GEOTECHNICAL ENGINEERING STUDY
FOR
SUTTER STREET (603)
603 Sutter Street
Folsom, California

Project No. E17056.000
March 2017

YOUNGDAHL
CONSULTING GROUP, INC.

Building Innovative Solutions

YOUNGDAHL CONSULTING GROUP, INC.
Building Innovative Solutions
1234 Glenhaven Court, El Dorado Hills, CA 95762
4300 Anthony Court, Unit D, Rocklin, CA 95677
ph 916.933.0633 fx 916.933.6482
www.youngdahl.net
30 YEARS

KW Commercial & Sacramento Commercial Properties
406 Sutter Street
Folsom, California 95630

Project No. E17056.000
16 March 2017

Attention: Ms. Kimberly Morphis

Subject: **SUTTER STREET (603)**
603 Sutter Street, Folsom, California
GEOTECHNICAL ENGINEERING STUDY

References: 1. Proposal and Executed Contract for Sutter Street (603), prepared by Youngdahl Consulting Group, Inc., dated 11 January 2017 (Project No. E17056.000).

Dear Ms. Morphis,

In accordance with your authorization, Youngdahl Consulting Group, Inc. has performed a Geotechnical Engineering Study for the project site located at 603 Sutter Street in Folsom, California. The purpose of this study was to perform a subsurface exploration and evaluate the surface and subsurface soil conditions at the site and provide geotechnical information and design criteria for the proposed project. Our scope was limited to a subsurface investigation, laboratory testing, and preparation of this report per the Reference No. 1 proposal.

Based upon our site reconnaissance and subsurface exploration program, it is our opinion that the primary geotechnical issues to be addressed consist of addressing excavation of undocumented fills, excavations into bedrock, and drainage related to the shallow bedrock and other geologic features. Due to the non-uniform nature of soils, other geotechnical issues may become more apparent during grading operations which are not listed above. The descriptions, findings, conclusions, and recommendations provided in this report are formulated as a whole; specific conclusions or recommendations should not be derived or used out of context. Please review the limitations and uniformity of conditions section of this report.

This report has been prepared for the exclusive use of KW Commercial & Sacramento Commercial Properties and their consultants, for specific application to this project, in accordance with generally accepted geotechnical engineering practice. Should you have any questions or require additional information, please contact our office at your convenience.

Very truly yours,
Youngdahl Consulting Group, Inc.

Christopher M. Sugar
Staff Engineer

Reviewed By:

Matthew J. Gross, P.E., G.E.
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
MATTHEW J. GROSS
GE 3088
GEOTECHNICAL
STATE OF CALIFORNIA

Distribution: (1) PDF: to Client

TABLE OF CONTENTS

1.0 INTRODUCTION 1
Purpose and Scope 1
Project Understanding 1
Background 1

2.0 FINDINGS 1
Surface Observations 2
Subsurface Conditions 2
Groundwater Conditions 2
Geologic Conditions 2
Seismicity 3
Earthquake Induced Liquefaction, Surface Rupture Potential, and Settlement 3
Static and Earthquake Induced Slope Instability 3
Laboratory Testing 3
Soil Expansion Potential 4

3.0 DISCUSSION AND CONCLUSIONS 4
General 4
Approach to Development 4

4.0 SITE GRADING AND EARTHWORK IMPROVEMENTS 4
Site Preparation 4
Excavation Characteristics 6
Soil Moisture Considerations 6
Engineered Fill Criteria 6

5.0 DESIGN RECOMMENDATIONS 7
Seismic Criteria 7
Shallow Conventional Foundations 8
Retaining Walls 9
Slab-on-Grade Construction 10
Drainage 13

6.0 DESIGN REVIEW AND CONSTRUCTION MONITORING 14
Construction Monitoring 14
Low Impact Development Standards 14
Post Construction Monitoring 14

7.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS 15

APPENDIX A 18
Introduction 19
Vicinity Map (Figure A-1) 20
Site Map (Figure A-2) 21
Logs of Exploratory Test Pits (Figures A-3 through A-4) 22
Soil Classification Chart and Exploratory Test Pit Log Legend (Figure A-5) 24

APPENDIX B 25
Introduction 26
Laboratory Testing Procedures 26
Direct Shear Test (Figure B-1) 27
Modified Proctor Test (Figure B-2) 28
Percent Passing No. 200 Test (Figure B-3) 29

APPENDIX C 30
Site Wall Drainage (Figure C-1) 31
Basement Wall Drainage (Figure C-2) 32

GEOTECHNICAL ENGINEERING STUDY
FOR
SUTTER STREET (603)

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering study performed for the proposed commercial development planned to be constructed at 603 Sutter Street in Folsom, California. An annotated vicinity map is provided on Figure A-1 to identify the approximate project location.

Purpose and Scope

The purpose of this study was to explore and evaluate the surface and subsurface conditions at the site, to provide geotechnical information and design criteria, and to develop geotechnical recommendations for the proposed project. The scope of this study includes the following:

- A review of geotechnical and geologic data available to us at the time of our study;
- A field study consisting of a site reconnaissance, followed by an exploratory test pit program to observe and characterize the subsurface conditions;
- A laboratory testing program performed on representative samples collected during our field study;
- Engineering analysis of the data and information obtained from our field study, laboratory testing, and literature review;
- Development of geotechnical recommendations regarding earthwork construction including, site preparation and grading, excavation characteristics, soil moisture conditions, engineered fill criteria, and drainage;
- Development of geotechnical design criteria for seismic conditions, shallow foundations, retaining walls, slabs on grade;
- Preparation of this report summarizing our findings, conclusions, and recommendations regarding the above described information.

Project Understanding

We understand that the proposed development will consist of the construction of a daylight basement parking structure with a 3-story commercial building on top. The development is anticipated to be cut back and in a retained condition against the south, east and west cuts, supported by a concrete retaining wall. Project plans were not available at the time of this report, but we anticipate excavations on the order of 15 feet to generate the proposed 3 story building. We anticipate the excavated materials will be off hauled.

Background

A review of aerial photographs available to us indicates that the project site may have been occupied by a building as recently as 1954. Our photographs indicate by 1959 the structure was no longer present. Some grading may have taken place during nearby roadway and underground utility improvements along the northern and eastern sides of the project site. We understand that no grading activities have occurred following these activities. If studies or plans pertaining to the site exist and are not cited as a reference in this report, we should be afforded the opportunity to review and modify our conclusions and recommendations as necessary.

2.0 FINDINGS

The following section describes our findings regarding the site conditions that we observed during our site reconnaissance and subsequent subsurface exploration. In addition, this section also provides the results of our laboratory testing, geologic review, and engineering assessment related to the project site.

Surface Observations
The project site is located at 603 Sutter Street in Folsom, California. The project site generally fronts Sutter Street to the northwest, Scott Street to the northeast, a single family residence to the southeast, and a commercial building to the southwest. The terrain at the project site generally slopes from the southwest to the northeast at approximately 7H:1V (Horizontal:Vertical) or flatter, with a 3 to 4 foot vertical cut along the north side of the site supported by a concrete cast in place wall. Along the northeast side of the site a water main and other utilities are present. The site was observed to be vegetated, with a moderately dense canopy of mature trees, short seasonal grasses, and a thick growth of bamboo within the southwest corner of the site. Some evidence of previous improvements were observable, including what appeared to be an old concrete footing along the southern corner of the site.

Subsurface Conditions
Our field study included a site reconnaissance by a representative of our firm followed by a subsurface exploration program conducted on 15 February 2017. The exploration program included the excavation of 2 exploratory test pits under the direction of our representative at the approximate locations shown on Figure A-2, Appendix A. A description of the field exploration program is provided in Appendix A.

Subsurface soil conditions were relatively consistent at the test pits observed and included silty sand fills overlaying sandy silts, which was underlain by bedrock. FILL was encountered at one of the test pits. The fill was observed to be comprised of SANDS in a medium dense to dense and moist condition but contained some construction debris. Underlying the surface materials, bedrock was encountered in a highly to moderately weathered, and soft to moderately hard condition to a maximum depth explored of 10½ feet below the ground surface.

A more detailed description of the subsurface conditions encountered during our subsurface exploration is presented graphically on the “Exploratory Test Pit Logs", Figures A-3 through A-4, Appendix A. These logs show a graphic interpretation of the subsurface profile, and the location and depths at which samples were collected.

Groundwater Conditions
Groundwater conditions were not observed at excavated test pit locations. Generally, subsurface water conditions vary in the foothill regions because of many factors such as, the proximity to bedrock, fractures in the bedrock, topographic elevations, and proximity to surface water. Some evidence of past repeated exposure to subsurface water may include black staining on fractures, clay deposits, and surface markings indicating previous seepage. Based on our experience in the area, at varying times of the year water may be perched on less weathered rock and/or present in the fractures and seems of the weathered rock found beneath the site.

Geologic Conditions
The geologic portion of this report included a review of geologic data pertinent to the site and an interpretation of our observations of the surface exposures and our observations in our exploratory test pits excavated during the field study.

The site is located within the western foothills region of the Sierra Nevada Mountain Range. According to the Geologic Map of the Sacramento Quadrangle (Wagner, D.L., et. al., 1981) this portion of the foothills and the project area are underlain by plutonic Mesozoic dioritic rocks.

Seismicity
According to the Fault Activity Map of California and Adjacent Areas (Jennings, 2010) and the Peak Acceleration from Maximum Credible Earthquakes in California (CDMG, 2007), no active faults or Earthquake Fault Zones (Special Studies Zones) are located on the project site. Additionally, no evidence of recent or active faulting was observed during our field study. The nearest mapped potentially active and active faults pertinent to the site are summarized in the following table.

Table 1: Local Active and Potentially Active Faults

Activity	Fault Name	Distance, Direction
Active	Dunnigan Hills	58 km W
Active	West Tahoe Fault	95 km NE
Potentially Active	Bear Mountains Fault Zone - West	8 km E
Potentially Active	Bear Mountains Fault Zone - East	18 km E
Potentially Active	Maidu Fault	16 km E
Potentially Active	Melones - West	30 km E
Potentially Active	Melones - East	33 km E

Based on estimations of the V_s30 velocity of the site conditions from topographic conditions (http://earthquake.usgs.gov/hazards/apps/vs30/custom.php) and subsurface interpretations, we recommend that the project site be classified as Site Class C in accordance with Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10.

Earthquake Induced Liquefaction, Surface Rupture Potential, and Settlement
Liquefaction is the sudden loss of soil shear strength and sudden increase in porewater pressure caused by shear strains, as could result from an earthquake. Research has shown that saturated, loose to medium-dense sands with a silt content less than about 25 percent and located within the top 40 feet are most susceptible to liquefaction and surface rupture/lateral spreading.

Due to the absence of permanently elevated groundwater table, the relatively low seismicity of the area and the relatively shallow depth to rock, the potential for seismically induced damage due to liquefaction, surface ruptures, and settlement is considered negligible. For the above-mentioned reasons mitigation for these potential hazards is not required for the development of this project.

Static and Earthquake Induced Slope Instability
The existing slopes on the project site were observed to have adequate vegetation on the slope face, appropriate drainage away from the slope face, and no apparent tension cracks or slump blocks in the slope face or at the head of the slope. No other indications of slope instability such as seeps or springs were observed. Additionally, due to the absence of permanently elevated groundwater table, the relatively low seismicity of the area, and the relatively shallow depth to rock, the potential for seismically induced slope instability for the existing slopes is considered negligible.

