SB Consultants, Inc.

Geotechnical-Concrete-Forensic Engineering Services
SBCIGEO.COM 619-922-3302

Job No. 210104
January 18, 2021
Revised July 27, 2021

To: Matt Holt
matthewbholt@gmail.com

Subject: **Limited Geotechnical Investigation**
Three Detached Multi-Unit Residential Structures
3903 Haines Street
San Diego, California 92109
APN 423-422-13

Mr. Holt,

In accordance with your request and our proposal dated October 21, 2020, we have conducted a geotechnical investigation at the property located at 3903 Haines Street, San Diego, California. The original report dated January 18, 2021 has been revised to address the cycle issues by the City of San Diego (City SD Job Number 669397).

The scope of work performed for this investigation was as follows:

- Review published geologic maps and relevant geotechnical reports,
- Subsurface soil exploration,
- Laboratory testing,
- Geotechnical analysis and preparation of this report summarizing our findings and conclusions and presenting recommendations for design and construction of building foundations, floor slabs, site grading, and other geotechnical aspects of construction.

In general, we found the site suitable for the proposed project provided the recommendations contained herein are adhered to. The most significant constraint from a geotechnical perspective is the presence of loose, compressible soils within the approximate upper 6.5 feet of existing grade. Grading and foundation recommendations are provided herein to address the site conditions. The recommendations include the removal of existing soils to a depth of 4.75 feet below existing grade, moisture conditioning and grading treatment of the removal bottom, and conventional placement of compacted fill. The construction of relatively rigid foundations is also recommended.

SITE AND PROJECT DESCRIPTION

For purposes of this report, the front of the existing property faces west. The property is located at 3903 Haines Street and is legally designated as APN 423-422-13. The site consists of an approximate 7,500 sft lot with an existing one-story residential structure and detached garage that were constructed around 1952, located in the Crown Point area of San Diego, California (see Figure 1).

The site slopes gently down towards the south and west. The property has elevations ranging from an approximate elevation of 47.5 feet mean sea level (msl) near the northern perimeter of the site to 44 ft msl near the southwest corner of the lot. Vegetation consists of a few mature trees, shrubs, and turf. A similar residential building borders the property to the north, Haines Street to the west, and alleys to the south and east.

The existing structures will be removed to make way for the proposed improvements.

The lot will be subdivided into three 2,500 sft rectangular lots. The lots will trend east to west in the long direction. The northernmost lot will be prepared to receive a three-level detached residential building. The two southernmost lots will be prepared to receive two-level structures. Each building will be composed of three dwellings: a primary dwelling, a companion unit, and junior companion unit. The bottom levels for each building will be near present grade.

The buildings will be supported by both continuous and isolated footings with slab-on-grade floors. It is anticipated that the structures will be wood framed with stucco façade.

Grading will consist of reprocessing the approximate upper 4.75 feet of the near-surface soils to achieve finished grades.

SUBSURFACE SOIL EXPLORATION

We conducted the subsurface exploration on January 5 and 13, 2021. Our investigation consisted of three hand-excavated test pits and one machine-excavated boring at the approximate locations shown on the attached Figure 2. The test pits and boring were excavated to a maximum depth of 12 feet below grade. The excavations were logged by a licensed engineer. Bulk and undisturbed soil samples were obtained for laboratory testing.

SUBSURFACE SOIL, LABORATORY RESULTS, AND GEOLOGIC CONDITIONS

Logs of the excavations are presented on the attached Figures 3A-D. The laboratory results are provided on the excavation logs and Appendix A.

In general, the site is underlain by a relatively thin layer of undocumented fill overlaying Old Paralic Deposits, Unit 6. The materials are described herein.

Undocumented Fill (Qudf)

We encountered a layer of undocumented fill, as mapped by Kennedy and Tan (2008), associated with the previous site improvements in our excavations. The fill extends to a depth of approximately 2 to 2.5 feet and consists of loose, dry, light brown, silty fine to medium sand with rootlets. The existing undocumented fill is considered unsuitable for support of the proposed structure and will require removal, moisture conditioning, and compaction. The fill has a very low expansion potential based on visual observations and experience with similar materials.

Old Paralic Deposits (Qop6)

Late Pleistocene-age Old Paralic Deposits, Unit 6 underlie the fill to the maximum depth explored of approximately 12 feet. The Old Paralic Deposits typically consist of interbedded layers of loose to medium dense silty sands, clayey sands, and conglomerate. As encountered at the site, the natural soils consist of a light gray to yellow-brown and light orange-brown, dry to slightly moist, loose to medium dense, silty fine to medium sand.

The settlement potential of the existing soils within the upper approximate 6.5 feet were estimated by remolding representative materials to in-situ moisture and density and loading to a bearing pressure of 2,000 psf. The testing was performed in accordance with the latest revision of ASTM 4546. The testing indicates that the loose natural soils have an estimated settlement potential of 1.59 percent. We consider this settlement potential to be in the moderate to high range.

To a depth of approximately 6.5 feet below existing grade, the natural soils are loose and considered unsuitable for support of the proposed structure. Grading and foundation recommendations have been provided to mitigate the loose soils.

The underlying medium dense natural soils are considered competent for the proposed grading and improvements. The natural soils have a very low expansion potential based on visual observations and experience with similar materials and are suitable for use as compacted fill.

SOIL CHEMESTRY

SBCI is not a corrosion consultant and does not provide recommendations related to corrosion. Laboratory testing should be performed at the completion of grading by the project corrosion engineer to evaluate the corrosion characteristics of the graded soils. The following testing was performed on a representative soil sample.

