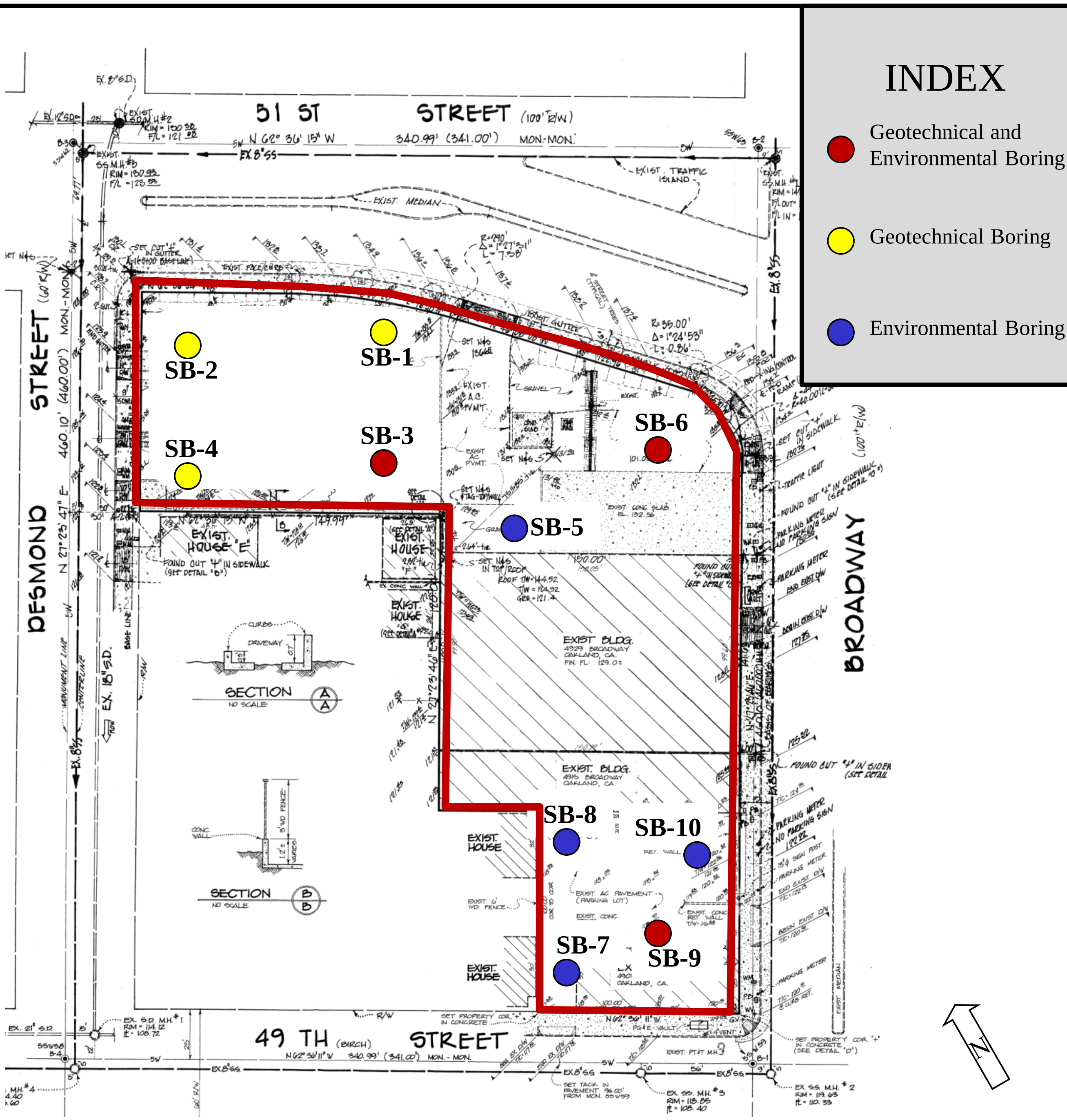
# APPENDIX A
## Figures




NOTE: Base map provided by EDR

FIGURE 1 – Site Vicinity

4901, 4915, 4919, 4921, 4939, and 4945 Broadway; Parcel No. 013-1136-008-04 (no address)
311 and 313 – 51st Street; 4974, 4970, 4966 and 4964 Desmond Street,
Oakland, California