Laboratory Testing
Laboratory testing of the collected samples was directed towards determining the physical and engineering properties of the soil underlying the site. A description of the tests performed for this project and the associated test results are presented in Appendix B. In summary, the following tests were performed for the preparation of this report:

Table 2: Laboratory Tests

Laboratory Test	Test Standard	Summary of Results	
Direct Shear	ASTM D3080	Bulk 2:	Φ = 26.8°, c = 582 psf
Maximum Dry Density	ASTM D1557	Bulk 2:	DD = 114.8 pcf, MC = 15.3 %
No. 200 Wash	ASTM D1140	Bulk 2:	% Passing No. 200 = 73.1

Soil Expansion Potential

The materials encountered in our explorations were generally non-plastic (rock, sand, and non-plastic silt). The non-plastic materials are generally considered to be non-expansive; therefore, we do not anticipate that special design considerations for expansive soils will be required for the design or construction of the proposed improvements. If necessary, recommendations can be made based on our observations at the time of construction should greater quantities of expansive soils be encountered at the project site which were not disclosed during our study.

3.0 DISCUSSION AND CONCLUSIONS

General

Based upon the results of our field explorations, findings, and analysis described above, it is our opinion that construction of the proposed improvements is feasible from a geotechnical standpoint, provided the recommendations contained in this report are incorporated into the design plans and implemented during construction.

Approach to Development

Grading plans were not available to us at the time of this report, but we anticipate cuts on the order of 15 feet to generate the daylight basement condition for the bottom level parking. The lower parking structure will require excavation into the existing sloping hillside on Scott Street on the northeast, and into the hillside adjacent to the existing single family residence along the southeast side, and the hillside adjacent to the commercial structure along the southwest side of the project site. We do not anticipate large quantities of engineered fill will be placed throughout the project site, as we understand the site is proposed to be fully within cut. In order to support the anticipated cut slopes along the sides of the project site, we are anticipating either concrete masonry unit (CMU) or cast-in-place (CIP) concrete walls will be used.

The soil and bedrock conditions are not anticipated to be favorable for tall near vertical cuts. Excavations performed for recent construction operations on Sutter Street included the installation of soil nails for slope stability during construction. Depending on the location and orientation of the final design, consideration should be given to stability systems such as soil nails or braced shoring and their proximity to the property line. These systems should be designed by a specialty engineering contractor. Additional recommendations could be provided by our firm following preparation of a site plan.

4.0 SITE GRADING AND EARTHWORK IMPROVEMENTS

Site Preparation

We anticipate the pad to be fully within cut material and do not anticipate significant quantities of fills will be placed. Should engineered fills be required for pad construction, they should conform to the following paragraph's requirements for engineered fill. Preparation of the project site should involve demolition, site drainage controls, dust control, clearing and stripping, and exposed grade compaction considerations. The following paragraphs state our geotechnical comments and recommendations concerning site preparation.

Demolition: As part of the demolition operation, any unwanted foundation, structural improvement, or site improvement elements (including underground utilities) should be exhumed and removed from the site. In addition, any underground storage tanks, abandoned wells or other utilities not intended for reuse should be removed or backfilled in accordance with the appropriate regulations.

Concrete and asphalt separated from the other debris, and adequately broken down in particle size, may be mixed thoroughly with soil and placed as engineered fill as described below. If this option is exercised, a representative from our firm should be contacted to observe the adequacy of grading operations associated with the breaking and mixing of these elements.

Site Drainage Controls: We recommend that initial site preparation involve intercepting and diverting any potential sources of surface or near-surface water within the construction zones. Because the selection of an appropriate drainage system will depend on the water quantity, season, weather conditions, construction sequence, and methods used by the contractor, final decisions regarding drainage systems are best made in the field at the time of construction. All drainage and/or water diversion performed for the site should be in accordance with the Clean Water Act and applicable Storm Water Pollution Prevention Plan.

Dust Control: Dust control provisions should be provided for as required by the local jurisdiction's grading ordinance (i.e. water truck or other adequate water supply during grading).

Clearing and Stripping: Clearing and stripping operations should include the removal of all organic laden materials including trees, bushes, root balls, root systems, and any soft or loose soil generated by the removal operations. Surface grass stripping operations are necessary based upon our observations during our site visit. Short or mowed dry grasses may be pulverized and lost within fill materials provided no concentrated pockets of organics result. It is the responsibility of the grading contractor to remove excess organics from the fill materials. **No more than 2 percent of organic material, by weight, should be allowed within the fill materials at any given location.**

General site clearing should also include removal of any loose or saturated materials within the proposed structural improvement and pavement areas. A representative of our firm should be present during site clearing operations to identify the location and depth of potential fills not disclosed by this report, to observe removal of deleterious materials, and to identify any existing site conditions which may require mitigation or further recommendations prior to site development. Preserved trees may require tree root protection which should be addressed on an individual basis by a qualified arborist.

Addressing Existing Fills: Existing fill was encountered within our exploratory test pits and should be anticipated to be present throughout the project site. We anticipate the existing fills will be largely off hauled to make the proposed lower level parking daylight basement condition. The remaining fill soils are anticipated to be encountered in a dense condition that are considered suitable for support of improvements.

Exposed Grade Compaction: Exposed soil grades following initial site preparation activities and overexcavation operations should be scarified to a minimum depth of 8 inches and compacted to the requirements for engineered fill. Prior to placing fill, the exposed subgrades should be in a firm and unyielding state. Any localized zones of soft or pumping soils observed within a subgrade should either be scarified and recompacted or be overexcavated and replaced with engineered fill as detailed in the engineered fill section below.

Excavation Characteristics
The exploratory test pits were excavated using a Takeuchi TB180 excavator equipped with a 24 inch wide bucket. The degree of difficulty encountered in excavating our test pits is an indication of the effort that will be required for excavation during construction. Based on our test pits, we expect that due to mobility restrictions of large dozer equipment typically used for grading with shallow bedrock conditions, large excavators such as Komatsu PC400 or CAT 345 (or equivalent) equipped with special rock excavation/trenching equipment may be more appropriate for exactions on single lot commercial development. As such, contractors should be equipped with equipment of suitable size to perform the site excavations.

Where hard rock cuts in fractured rock are proposed, the orientation and direction of excavation/ripping will likely play a large role in the rippability of the material. Blasting cannot be ruled out in areas of resistant rock. When hard rock is encountered, we should be contacted to provide additional recommendations prior to performing an alternative such as blasting. Water inflow into any excavation approaching the hard rock surface is likely to be experienced in all but the driest summer and fall months.

Soil Moisture Considerations
The near-surface soils may become partially or completely saturated during the rainy season. Grading operations during this time period may be difficult since compaction efforts may be hampered by saturated materials. Therefore, we suggest that consideration be given to the seasonal limitations and costs of winter grading operations on the site. Special attention should be given regarding the drainage of the project site.

If the project is expected to work through the wet season, the contractor should install appropriate temporary drainage systems at the construction site and should minimize traffic over exposed subgrades due to the moisture-sensitive nature of the on-site soils. During wet weather operations, the soil should be graded to drain and should be sealed by rubber tire rolling to minimize water infiltration.

Engineered Fill Criteria
All materials placed as fills on the site should be placed as "Engineered Fill" which is observed, tested, and compacted as described in the following paragraphs.

Suitability of Onsite Materials: We anticipate that a large amount of onsite soils will be generated during mass grading operations and off hauled. We expect that soil generated from excavations on the site, excluding deleterious material, may be used as engineered fill provided the material does not exceed the maximum size specifications listed below.

Import Materials: If imported fill material is needed for this project, import material should be approved by our firm prior to transporting it to the project. It is preferable that import material meet the following requirements:

1. Plasticity index not to exceed 12;
2. An angle of friction equal to or greater than 29 degrees;
3. Should not contain rocks larger than 6 inches in diameter;
4. Not more than 15 percent passing through the No. 200 sieve.

If these requirements are not met, additional testing and evaluation may be necessary to determine the appropriate design parameters for foundations, and other improvements.

Fill Placement and Compaction: All areas proposed to receive fill should be scarified to a minimum depth of 8 inches, moisture conditioned as necessary, and compacted to at least 90 percent of the maximum dry density based on the ASTM D1557 test method. The fill should be placed in thin horizontal lifts not to exceed 12 inches in uncompacted thickness. The fill should be moisture conditioned as necessary and compacted to a relative compaction of not less than 90 percent based on the ASTM D1557 test method. The upper 8 inches of fills placed under proposed pavement areas should be compacted to a relative compaction of not less than 95 percent based on the ASTM D1557 test method. Fill soil compaction should be evaluated by means of in-place density tests performed during fill placement so that adequacy of soil compaction efforts may be determined as earthwork progresses.

5.0 DESIGN RECOMMENDATIONS

Seismic Criteria

Based on the 2016 California Building Code, Chapter 16, and our site investigation findings, the following seismic parameters are recommended from a geotechnical perspective for structural design. The final choice of design parameters, however, remains the purview of the project structural engineer.

Table 3: Seismic Design Parameters

2016 CBC	ASCE 7-10	Seismic Parameter	Recommended Value
	Table 20.3-1	Site Class	C
Figure 1613.3.1(1)		Short-Period MCE at 0.2s, S_S	0.480g
Figure 1613.3.1(2)		1.0s Period MCE, S_1	0.243g
Table 1613.3.3(1)		Site Coefficient, F_a	1.200
Table 1613.3.3(2)		Site Coefficient, F_v	1.557
Equation 16-37		Adjusted MCE Spectral Response Parameters, $S_{MS} = F_aS_s$	0.576g
Equation 16-38		Adjusted MCE Spectral Response Parameters, $S_{M1} = F_vS_1$	0.379g
Equation 16-39		Design Spectral Acceleration Parameters, $S_{DS} = ⅔S_{MS}$	0.384g
Equation 16-40		Design Spectral Acceleration Parameters, $S_{D1} = ⅔S_{M1}$	0.253g
Table 1613.3.5(1)		Seismic Design Category (Short Period), Occupancy I to III	C
Table 1613.3.5(1)		Seismic Design Category (Short Period), Occupancy IV	C
Table 1613.3.5(2)		Seismic Design Category (1-Second Period), Occupancy I to III	D
Table 1613.3.5(2)		Seismic Design Category (1-Second Period), Occupancy IV	D
	Figure 22-7	Maximum Considered Earthquake Geometric Mean (MCE_C) PGA	0.154g
	Table 11.8-1	Site Coefficient F_{PGA}	1.200
	Equation 11.8-1	$PGA_M = F_{PGA}$ PGA	0.184g

*Based on the online calculator available at http://earthquake.usgs.gov/designmaps/us/application.php

Shallow Conventional Foundations
We offer the following comments and recommendations for purposes of design and construction of shallow continuous and/or isolated pad foundations. The provided minimums do not constitute a structural design of foundations which should be performed by the structural engineer. Our firm should be afforded the opportunity to review the project grading and foundation plans to confirm the applicability of the recommendations provided below. Modifications to these recommendations may be made at the time of our review. In addition to the provided recommendations, foundation design and construction should conform to applicable sections of the 2016 California Building Code.

