APPENDIX D
GEOTECHNICAL INVESTIGATION

COAST GEOTECHNICAL, INC.

Geotechnical Engineering Investigation

for

Proposed Self Storage Facility

at

414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue, San Gabriel, California

BY:

COAST GEOTECHNICAL, INC.
W. O. 565718-01, dated January 16, 2019

FOR:

Mr. Kelly McKone
1784 Capitol Holdings, LLC
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Scottsdale, AZ 85250

COAST GEOTECHNICAL, INC.

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January 16, 2019 W.O. 565718-01

Mr. Kelly McKone
1784 Capitol Holdings, LLC
8777 North Gainey Drive, Suite 191
Scottsdale, AZ 85250

Subject: Geotechnical Engineering Investigation for Proposed Self Storage Facility at 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue, San Gabriel, California

Dear Mr. McKone:

Pursuant to your request, a geotechnical engineering investigation has been performed at the subject site. The purposes of the investigation were to determine the general engineering characteristics of the near surface earth materials on and underlying the site and to provide recommendations for the design of foundations and underground improvements.

The conclusions and recommendations contained in this report are based upon our understanding of the proposed development and analyses of the data obtained from our field and laboratory testing programs.

This report completes our scope of geotechnical engineering services authorized by you in our executed proposal dated November 11, 2018.

PROJECT DESCRIPTION

It is our understanding the proposed development will consist of the demolition of the existing site improvements and construction of a two story over basement self storage facility. Structural loads are anticipated to be moderate.

A preliminary site development plan available at the time our site work was performed is appended on Figure 3. Modifications to the conclusions and recommendations presented herein may be needed as the project progresses through design and permitting.

PROJECT WORK SCOPE

The purpose of our services was to evaluate the project near subsurface conditions and to provide geotechnical engineering conclusions and recommendations relative to the proposed development. Our scope of services consisted of the following:

1. A cursory reconnaissance of the site and surrounding areas.

2. Excavation of four exploratory borings to determine the subsurface earth materials and groundwater conditions.

3. Collection of representative bulk and/or undisturbed earth material samples for laboratory analysis.

4. Laboratory analyses of soil samples including determination of in-situ and maximum density, in-situ and optimum moisture content, shear strength characteristics, expansion potential, consolidation, R-value, and chemical analysis.

5. Preparation of this report presenting results of our investigation and recommendations of the proposed development.

SITE CONDITIONS

The project site is composed of multiple addresses identified as 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue in the City San Gabriel California, and is shown on the Site Vicinity Map, Figure 1.

Developed commercial property to the north, Gladys Avenue to the east, Commercial Avenue and developed property to the south, and developed property and San Gabriel Avenue to the west bind the property.

The combined properties form an "L" shaped parcel which is generally level. The properties are developed with commercial structures, asphalt paving, hardscape, and landscape. Current usage is as a commercial bus facility, office space, storage, and plumbing repair. Adjacent lots are developed with similar usages.

A depiction of onsite and offsite properties, and a proposed development layout, prepared by RKAA Architects is presented on Figure 3 and has been utilized for presentation of site geotechnical data. This depiction is for geotechnical use only and is not intended as, nor shall be utilized as, a survey.

GEOTECHNICAL RECORD SEARCH

Geotechnical records were searched at the City of San Gabriel based on address. Records were not found.

Records were found through the State of California Geotraker GIS site showing an underground storage tank (UST) was removed circa 1999. A site plan, by The Tyree Organization, showing the location of the UST is attached in Appendix C. No documentation was found addressing the backfill of the UST excavation; as such, earth materials in this area are considered undocumented and will require mitigation during site earthwork. Environmental aspects of these records were not within our expertise and or project work scope.

Readers of this report are advised that a record search is not an exact science; it is limited by time and resource constraints, incomplete records, ability of custodian of records to locate files, and where records are located is only a limited interpretation of other consultant's work. Readers of this report should perform their own review of records to arrive at their own interpretations and conclusions.

AIR PHOTO REVIEW

A review of available air photos through NETR Online from 1948 through 2014 showed apparent residential usage from 1948 to 1953, residential and commercial usage in 1964 through 1980, and essentially what is present today after that. Readers are advised that specific usages and impact to the project are not discernible in the air photos reviewed.

REGIONAL GEOLOGY

Regionally, the site is located within the Peninsular Range geomorphic province, near the boundary of the Transverse Range geomorphic province and is shown on a regional geology map prepared by Thomas Dibblee (Geologic Map of the El Monte and Baldwin Park Quadrangle, 1999), a portion of which is attached as Figure 2. This map shows the site to be mapped as being underlain by alluvial deposit (Qae).

The alluvial soils are derived from materials eroded from the adjacent San Gabriel Mountain range. The alluvial soils occur as interlayered episodes of stream erosion and subsequent alluvial deposition. The alluvial soils generally consist of a mixture of sand, silt, and gravels.

FIELD INVESTIGATION

The field investigation was performed on December 12, 2018 consisting of the excavation of four exploratory borings, placed by a hollow stem auger drill rig, at the locations shown on the attached Site Geotechnical Map, Figure 3. As excavations progressed, a representative from this office visually classified the earth materials encountered, and secured representative samples for laboratory testing.

Pushing or driving a sampling spoon into the earth material obtained undisturbed samples for detailed testing in our laboratory. A solid barrel-type spoon was used having an inside diameter of 2.5 inches with a tapered cutting tip at the lower end and a ball valve at the upper end. The sampler is driven into the soil at the bottom of the borehole by means of hammer blows. The hammer blows are given at the top of the drilling rod. The hammer weighs 140 lbs. For each blow, the hammer drops a distance of 30 inches.

The barrel is lined with thin brass rings, each one inch in length. The spoon penetrated into the soil below the depth of the boring approximately eighteen inches. The end portion of this sample was retained for testing. All samples in their natural field condition were sealed in airtight containers and transported to the laboratory.

EARTH MATERIALS

Earth materials encountered within the exploratory boreholes were visually logged by a representative of COAST GEOTECHNICAL, Inc. The materials were classified as artificial fill and native alluvial deposits.