NOTE: Base map provided by current property owner

FIGURE 2 – Soil Boring Locations

4901, 4915, 4919, 4921, 4939, and 4945 Broadway; Parcel No. 013-1136-008-04 (no address); 311 and 313 – 51st Street; 4974, 4970, 4966 and 4964 Desmond Street, Oakland, California

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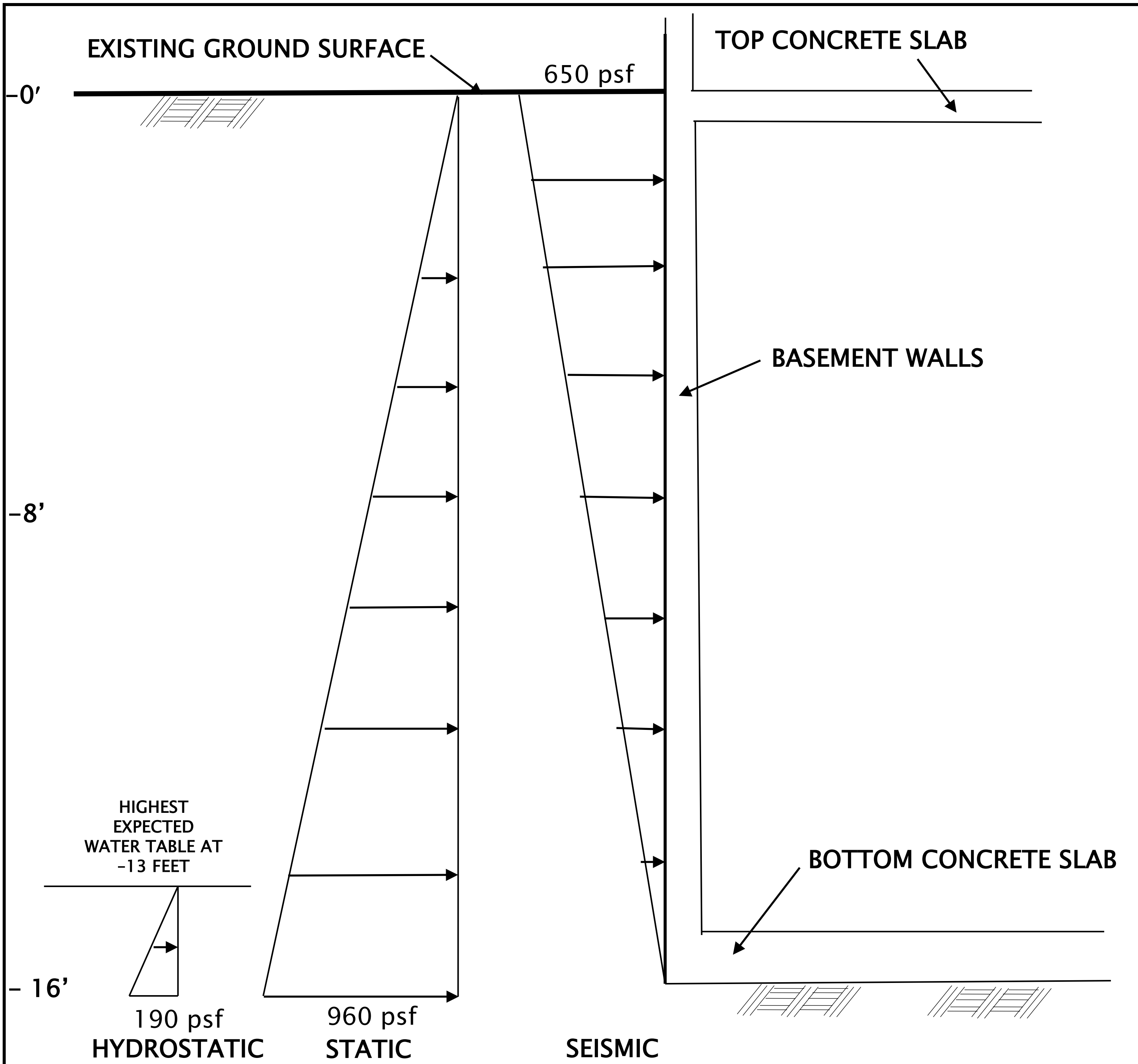
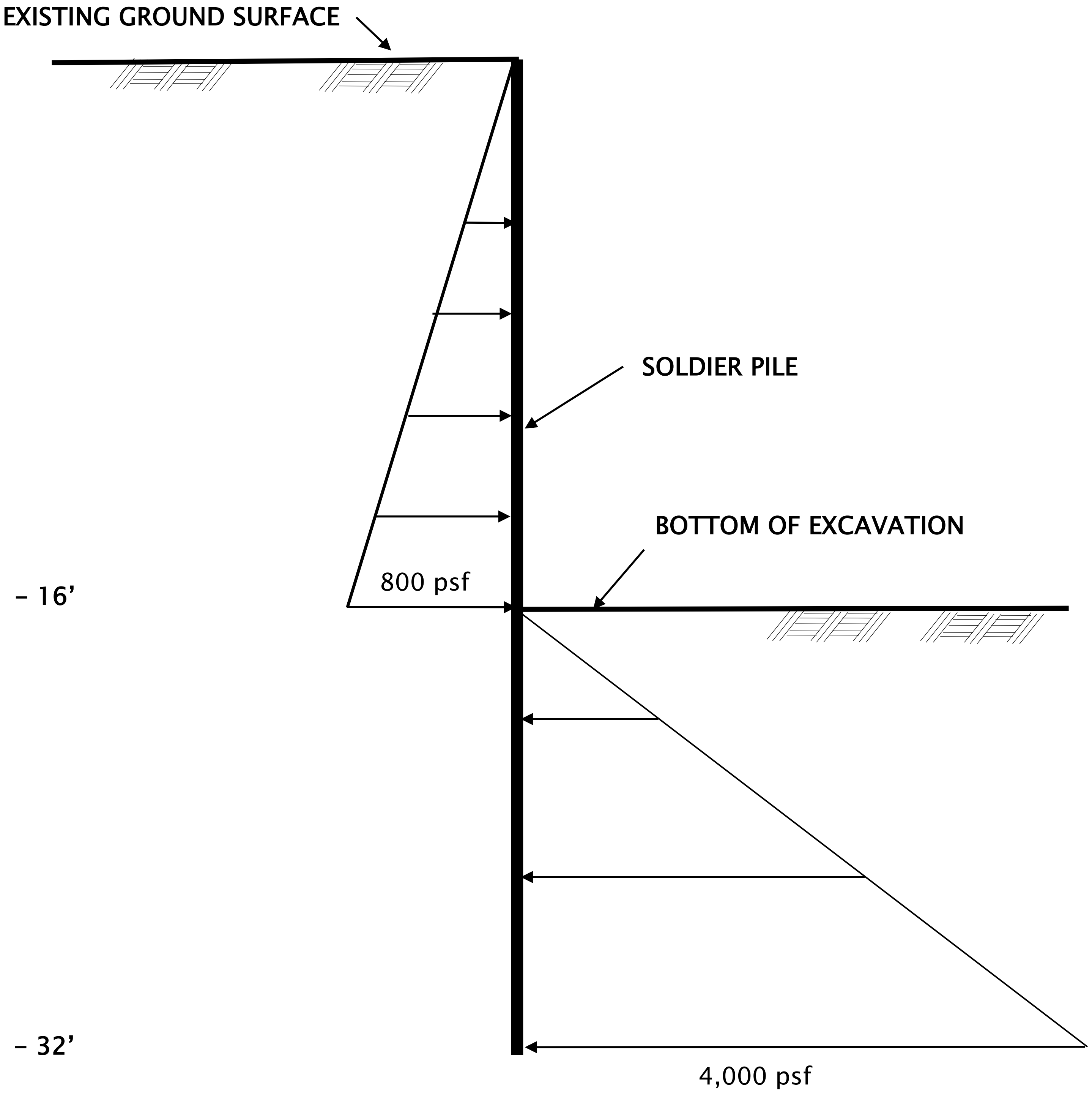