Water Soluble Sulfates

We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content in accordance with California test method 417 (see Appendix A). The test results indicate the on-site materials at the locations tested is “S0” sulfate exposure to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-14 Chapter 19. Table 1 presents a summary of concrete requirements set forth by 2016 CBC Section 1904 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

Table 1
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Exposure Class	Water-Soluble Sulfate (SO_4) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio[1] by Weight[1]	Minimum Compressive Strength (psi)
S0	SO_4<0.10	No Type Restriction	n/a	2,500
S1	0.10≤SO_4<0.20	II	0.50	4,000
S2	0.20≤SO_4≤2.00	V	0.45	4,500
S3	SO_4>2.00	V+Pozzolan or Slag	0.45	4,500

[1] Maximum water to cement ratio limits do not apply to lightweight concrete.

Chlorides

We performed laboratory tests on samples of the site materials to evaluate the chloride content of a representative soil sample in accordance with California test method 422 (see Appendix A). The test results indicate the on-site materials at the location tested to be slightly corrosive as defined by NAVFAC DM-5.

Table 2
Chlorides (%)

Percent (%)	Corrosiveness
0.001-0.0025	Slightly Corrosive
0.0025-0.01	Moderately Corrosive
0.01-0.05	Very Corrosive
Over 0.05	Extremely Corrosive

Minimum Resistivity

The corrosion potential of the soil to buried uncoated metal conduit was evaluated by California test 643, 1999 Department of Transportation Division of Construction, Method of Estimating Service Life of Steel Culverts. The rates of corrosion for various culvert gauge thicknesses are provided in Appendix A. The site's soils should be considered corrosive to unwrapped buried metal conduit.

GROUNDWATER

Groundwater was not encountered in the test pits. Groundwater is anticipated greater than 20 feet below grade. Perched (shallow) water conditions may develop at times of heavy irrigation or rainfall near the contact between the fill and natural sedimentary soils.

GEOLOGY AND SEISMICITY

A review of the City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Sheet 25, defines the site with a *Hazard Category* 52: Other l*evel areas, gently sloping to steep terrain, favorable geologic structure, low risk.*

The site is underlain by a thin veneer of undocumented fill, in turn underlain by late Pleistocene-age Old Paralic Deposits, Unit 6.

Based on our background review, there are no mapped earthquake faults at or near the site. The Rose Canyon Fault Zone is the closest active fault and is located approximately 2.7 km east of the site. The building may be subject to ground shaking and possible damage from earthquakes on nearby, or more distant, active faults. The potential damage due to ground shaking at the site is not greater than the surrounding areas.

LANDSLIDE POTENTIAL AND SLOPE STABILITY

A review of the geologic hazards map indicates there are no known deep or suspected ancient landslides located on the site. Due to the relatively flat topography and underlying competent materials, landslide hazards do not appear to present a significant risk to the proposed project.

LIQUEFACTION

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless, groundwater is encountered within 50 feet of the surface, and soil relative

densities are less than about 70 percent. If all four previous criteria are met, a seismic event could result in a rapid pore-water pressure increase from the earthquake-generated ground accelerations. Seismically induced settlement is settlement that may occur whether the potential for liquefaction exists or not. The potential for liquefaction and seismically induced settlement occurring within the site soils is considered to be "very low" due to the proposed grading and dense nature of the formational soils.

SEICHES & TSUNAMIS

Seiches are caused by the movement of an inland body of water due to the movement from seismic forces, and tsunamis are large sea waves caused by submarine earthquakes or volcano eruptions. The potential of seiches to occur is considered to be very low due to the absence of a nearby inland body of water.

A tsunami is a series of long period waves generated in the ocean by a sudden displacement of large volumes of water. Causes of tsunamis include underwater earthquakes, volcanic eruptions, or offshore slope failures. The first order driving force for locally generated tsunamis offshore Southern California is expected to be tectonic deformation from large earthquakes (Legg, *et al.*, 2002). Historically, tsunami wave heights have ranged up to 3.7 feet in the San Diego area. According to the County of San Diego Hazard Mitigation Plan (2010), the largest tsunami effect recorded in San Diego since 1950 was May 22, 1960, which had maximum run-up amplitudes of 2.1 feet (0.7 meters). Wave heights and run-up elevations from tsunamis along the San Diego coast have historically fallen within the normal range of the tides. The County of San Diego Hazard Mitigation Plan (2010) maps zones of possible tsunami inundation for coastal areas throughout the county. Moreover, the site is situated outside of the mapped Tsunami Inundation Area according to the State of California (2009). The site is not included within one of these high-risk hazard areas. Therefore, we consider the risk of a tsunami hazard at the site to be low.

SEISMIC DESIGN VALUES

Seismic design values for the proposed building are presented in the attached Figure 4.

CONCLUSIONS

In general, we found the site suitable for the proposed project provided the recommendations contained herein are adhered to. The most significant constraint from a geotechnical perspective is the presence of loose, compressible soils within the approximate upper 6.5 feet of existing grade. If the compressible soils are not remediated, soils related foundation movement and associated structural distress may occur.

Expansive soils were not encountered on the site.

Soluble sulfate testing indicates that the soils have a negligible potential for concrete sulfate attack. Chloride testing indicates that the soils are slightly corrosive. The maximum water to cement ratio and minimum concrete cover recommendations provided in this report are intended to reduce the potential for detrimental effects to concrete and reinforcing steel.

The soils are considered corrosive to buried metal conduit. The project's corrosion engineer should address potential corrosion issues and design recommendations.

Grading and foundation recommendations are provided herein to address the site conditions. The recommendations include the removal of existing soils to a depth of 4.75 feet below existing grade, moisture conditioning and grading treatment of the removal bottom, and conventional placement of compacted fill. The construction of relatively rigid foundations is also recommended.

RECOMMENDATIONS

1. Site Grading and Compaction

- **Removal of Concrete and Other Debris**

Concrete and other debris resulting from demolition of the existing improvements should be removed from the site.