Artificial fills encountered consisted of dark brown sandy silt, moist, and soft to firm. Artificial fills are opinioned undocumented and require mitigation for support of future improvements and or fills.

The underlying alluvial soil consisted of medium brown to dark brown silty sand, moist, medium dense, grades with depth to slightly oxidized to oxidized brown to buff, medium to coarse grained sands, damp to moist, medium dense to dense, with zones of small pebbles to weathered granitic rock fragments and stringers of silt.

Descriptions of the earth materials encountered are presented on the attached Boring Logs, Plates B through E. The data presented on these logs is a simplification of actual subsurface conditions encountered and applies only at the specific boring locations and the date excavated. It is not warranted to be representative of subsurface conditions at other times and locations.

GROUNDWATER

Groundwater was not encountered in the borings placed; however, zones of perched waters are known to exist in the area within isolated lenses of granular soils.

The historic high groundwater map found in USGS Open File Report 98-15 shows historic high groundwater to be at a depth of near 100 feet. This map is appended as Figure 5.

Groundwater is not anticipated to affect the proposed construction as currently understood; although, localized saturated pockets of permeable soils could cause nuisance seepage during grading and or basement construction.

SEISMICITY

Southern California is located in an active seismic region. Moderate to strong earthquakes can occur on numerous faults. The United States Geological Survey, California Division of Mines and Geology, private consultants, and universities have been studying earthquakes in Southern California for several decades. Early studies were directed toward earthquake prediction estimation of the effects of strong ground shaking. Studies indicate that earthquake prediction is not practical and not sufficiently accurate to benefit the general public. Governmental agencies are shifting their focus to earthquake resistant structures as opposed to prediction. The purpose of the code seismic design parameters is to prevent collapse during strong ground shaking. Some damage should be expected.

Within the past 48 years, Southern California and vicinity have experienced an increase in seismic activity beginning with the San Francisco earthquake in 1971. In 1987, a moderate earthquake struck the Whittier area and was located on a previously unknown fault. Ground shaking from this event caused substantial damage to the City of Whittier, and surrounding cities. The January 17, 1994, Northridge earthquake was initiated along a previously unrecognized fault below the San Fernando Valley. The energy released by the earthquake propagated to the southeast, northwest, and northeast in the form of shear and compression waves, which caused the strong ground shaking in portions of the San Fernando Valley, Santa Monica Mountains, Simi Valley, City of Santa Clarita, and City of Santa Monica.

Southern California faults are classified as: active, potentially active, or inactive. Faults from past geologic periods of mountain building, that do not display any evidence of recent offset, are considered "inactive" or "potentially active". Faults that have historically produced earthquakes or show evidence of movement within the past 11,000 years are known as "active faults". Known active faults have been placed on Alquist-Priolo Maps published by the State of California. There are no known active faults within the subject property. Nearby causative faults are as follows.

- *Northridge Fault.* The Northridge fault is an inferred deep thrust fault that is considered the eastern extension of the Oak Ridge fault. The Northridge Thrust is located beneath the majority of the San Fernando Valley and is believed to be the causative fault of the 1994 Northridge earthquake. This thrust fault is not exposed at the surface and does not present a potential surface fault rupture hazard. However, the Northridge Thrust is an active feature that could generate future earthquakes. The most recent earthquake of regional significance in Southern California affecting the community of Hollywood was the 1994 Northridge Earthquake, a magnitude 6.7 earthquake that occurred in the San Fernando Valley. The epicenter of this blind thrust fault earthquake was located 11.4 miles below the surface, near the Saticoy Street and Reseda Boulevard intersection in Reseda on a previously unmapped fault. Major structural failures along Los Angeles County freeways occurred, including the collapse of the Interstate 10 (I-10), (a major transportation route to Hollywood)overpass at La Cienega Boulevard.

- *Santa Monica Fault.* The Santa Monica Fault is a part of the Transverse Ranges Southern Boundary fault system, a west-trending system of reverse faults that extend for more than 125 miles along the southern edge of the Transverse Ranges (Dolan et al., 2000a). It extends east from the coastline in Pacific Palisades through Santa Monica and West Los Angeles and merges with the Hollywood fault at the West Beverly Hills Lineament in Beverly Hills. It is considered active with evidence of recent movement along the fault with the potential of generating an earthquake with a maximum moment magnitude (Mw) of 6.6 (Petersen et al., 1996).

- *Hollywood Fault.* The Hollywood fault extends east-northeast for a distance of 17 kilometers through Beverly Hills, West Hollywood, and Hollywood to the Los Angeles River. It is truncated on the west by the north-northwest striking West Beverly Hills Lineament, which marks a left step of ¾ mile between the Santa Monica fault and the Hollywood fault (Dolan et al., 2000a). This fault is considered active, and is thought to be capable of generating an earthquake with a maximum moment magnitude (Mw) of 7.1 (Petersen et al., 1996).

- *San Gabriel Fault.* The San Gabriel fault trends northwest-southeast through the San Gabriel Mountains and is approximately 87 miles in length. The fault is comprised of a series east-west trending faults with a right-lateral strike-slip and with a dip steep to the north. The most recent surface rupture was in the Holocene Epoch. Estimated slip rate is 1 to 5 millimeters per year (mm/yr). There are no estimations on the maximum credible magnitude of future earthquakes, but the recurrence interval varies per fault section and is likely to be more active on the western portions of the fault.

- *Raymond Fault.* The Raymond fault is an east-northeast trending, left-lateral fault with minor reverse slip. The structure forms the western boundary of the San Gabriel Basin with the Raymond Groundwater Basin. The fault has a slip rate between 0.10 and 0.22 mm/yr. This fault extends a total of 16.2 miles. The most recent surface rupture was during the Holocene Epoch. The most recent major earthquake associated with this fault was the Pasadena Earthquake of 1988, which occurred at a depth 9.6 miles below ground with a 5.0 magnitude. The interval between major ruptures is estimated to be 4,500 years.