| | | | |
|---|---|---|---|
| | **LATERAL SOIL PRESSURES BASEMENT WALLS** | File No.: SV1015G | FIGURE |
| | Proposed Building | Drawn by: V.V. | 3 |
| | 51st Street & Broadway<br>Oakland, California | Scale: NOT TO SCALE | November 2013 |




| | | | |
|---|---|---|---|
| | **LATERAL SOIL PRESSURES SOLDIER PILE & WOOD LAGGING**<br>Proposed Building<br><br>51st Street & Broadway<br>Oakland, California | File No.: SV1015G | FIGURE |
| | | Drawn by: V.V. | 4 |
| | | Scale: NOT TO SCALE | November 2013 |

# APPENDIX B
# Geotechnical Boring Logs

## SOIL BORING LOG

**REPORT OF BORING: SB-1**

PAGE 1 OF 1

**DEPTH TO GROUND WATER (DTGW):** Groundwater not encountered

**Boring Location:** Broadway/51st, Oakland, CA
**Drilling equip.:** Hollow Stem
**Sampling Equip.:** CA Modified SS
**Hammer:** Automatic
**Weight:** 140 lbs **Fall:** 30 in

**CLIENT:** SRM Development
**PROJECT LOCATION:** Broadway/51st, Oakland
**FILE NO.:** SRM, Broadway/51st
**BORING COMPANY:** HEW Drilling
**FOREMAN:** Perfecto
**ERS SCIENTIST:** J. Amendola

**Start date:** 1/14/2013
**Completion date:** 1/14/2013
**Backfill Material :** Concrete Grout

| DEPTH BELOW GRADE | SAMPLE INTERVAL (FEET)/ SAMPLE ID | BLOWS /6" | PENETR/ RECOVERY (inches) | "N" Value [1] | SAMPLE DESCRIPTION | UNIFIED SOIL CLASSIF. SYSTEM | GEOTECHNICAL TEST RESULTS: DRY DENSITY (pcf) | MOIS-TURE % | DIRECT SHEAR Φ (°) | DIRECT SHEAR UNIT COHES. (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | Grass and topsoil | | | | | |
| 1 | | 20 | | | light gray to tan SILT, partially cemented, reddish mottling in gaps | ML | | | | |
| | | 50 for 5.5" | | >50 | | | | | | |
| 2 | | | | | | | | | | |
| 3 | | | | | cemented coarse sand and fine angular light tan fractured siltstone gravel | SP | | | | |
| | | 40 | | | | | | | | |
| 4 | | 50 for 4" | | >50 | | | | | | |
| 5 | | | | | | | | | | |
| 6 | | | | | silt with weathered siltstone clasts | ML | | | | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |
| 9 | | | | | | | | | | |
| 10 | | 50 for 1" | | >50 | | | | | | |
| 11 | | | | | | | | | | |
| 12 | | | | | | | | | | |
| | | | | | Coarse weathered SANDSTONE | | | | | |
| 13 | | | | | | | | | | |
| 14 | | | | | End of Boring with refusal at 14 feet | | | | | |
| 15 | | | | | | | | | | |
| 16 | | | | | | | | | | |
| 17 | | | | | | | | | | |
| 18 | | | | | | | | | | |
| 19 | | | | | | | | | | |
| 20 | | | | | | | | | | |

Notes: Blow Counts and N values are CA modified NOT corrected.