Continuous Foundation Bearing Capacities: An allowable dead plus live load bearing pressure of 1,500 psf may be used for design of conventional shallow foundations based on firm native soils or engineered fills and 4,000 for foundation based on weathered bedrock. The allowable pressures are for support of dead plus live loads and may be increased by 1/3 for short-term wind and seismic loads.

Foundation Lateral Pressures: Lateral forces on structures may be resisted by passive pressure acting against the sides of shallow footings and/or friction between the soil and the bottom of the footing. For resistance to lateral loads, a friction factor of 0.35 may be utilized for sliding resistance at the base of conventional shallow foundations in firm native materials or engineered fill and 0.45 pcf for weathered rock. A passive resistance of 350 pcf equivalent fluid weight may be used against the side of conventional shallow footings in firm native soil or engineered fill and 400 pcf for weathered bedrock conditions. If friction and passive pressures are combined, the lesser value should be reduced by 50 percent.

Foundation Settlement: A total settlement of less than 1 inch is anticipated; a differential settlement of ½ of the total is anticipated where foundations are bearing on like materials. This settlement is based upon the assumption that foundation will be sized and loaded in accordance with the recommendations in this report.

Foundation Configuration: Conventional shallow foundations should be a minimum of 12 inches wide and founded a minimum of 18 inches below the lowest adjacent soil grade for commercial structures. Isolated pad foundation should be a minimum of 24 inches in diameter.

Foundation reinforcement should be provided by the structural engineer. The reinforcement schedule should account for typical construction issues such as load consideration, concrete cracking, and the presence of isolated irregularities. At a minimum, we recommend that reinforcing steel for commercial structures should consist of a minimum of four No. 4 reinforcing bars; two each top and bottom at all areas of the foundation.

All footings should be founded below an imaginary 2H:1V plane projected up from the bottoms of adjacent footings and/or parallel utility trenches, or to a depth that achieves a minimum horizontal clearance of 6 feet from the outside toe of the footings to the slope face, whichever requires a deeper excavation.

Subgrade Conditions: Footings should never be cast atop soft, loose, organic, slough, debris, nor atop subgrades covered by ice or standing water. A representative of our firm should be retained to observe all subgrades during footing excavations and prior to concrete placement so that a determination as to the adequacy of subgrade preparation can be made.

Shallow Footing / Stemwall Backfill: All footing/stemwall backfill soil should be compacted to at least 90 percent of the maximum dry density (based on ASTM D1557).

Retaining Walls

Our design recommendations and comments regarding retaining walls for the project site are discussed below.

Foundation Design Parameters: An allowable dead plus live load bearing pressure of 1,500 psf may be used for design of conventional shallow foundations based on firm native soils or engineered fills and 4,000 for foundation based on weathered bedrock. The allowable pressures are for support of dead plus live loads and may be increased by 1/3 for short-term seismic loads.

Foundation Lateral Pressures: Lateral forces on structures may be resisted by passive pressure acting against the sides of shallow footings and/or friction between the soil and the bottom of the footing. For resistance to lateral loads, a friction factor of 0.35 may be utilized for sliding resistance at the base of conventional shallow foundations in firm native materials or engineered fill and 0.45 pcf for weathered rock. A passive resistance of 350 pcf equivalent fluid weight may be used against the side of conventional shallow footings in firm native soil or engineered fill and 400 pcf for weathered bedrock conditions. If friction and passive pressures are combined, the lesser value should be reduced by 50 percent.

Retaining Wall Lateral Pressures: Based on our observations and testing, the retaining wall should be designed to resist lateral pressure exerted from a soil media having an equivalent fluid weight provided in Table 4, below. In accordance with Section 1803.5.12.1 of the 2016 California Building Code, application of the seismic design values for earthquake loading are required for retaining walls supporting more than 6 feet of backfill.

Table 4: Retaining Wall Pressures

Wall Type	Wall Slope Configuration	Equivalent Fluid Weight (pcf)	Surcharge Load (psf)*	Lateral Pressure Coefficient	Earthquake Loading (plf)***	
Free Cantilever	Flat	45	per structural	0.38	$5H^2$	Applied 0.6H above the base of the wall
	2½H:1V	65	per structural	0.55		
Restrained**	Flat	65	per structural	0.55	$12H^2$	

* The surcharge loads should be applied as uniform loads over the full height of the walls as follows: Surcharge Load (psf) = (q) (K), where q = surcharge in psf, and K = coefficient of lateral pressure. Final design is the purview of the project structural engineer.

** Restrained conditions shall be defined as walls which are structurally connected to prevent flexible yielding, or rigid wall configurations (i.e. walls with numerous turning points) which prevent the yielding necessary to reduce the driving pressures from an at-rest state to an active state.

*** Section 1803.5.12 of the 2016 California Building Code states that a determination of lateral pressures on basement and retaining walls due to earthquake loading shall be provided for structures to be designed in Seismic Design Categories D, E or F (Load value derived from Wood (1973) and modified by Whitman (1991)).

Site Wall Drainage: The above criteria are based on fully drained conditions as detailed in the attached Figure C-1, Appendix C. For these conditions, we recommend that a blanket of filter material be placed behind all proposed walls. The blanket of filter material should be a minimum of 12 inches thick and should extend from the bottom of the wall to within 12 inches of the ground surface. The filter material should conform to Class One, Type B permeable material as specified in Section 68 of the California Department of Transportation Standard Specifications, current edition. A clean ¾ inch crushed rock is also acceptable, provided filter fabric is used to separate the open graded gravel/rock from the surrounding soils. The top 12 inches of wall backfill should consist of a compacted soil cap. A filter fabric should be placed on top of the gravel filter material to separate it from the soil cap. A 4 inch diameter drain pipe should be installed near the bottom of the filter blanket with perforations facing down. The drainpipe should be underlain by at least 4 inches of filter-type material. An adequate gradient should be provided along the top of the foundation to discharge water that collects behind the retaining wall to a controlled discharge system.

The configuration of a long retaining wall generally does not allow for a positive drainage gradient within the perforated drain pipe behind the wall since the wall footing is generally flat with no gradient for drainage. Where this condition is present, to maintain a positive drainage behind the walls, we recommend that the wall drains be provided with a discharge to an appropriate non-erosive outlet a maximum of 50 feet on center. **In addition, if the wall drain outlets are temporarily stubbed out in front of the walls for future connection during home construction, it is imperative that the outlets be routed into the tight pipe area drainage system and not buried and rendered ineffective.**

Basement Wall Drainage: Based on our experience in the project area, excavation into bedrock to create a daylight basement condition may have the potential for creating moisture related problems within the underlying slab on grade areas of the daylight basement (i.e. wet slab conditions associated with seepage through bedrock fractures, perched groundwater, etc.). The following recommendations have been provided to mitigate the potential for the abovementioned moisture related issues.

The configuration of a long retaining wall generally does not allow for a positive drainage gradient within the perforated drain pipe behind the wall since the wall footings are generally flat with no gradient for drainage. Where this condition is present, to maintain positive drainage behind the walls, we recommend that the length of the wall drain be broken up into segments of 20 foot lengths that will allow for drainage outlets within the central portion of the drain segment. To accomplish this, we recommend that the perforated pipe be installed in contact with the top of the footing and sleeved with a tight pipe through the footing as detailed on Figure C-2, Appendix C. The drain should be installed in a trench and directed to a non-erosive outlet. Once the drain enters the footing, the perforated drain pipe should transition to a non-perforated rigid wall pipe. A second perforated pipe should be installed within the trench as detailed on Figure C-2, Appendix C. The trench should be backfilled with crushed rock up to finished pad grade so that it contacts the crushed rock beneath the slab and functions as a slab underdrain system. The drain trenches should be excavated to a depth such that they are below any plumbing trenches, so that any water that may accumulate in those trenches can also be drained.

The final drainage configuration should be addressed prior to the completion of pad grading operations, so that a determination can be made, based on the geotechnical and/or geologic conditions observed, where installation of the wall drain outlets/slab underdrain system would be most beneficial. In addition, pre-excavation of the drainage trenches could be performed with the large grading equipment on the site. A representative from our firm should be present during these operations to provide additional consultation services as field conditions dictate.

Slab-on-Grade Construction

It is our opinion that soil-supported slab-on-grade floors could be used for the main floors of the commercial structure, contingent on proper subgrade preparation. Often the geotechnical issues regarding the use of slab-on-grade floors include proper soil support and subgrade preparation, proper transfer of loads through the slab underlayment materials to the subgrade soils, and the anticipated presence or absence of moisture at or above the subgrade level. We offer the following comments and recommendations concerning support of slab-on-grade floors. The slab design (concrete mix, reinforcement, joint spacing, moisture protection, and underlayment materials) is the purview of the project Structural Engineer.

Slab Subgrade Preparation: All subgrades proposed to support slab-on-grade floors should be prepared and compacted to the requirements of engineered fill as discussed in the Site Grading and Improvements section of this report.

Slab Underlayment: As a minimum for slab support conditions, the slab should be underlain by a minimum 4 inch crushed rock layer and covered by a minimum 10-mil thick moisture retarding plastic membrane. An optional 1 inch blotter sand layer above the plastic membrane is sometimes used to aid in curing of the concrete in commercial structures. The blotter layer can become a reservoir for excessive moisture if inclement weather occurs prior to pouring the slab, excessive water collects in it from the concrete pour, or an external source of water enters above or bypasses the membrane. The membrane may only be functional when it is above the vapor sources. The bottom of the crushed rock layer should be above the exterior grade to act as a capillary break and not a reservoir, unless it is provided with an underdrain system. The slab design and underlayment should be in accordance with ASTM E1643 and E1745.

If the blotter sand layer is omitted (as may be required if slab design and construction is to be performed according to the 2016 Green Building Code), special wet curing procedures will be necessary. In all cases, development of appropriate slab mix design and curing procedures remains the purview of the project structural engineer.

Slab Moisture Protection: Due to the potential for landscape to be present directly adjacent to the slab edge/foundation or for drainage to be altered following our involvement with the project, varying levels of moisture below, at, or above the pad subgrade level should be anticipated. The slab designer should include the potential for moisture vapor transmission when designing the slab. Our experience has shown that vapor transmission through concrete is controlled through slab thickness as well as proper concrete mix design.

It should be noted that placement of the recommended plastic membrane, proper mix design, and proper slab underlayment and detailing per ASTM E1643 and E1745 will not provide a waterproof condition. If a waterproof condition is desired, we recommend that a waterproofing expert be consulted for slab design.

Slab Thickness and Reinforcement: Geotechnical reports have historically provided minimums for slab thickness and reinforcement for general crack control. The concrete mix design and construction practices can additionally have a large impact on concrete crack control. All concrete should be anticipated to crack. As such, these minimums should not be considered to be stand alone items to address crack control, but are suggested to be considered in the slab design methodology.