- **Grading Removals**

The undocumented fill and loose natural soils should be assumed to overlie the entire site.

The removals shall extend a minimum of 4.75 feet below existing grade. This removal is intended to address the loose soils and possible cut to fill transitions below the improvements.

Deeper removals may be necessary depending on the density of the exposed natural soils.

The engineering firm providing geotechnical services at the time of grading shall observe all removals and verify conditions and removal depths.

The lateral limits of the removals shall be 4 feet beyond the footprint of the settlement-sensitive improvements such as the buildings and exterior slabs and retaining walls (where space permits) or equal to the vertical limits of the removals, whichever is greater.

- **Pre-Saturation and Compaction of Removal Bottom**

Prior to placing fill, the exposed natural soils in the removal bottom shall be presaturated to a minimum depth of 2 feet below the removal bottom. The soils shall be moisture conditioned to at least 2 percent above the soil's optimum moisture content. The moisture content shall be verified prior to the placement of fill.

The removal bottom shall be scarified to a depth of 8 to 12 inches, moisture conditioned a minimum of 2 percent above the soil's optimum moisture content, and compacted to a minimum of 95 percent relative compaction per ASTM D1557.

- **Compaction of Fill**

The on-site soils may be reused as compacted fill and trench backfill, provided they are free of organic materials and debris and rock fragments over 6 inches in maximum dimension. Any imported fill soils should be predominantly granular and approved prior to importation by the engineering firm providing geotechnical services.

Subsequent fill should be placed at slightly above optimum moisture content, in 6- to 8-inch thick loose layers, with each layer compacted by mechanical means to a minimum relative compaction of 90 percent as determined by ASTM D1557.

All fill placement and compaction should be performed in accordance with the grading requirements of the City of San Diego and should be observed and tested as necessary by the engineering firm providing geotechnical services.

Utility trench backfill within five feet of the proposed structure and beneath all pavements and concrete flatwork should be compacted to a minimum of 90 percent of its maximum dry density.

The upper one-foot of pavement subgrade and base material should be compacted to at least 95 percent relative density.

Recompaction of the on-site soils may result in up to 15 percent shrinkage by volume. Actual shrinkage may be greater.

Imported soils should be primarily granular and have a low expansion potential with an expansion index less than 31.

Imported soils should be tested and approved by the engineering firm providing geotechnical services prior to importation.

- **Temporary Cut Slopes and Excavations**

Temporary cut slopes, up to approximately 4.75 feet in maximum height, are anticipated. The stability of temporary slopes should be verified by a representative of the engineering firm providing geotechnical services at the time of excavation. Temporary cut slopes of 3.5 feet may be excavated vertically. Temporary cut slopes exceeding 3.5 feet in height should be sloped at 3/4:1 (horizontal to vertical).

No surcharge loads such as stockpiles, vehicles, etc. should be allowed within a distance from the top of temporary slopes equal to half the slope height.

Care shall be taken not to undermine adjacent improvements by the placement of temporary excavations. The contractor shall be responsible to support and protect existing improvements.

- **Excavation and Soil Characteristics**

Excavation of the surficial soil (undocumented fill and the Old Paralic Deposits) should be possible with moderate effort using conventional heavy-duty equipment.

2. Footings

- **Footing Depths and Minimum Dimensions**

Footings may be supported on continuous and/or individual spread concrete footings having the following minimum depths and widths:

Number of Levels Supported by the Footing	Width of Footing (in.) *	Embedment Below Lowest Adjacent Grade (in.)
1 Story	12**	15
2 Story	15	24
3 Story	18	24

*Isolated footings shall have a minimum plan dimension of 24 inches

**Including exterior stairs and walls

- **Footing Reinforcing**

All load-bearing continuous footings should be reinforced with a minimum of two No. 5 rebars placed two at the top and two at the bottom. Isolated footings should be reinforced with two number 5 rebars each way near the bottom of the footing.

Structural requirements may increase steel recommendations.

All reinforcing steel should have a minimum of 3 inches of concrete cover.

- **Footing Concrete**

Concrete should have a minimum 28-day compressive strength of 3,000 psi and maximum water to cement ratio of 0.5 (due to permeability requirements). Concrete should be placed, finished, and cured in accordance with ACI guidelines.

- **Allowable Soil Bearing Value**

Footings may be designed for an allowable, dead plus live load, bearing value of 2,500 psf, with a one-third increase for short-term, wind, or seismic loads.

- **Lateral Load Resistance**

An equivalent fluid, passive soil pressure of 350 pcf may be used for lateral load resistance. A soil/concrete friction factor of 0.4 may also be used. When combining friction and passive resistance, the passive resistance should be reduced by one-third.

- **Utility Penetrations through Footings**

Utilities that penetrate footings should be sleeved with a minimum annular space between the sleeve and utility of ½-inch and in accordance with the recommendations of the project structural engineer. All penetrations shall be sealed and waterproofed.

- **Anticipated Settlements**

Total and differential building settlements should be less than ¾- and ½-inch, respectively, over 40 feet.

From a geotechnical perspective, the proposed development will not destabilize or result in settlement of adjacent property or right-of-way. Monitoring of the adjacent improvements is recommended. The contractor is responsible for the support and protection of adjacent improvements.

It should be recognized that minor cracks normally occur in concrete slabs and foundations due to shrinkage during curing and/or redistribution of stresses, and some cracks may be anticipated. Such cracks are not necessarily an indication of excessive vertical movements. Curing per ACI guidelines can be performed in an effort to minimize concrete cracking.

- **Cleaning of Footing Excavations**

Footing excavations should be cleaned of loose soils prior to placing reinforcing steel and concrete.

3. Inspection of Footing Excavations

All footing excavations should be inspected and approved by the engineering firm providing geotechnical services prior to placement of reinforcing steel.