**Geologist Signature:**

ers

## SOIL BORING LOG

## REPORT OF BORING: SB-2

PAGE 1 OF 1

**Boring Location:** Broadway/51st, Oakland, CA

**DEPTH TO GROUND WATER (DTGW):** Groundwater not encountered

**CLIENT:** SRM Development
**PROJECT LOCATION:** Broadway/51st, Oakland
**FILE NO.:** SRM, Broadway/51st

**Drilling equip.:** Hollow Stem
**Sampling Equip.:** CA Modified SS
**Hammer:** Automatic
**Weight:** 140 lbs **Fall:** 30 in

**BORING COMPANY:** HEW Drilling
**FOREMAN:** Perfecto
**ERS SCIENTIST:** J. Amendola

**Start date:** 1/14/2013
**Completion date:** 1/14/2013
**Backfill Material :** Concrete Grout

| DEPTH BELOW GRADE | SAMPLE INTERVAL (FEET)/ SAMPLE ID | | BLOWS /6" | PENETR/ RECOVERY (inches) | "N" Value [1] | SAMPLE DESCRIPTION | UNIFIED SOIL CLASSIF. SYSTEM | GEOTECHNICAL TEST RESULTS: DRY DENSITY (pcf) | MOIS-TURE % | DIRECT SHEAR: Φ (°) | UNIT COHES. (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Grass and topsoil | | | | | |
| | | | | | | | | | | | |
| 1 | | | 6 | | | moist, dark brown SILTwith fine sand, some clay | ML | | | | |
| | | | 3 | | | | | | | | |
| 2 | | | 3 | | 6 | | | | | | |
| | | | | | | | | | | | |
| 3 | | | | | | med to dark brown sandy SILT, some clasts of silty clay | ML | | | | |
| | | | 6 | | | | | | | | |
| 4 | | | 9 | | | | | | | | |
| | | | 20 | | 29 | | | | | | |
| 5 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 10 | | | 26 | | | | | | | | |
| | | | 26 | | | | | | | | |
| 11 | | | 51 | | >50 | silt with weathered siltstone clasts | ML | | | | |
| | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 13 | | | | | | End of Boring with refusal at 13 feet | | | | | |
| | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
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| 16 | | | | | | | | | | | |
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| 17 | | | | | | | | | | | |
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| 18 | | | | | | | | | | | |
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| 19 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
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Notes: Blow Counts and N values are CA modified NOT corrected.

**Geologist Signature:**

| SOIL BORING LOG | REPORT OF BORING: SB-4 |
|---|---|
| **Boring Location:** Broadway/51st, Oakland, CA | PAGE 1 OF 1 |
| **Drilling equip.:** Hollow Stem | **DEPTH TO GROUND WATER (DTGW):** Groundwater not encountered |
| **Sampling Equip.:** CA Modified SS | |
| **Hammer:** Automatic | |
| **Weight:** 140 lbs **Fall:** 30 in | |

**CLIENT:** SRM Development
**PROJECT LOCATION:** Broadway/51st, Oakland
**FILE NO.:** SRM, Broadway/51st
**BORING COMPANY:** HEW Drilling
**FOREMAN:** Perfecto
**ERS SCIENTIST:** J. Amendola

**Start date:** 1/14/2013
**Completion date:** 1/14/2013
**Backfill Material :** Concrete Grout

| DEPTH BELOW GRADE | SAMPLE INTERVAL (FEET)/ SAMPLE ID | | BLOWS /6" | PENETR/ RECOVERY (inches) | "N" Value [1] | SAMPLE DESCRIPTION | UNIFIED SOIL CLASSIF. SYSTEM | GEOTECHNICAL TEST RESULTS: DRY DENSITY (pcf) | MOIS-TURE % | DIRECT SHEAR Φ (°) | UNIT COHES. (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Grass and topsoil | | | | | |
| | | | | | | | | | | | |
| 1 | | | 3 | | | wet saturated, dark brown, sandy SILT with some clay | ML | | | | |
| | | | 3 | | | | | | | | |
| 2 | | | 8 | | 11 | | | | | | |
| | | | | | | | | | | | |
| 3 | | | | | | med to dark brown clay with SILT, some clasts of silty clay | CL | | | | |
| | | | 12 | | | | | | | | |
| 4 | | | 15 | | | | | | | | |
| | | | 20 | | 35 | | | | | | |
| 5 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 10 | | | 26 | | | light tan pulverized siltstone | | | | | |
| | | | 26 | | | | | | | | |
| 11 | | | 51 | | >50 | | | | | | |
| | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 15 | | | | | | End of Boring with refusal at 15 feet | | | | | |
| | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| | | | | | | | | | | | |