SEISMIC HAZARDS

The potential hazards to be evaluated with regard to seismic conditions include fault rupture, landslides triggered by ground shaking, soil liquefaction, earthquake-induced vertical and lateral displacements, earthquake-induced flooding due to the failure of water containment structures, seiches, and tsunamis.

Fault Rupture

The project is not located within a currently designated Alquist-Priolo Earthquake Zone. No known active faults are mapped within the site. Based on this consideration, the potential for surface fault rupture at the site is considered to be remote.

Ground Shaking

The site is located in a seismically active area that has historically been affected by moderate to occasionally high levels of ground motion, and the site lies in relatively close proximity to several active faults; therefore, during the life of the proposed development, the property will probably experience moderate to occasionally high ground shaking from these fault zones, as well as some background shaking from other seismically active areas of the Southern California region. Design of structures is typically to maintain structural integrity not to prevent damage. Earthquake insurance is available where the damage risk is not acceptable to the client.

Seismic Induced Landslide

Earthquake-induced landslide zones were delineated by the State of California using criteria adopted by the California State Mining and Geology Board. Under those criteria, earthquake-induced landslide zones are areas meeting one or more of the following:

1. Areas known to have experienced earthquake-induced slope failure during historic earthquakes.

2. Areas identified as having past landslide movement, including both landslide deposits and source areas.

3. Areas where CDMG's analyses of geologic and geotechnical data indicate that the geologic materials are susceptible to earthquake-induced slope failure.

Based on the Seismic Hazard Zone Map published by the State of California, El Monte Quadrangle (March 25, 1999), appended as Figure 4, the site is not mapped as being in an area subject to potential seismic induced landslides. Impact to the subject site from a seismic induced landslide is considered remote.

Seismic Induced Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, non-cohesive granular soils exhibit severe reduction in strength and stability when subjected to high-intensity ground shaking. The mechanism by which liquefaction occurs is the progressive increase in excess pore pressure generated by the shaking associated with the seismic event and the tendency for loose non-cohesive soils to consolidate. As the excess pore fluid pressure approaches the in-situ overburden pressure, the soils exhibit behavior similar to a dense fluid with a corresponding significant decrease in shear strength and increase in compressibility. Liquefaction occurs when three general conditions exist: 1) shallow groundwater; 2) low density, non-cohesive sandy soils; and 3) high-intensity ground motion.

Seismic Hazard Zone Maps published by the State of California have been prepared to indicate areas that have a potential for seismic induced liquefaction hazards. The Seismic Hazard Zone Map for the El Monte Quadrangle (March 25,1999), appended as Figure 4, shows that the site is not mapped as being in an area subject to potential liquefaction hazards. Liquefaction induced damage is not considered probable at the subject site.

Lateral Spreading

The occurrence of liquefaction may cause lateral spreading. Lateral spreading is a phenomenon in which lateral displacement can occur on the ground surface due to movement of non-liquefied soils along zones of liquefied soils. For lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along sloping ground toward an unconfined area.

The area does not exhibit characteristics common to areas subject to seismic induced lateral spread. Our opinion is that the site is not subject to seismic induced lateral spread.

Earthquake Induced Settlements

Earthquake-induced settlements result from densification of non-cohesive granular soils which occur as a result of reduction in volume during or after an earthquake event. The magnitude of settlement that results from the occurrence of liquefaction is typically greater than the settlement that results solely from densification during strong ground shaking in the absence of liquefaction.

Based on site conditions and the physical characteristics of site earth materials seismic induced settlement is considered to be negligible.

Earthquake-Induced Flooding

The failure of dams or other water-retaining structures as a result of earthquakes and strong ground shaking could result in the inundation of adjacent areas. Due to the lack of a major dam or water-retaining structure located near the site, the potential of earthquake-induced flooding affecting the site is considered not to be present.

Seiches

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Based on the lack of nearby enclosed bodies of water the risk from a seiche event is not present.

Tsunami

Tsunamis are waves generated in large bodies of water as a result of change of seafloor topography caused by tectonic displacement. Based on the elevation of the site the project has no potential to be affected by a tsunami.

GEOTECHNICAL DISCUSSION

Development of the site as proposed is considered feasible from a soil engineering standpoint, provided that the recommendations stated herein are incorporated in the design and are implemented in the field. General comments are as follows.

- Earthwork is anticipated to consist of grade changes to create designed pad elevations and drainage required for the proposed construction.

- Conventional earth moving equipment may be utilized. Removals will be required prior to the placement of any fills and remedial grading will be needed to eliminate any cut fill transitions.

- Care shall be taken during site construction not to remove lateral and or vertical support from adjacent properties.

- Construction cuts that cannot be made within the guidelines of this report will need to be supported with designed shoring. The shoring design would need to take into account removal depths needed for site grading and surcharges.

- The proposed site improvements shall be supported by foundations bearing into fills placed and compacted under the observation and testing of COAST GEOTECHNICAL, Inc.

- Proposed pavement, interior slab areas, and hardscape areas shall be supported by fills placed and compacted under the observation and testing of COAST GEOTECHNICAL, Inc.

- Foundations for proposed site walls and free standing retaining walls may be supported by competent native soils or compacted fills. Where native soils are used for support, designed foundations may need to be deepened and footings bottoms mitigated with moisture and compaction.

- Development of the site as proposed is considered feasible from a soils engineering standpoint, provided that the recommendations stated herein are incorporated in the design and are implemented in the field. The proposed site improvements will not adversely affect adjacent properties and vice versa, provided proper construction techniques are utilized and required geotechnical observations are made.

Recommendations that follow shall be incorporated into the project as needed and are subject to change based on review of future building, foundation, and grading plans.

PROPOSED GRADING

Grading plans were not available at the time this report was prepared. It is anticipated that grading will consist of excavation of the subterranean level (estimated at ten feet below existing grade), excavation and compaction for uniform support of foundations, as wall backfill, and for support of hardscape, and paving materials.

GRADING RECOMMENDATIONS

Foundations for the structure and improvements will derive support from compacted fills placed under the observation and testing of COAST GEOTECHNICAL, Inc.

Unacceptable site earth materials shall be over-excavated down to competent earth material. Competent earth material is determined by the project soil engineer based on physical testing of soil samples obtained during exploration and proposed construction.