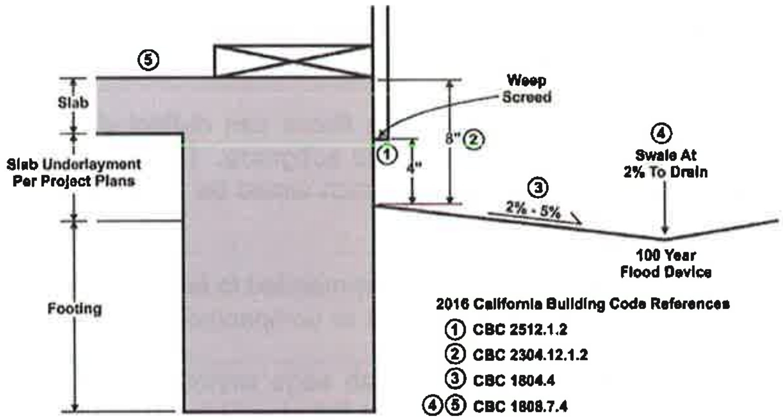
In order to help control the growth of cracks in interior concrete from becoming significant, we suggest the following minimums. Interior concrete slabs-on-grade not subject to heavy loads should be a minimum of 4 inches thick. A 4 inch thick slab should be reinforced. A minimum of No. 3 deformed reinforcing bars placed at 24 inches on center both ways, at the center of the structural section is suggested. Joint spacing should be provided by the structural engineer. Troweled joints recovered with paste during finishing or "wet sawn" joints should be considered every 10 feet on center. Expansion joint felt should be provided to separate floating slabs from foundations and at least at every third joint. Cracks will tend to occur at recurrent corners, curved or triangular areas and at points of fixity. Trim bars can be utilized at right angle to the predicted crack extending 40 bar diameters past the predicted crack on each side.

Vertical Deflections: Soil-supported slab-on-grade floors can deflect downward when vertical loads are applied, due to elastic compression of the subgrade. For design of concrete floors, a modulus of subgrade reaction of k = 150 psi per inch would be applicable for native soils and engineered fills.

Exterior Flatwork: Exterior concrete flatwork is recommended to have a 4 inch rock cushion. This could consist of vibroplate compacted crushed rock or compacted ¾ inch aggregate baserock.

If exterior flatwork concrete is against the floor slab edge without a moisture separator it may transfer moisture to the floor slab. Expansion joint felt should be provided to separate exterior flatwork from foundations and at least at every third joint. Contraction / groove joints should be provided to a depth of at least 1/4 of the slab thickness and at a spacing of less than 30 times the slab thickness for unreinforced flatwork, dividing the slab into nearly square sections. Cracks will tend to occur at recurrent corners, curved or triangular areas and at points of fixity. Trim bars can be utilized at right angle to the predicted crack extending 40 bar diameters past the predicted crack on each side.

Drainage Adjacent to Slabs: All grades should provide rapid removal of surface water runoff; ponding water should not be allowed on building pads or adjacent to foundations or other structural improvements (during and following construction). All soils placed against foundations during finish grading should be compacted to minimize water infiltration. Finish and landscape grading should include positive drainage away from all foundations. Section 1808.7.4 of the 2016 California Building Code (CBC) states that for graded soil sites, the top of any exterior foundation shall extend above the elevation of the street gutter at the point of discharge or the inlet of an approved drainage device a minimum of 12 inches plus 2 percent. If overland flow is not achieved adjacent to buildings, the drainage device should be designed to accept flows from a 100 year event. Grades directly adjacent to foundations should be no closer than 8 inches from the top of the slab (CBC 2304.12.1.2), and weep screeds are to be placed a minimum of 4 inches clear of soil grades and 2 inches clear of concrete or other hard surfacing (CBC 2512.1.2). From this point, surface grades should slope a minimum of 2 percent away from all foundations for at least 5 feet but preferably 10 feet, and then 2 percent along a drainage swale to the outlet (CBC 1804.4). Downspouts should be tight piped via an area drain network and discharged to an appropriate non-erosive outlet away from all foundations.



Typical 2016 California Building Code
Drainage Requirements

The above referenced elements pertaining to drainage of the proposed structures is provided as general acknowledgement of the California Building Code requirements, restated and graphically illustrated for ease of understanding. Surface drainage design is the purview of the Project Architect/Civil Engineer. Review of drainage design and implementation adjacent to the building envelopes is recommended as performance of these improvements is crucial to the performance of the foundation and construction of rigid improvements.

It should be noted that due to the Americans with Disabilities Act (ADA) requirements, design and construction of alternative site drainage configurations may be necessary, particularly for multi-family and commercial developments. In this case, design and construction of adequate drainage adjacent to foundations and slabs are essential to preserving foundation support and reducing the potential for wet slab related issues. A typical example of this condition occurs in commercial developments where the landscape grades are situated at the same elevation as the parking areas so as to not create a drop off between the grades. This condition subsequently results in flat grades between the building, landscape area, and parking lot which do not meet building code requirements.

Drainage

In order to maintain the engineering strength characteristics of the soil presented for use in this geotechnical engineering study, maintenance of the building pads will need to be performed. This maintenance generally includes, but is not limited to, proper drainage and control of surface and subsurface water which could affect structural support and fill integrity. A difficulty exists in determining which areas are prone to the negative impacts resulting from high moisture conditions due to the diverse nature of potential sources of water; some of which are outlined in the paragraph below. We suggest that measures be installed to minimize exposure to the adverse effects of moisture, but this will not guarantee that excessive moisture conditions will not affect the structure.

Some of the diverse sources of moisture could include water from landscape irrigation, annual rainfall, offsite construction activities, runoff from impermeable surfaces, collected and channeled water, and water perched in the subsurface soils on the bedrock horizon or present in fractures in the weathered bedrock. Some of these sources can be controlled through drainage features installed either by the owner or contractor. Others may not become evident until they, or the effects of the presence of excessive moisture, are visually observed on the property.

Some measures that can be employed to minimize the buildup of moisture include, but are not limited to proper backfill materials and compaction of utility trenches within the footprint of the proposed commercial structures; grout plugs at foundation penetrations; collection and channeling of drained water from impermeable surfaces (i.e. roofs, concrete or asphalt paved areas); installation of subdrain/cut-off drain provisions; utilization of low flow irrigation systems; education to the proposed homeowners of proper design and maintenance of landscaping and drainage facilities that they or their landscaper installs.

Post Construction: All drainage related issues may not become known until after construction and landscaping are complete. Therefore, some mitigation measures may be necessary following site development. Landscape watering is typically the largest source of water infiltration into the subgrade. Given the soil conditions on site, excessive or even normal landscape watering may contribute to groundwater levels rising, which could contribute to moisture related problems and/or cause distress to foundations and slabs, pavements, and underground utilities, as well as creating a nuisance where seepage occurs. In order to mitigate these conditions, additional subdrainage measures may be necessary.

6.0 DESIGN REVIEW AND CONSTRUCTION MONITORING

The design plans and specifications should be reviewed and accepted by Youngdahl Consulting Group, Inc. prior to contract bidding. A review should be performed to determine whether the recommendations contained within this report are still applicable and/or are properly reflected and incorporated into the project plans and specifications.

Construction Monitoring

Construction monitoring is a continuation of the findings and recommendations provided in this report. It is essential that our representative be involved with all grading activities in order for us to provide supplemental recommendations as field conditions dictate. Youngdahl Consulting Group, Inc. should be notified at least two working days before site clearing or grading operations commence, and should observe the stripping of deleterious material, overexcavation of existing fills and provide consultation to the Grading Contractor in the field.

Low Impact Development Standards

Low Impact Development or LID standards have become a consideration for many projects in the region. LID standards are intended to address and mitigate urban storm water quality concerns. These methods include the use of Source Controls, Run-off Reduction and Treatment Controls. For the purpose of this report use of Run-off Reduction measures and some Treatment Controls may impact geotechnical recommendations for the project.

Youngdahl Consulting Group, Inc. did not perform any percolation or infiltration testing for the site as part of the Geotechnical Investigation. A review of soil survey and the data collected from test pits indicate that soils within the project are Hydrologic Soil Group D (low permeability). Based on this condition, use of infiltration type LID methods (infiltration trenches, dry wells, infiltration basins, permeable pavements, etc.) should not be considered without addressing applicable geotechnical considerations/implications. As such, use of any LID measure that would require infiltration of discharge water to surfaces adjacent to structures/pavement or include infiltration type measures should be reviewed by Youngdahl Consulting Group, Inc. during the design process.

Post Construction Monitoring

As described in Post Construction section of this report, all drainage related issues may not become known until after construction and landscaping are complete. Youngdahl Consulting

Group, Inc. can provide consultation services upon request that relate to proper design and installation of drainage features during and following site development. In addition, if the development includes use of LID measures maintenance of those features in conformance with the standard of practice and documentation from the designer will be necessary. The impact from infiltration or run-off reduction measures to engineered structures and foundations may not become apparent until after construction. We recommend that all LID measures be inspected and maintained as documented by the designer and if adverse impacts are noted related to the structure or site that Youngdahl Consulting Group, Inc. be retained to review the LID measure and provide additional consulting and options.

7.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. This report has been prepared for the exclusive use of KW Commercial & Sacramento Commercial Properties and their consultants for specific application to the Sutter Street (603) project. Youngdahl Consulting Group, Inc. has endeavored to comply with generally accepted geotechnical engineering practice common to the local area. Youngdahl Consulting Group, Inc. makes no other warranty, expressed or implied.

2. As of the present date, the findings of this report are valid for the property studied. With the passage of time, changes in the conditions of a property can occur whether they be due to natural processes or to the works of man on this or adjacent properties. Legislation or the broadening of knowledge may result in changes in applicable standards. Changes outside of our control may cause this report to be invalid, wholly or partially. Therefore, this report should not be relied upon after a period of three years without our review nor should it be used or is it applicable for any properties other than those studied.

3. Section [A] 107.3.4 of the 2016 California Building Code states that, in regard to the design professional in responsible charge, the building official shall be notified in writing by the owner if the registered design professional in responsible charge is changed or is unable to continue to perform the duties.

   WARNING: Do not apply any of this report's conclusions or recommendations if the nature, design, or location of the facilities is changed. If changes are contemplated, Youngdahl Consulting Group, Inc. must review them to assess their impact on this report's applicability. Also note that Youngdahl Consulting Group, Inc. is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or reuse of this report's subsurface data or engineering analyses without the express written authorization of Youngdahl Consulting Group, Inc.

4. The analyses and recommendations contained in this report are based on limited windows into the subsurface conditions and data obtained from subsurface exploration. The methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Samples cannot be relied on to accurately reflect the strata variations that usually exist between sampling locations. Should any variations or undesirable conditions be encountered during the development of the site, Youngdahl Consulting Group, Inc. will provide supplemental recommendations as dictated by the field conditions.

5. The recommendations included in this report have been based in part on assumptions about strata variations that may be tested only during earthwork. Accordingly, these recommendations should not be applied in the field unless Youngdahl Consulting Group, Inc. is retained to perform construction observation and thereby provide a complete professional

geotechnical engineering service through the observational method. Youngdahl Consulting Group, Inc. cannot assume responsibility or liability for the adequacy of its recommendations when they are used in the field without Youngdahl Consulting Group, Inc. being retained to observe construction. Unforeseen subsurface conditions containing soft native soils, loose or previously placed non-engineered fills should be a consideration while preparing for the grading of the property. It should be noted that it is the responsibility of the owner or his/her representative to notify Youngdahl Consulting Group, Inc., in writing, a minimum of 48 hours before any excavations commence at the site.

6. Our experience has shown that vapor transmission through concrete is controlled through proper concrete mix design. As such, proper control of moisture vapor transmission should be considered in the design of the slab as provided by the project architect, structural or civil engineer. It should be noted that placement of the recommended plastic membrane, proper mix design, and proper slab underlayment and detailing per ASTM E1643 and E1745 will not provide a waterproof condition. If a waterproof condition is desired, we recommend that a waterproofing expert be consulted for slab design.