Notes: Blow Counts and N values are CA modified NOT corrected.

**Geologist Signature:**

ers

## SOIL BORING LOG

## REPORT OF BORING: SB-6

PAGE 1 OF 1

**CLIENT:** SRM Development
**PROJECT LOCATION:** Broadway/51st, Oakland
**FILE NO.:** SRM, Broadway/51st

**Boring Location:** Broadway/51st, Oakland, CA
**Drilling equip.:** Hollow Stem
**Sampling Equip.:** CA Modified SS
**Hammer:** Automatic
**Weight:** 140 lbs **Fall:** 30 in

**DEPTH TO GROUND WATER (DTGW):**
Groundwater not encountered

**BORING COMPANY:** HEW Drilling
**FOREMAN:** Perfecto
**ERS SCIENTIST:** J. Amendola

**Start date:** 1/14/2013
**Completion date:** 1/14/2013
**Backfill Material :** Concrete Grout

GEOTECHNICAL TEST RESULTS

| DEPTH BELOW GRADE | SAMPLE INTERVAL (FEET)/ SAMPLE ID | | BLOWS /6" | PENETR/ RECOVERY (inches) | "N" Value [1] | SAMPLE DESCRIPTION | UNIFIED SOIL CLASSIF. SYSTEM | DRY DENSITY (pcf) | MOIS-TURE % | DIRECT SHEAR Φ (°) | DIRECT SHEAR UNIT COHES. (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Asphalt and baserock | | | | | |
| | | | | | | | | | | | |
| 1 | | | 9 | | | dark brown, moist, SILT with some clay | ML | | | | |
| | | | 8 | | | | | | | | |
| 2 | | | 8 | | 16 | | | | | | |
| | | | | | | | | | | | |
| 3 | | | | | | | | | | | |
| | | | 3 | | | | | | | | |
| 4 | | | 3 | | | | | | | | |
| | | | 3 | | 6 | | | | | | |
| 5 | | | | | | | | | | | |
| | | | | | | med brown to light tan SILT, some sand | ML | | | | |
| 6 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 9 | | | 17 | | | | | | | | |
| | | | 40 | | | | | | | | |
| 10 | | | 55 | | >50 | | | | | | |
| | | | | | | | | | | | |
| 11 | | | | | | | | | | | |
| | | | | | | light tan pulverized siltstone | | | | | |
| 12 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 15 | | | | | | End of Boring with refusal at 15 feet | | | | | |
| | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
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| 19 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| | | | | | | | | | | | |

Notes: Blow Counts and N values are CA modified NOT corrected.

**Geologist Signature:**

**SOIL BORING LOG**

**REPORT OF BORING: SB-9 Page 1**

PAGE 1 OF 2

**Boring Location:** Braodway/51st, Oakland, CA
**Drilling equip.:** Hollow Stem
**Sampling Equip.:** CA Modified SS
**Hammer:** Automatic
**Weight:** 140 lbs **Fall:** 30 in

**DEPTH TO GROUND WATER (DTGW):**
Initial groundwater N
Final groundwater rose to 14'

**CLIENT:** SRM Development
**PROJECT LOCATION:** Broadway/51st, Oakland
**FILE NO.:**
**BORING COMPANY:** HEW Drilling
**FOREMAN:** Perfecto
**ERS SCIENTIST:** J. Amendola