Based on in place densities and consolidation tests, soils found at a depth of about four feet below existing grade and deeper have adequate geotechnical properties to provide adequate support of proposed fills and the structure; as such, removals to a depth of four feet below existing grade or to one foot below proposed footing bottoms, whichever is greater, are anticipated for at grade portions of the project, and three feet below proposed subgrade or to one foot below proposed footing bottoms, whichever is greater, are anticipated for the subterranean area; however, field observations made at the time of grading shall determine final removal limits. Areas proposed for asphalt, concrete, or hardscape shall have a minimum of two feet of removal below existing grade or proposed grade, whichever is deeper.

The overexcavation areas shall include areas proposed for foundations, slabs, hardscape, asphaltic concrete or other areas as determined by the geotechnical engineer. The excavations shall extend five feet beyond the structure's outline, except where contained by a designed wall, shoring, or property lines, and three feet beyond the limits of parking, driveway, and hardscape areas.

To provide adequate support along property lines excavations shall be sloped at a 1:1 (H:V) gradient from the excavation bottom up to existing grade. As fill soils are placed the grading contractor shall bench into the 1:1 construction cut to final grade. Where this designed cut cannot be made designed shoring shall be utilized.

Exposed excavation bottoms shall be observed by the geotechnical engineer prior to processing. Field recommendations will be made depending on conditions encountered. Upon approval, the excavation bottoms shall be processed, moisture conditioned approximately to optimum moisture content and compacted to a minimum of 90% relative compaction.

Subsequent fills shall be placed in six to eight inch lifts, moisturized conditioned to approximately optimum moisture content and compacted to a minimum of 90% relative compaction. This process shall be followed to finish grade.

The project is in an area where usage of septic systems and or trash pit disposal was common. If encountered during site earth work the soil engineer shall be notified for recommendations. Typically septic tanks, leach fields, and trash pits are removed and the void backfilled with compacted soil. Seepage pits are typically drilled clean and backfilled with minimum three sack slurry.

Undocumented backfill of a former UST location shall be removed and replaced as documented compacted fill during earthwork operations. The contractor shall be responsible for locating this area during site construction.

During earthwork operations, a representative of COAST GEOTECHNICAL, Inc. shall be present to verify acceptable conditions and that compaction requirements are being obtained.

GENERAL GRADING NOTES

All existing structures shall be demolished and all vegetation and debris shall be stripped and hauled from the site. The entire grading operation shall be done in accordance with the attached "Specifications for Grading".

Any import fill materials to the site shall not have an expansion index greater than 20, and shall be tested and approved by our laboratory. Samples must be submitted 48 hours prior to import.

Grading and/or foundation recommendations are subject to modification upon review of final plans by the Geotechnical Engineer. Please submit plans to COAST GEOTECHNICAL, Inc. when available.

TEMPORARY CUTS

Temporary construction cuts are anticipated for grading and construction of the project. The following recommendations are for unsurcharged conditions, and are subject to modification based on field observations.

Temporary cuts in site earth materials are anticipated to expose artificial fill and alluvial deposits.

Cuts in the existing fill and alluvial soils shall be no steeper than 1:1(H:V).

Tops of 1:1(H:V) construction cuts shall be at least five feet from property line.

Under observation of the soil engineer some short term grading cuts within this 1:1 projection may be made vertical. These cuts shall be performed under the continuous observation of Coast Geotechnical, are usually a result of benching, and are re-supported immediately after placement. Designed cuts may remain open for thirty days upon observation and approval of the soil engineer. In wet seasons the cuts shall be protected from moisture intrusion by covering with plastic and sandbagging. The soils engineer based on field observation has the option of allowing the cuts to remain as is, requiring more conservative cuts, infilling of the excavation, or use of shoring.

Where designed cuts cannot be made due to physical constraints, or local jurisdiction policy prevents them from being used, shoring will need to be used. Shoring should be anticipated to be needed along the building portion near San Gabriel Boulevard, and between the north property line and north building wall.

No cuts shall be allowed which would remove lateral support from adjacent properties, structures, or public right of ways.

The project soil engineer shall observe all cuts at the time of excavation. If adverse conditions are exposed, remedial measures will be recommended and implemented.

OSHA guidelines shall be followed where workers are to enter confined spaces, trench work, or excavations.

SHORING

Final determination of shoring needs will be dependent on review of final site development plans and grading plans. Where shoring is needed the following guidelines shall be utilized:

- Prior to any earthwork activities adjacent properties shall be photo documented and vertical and horizontal monument points established and surveyed to establish a datum. Monument points should be periodically surveyed during construction to establish any movement and should continue until permanent restrained conditions are constructed.

- No vibratory equipment or hammering shall be utilized in shoring installation.

- Shoring shall be designed by a licensed engineer and shall consist of drilled piles and lagging.

- The shoring engineer shall take into account improvements on adjoining properties in determining allowable shoring deflections.

- Temporary shoring may be designed for an active pressure of 37.2 pcf or an at rest pressure of 62.5 pcf, plus any surcharges. It is very important to note that active pressures can only be achieved when movement in earth materials occurs. If movement in the earth material is not acceptable; such as, adjacent to an existing structures, the at-rest pressure should be considered for design purposes.

- In addition to the recommended earth pressure, the upper ten feet of the shoring adjacent to a street or driveway area should be designed to resist a uniform lateral pressure of 100 psf, acting as a result of an assumed 300 psf surcharge behind the shoring due to normal street traffic. If the traffic is kept back at least ten feet from the shoring, the traffic surcharge may be neglected.

- Provided shoring maintains a spacing of three times the diameter of the shoring pile no reduction in passive pressure is needed. The point of fixity for shoring piles shall be at five feet below proposed finish grade.

- Where shoring piles are designed to also carry vertical loads the drilled piles may utilize a skin friction value of 300 psf per square foot of contact with alluvial soils.

- Drilling may encounter granular soil zones. Caving of granular soils is a possibility. Casing may be required.

- Perched water could be encountered. Where significant seepage is found casing may be needed to maintain an open hole.