7. Following site development, additional water sources (i.e. landscape watering, downspouts) are generally present. The presence of low permeability materials can prohibit rapid dispersion of surface and subsurface water drainage. Utility trenches typically provide a conduit for water distribution. Provisions may be necessary to mitigate adverse effects of perched water conditions. Mitigation measures may include the construction of cut-off systems and/or plug and drain systems. Close coordination between the design professionals regarding drainage and subdrainage conditions may be warranted.

   Seepage may be observed emanating from the cut slopes following their excavation during the following rainy season or following development of the areas above the cut. Generally this seepage is not enough flow to be a stability issue to the cut slope, but may be an issue for the owner of the lot at the base of the cut from a surface drainage and standing water (damp spot) standpoint. This amount of water is generally collected easily with landscaping drainage, surface drainage at the toe of the slope, or subsurface toe drains. Recommendations may be provided at the time of observed seepage; however, we recommend that the developer of the property disclose this possibility to future owners.

Table 5: Checklist of Recommended Services

	Item Description	Recommended	Not Anticipated
1	Provide foundation design parameters	Included	
2	Review grading plans and specifications	✓	
3	Review foundation plans and specifications	✓	
4	Observe and provide recommendations regarding demolition	✓	
5	Observe and provide recommendations regarding site stripping	✓	
6	Observe and provide recommendations on moisture conditioning removal, and/or recompaction of unsuitable existing soils		✓
7	Observe and provide recommendations on the installation of subdrain facilities	✓	
8	Observe and provide testing services on fill areas and/or imported fill materials	✓	
9	Review as-graded plans and provide additional foundation recommendations, if necessary	✓	
10	Observe and provide compaction tests on storm drains, water lines and utility trenches		✓
11	Observe foundation excavations and provide supplemental recommendations, if necessary, prior to placing concrete	✓	
12	Observe and provide moisture conditioning recommendations for foundation areas and slab-on-grade areas prior to placing concrete		✓
13	Provide design parameters for retaining walls	Included	
14	Provide finish grading and drainage recommendations	Included	
15	Provide geologic observations and recommendations for keyway excavations and cut slopes during grading		✓
16	Excavate and recompact all test pits within structural areas	✓	

APPENDIX A
Field Study

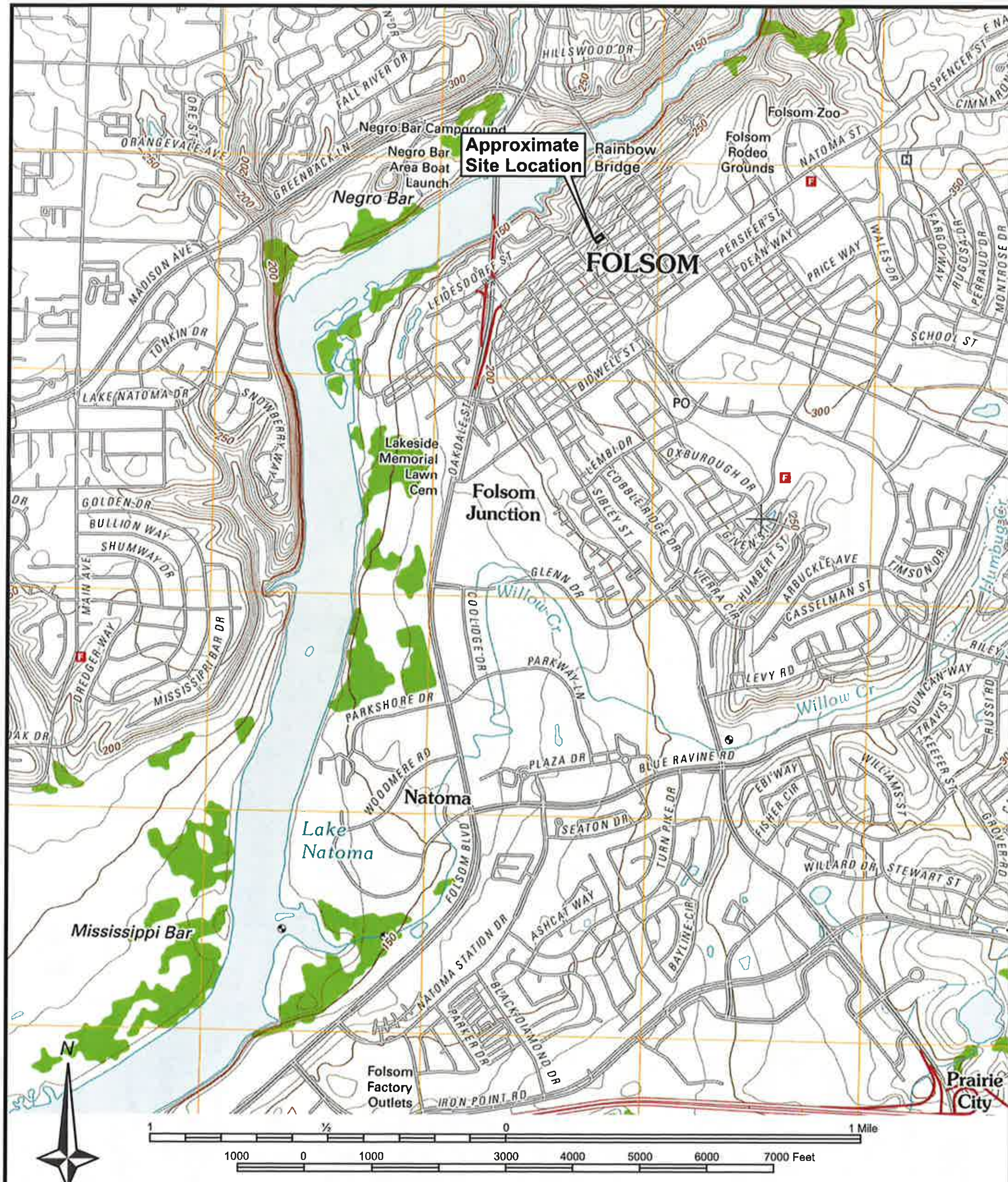
Vicinity Map
Site Plan
Logs of Exploratory Test Pits
Soil Classification Chart and Log Exploration

Introduction
The contents of this appendix shall be integrated with the geotechnical engineering study of which it is a part. They shall not be used in whole or in part as a sole source for information or recommendations regarding the subject site.

Our field study included a site reconnaissance by a Youngdahl Consulting Group, Inc. representative followed by a subsurface exploration program conducted on 15 February 2017, which included the excavation of 2 test pits under his direction at the approximate locations shown on Figure A-2, this Appendix. Excavation of the test pits was accomplished with a Takeuchi TB180 excavator equipped with a 24 inch wide bucket. The bulk and bag samples collected from the test pits returned to our laboratory for further examination and testing.

The Exploratory Test Pit Logs describe the vertical sequence of soils and materials encountered in each test pit, based primarily on our field classifications and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradual, our logs indicate the average contact depth. Our logs also graphically indicate the sample type, sample number, and approximate depth of each soil sample obtained from the test pits.

The soils encountered were logged during excavation and provide the basis for the "Logs of Test Pits", Figures A-3 through A-4, this Appendix. These logs show a graphic representation of the soil profile, the location, and depths at which samples were collected.



Scale: 1:24,000

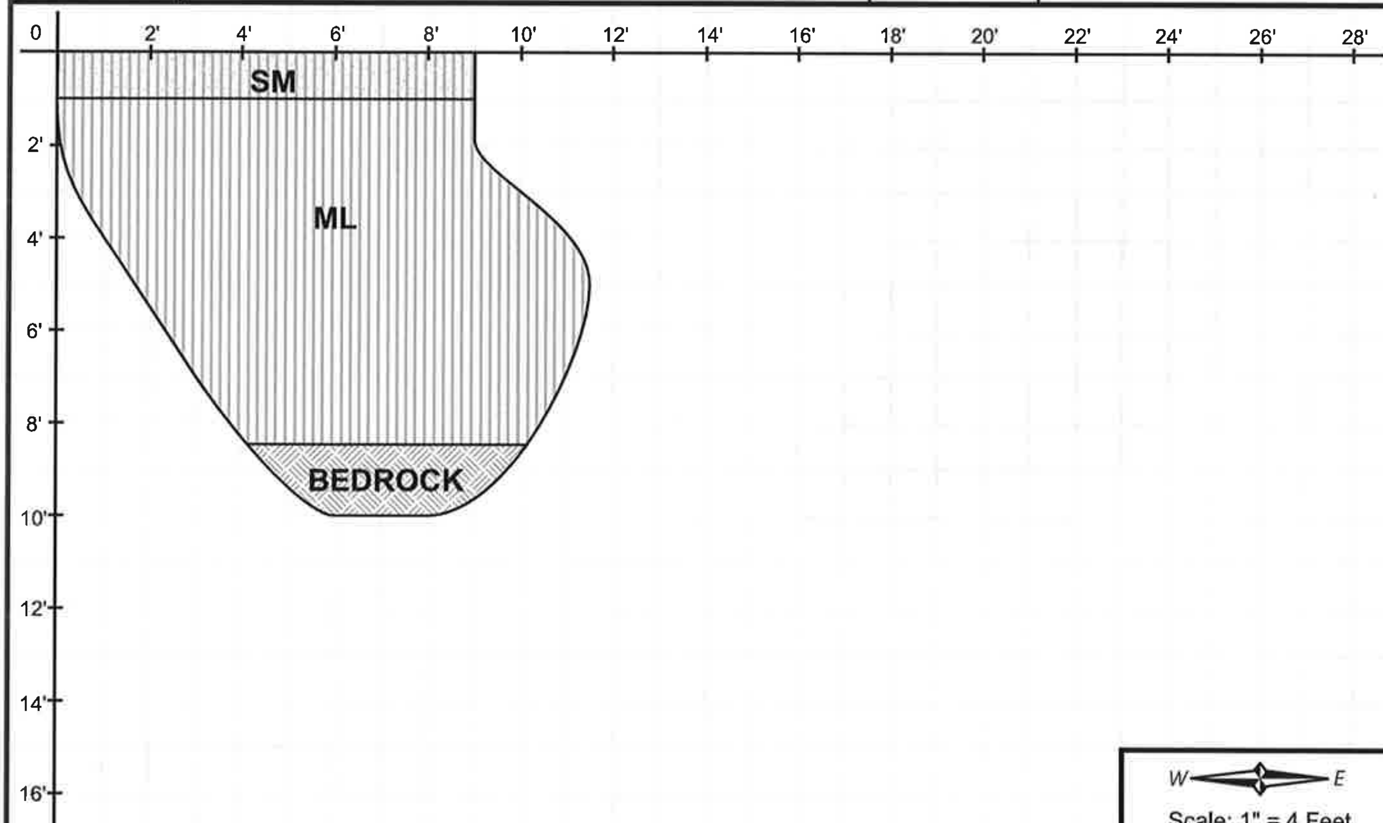
BASE MAP REFERENCE: *U.S.G.S. 7.5 Minute Topographic Series, Folsom Quadrangle, Dated 2015*

YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E17056.000 **March 2017**	**VICINITY MAP** **Sutter Street (603)** Folsom, California	**FIGURE** **A-1**

YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E17056.000	**SITE PLAN**	**FIGURE**
	March 2017	**Sutter Street (603)** Folsom, California	**A-2**

Logged By: **CMS**	Date: **15 Feb 2017**	Lat / Lon: **~ / ~**		Pit No. **TP-1**
Equipment: **Takeuchi TB180 With 24" Bucket**		Pit Orientation: **W - E**	Elevation: **~**	

Depth (Feet)	Geotechnical Description & Unified Soil Classification	Sample	Tests & Comments
@ 0' - 1'	Dark red brown silty **SAND (SM)** with cobbles, medium dense, moist	**BULK 1** @ 1'	***Field moisture density test at 0'*** *DD = 87.3 pcf MC = 29.5%*
@ 1' - 4.5'	Red sandy **SILT (ML)** with cobbles, stiff, moist	**BULK 2** @ 3'	***Field moisture density test at 2'*** *DD = 106.1 pcf MC = 19.0%* ***Field moisture density test at 4'*** *DD = 106.3 pcf MC = 23.1%*
@ 4.5' - 8.5'	*Grades trace cobbles*		*PP @ 3' = 3.25 tsf*
@ 8.5' - 9.5'	Grey **BEDROCK**, highly weathered, thinly foliated, soft		*PP @ 4' = 4.5+ tsf*
@ 9.5' - 10'	*Grades blue grey, moderately weathered, moderately hard*		
	Test pit terminated at 10' (practical refusal) No free groundwater encountered No caving noted		

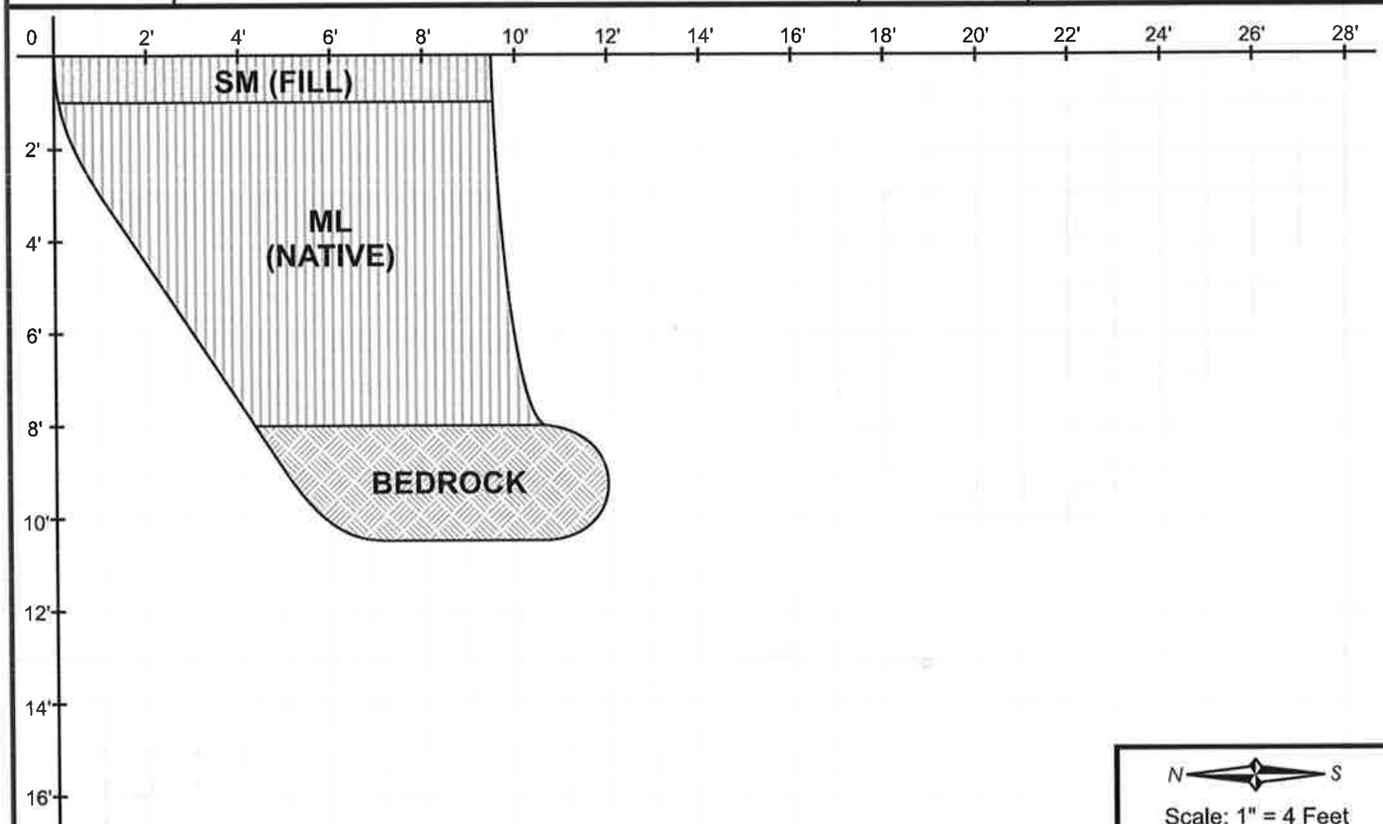


Note: The test pit log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations, Note, too, that the passage of time may affect conditions at the sampling locations.

YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E17056.000	**EXPLORATORY TEST PIT LOG**	**FIGURE**
	March 2017	**Sutter Street (603)** Folsom, California	**A-3**

Logged By: **CMS**	Date: **15 Feb 2017**	Lat / Lon: **~ / ~**		Pit No. **TP-2**
Equipment: **Takeuchi TB180 With 24" Bucket**		Pit Orientation: **N - S**	Elevation: **~**	

Depth (Feet)	Geotechnical Description & Unified Soil Classification	Sample	Tests & Comments
@ 0' - 1.5'	Dark yellow brown silty **SAND (SM)** with cobbles, medium dense, moist, with concrete and metal debris (FILL)		***Field moisture density test at 0'*** *DD = 99.6 pcf MC = 18.0%* ***Field moisture density test at 2'*** *DD = 101.9 pcf MC = 23.5%* ***Field moisture density test at 4'*** *DD = 103.4 pcf MC = 24.9%*
@ 1.5' - 5'	Red sandy **SILT (ML)** with cobbles, stiff, moist (NATIVE)	**BULK 3** @ 6'	
@ 5' - 8'	*Grades trace cobbles*		
@ 8' - 9.5'	Blue grey **BEDROCK**, highly weathered, moderately soft to moderately hard		
@ 9.5' - 10.5'	*Grades moderately weathered, moderately hard*		
	Test pit terminated at 10.5' (practical refusal) No free groundwater encountered No caving noted		



Note: The test pit log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations, Note, too, that the passage of time may affect conditions at the sampling locations.

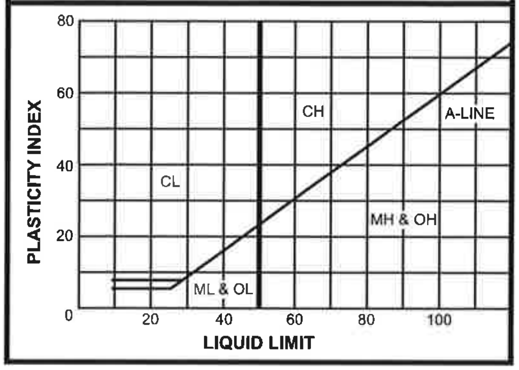
YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E17056.000	**EXPLORATORY TEST PIT LOG**	**FIGURE**
	March 2017	**Sutter Street (603)** Folsom, California	**A-4**

UNIFIED SOIL CLASSIFICATION SYSTEMS

MAJOR DIVISION			SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS Over 50% > #200 sieve	GRAVELS Over 50% > #4 sieve	Clean **GRAVELS** With Little Or No Fines	GW	Well graded **GRAVELS**, **GRAVEL-SAND** mixtures
			GP	Poorly graded **GRAVELS**, **GRAVEL-SAND** mixtures
		GRAVELS With Over 12% Fines	GM	Silty **GRAVELS**, poorly graded **GRAVEL-SAND-SILT** mixtures
			GC	Clayey **GRAVELS**, poorly graded **GRAVEL-SAND-CLAY** mixtures
	SANDS Over 50% < #4 sieve	Clean **SANDS** With Little Or No Fines	SW	Well graded **SANDS**, gravelly **SANDS**
			SP	Poorly graded **SANDS**, gravelly **SANDS**
		SANDS With Over 12% Fines	SM	Silty **SANDS**, poorly graded **SAND-SILT** mixtures
			SC	Clayey **SANDS**, poorly graded **SAND-CLAY** mixtures
FINE GRAINED SOILS Over 50% < #200 sieve	**SILTS & CLAYS** Liquid Limit < 50		ML	Inorganic **SILTS**, silty or clayey fine **SANDS**, or clayey **SILTS** with plasticity
			CL	Inorganic **CLAYS** of low to medium plasticity, gravelly, sandy, or silty **CLAYS**, lean **CLAYS**
			OL	Organic **CLAYS** and organic silty **CLAYS** of low plasticity
	SILTS & CLAYS Liquid Limit > 50		MH	Inorganic **SILTS**, micaceous or diamacious fine sandy or silty soils, elastic **SILTS**
			CH	Inorganic **CLAYS** of high plasticity, fat **CLAYS**
			OH	Organic **CLAYS** of medium to high plasticity, organic **SILTS**
HIGHLY ORGANIC CLAYS			PT	PEAT & other highly organic soils

PLASTICITY CHART

USED FOR CLASSIFICATION OF FINE GRAINED SOILS



SAMPLE DRIVING RECORD

BLOWS PER FOOT	DESCRIPTION
25	25 Blows drove sampler 12 inches, after initial 6 inches of seating
50/7"	50 Blows drove sampler 7 inches, after initial 6 inches of seating
50/3"	50 Blows drove sampler 3 inches during or after initial 6 inches of seating

Note: To avoid damage to sampling tools, driving is limited to 50 blows per 6 inches during or after seating interval.

SOIL GRAIN SIZE

U.S. STANDARD SIEVE	6"		3"	¾"	4	10	40	200	
SOIL	BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY
			COARSE	FINE	COARSE	MEDIUM	FINE		
GRAIN SIZE IN MILLIMETERS	150		75	19	4.75	2.0	.425	0.075	0.002

KEY TO PIT & BORING SYMBOLS

- Standard Penetration test
- 2.5" O.D. Modified California Sampler
- 3" O.D. Modified California Sampler
- Shelby Tube Sampler
- 2.5" Hand Driven Liner
- Bulk Sample
- Water Level At Time Of Drilling
- Water Level After Time Of Drilling
- P Perched Water

KEY TO PIT & BORING SYMBOLS

	Joint
	Foliation
	Water Seepage
NFWE	No Free Water Encountered
FWE	Free Water Encountered
REF	Sampling Refusal
DD	Dry Density (pcf)
MC	Moisture Content (%)
LL	Liquid Limit
PI	Plasticity Index
PP	Pocket Penetrometer
UCC	Unconfined Compression (ASTM D2166)
TVS	Pocket Torvane Shear
EI	Expansion Index (ASTM D4829)
Su	Undrained Shear Strength

YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E17056.000 / **March 2017**	**SOIL CLASSIFICATION CHART AND LOG EXPLANATION Sutter Street (603)** Folsom, California	**FIGURE A-5**

APPENDIX B

Laboratory Testing

Direct Shear Test
Modified Proctor Test
Percent Passing No. 200 Test

Introduction
Our laboratory testing program for this evaluation included numerous visual classifications, direct shear, 200 wash, and modified proctor tests. The following paragraphs describe our procedures associated with each type of test. Graphical results of certain laboratory tests are enclosed in this appendix. The contents of this appendix shall be integrated with the geotechnical engineering study of which it is a part. They shall not be used in whole or in part as a sole source for information or recommendations regarding the subject site.