**Start date:** 1/14/2013
**Completion date:** 1/14/2013
**Backfill Material :** Concrete Grout

**GEOTECHNICAL TEST RESULTS**

| DEPTH BELOW GRADE | SAMPLE INTERVAL (FEET)/ SAMPLE ID | | BLOWS /6" | PENETR/ RECOVERY (inches) | "N" Value [1] | SAMPLE DESCRIPTION | UNIFIED SOIL CLASSIF. SYSTEM | DRY DENSITY (pcf) | MOIS-TURE % | DIRECT SHEAR Φ (°) | DIRECT SHEAR UNIT COHES. (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | Asphalt and baserock | | | | | |
| | | | | | | | | | | | |
| 1 | | | 2 | | | SILT, dark brown, moist, clayey, medium stiff. | ML | | | | |
| | | | 7 | | | | | | | | |
| 2 | | | 7 | | 14 | | | | | | |
| | | | | | | | | | | | |
| 3 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 4 | | | 4 | | | | | | | | |
| | | | 4 | | | | | | | | |
| 5 | | | 6 | | 10 | | | | | | |
| | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| | | | | | | med. Brown, slity CLAY, some coarse sand | CL | | | | |
| 7 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 9 | | | 11 | | | | | | | | |
| | | | 16 | | | | | | | | |
| 10 | | | 32 | | 48 | | | | | | |
| | | | | | | | | | | | |
| 11 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 13 | | | | | | Fine SAND with silt, med. Brown, damp | SP | | | | |
| | | | | | | | | | | | |
| 14 | | | 22 | | | | | | | | |
| | | | 24 | | | | | | | | |
| 15 | | | 25 | | 49 | | | | | | |
| | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 19 | | | 8 | | | | | | | | |
| | | | 30 | | | | | | | | |
| 20 | | | 36 | | >50 | Saturated Fine SAND with silt, med. Brown | SP | | | | |
| | | | | | | | | | | | |

Notes: Blow Counts and N values are CA modified NOT corrected.

**Geologist Signature:**

| ers | SOIL BORING LOG | REPORT OF BORING: SB-9 Page 2 |
|---|---|---|
| | **Boring Location:** Braodway/51st, Oakland, CA | PAGE 2 OF 2 |
| **CLIENT:** SRM Development<br>**PROJECT LOCATION:** Broadway/51st, Oakland<br>**FILE NO.:** | **Drilling equip.:** Hollow Stem<br>**Sampling Equip.:** CA Modified SS<br>**Hammer:** Automatic<br>**Weight:** 140 lbs **Fall:** 30 in | **DEPTH TO GROUND WATER (DTGW):**<br>Initial groundwater 20'<br>Final groundwater 20' |
| **BORING COMPANY:** HEW Drilling<br>**FOREMAN:** Perfecto<br>**ERS SCIENTIST:** J. Amendola | **Start date:** 1/14/2013<br>**Completion date:** 1/14/2013<br>**Backfill Material :** Concrete Grout | **GEOTECHNICAL TEST RESULTS** |