- The annulus of the drilled hole into which the temporary shoring pile is placed shall be backfilled with a minimum one sack slurry. We do not recommend the use of pea gravel backfill.

- Where temporary shoring is incorporated into a permanent wall the structural engineer shall specify the concerte design for backfill of the annulus.

- Lagging shall be installed as the excavation is made. No more than two feet of unsupported earth material shall be exposed at anytime, unless written field observations by COAST GEOTECHNICAL, Inc. allows otherwise.

- The lagging shall be backfilled with a minimum one sack slurry, and the slurry allowed to set prior to any excavation below the bottom of lagging.

- Shoring shall be designed to accommodate foundation and grading excavations.

- COAST GEOTECHNICAL, Inc. shall observe all phases of shoring installation.

- Shoring plans shall be reviewed by this office.

FOUNDATION DESIGN

The site is within an area subject to seismic events. Under current CBC codes, City policy, and industry standards noncritical structures subject to seismic hazards are designed to protect life and safety. Under this design objective the requirements of protecting life and safety could be met but the structure could be damaged. The damage to the structure could range from minimal to being non-functional. The reduction of risk, for the occurrence of structural damage from a seismic event, is generally associated with the structure's foundation system.

Within this report we will address two foundation designs typically utilized in the area, conventional and mat foundations. Typically a mat foundation is associated with providing increased protection from seismic events, than that provided by a conventional foundation system. If the risk associated with these foundation systems is not acceptable to the client, the client has the option of utilizing alternate designs that could decrease the risk of damage to the structure to a level they perceive as acceptable.

CONVENTIONAL FOUNDATION

Conventional foundations for the structure may consist of continuous footings or isolated pad footings placed a minimum of 24 inches below lowest adjacent grade bearing into engineered fill soil. Foundations complying with this recommendation may utilize an allowable bearing value of 2,000 psf. This value is for dead plus live load and may be increased 1/3 for total including seismic and wind loads where allowed by Code. Calculations for bearing capacity are presented on Plate J.

Bearing loads may be increased by 200 psf for each increase in foot of width and depth up to a maximum of 3,000 psf.

Where isolated pads are utilized they shall be tied into adjacent foundations in at least two directions with structural grade beams.

All footings shall be reinforced with a minimum of four #5 bars, two top and two bottom. Structural design shall be utilized where more conservative.

Foundation excavations shall be observed by a representative of COAST GEOTECHNICAL, Inc. prior to placement of steel and concrete, to verify compliance with geotechnical recommendations.

MAT FOUNDATION

If a mat slab design is utilized, the structural engineer should design the building's mat foundation thickness and reinforcement requirements based on the anticipated loading conditions. The mat foundation slab should be at least twelve inches thick, with perimeter footings a minimum of 24 inches below the lowest adjacent grade. A modulus of subgrade reaction of 100 pci may be used in the design of the mat foundation. Reinforcement shall be determined by the structural engineer. Calculations for the subgrade reaction are provided on Plate K.

LATERAL DESIGN

Lateral restraint at the base of footings and on slabs may be assumed to be the product of the dead load and a coefficient of friction of .35. Passive pressure on the face of footings may also be used to resist lateral forces. A passive pressure of zero at the surface of finished grade, increasing at the rate of 300 pounds per square foot of depth to a maximum value of 3,000 pounds per square foot, may be used for compacted fill and native soil. If passive pressure and friction are combined when evaluating the lateral resistance, the value of the passive pressure should be limited to 2/3 of the values given above. Calculations for passive pressure is presented on Plates L and M.

SEISMIC DESIGN

Based on the 2016 CBC the following seismic design parameters are provided. These seismic design values were determined utilizing latitude 34.097145 and longitude -118.09052, and data from the USGS Seismic Design Maps through a third party application by SEA. The data output by SEA is appended in Appendix B. A conservative site class D was assigned to site earth materials.

- Site Class = D
- Mapped 0.2 Second Spectral Response Acceleration, Ss = 2.737g
- Mapped One Second Spectral Response Acceleration S_1 = 0.939g
- Site Coefficient from Table 1613A5.3(1), Fa = 1.0
- Site Coefficient from Table 1613A5.3(2), Fv = 1.5
- Maximum Design Spectral Response Acceleration for short period, S_{MS} = 2.737g
- Maximum Design Spectral Response Acceleration for one-second period, S_{M1} = 1.409g
- 5% Design Spectral Response Acceleration for short period, S_{DS} = 1.825g
- 5% Design Spectral Response Acceleration for one-second period, S_{D1} = 0.939g

SETTLEMENT

The maximum total post-construction static settlement is anticipated to be on the order of 3/4-inch. Differential static settlements are expected to be less than 1/2-inch, measured between adjacent structural elements over a distance of forty feet.

SUBSIDENCE AND SHRINKAGE

Subsidence over the site is anticipated to be negligible. Shrinkage of reworked materials should be in the range of 8 to 12 percent.

EXPANSIVE SOILS

Results of expansion tests indicate that the surface soils have a very low expansion potential.

CHEMICAL ANALYSIS

A representative soil sample was analyzed for a corrosion series by Anaheim Test Labs with the following results, soluble chlorides of 68 ppm, minimum resistivity of 8,000 max ohm-cm, a pH of 7.1, and soluble sulfates of 92 ppm.

The client should consult with a corrosion expert to assess if the site soils are adverse to the site improvement proposed.

Based on the CBC and Table 4.3.1 of ACI 318, the sulfate content shows a negligible exposure. Concrete with Type II cement may be utilized. Structural design could dictate a higher strength concrete be utilized.

RETAINING WALL DESIGN

Unrestrained retaining walls may be founded in competent compacted fill utilizing previously stated bearing values. Walls retaining drained earth under static loading may be designed for the following:

Surface Slope of Retained Material Horizontal to Vertical	Equivalent Fluid Pressure Pounds per Cubic Foot
Level	37.2
5 to 1	43.4
4 to 1	45.5
3 to 1	49.8
2 to 1	65.6

Calculations for the stated equivalent fluid pressures are based on the Coulomb theory provided on Plate N. The point of resultant force is at H/3 above the base of the retaining wall, where H is the wall height.