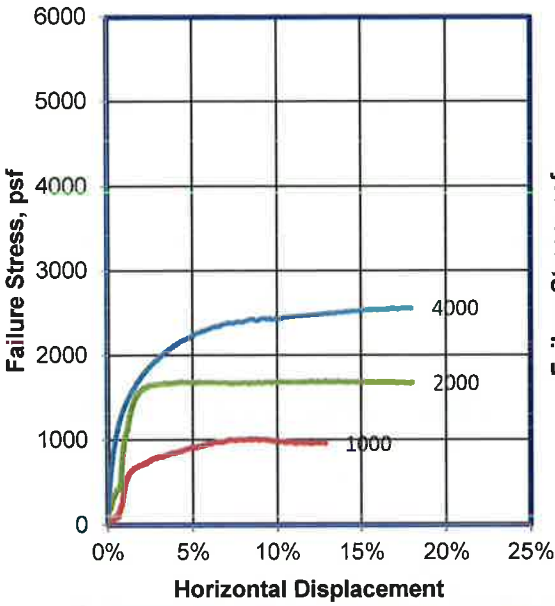
Laboratory Testing Procedures
Visual Classification: Visual soil classifications were conducted on all samples in the field and on selected samples in our laboratory. All soils were classified in general accordance with the Unified Soil Classification System, which includes color, relative moisture content, primary soil type (based on grain size), and any accessory soil types. The resulting soil classifications are presented on the exploration logs in Appendix A.

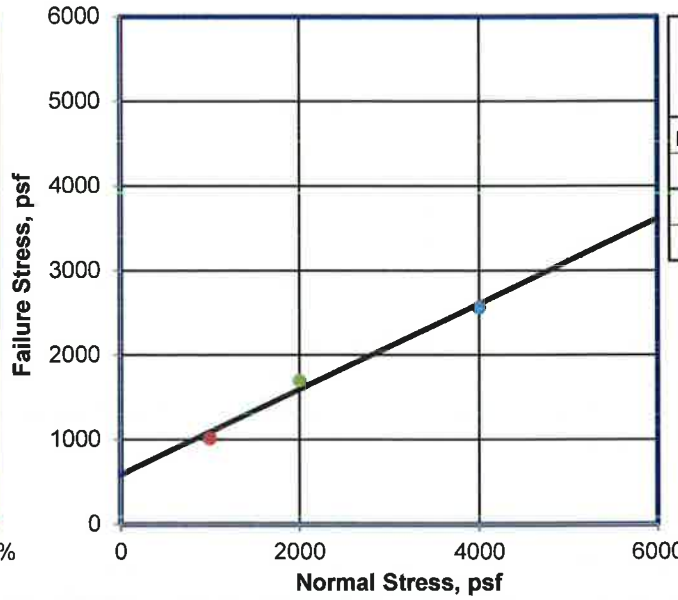
Soil Strength Determination: The strength parameters of the foundation soils were based on direct shear tests (ASTM D3080) performed on a representative remolded sample of the near-surface soils. The results of these tests are presented on Figure B-1, this Appendix.

Maximum Dry Density Determination: A modified proctor test (ASTM D1557) was conducted to provide the optimum moisture and maximum dry density on the near surface material. The results of this test are presented on Figure B-2, this Appendix.

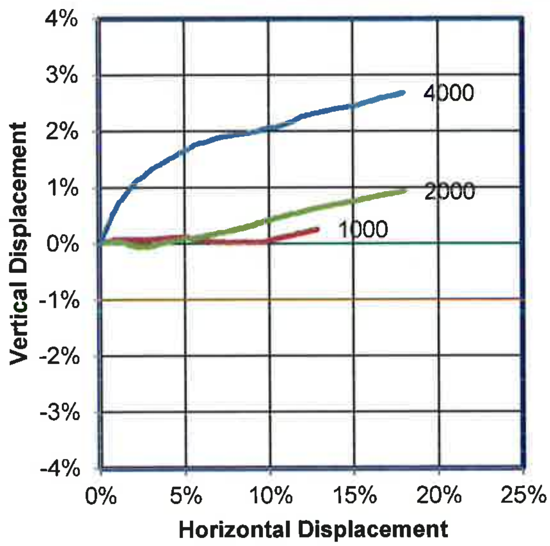
Percent Passing No. 200 Test: A percent passing No. 200 sieve test (ASTM D1557) was conducted to provide an accurate determination of fine materials in the sample tested. The results of this test are presented on Figure B-3, this Appendix.

Direct Shear Test of Soils Under Consolidated Drained Conditions, ASTM D3080





Direct Shearbox Results
Friction Angle
26.8°
Cohesion
582 psf



Test No.		1	2	3
Initial	Wet Density, pcf	119.1	119.1	119.1
	Dry Density, pcf	103.3	103.3	103.3
	Moisture Content, %	15.3	15.3	15.3
	Diameter, in	2.50	2.50	2.50
	Height, in	1.00	1.00	1.00
Pre Shear	Wet Density, pcf	130.4	128.6	130.8
	Dry Density, pcf	106.7	105.9	108.3
	Moisture Content, %*	22.3	21.4	20.8
	Diameter, in	2.50	2.50	2.50
	Height, in	0.97	0.98	0.95
Normal Stress, psf		1000	2000	4000
Failure Stress, psf		1015	1697	2564
Failure Strain, %		8.71	12.91	17.83
Rate, in/min		0.0025		

*Based on post shear moisture content

Sample Type: Remolded to 90% RC

Material Description: **Red Yellow Sandy SILT with Gravel**

Source:

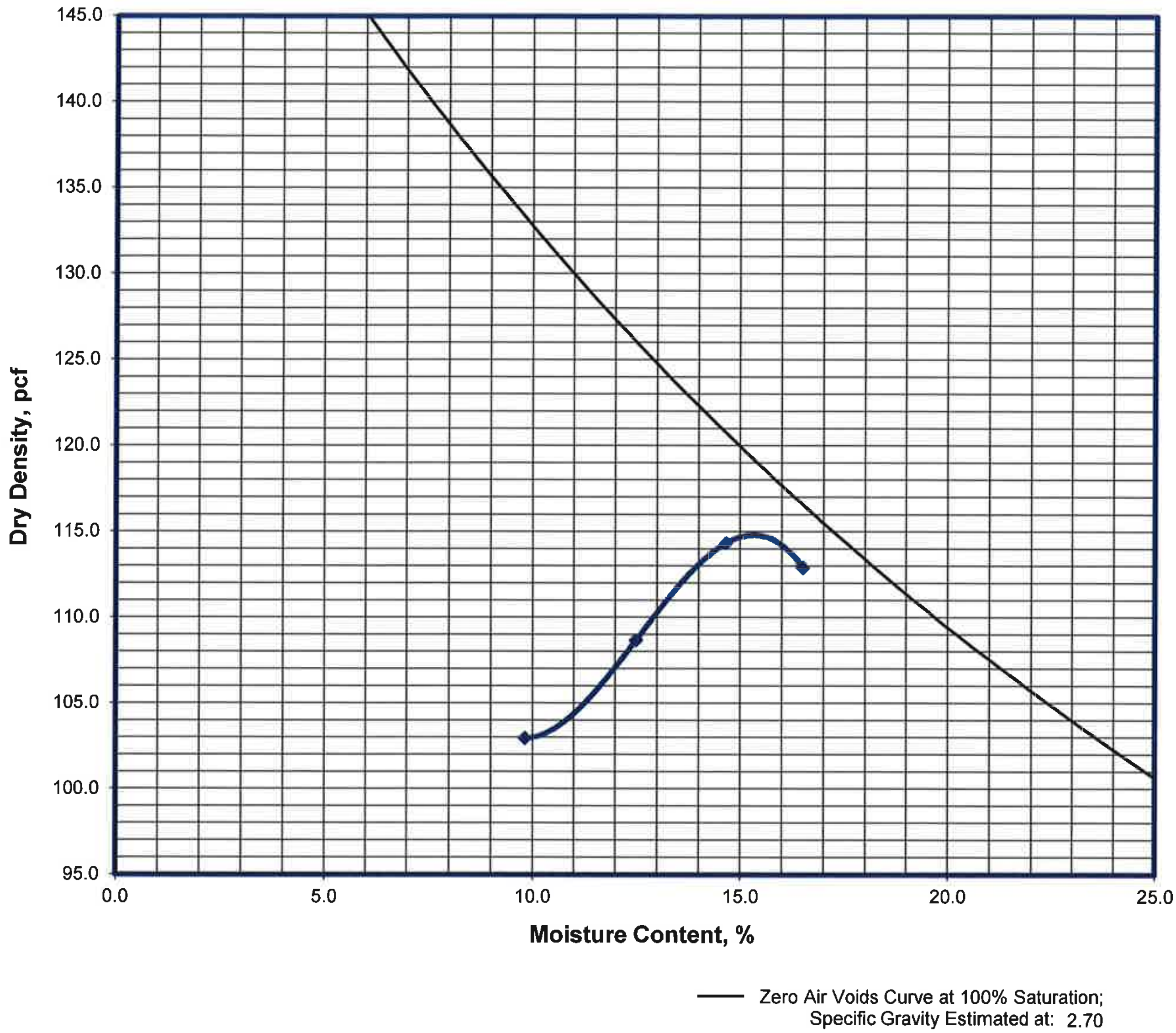
Notes: Gravel removed from test sample.