4. Interior Floor Slabs

Floor slabs should be at least 5 inches thick and reinforced with No. 4 rebars spaced at 16 inches on centers in both directions and placed at the upper one-third of the slab. The new floor slabs should be underlain by 4 inches of clean sand with a 10-mil visqueen moisture barrier placed at mid-height in the sand layer. All visqueen laps and splices should be in accordance with standard industry practices. Stego Wrap (15 mil) should be considered for areas with moisture-sensitive flooring. Due to permeability requirements, concrete should have a minimum 28-day compressive strength of 3,000 psi and maximum water to cement ratio of 0.5. Concrete should be placed, finished, and cured in accordance with ACI guidelines.

In an effort to reduce reflective cracking from underlying concrete to floor tile finishes, an anti-fracture membrane, or slip sheet, can be installed. Following placement of concrete floor slabs, sufficient drying time must be allowed prior to placement of floor coverings. Premature placement of floor coverings may result in degradation of adhesive materials and loosening of the finish floor materials. Prior to installation, standardized testing (calcium chloride test and/or relative humidity) can be performed to determine if the slab moisture emissions are within the limits recommended by the manufacturer of the specified floor-covering product.

5. *Soil Values and Other Recommendations for Retaining Walls*

The following soil values may be used for design of the new retaining walls. The following values assume that soils having a low expansion potential with an expansion index of less than 31 are utilized as backfill within a horizontal distance equal to the height of the retaining structure.

- Soil density = 125 pcf
- Active equivalent fluid soil pressure = 38 pcf (retaining wall, free to rotation, level backfill, no surcharge from slope or adjacent footings)

- At rest equivalent fluid soil pressure = 60 pcf (basement wall, no rotation, level backfill, no surcharge from slope or adjacent footings)
- Allowable soil bearing pressure in fill = 2,500 psf. This value may be increased by one-third for short-term seismic loads.
- Allowable, equivalent fluid, passive soil pressure = 350 pcf. This value may be increased by one-third for short-term seismic loads.
- Allowable friction value between concrete and fill = 0.4. When combining passive and frictional resistance, the passive pressure should be reduced by one-third.
- Minimum Footing Depth = 18 inches

- **Seismic Coefficient For Retaining Wall Design**

  A horizontal seismic coefficient Kh = SDS/2.5 = 0.36 should be used for seismic design of the retaining walls over 6 feet in height. See also attached Figure 4 for seismic design values. The resultant earthquake force F = 3/8*Kh*Soil density*Wall height (H)^2 may be assumed to act at a distance of 0.6*H from the base of the wall.

- **Wall Drainage**

  The above retaining wall soil values assume the wall will be properly drained. A typical wall drainage schematic is shown on Figure 5. Specifications for Class 2 Permeable Material are also presented on Figure 5. Class 2 Permeable Material is a mixture of sand and gravel and is not the same as Class 2 road base. Gravel and Class 2 materials shall be separated from soil with a non-woven filter fabric (such as Mirafi 140N or better). Geocomposites can be used in place of gravel/permeable base. A perforated 4-inch diameter pipe should be placed at the bottom, rear side of the wall and drained at a gradient of at least 0.5 percent to an approved outlet. We recommend SDR-35 PVC pipe or better. All joints should be glued and taped. The pipe should be encased in a filter sock. No weep holes or open head joints should be constructed for interior retaining walls. The drain system behind the wall should collect all drainage water and dispose of it at an approved outlet.

  The walls should be waterproofed in accordance with the recommendations of the project architect or specialty waterproofing contractor.

- **Surcharge Loads**

  Retaining walls should be designed to resist horizontal pressures that are generated by surcharge loads. Where an imaginary 1:1 plane projecting downward from the outermost edge of a surcharge load or foundation intersects a retaining wall, that portion of the wall

below the intersection should be designed for an additional horizontal load from a uniform pressure equivalent of 0.3Q psf where Q = the surcharge pressure of adjacent building or construction loads. Q may be assumed to be 250 psf unless otherwise determined. Excavated soils should be stockpiled no closer than 10 feet from the excavation or retaining wall.

6. Driveway and Exterior Slabs

For preliminary design purposes, concrete slabs subjected to automobile traffic should be at least 5.5 inches thick and reinforced with No. 4 rebars spaced at 16 inches on centers in two directions at middle of the slab. If driveway areas will be subjected to trash truck traffic, the thickness should be increased to 7 inches. Concrete slabs subjected to auto traffic should be underlain with a minimum of 4 inches of Caltrans Class 2 road base compacted to a minimum of 95 percent relative compaction per the latest revision of ASTM 1557.

Sidewalk, patio, and walkway concrete should be at least 5 inches thick and reinforced with No. 4 rebars spaced at 18 inches on centers in two directions at the middle of the slab.

Concrete should be placed, finished, and cured in accordance with ACI guidelines. Concrete should have a minimum 28-day compressive strength of 3,000 psi and maximum water to cement ratio of 0.5. Crack control joint spacing should not exceed 10 feet in any direction for both slabs and curbs. Control joints should be scored to a minimum depth of 1 inch and be placed within 8 hours of concrete placement.

7. Drainage, Landscaping, and Erosion Control

Surface water should not be allowed to pond next to the building. Finished grades should slope a minimum of 2 percent away from the building. Surface drains should be installed in planters and surface gradients directed and maintained towards the inlets. Roof gutters and downspouts, as well as the surface drains, connecting to solid walled outlet pipes are recommended. Drainage water should be discharged to an approved outlet.
In addition, appropriate erosion-control measures shall be taken at all times during construction to prevent surface runoff waters from entering footing excavations, ponding on finished building pad or pavement areas, or running uncontrolled over the tops of newly

constructed cut or fill slopes. Appropriate Best Management Practice (BMP) erosion control devices should be provided in accordance with local and federal governing agencies.