All retaining structures should include appropriate allowances for anticipated surcharge loading, where applicable.

The provided design is based on the use of select onsite or import very low expansive granular earth materials, or gravels, as backfills. The structural engineer shall designate this on his plans. Onsite expansive earth materials may be used as a two foot soil cap to mitigate the infiltration of surface waters into the backfill zone.

Footing excavations require observation and approval by COAST GEOTECHNICAL, Inc.

RESTRAINED WALL DESIGN

Walls restrained from deflection by the structural frame should be designed for “at-rest” earth pressures. For the level backfill conditions, an equivalent fluid pressure of 62.5 pounds per cubic foot, as calculated on Plate O, may be used for static conditions.

The structural engineer shall designate on the foundation plans whether basement walls are designed for restrained or unrestrained conditions. Walls designed as restrained must have the deck or framing in place prior to backfill placement.

All retaining structures should include appropriate allowances for anticipated surcharge loading, where applicable.

The provided design is based on the use of select onsite or import very low expansive granular earth materials, or gravels, as backfills. The structural engineer shall designate this on his plans. Onsite expansive earth materials may be used as a two foot soil cap to mitigate the infiltration of surface waters into the backfill zone.

Footing excavation requires observation and approval by COAST GEOTECHNICAL, Inc.

SEISMIC DESIGN VALUE

Code requires that retaining walls with more than six feet of backfill be designed for a seismic load.

For a retaining wall under earthquake loading the designed equivalent fluid pressure is sensitive to the ground motion value and seismic coefficient (Kh) value utilized in analysis. Regulating jurisdictions in the area differ on how these values are arrived at and some regulating agencies recognize that the calculated ground motion value and the seismic coefficient utilized in analysis of seismic loads are not equivalent and allow the use of a seismic coefficient that is less than the ground motion value.

Where local policy is not present most jurisdictions allow the geotechnical engineer to use their best judgment in arriving at a usable seismic design value. Many jurisdictions allow the use of PGAm as the ground motion value, and 1/3PGAm for use as the seismic coefficient. We concur with the use of this method in design of seismic forces on retaining walls. Based on the USGS Seismic Tool application, the PGAm for the site is 1.031, with 1/3 of that value being 0.344g.

For this project, assessment of seismic loads on retaining walls shall utilize a seismic coefficient (Kh) of 0.344g.

Utilizing a simplified approach for determination of seismic design loads of $\Delta P_{AE} = 3/4\ \gamma\ Kh$, a value of $\Delta P_{AE} = 32.3$ pcf was determined. This seismic design load value shall be added to the static design loads. The client is advised that if through review it becomes evident that the City requires an alternate seismic design analysis that differing design values could be required.

WATERPROOFING

There is an inherent risk with moisture problems when constructing below grade levels. The geotechnical consultant is only responsible for identification of adverse moisture conditions, which could impact below grade rooms at this site. Groundwater conditions are not anticipated. The client should consult with a waterproofing expert for the design of a waterproofing system for the subterranean level and for inspection during construction.

WALL SUBDRAINS

Subdrain systems shall be installed behind retaining and subterranean walls and typically consist of four-inch diameter SCH 40 or SDR 35 perforated pipe surrounded with one cubic foot, per lineal pipe foot, of 3/4-inch gravel. The gravel shall be wrapped in filter fabric. Outlet pipes shall be solid pipe of similar material. A typical subdrain detail is shown on Plate P.

Alternate subdrain systems, such as Miradrain systems, are feasible, but are subject to the review and approval of the soils engineer.

Subdrains for the subterranean walls shall be placed below the elevation of the subterranean floor. Subdrain systems shall be independent of area surface drain and roof drain systems.

Subdrain placement requires the observation and approval by COAST GEOTECHNICAL, Inc.

RETAINING WALL BACKFILL

Retaining wall backfills shall consist of onsite very low expansive onsite earth materials, import materials with a very low expansion index, or gravels. Onsite expansive earth materials may be used as a two foot soil cap to mitigate the infiltration of surface waters into the backfill zone.

Prior to placement of any backfills the area shall be cleaned of loose soils and construction debris. COAST GEOTECHNICAL, Inc. shall observe and approve the area as acceptable prior to any backfill placement.

Retaining wall backfill shall be placed in six to eight inch loose; moisture conditioned lifts and mechanically compacted to a minimum of ninety percent relative compaction. Backfills require testing at two-foot vertical intervals during placement.

If imported gravels are used as backfill material, the gravels shall be separated from on-site soils with filter cloth. Gravel backfill material shall be lubricated with water and compacted as placed. A soil cap, consisting of on-site soils or similar material, shall be placed over any gravel backfill and separated by filter cloth from the underlying material. The soil cap shall be a minimum of two and a half feet in thickness or one foot below footing bottoms, whichever is deeper. Soil cap soils shall be placed in six to eight inch loose lifts, moisture conditioned as needed, and compacted to a minimum of 90% relative compaction.

Compaction of backfill material requires observation and approval by COAST GEOTECHNICAL, Inc. during the backfill operation.

UTILITY LINE BACKFILLS

All utility line backfills, both interior and exterior, shall be compacted to a minimum of 90% relative compaction and shall require testing at a maximum of two-foot vertical intervals.

Where utility lines enter a structure the utility trench shall have an impermeable plug of backfill placed to mitigate the potential migration of waters through the backfill zone underneath the slab.

BASEMENT AND FLOOR SLAB

Concrete slabs supported by engineered fill soil shall be designed utilizing values of 1.0 for C_O, 1.0 for C_S, non plastic soils, and in accordance with publications or methods stated in the CBC or referenced publications.

Minimum geotechnical recommendations for the any basement slab design are six inches actual thickness with #4 bars at twelve-inches on center each way. Structural design for anticipated floor loads may be more conservative.

Minimum geotechnical recommendations for on grade slab design are five inches actual thickness with #4 bars at twelve inches on center each way. Structural design for anticipated floor loads may be more conservative.