| DEPTH BELOW GRADE | SAMPLE INTERVAL (FEET)/ SAMPLE ID | | BLOWS /6" | PENETR/ RECOVERY (inches) | "N" Value [1] | SAMPLE DESCRIPTION | UNIFIED SOIL CLASSIF. SYSTEM | DRY DENSITY (pcf) | MOIS-TURE % | DIRECT SHEAR Φ (°) | DIRECT SHEAR UNIT COHES. (ksf) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | | | | | Saturated Fine SAND with silt, med. Brown | | | | | |
| | | | | | | | | | | | |
| 21 | | | | | | | | | | | |
| | | | | | | reddish brown fractured SANDSTONE | | | | | |
| 22 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 24 | | | 22 | | | | | | | | |
| | | | 31 | | | | | | | | |
| 25 | | | 45 | | >50 | | | | | | |
| | | | | | | | | | | | |
| 26 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 27 | | | | | | | | | | | |
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| 28 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 29 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 30 | | | | | | | | | | | |
| | | | | | | End of boring at 30 feet- boring collapsed | | | | | |
| 31 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 32 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 33 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 34 | | | | | | | | | | | |
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| 35 | | | | | | | | | | | |
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| 36 | | | | | | | | | | | |
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| 37 | | | | | | | | | | | |
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| 38 | | | | | | | | | | | |
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| 39 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 40 | | | | | | | | | | | |
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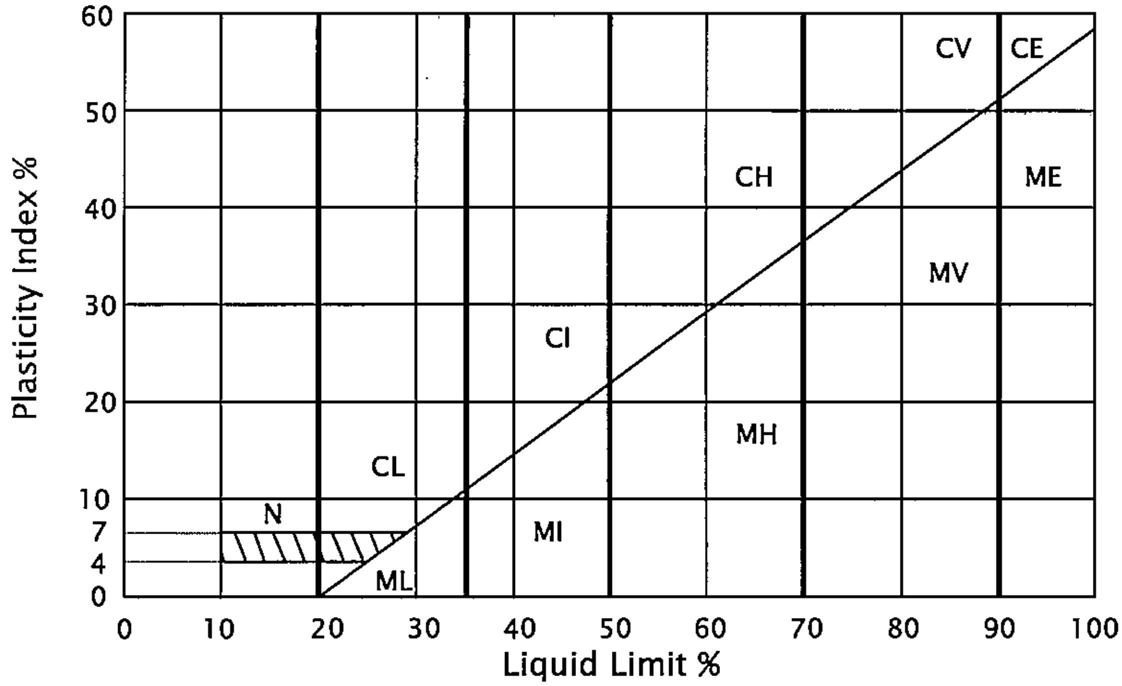
Notes: Blow Counts and N values are CA modified NOT corrected.

**Geologist Signature:**

# APPENDIX C
# Plasticity Index Chart

## PLASTICITY CHART




## PLASTICITY DATA

| Key Symbol | Boring No. | Depth ft. | Liquid Limit % | Plasticity Index % | Unified Soil Classification Symbol * |
|---|---|---|---|---|---|
| ● | SB-4 | 10.0 - 10.5 | -- | -- | NON PLASTIC |

*Soil type classification Based on British suggested revisions to Unified Soil Classification System

| | | | |
|---|---|---|---|
| Silicon Valley Soil Engineering<br><br>2391 Zanker Road, #350<br>Santa Clara, CA 95131 | **PLASTICITY INDEX**<br><br>51st Street & Broadway<br>Oakland, California | File No.: SV1015G<br><br>Drawn by: V.V.<br><br>Scale: NOT TO SCALE | FIGURE<br>1<br><br>January 2013 |