8. Additional Testing

Once final grades are achieved, the soils should be tested for expansion potential, soluble sulfates, and minimum resistivity to confirm the assumptions made in this report. Final concrete design recommendations will be predicated on the testing results.

9. Review of Building Plans

Final structural building plans should be reviewed by SBCI to ensure that they conform with the recommendations presented in this report. Additional or amended recommendations may be issued based on this review.

10. Safety

It should be noted that the contractor is solely responsible for designing and constructing stable, temporary excavations and may need to shore, slope, or bench the sides of trench excavations as required to maintain the stability of the excavation sides where friable sands or loose soils are exposed. The contractor's "responsible person" as defined in the OSHA Construction Standards for Excavations, 29 CFR, Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety process. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. Actual safe slope angles should be verified by the engineering consultant at the time of excavation.

LIMITATIONS

The recommendations and opinions expressed in this report reflect our best interpretation of the project requirements based on an evaluation of the subsurface soil conditions encountered at the subsurface exploration locations performed and on the assumption that the soil conditions do not deviate appreciably from those encountered. It should be recognized that the performance of the foundations may be influenced by undisclosed or unforeseen variations in the soil conditions that may occur in the intermediate and unexplored areas. Any unusual conditions not covered in this report that may be encountered during site development should be brought to the attention of the engineering firm providing geotechnical services so that modifications can be made, if necessary.

This office should be advised of any changes in the project scope or proposed site grading so that we may determine if the recommendations contained herein are appropriate. It should be verified in writing if the recommendations are found to be appropriate for the proposed changes or our recommendations should be modified by a written addendum.

In the performance of our professional services, we comply with that level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the locations where our borings, surveys, and explorations are made and that our data, interpretations, and recommendations are based solely on the information obtained by SBCI. We will be responsible for those data, interpretations, and recommendations but shall not be responsible for the interpretations by others of the information developed. This report provides no warranty, either expressed or implied, concerning future building performance. Future damage from geotechnical or other causes is a possibility.

It is the responsibility of the stated client or their representatives to ensure that the information and recommendations contained herein are brought to the attention of the structural engineer and architect for the project and incorporated into the project's plans and specifications. It is further their responsibility to take the necessary measures to ensure that the contractor and his subcontractors carry out such recommendations during construction.

This report should be considered valid for a period of two years and is subject to review and possible changes following that time.

This opportunity to be of service is appreciated.

Respectfully submitted,

Scott C. Burns, PE, MSCE
Principal Engineer

Stephen E. Jacobs
Engineering Geologist
PG 3978, CEG 1307

ATTACHMENTS:

- References
- Figure 1 – Site Location
- Figure 2 –Geologic and Test Pit Location Map
- Figure 3A-D –Excavation Logs T-1, T-2, T-3, B-1
- Figure 4 - Seismic Design Parameters
- Figure 5 – Retaining Wall Schematic
- Appendix A – Laboratory Results

REFERENCES:

- City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Grid Title 25, dated 2008.

- Geologic Map of the San Diego 30' x 60' Quadrangle, prepared by M. P. Kennedy and S.S. Tan: California Geological Survey, Regional Geologic Map series, Map No. 3, scale 1:100,000, dated 2008.

- State of California, County of San Diego, Tsunami Inundation Map For Emergency Planning, San Diego Bay, dated 2009.

- Draft Coastal Storm/Erosion/Tsunami, County of San Diego, Hazard Mitigation Planning

- ACI (1982) Guide to Durable Concrete, ACI Committee 201, American Concrete Institute, Detroit, Mich.

- ACI (1990) ACI Manual of Concrete Practice, Part 1, Materials and General Properties of Concrete, American Concrete Institute, Detroit, Mich.

- Coduto, Donald P. (1994) Foundation Design, Principles and Practices

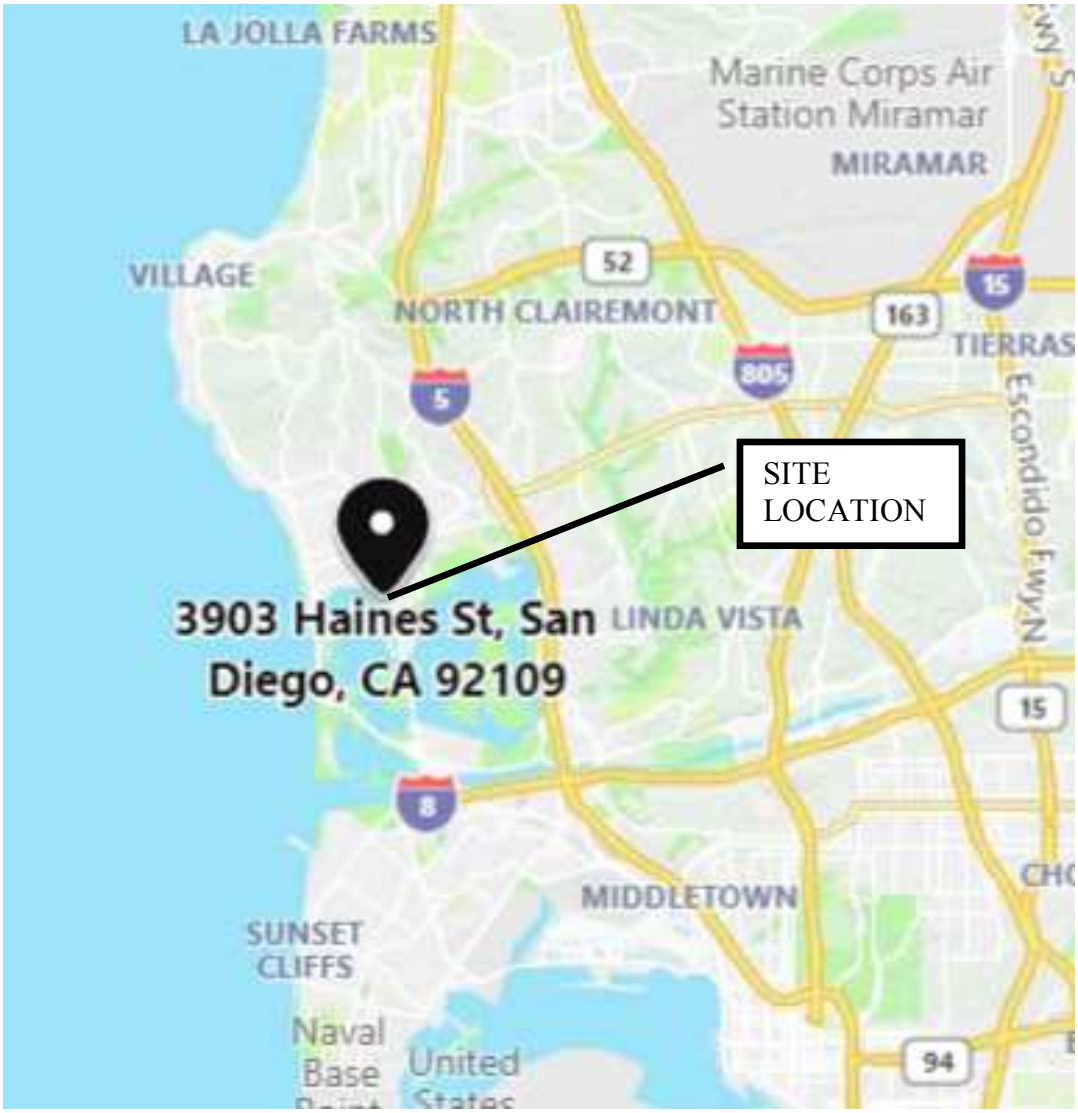
- Day, Robert W. (1999) Geotechnical and Foundation Engineering, Design and Construction