The stabilization of expansive soils will be accomplished through moisture conditioning of expansive soils to 3-4% over optimum moisture content during grading and by pre-saturating slabs areas prior to concrete placement in accordance with our Plate A.

Prior to placement of the capillary break or vapor retarder COAST GEOTECHNICAL, Inc. shall test the slab subgrade soils for moisture content. If the subgrade soils do not exhibit the recommendations on Plate A they shall be moisture conditioned to the required depth and content.

The capillary break material shall comply with the requirements of the local jurisdiction and shall be a minimum of four inches in thickness. The capillary break shall consist of open graded 1/2 inch or larger gravel. The gravels shall be vibrated smooth. Vibration of the gravels shall be verified by Coast Geotechnical. The gravels shall be covered with a heavy filter fabric prior to placement of the vapor retarder to minimize puncturing of the vapor retarder. A minimum 15-mil thick vapor retarder in accordance with requirements of ASTM E:1745 and E:1643 is recommended.

The vapor retarder is recommended for all slab on grade areas and shall be properly lapped and sealed in accordance with code. The vapor barrier shall be in contact with the slab bottom.

HARDSCAPE SLABS

Hardscape slab subgrade areas shall exhibit a minimum of 90% relative compaction and moisture content 3-4% over optimum moisture content to a depth of at least one foot. Deeper removal and recompaction may be required if unacceptable conditions are encountered. These areas require testing just prior to placing concrete.

Exterior hardscape slabs will be subject to stress from volume changes due to variations in subgrade soils, which could lead to cracking. The followings recommendations will minimize cracking and offsets, but will not eliminate concrete cracks.

Doweling slabs to perimeter footings can mitigate movement of slabs adjacent to structures. Doweling should consist of No. 4 bars bent around exterior slabs. Doweling should be spaced no farther than 36 inches on centers. As an option to doweling, an architectural separation could be provided between the main structure and abutting appurtenance improvements. Pre-saturation of exterior slab areas is also desirable. At exterior edges of patios and other flatwork, a cut-off wall to the same depth and containing the same reinforcement as exterior footings is highly recommended. If no significant load is associated with the edge of the slab, the width of the cut-off wall may be limited to eight inches. Reinforcement adopted for the main structure may be applied to the appurtenances.

Exterior hardscape shall be a minimum of four inches in thickness and reinforced with # 3 bars at twelve inches OCEW.

As an alternative to rigid hardscape or brickwork, flexible pavers may be utilized.

DRAINAGE

Positive drainage should be planned for the site. Drainage should be directed away from structures via non-erodible conduits to suitable disposal areas. The structure should utilize roof gutters and down spouts tied directly to yard drainage.

Unlined flowerbeds, planters, and lawns should not be constructed against the perimeter of the structure. If such landscaping (against the perimeter of a structure) is planned, it should be properly drained and lined or provided with an underground moisture barrier. Irrigation should be kept to a minimum.

Section 1804.3 of the 2016 CBC recommends 5% slope away from structures for landscape areas and 2% slope away for hardscape areas, within ten feet of a residence. Minimum drainage shall be one percent for hardscape areas and two percent for landscape areas for all other areas.

We do not recommend the use of infiltration trenches, infiltration basins, dry wells, permeable pavements or similar systems designed primarily to percolate water into the subsurface soils to conform with infiltration best management practice (BMP), within fifteen feet of a structure. Due to the physical characteristics of the site earth materials, infiltration of waters into the subsurface earth materials has a risk of adversely affecting below grade structures, building foundations and slabs, and hardscape improvements. From a geotechnical viewpoint surface drainage should be directed to the street.

No cuts shall be allowed which would remove lateral support from adjacent properties, structures, or public right of ways.

The project soil engineer shall observe all cuts at the time of excavation. If adverse conditions are exposed, remedial measures will be recommended and implemented.

OSHA guidelines shall be followed where workers are to enter confined spaces, trench work, or excavations.

PRELIMINARY INFILTRATION ASSESSMENT

Site explorations placed by this consultant did not encounter groundwater to a depth of thirty feet below existing grade. The upper earth materials in this area consist of silty, fine to coarse-grained sand, with gravel and cobbles, which are opinioned to have favorable; although, variable infiltration rates. Infiltration systems should be kept a minimum of fifteen feet away from structures.

Actual infiltration rates will require testing which can be performed, when system type and location(s) are known, under separate contract.

PAVEMENT DESIGN

The parking lot subgrade will require over-excavation and compaction to provide a minimum of two feet of compacted fill placed in accordance will recommendations of this report. An R-Value of 78 has been determined for near surface site soils; although, for analysis a maximum R-Value of 50 is utilized. Based on assumed traffic indexes and an R-value of 50 the following pavement sections may be utilized. Import material for future grading of the parking and driveways should consist of earth material similar to onsite soils. Additional R-values should be determined upon completion of grading. The following pavement sections may be subject to change based on these results.

AREA	FLEXIBLE PAVEMENT SECTION				
	T. I.	GE	AC	AB	SUBGRADE
Auto Parking	5.0	0.80	4.0"	4.0"**	* 24"
Auto Drives	6.0	0.96	4.0"	5.0"**	* 24"
Truck Drives	7.0	1.12	4.0"	6.0"**	*24"
Pavers (80mm stone thickness)	7.0	-	-	9.5"**	*24"

* *Compacted to 90% relative compaction.*
** *Compacted to 95% relative compaction.*

If concrete pavement is used, the concrete should be at least six inches thick underlain by at least four inches of base material compacted to a minimum of 95% relative compaction. Reinforcement is highly advised and at a minimum should consist of #3 bars on 12-inch centers both ways. To minimize cracking of concrete pavement recommendations of the PCA should be utilized as guidelines for placement, curing, jointing, saw cutting, etc.

Increased pavement sections and/or reinforced concrete aprons should be utilized where heavy axle loads from trash or delivery trucks will be encountered.

ENGINEERING CONSULTATION, TESTING & OBSERVATION

We will be pleased to provide additional input with respect to foundation design once methods of construction have been determined.