Sample No./Depth, ft: Bulk 2 @ 3'		USCS Class.	Liquid Limit	Plasticity Index	% Greater than No. 4	% Less than No. 200
Date Sampled: 2/15/2017	Date Test Started: 2/21/2017				18	73.1

YOUNGDAHL CONSULTING GROUP, INC. 30 YEARS
Building Innovative Solutions
1234 Glenhaven Court, El Dorado Hills, CA 95762
ph 916.933.0633 · fx 916.933.6482 · www.youngdahl.net

Project:	**Sutter Street (603)**			Figure
Project No.:	**E17056.000**			
Reviewed By:	DN	Date:	2/28/2017	B-1

Laboratory Compaction Characteristics of Soil
Using Modified Effort (56,000 lf-lbf/ft3), ASTM D1557, Method A



Maximum Dry Density, pcf:	**114.8**		Optimum Moisture Content, %:	**15.3**		
Material Description:	**Red Yellow Sandy SILT with Gravel**					
Source:						
Notes:						
Sample No./Depth, ft:	Bulk 2 @ 3'		USCS Class.	Liquid Limit	Plasticity Index	% Greater than No. 4	% Less than No. 200
Date Sampled:	2/15/2017	Date Test Started: 2/17/2017				18	73.1

YOUNGDAHL CONSULTING GROUP, INC.
Building Innovative Solutions
30 YEARS
1234 Glenhaven Court, El Dorado Hills, CA 95762
ph 916.933.0633 · fx 916.933.6482 · www.youngdahl.net

Project:	**Sutter Street (603)**		
Project No.:	**E17056.000**		Figure
Reviewed By: DN	Date: 2/21/2017		B-2

Amount of Material Finer than No. 200 (75-µm) Sieve in Soils by Washing, ASTM D1140, Method A

Sample No.	Depth, ft	Sample Description	Material Finer than No. 200 Sieve, %
Bulk 2	3	Red Yellow Sandy SILT with Gravel	73.1

Notes:			
Date Sampled:	2/15/2017	Date Test Started:	3/15/2017

YOUNGDAHL CONSULTING GROUP, INC. 30 YEARS
Building Innovative Solutions
1234 Glenhaven Court, El Dorado Hills, CA 95762
ph 916.933.0633 · fx 916.933.6482 · www.youngdahl.net

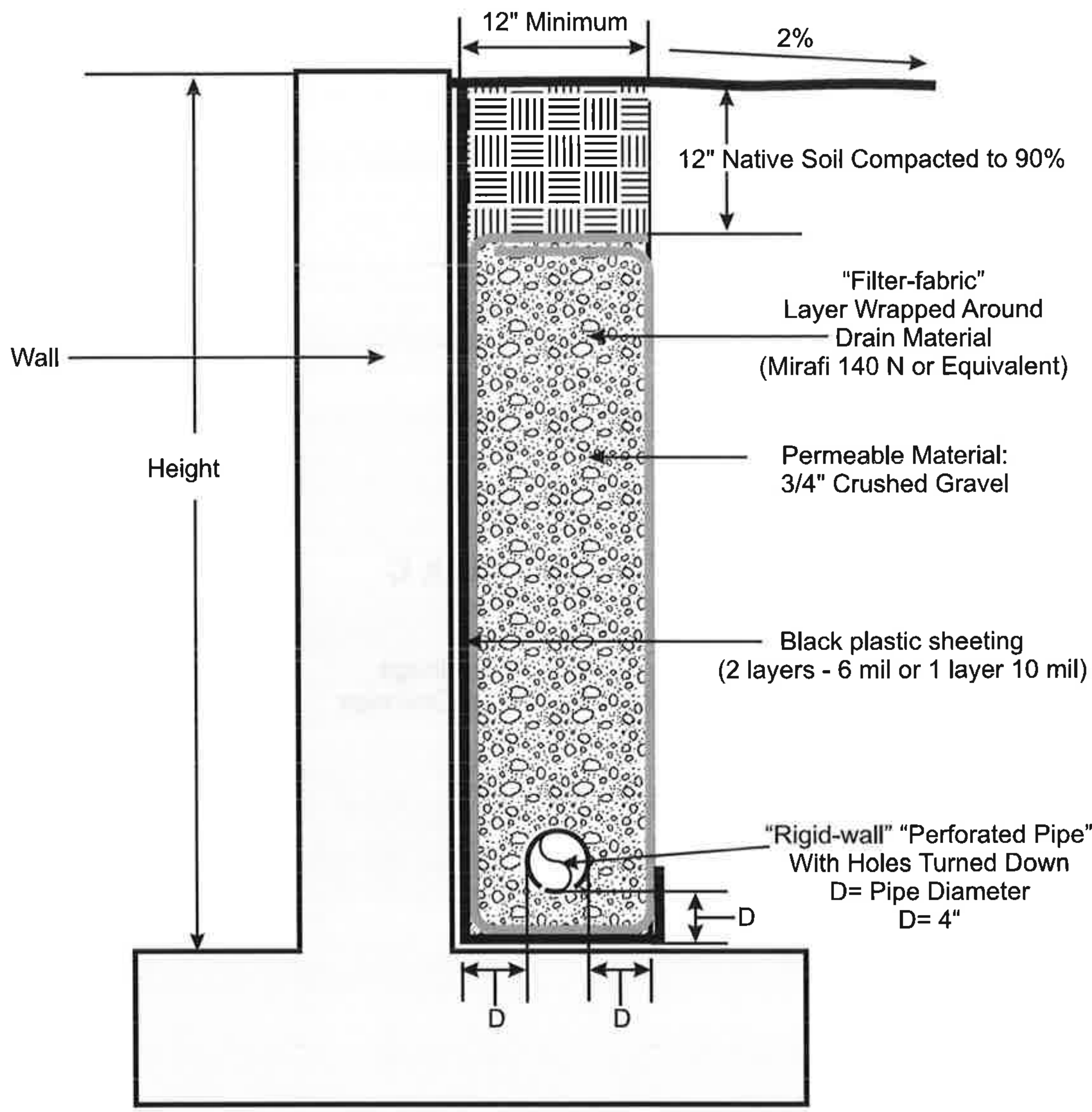
Project:	**Sutter Street (603)**			
Project No.:	**E17056.000**			Figure
Reviewed By:	DN	Date:	3/16/2017	B-3

APPENDIX C
Details

Site Wall Drainage
Basement Wall Drainage

Retaining Wall With "Perforated Pipe Sub-Drain"

(Typical Cross Section)



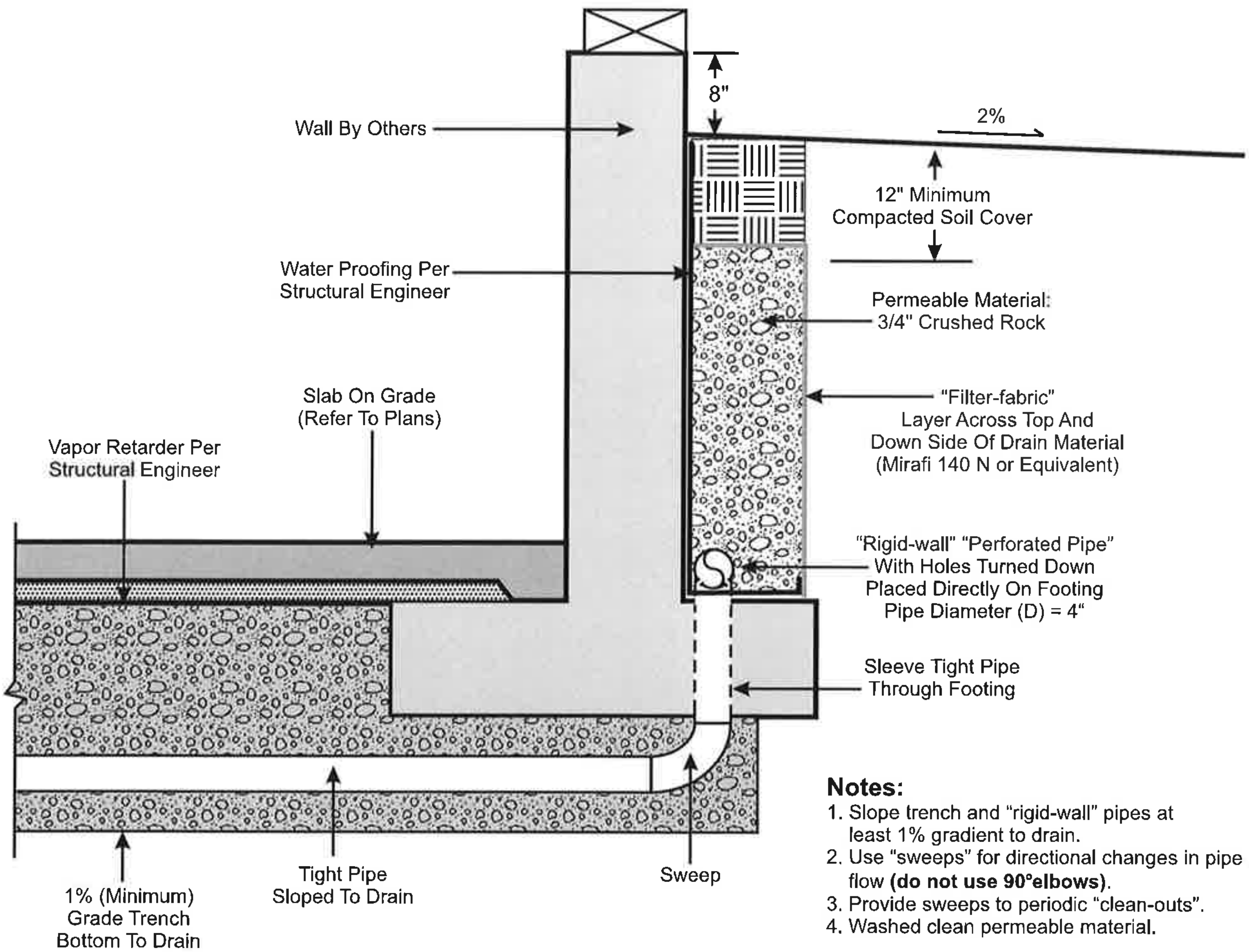
Notes:

1. Slope trench and "rigid-wall" pipes at least 1% gradient to drain to an appropriate outfall area away from residence.
2. Use "sweeps" for directional changes in pipe flow **(do not use 90°elbows)**.
3. Provide periodic "clean-outs".
4. Washed clean permeable material.

Not To Scale

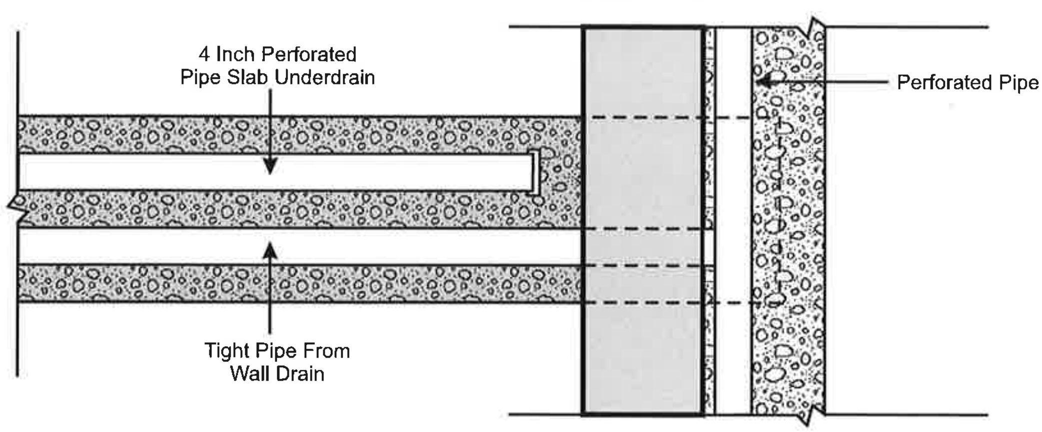
YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E17056.000	**RETAINING WALL DRAIN DETAIL**	**FIGURE**
	March 2017	**Sutter Street (603)** Folsom, California	**C-1**

Profile View
(Typical)



Notes:
1. Slope trench and "rigid-wall" pipes at least 1% gradient to drain.
2. Use "sweeps" for directional changes in pipe flow **(do not use 90°elbows)**.
3. Provide sweeps to periodic "clean-outs".
4. Washed clean permeable material.

Plan View
(Typical)



YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E17056.000	**BASEMENT STEMWALL DRAIN**	**FIGURE**
	March 2017	**Sutter Street (603)** Folsom, California	**C-2**