- Holtz and Kovacs (1981) An Introduction to Geotechnical Engineering

- NAVFAC DM-7-2 (1982) Foundations and Earth Structures Design Manual 7-2, Department of the Navy, Naval Facilities Engineering Command, Alexandria, VA.

FIGURE 1

VICINITY MAP



SITE ADDRESS: 3903 HAINES STREET, SAN DIEGO, CA 92109

FIGURE 2
GEOLOGIC & TEST PIT LOCATION MAP

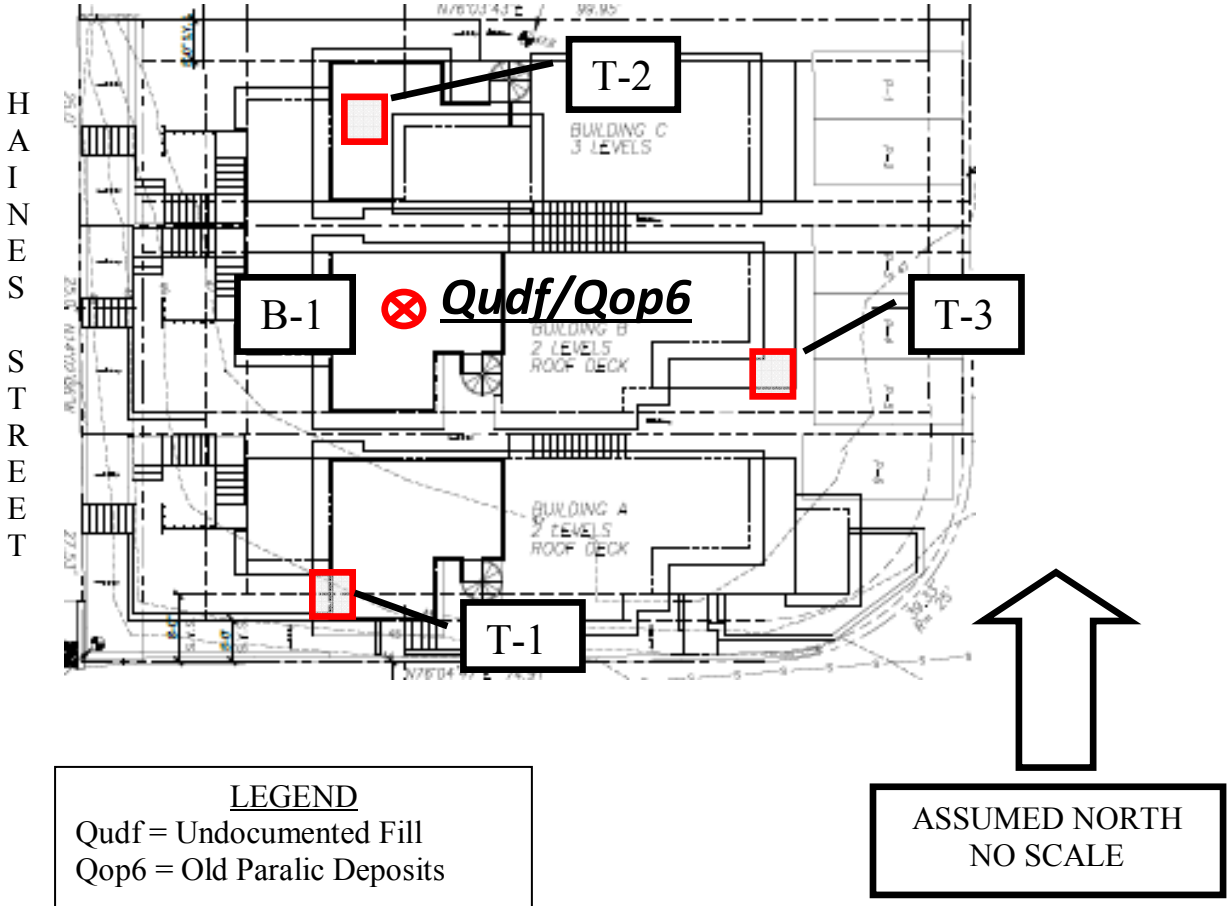


FIGURE 3A
EXCAVATION LOG T-1

T-1

PROJECT NUMBER: 210104 Date: 01/05/21 Logged By: SB Checked by:
EQUIPMENT: hand excavation and auger Drive Wt.: ELEVATION: 46′ msl
EXCAVATION DIMENSION: 2x2x4′, 6″ dia. Drop: DEPTH OF EXCAVATION (ft.): 12

Depth (ft.)	Sample Type	Penetration Resistance	Soil Classification	Dry Density (lb/ft3)	Moisture Content (%)	(-) # 200 sieve	Groundwater	Description
1	R		SM	96.2	3%			**Undocumented Fill (Qudf)** Light grey to yellow-brown, dry, loose, silty fine to medium sand with rootlets and few orange-brown clasts to 2” in max dimension
2	B		SM			11.6%		**Old Paralic Deposits (Qop6)** Light gray to yellow-brown, dry to damp, loose, silty fine to medium sand; light cementation
3	B				4.7%			**REMOLDED SAMPLE FROM 1-3’ AT 103 PCF AT 4% MOISTURE; LOADED TO 2000 PSF AND WETTED = 1.59% COMPRESSION**
4	B				2.9%			Light yellow-brown to light orange-brown, damp, loose, silty fine to medium sand; no cementation, few dark orange-brown blebs
5								Pit extended from 4-12’ with hand auger
6								
7	B				5.2%			@ 7’ light yellow-brown and orange-brown, slightly moist, medium dense, silty fine to medium sand
8								
9								
10								**TOTAL DEPTH 12’** NO GROUNDWATER ENCOUNTERED

S - SPT Sample R - Ring Sample B - Bulk Sample N - Nuclear Gauge Test D - Disturbed Sample

NOTES: NO GROUNDWATER ENCOUNTERED. EXCAVATION BACKFILLED ON JAN. 5, 2021.

FIGURE 3B
EXCAVATION LOG T-2

T-2

PROJECT NUMBER: 210104 Date: 01/05/21 Logged By: SB Checked by:
EQUIPMENT: hand excavation and auger Drive Wt.: ELEVATION: 47’ msl
EXCAVATION DIMENSION: 2x2x4’, 6” dia. Drop: DEPTH OF EXCAVATION (ft.): 12

Depth (ft.)	Sample Type	Penetration Resistance	Soil Classification	Dry Density (lb/ft3)	Moisture Content (%)	(-) # 200 sieve	Groundwater	Description
1			SM					**Undocumented Fill (Qudf)** Light brown, moist, loose, silty fine to medium sand with rootlets
2								
3	R		SM	103.2	7.2%			**Old Paralic Deposits (Qop6)**
	R			102.5	7%			Light brown, moist, loose, silty fine to medium sand
4								Light yellow-brown to light orange-brown, damp, loose, silty fine to
	R			104.2	8.7%	12.4%		medium sand; no cementation, few dark orange-brown nodules
5								-
6								Pit extended from 4-12’ with hand auger
7								@ 7.5’ Light yellow-brown and orange-brown, moist, medium dense,
	B				7.4%			silty fine to medium sand
8								
9								
10								**TOTAL DEPTH 12’** NO GROUNDWATER ENCOUNTERED

S - SPT Sample R - Ring Sample B - Bulk Sample N - Nuclear Gauge Test D - Disturbed Sample

NOTES: NO GROUNDWATER ENCOUNTERED. EXCAVATION BACKFILLED ON JAN. 5, 2021.

FIGURE 3C
EXCAVATION LOG T-3

T-3

PROJECT NUMBER: 210104 Date: 01/05/21 Logged By: SB Checked by:
EQUIPMENT: hand excavation and auger Drive Wt.: ELEVATION: 47′ msl
EXCAVATION DIMENSION: 2x2x4′, 6″ dia. Drop: DEPTH OF EXCAVATION (ft.): 12

Depth (ft.)	Sample Type	Penetration Resistance	Soil Classification	Dry Density (lb/ft3)	Moisture Content (%)	(-) # 200 sieve	Groundwater	Description
1			SM					**Undocumented Fill (Qudf)** Light grey to yellow-brown, dry, loose, silty fine to medium sand with many rootlets and pores
2	R			100.2	3.7%			
2	R		SM	101.1	3.1%			**Paralic Deposits (Qop6)** Light gray to yellow-brown, dry to damp, loose, silty fine to medium sand; light cementation
3	R			103.7	2.9%			
4								Light yellow-brown to light orange-brown, damp, loose, silty fine to medium sand; no cementation
5								Pit extended from 4-12’ with hand auger
6								
7	B				6.4%			@ 7.5’ Yellow-brown and orange-brown, slightly moist, medium dense, silty fine to medium sand
8								
9								
10								**TOTAL DEPTH 12’** NO GROUNDWATER ENCOUNTERED

S - SPT Sample R - Ring Sample B - Bulk Sample N - Nuclear Gauge Test D - Disturbed Sample

NOTES: NO GROUNDWATER ENCOUNTERED. EXCAVATION BACKFILLED ON JAN. 5, 2021.

FIGURE 3D
EXCAVATION LOG B-1

B-1

PROJECT NUMBER: 210104 Date: 01/13/21 Logged By: SB Checked by:
EQUIPMENT: hand excavation and auger Drive Wt.: 140# ELEVATION: 47′ msl
EXCAVATION DIMENSION: 6″ dia. Drop: 30″ DEPTH OF EXCAVATION (ft.): 12

Depth (ft.)	Sample Type	Penetration Resistance	Soil Classification	Dry Density (lb/ft3)	Moisture Content (%)	(-) # 200 sieve	Groundwater	Description
1			SM					**Undocumented Fill (Qudf)** Light brown, moist, loose, silty fine to medium sand with rootlets
2								
3	SPT	6	SM					**Old Paralic Deposits (Qop6)** Light brown, moist, loose, silty fine to medium sand
4	SPT	6						Light yellow-brown to light orange-brown, damp, loose, silty fine to medium sand; no cementation, few dark orange-brown nodules
5								-
6	SPT	8						
7	SPT	11			6.5			more resistance around 6.5′ @ 7.5′ Light yellow-brown and orange-brown, moist, medium dense, silty fine to medium sand
8	SPT	21						
9								
10	SPT	23						**TOTAL DEPTH 12′** NO GROUNDWATER ENCOUNTERED

S - SPT Sample R - Ring Sample B - Bulk Sample N - Nuclear Gauge Test D - Disturbed Sample

NOTES: NO GROUNDWATER ENCOUNTERED. EXCAVATION BACKFILLED ON JAN. 5, 2021.

FIGURE 4

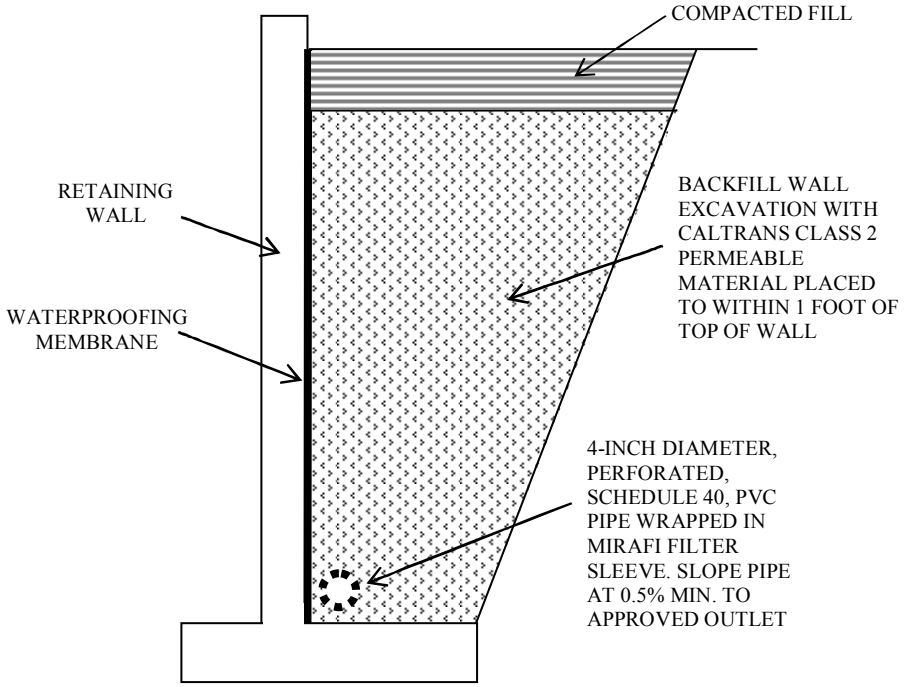
Site Coefficients and Spectral/Ground Response Acceleration Parameters

LATTITUDE - 32.7903876 / LONGITUDE - 117.2397091
Risk Category II
Site Class "D" – Stiff Soil

ASCE 7-16 STANDARD

S_s	S_1	F_a	F_v	S_{ms}	S_{m1}	S_{ds}	S_{d1}	PGA_M	PGA
1.343	0.466	1.0	Null-See Section 11.4.8	1.343	Null-See Section 11.4.8	0.895	Null-See Section 11.4.8	0.671	0.61

FIGURE 5
RETAINING WALL DRAINAGE SCHEMATIC



SPECIFICATIONS FOR CALTRANS CLASS 2 PERMEABLE MATERIAL

Sieve Size	% Passing
1"	100
3/4"	90–100
3/8"	40–100
No. 4	25–40
No. 8	18–33
No. 30	5–15
No. 50	0–7
No. 200	0–3

APPENDIX A

L A B O R A T O R Y R E P O R T

Telephone (619) 425-1993 Fax 425-7917 Established 1928

C L A R K S O N L A B O R A T O R Y A N D S U P P L Y I N C.
350 Trousdale Dr. Chula Vista, Ca. 91910 www.clarksonlab.com
A N A L Y T I C A L A N D C O N S U L T I N G C H E M I S T S

Date: July 20, 2021
Purchase Order Number: SBCI/HAINES
Sales Order Number: 52456
Account Number: TERP

To:
--
TerraPacific Consultants Inc
4010 Morena Boulevard Ste 108
San Diego, CA 92117
Attention: Sarah McMillin

Laboratory Number: SO8320 Customers Phone: 858-521-1190
Fax: 858-521-1199
Sample Designation:
--
One soil sample received on 07/14/21 at 4:00pm,
taken from SBCI/Haines marked as T-1@0-1'.

Analysis By California Test 643, 1999, Department of Transportation Division of Construction, Method for Estimating the Service Life of Steel Culverts.

pH 6.8

Water Added (ml)	Resistivity (ohm-cm)
10	13000
5	8200
5	8000
5	5300
5	4100
5	3700
5	3400
5	3500
5	3600

27 years to perforation for a 16 gauge metal culvert.
36 years to perforation for a 14 gauge metal culvert.
49 years to perforation for a 12 gauge metal culvert.
63 years to perforation for a 10 gauge metal culvert.
77 years to perforation for a 8 gauge metal culvert.

Water Soluble Sulfate Calif. Test 417 0.009%

Water Soluble Chloride Calif. Test 422 0.008%

Rosa Bernal
RMB/arr