Grading, foundation and shoring plans should be reviewed by this office prior to commencement of grading so that appropriate recommendations, if needed, can be made.

Areas to receive fill should be observed when unsuitable materials have been removed and prior to placement of fill, and fill should be observed and tested for compaction as it is placed.

SUPPLEMENTAL CONSULTING

During construction, a number of reviews by this office are recommended to verify site geotechnical conditions and conformance with the intentions of the recommendations for construction. Although not all possible geotechnical observation and testing services are required. The following site reviews are advised, some of which will probably be required by the City of San Gabriel:

- Shoring installation
- Grading and excavations
- Foundation excavations and slab subgrade compaction testing
- Slab steel placement, primary and appurtenant structures
- Backfill compaction basement/retaining walls
- Compaction of utility trench backfill
- Hardscape subgrade compaction

AGENCY REVIEW

All soil and structural aspects of the proposed development are subject to the review and approval of the governing agency(s). It should be recognized that the governing agency(s) can dictate the manner in which the project proceeds. They could approve or deny any aspect of the proposed improvements and/or could dictate which foundation and grading options are acceptable. Supplemental geotechnical consulting in response to agency requests for additional information could be required and will be charged on a time and materials basis.

LIMITATIONS

This report presents recommendations pertaining to the subject site based on the assumption that the subsurface conditions do not deviate appreciably from those disclosed by our exploratory excavations. Our recommendations are based on the technical information, our understanding of the proposed construction, and our experience in the geotechnical field. We do not guarantee the performance of the project, only that our engineering work and judgments meet the standard of care of our profession at this time. In view of the general conditions in the area, the possibility of different local soil conditions may exist. Any deviation or unexpected condition observed during construction should be brought to the attention of the Geotechnical Engineer. In this way, any supplemental recommendations can be made with a minimum of delay necessary to the project.

If the proposed construction will differ from our present understanding of the project, the existing information and possibly new factors may have to be evaluated. Any design changes and the finished plans should be reviewed by the Geotechnical Consultant. Of particular importance would be extending development to new areas, changes in structural loading conditions, postponed development for more than a year, or changes in ownership.

COAST GEOTECHNICAL, INC.

This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are called to the attention of the Architects and Engineers for the project, and incorporated into the plans and that the necessary steps are taken to see that the Contractors and Subcontractors carry out such recommendations in the field.

This report is subject to review by the controlling authorities for this project.

We appreciate this opportunity to be of service to you.

Respectfully submitted:
COAST GEOTECHNICAL, INC.

Ming-Tarng Chen
RCE 54011

REGISTERED PROFESSIONAL ENGINEER
MING-TARNG CHEN
No. 54011
Exp. 12/31/19
CIVIL
STATE OF CALIFORNIA

Todd D. Houseal
CEG #1914 Exp. 4/20

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TODD D. HOUSEAL
No. 1914
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

APPENDIX A

This appendix contains a description of the field investigation, laboratory testing procedures and results, outside lab testing, site plan, exploratory logs and expansive soil recommendations.

FIELD INVESTIGATION

The field investigation was performed on December 12, 2018, and consisted of the excavation of four borings by hollow stem auger equipment at the locations shown on the attached Site Geotechnical Map. As drilling progressed, personnel from this office visually classified the soils encountered, and secured representative samples for laboratory testing.

Undisturbed samples for detailed testing in our laboratory were obtained by pushing or driving a sampling spoon into the material. A solid barrel-type spoon was used having an inside diameter of 2.5 inches with a tapered cutting tip at the lower end and a ball valve at the upper end. The barrel is lined with thin brass rings, each one inch in length. The spoon penetrated into the soil below the depth of boring approximately twelve inches. The central portion of this sample was retained for testing. All samples in their natural field condition were sealed in airtight containers and transported to the laboratory.

Description of the soils encountered is presented on the attached Boring Logs. The data presented on this log is a simplification of actual subsurface conditions encountered and applies only at the specific boring locations and the date excavated. It is not warranted to be representative of subsurface conditions at other locations and times.

LABORATORY TESTING

Field samples were examined in the laboratory and a testing program was then established to develop data for preliminary evaluation of geotechnical conditions.

Field moisture and dry densities were calculated for each undisturbed sample. The samples were obtained per ASTM:D-2937 and tested under ASTM:D-2216.

Maximum density-optimum moisture relationships were established per ASTM:D-1557 for use in evaluation of in-situ conditions and for future use during grading operations.

Direct shear tests were performed in accordance with ASTM:D-3080, on specimens at near saturation under various normal loads. The results of tests are based on an 80% peak strength or ultimate strength, whichever is lower, and are attached as Plates F and G.

Expansion tests were performed on typical specimens of earth materials in accordance with the procedures outlined in ASTM D-4829.

Consolidation tests were performed on a representative sample based on ASTM:D-2435. The consolidation plots are presented on Plates H and I.

TEST RESULTS

Maximum Density/Optimum Moisture (ASTM:D-1557)

Boring	Depth in Feet	Maximum Density, pcf	Optimum Moisture, %
1	0 - 5	126.0	9.5

Direct Shear (ASTM:D-3080)

Boring	Depth in Feet	Cohesion (lbs./sq. ft.)	Angle of Internal Friction (Degrees)
1	0– 5 (remolded)	250	30
1	10	250	31

Expansion Index (ASTM:D-4829)

Boring	Depth in Feet	Expansion Index	Expansion Potential
1	0 – 5	15	Very low
1	5 - 10	5	Very low
1	10 - 15	4	Very low

SPECIFICATIONS FOR GRADING

SITE CLEARING

All existing vegetation shall be stripped and hauled from the site.

PREPARATION

After the foundation for the fill has been cleared, plowed or scarified, it shall be disced or bladed until it is uniform and free from large clods, brought to a proper moisture content and compacted to not less than ninety percent of the maximum dry density in accordance with ASTM:D-1557-00 (5 layers - 25 blows per layer; 10 lb. hammer dropped 18"; 4" diameter mold).

MATERIALS

On-site materials may be used for fill, or fill materials shall consist of materials approved by the Soils Engineer and may be obtained from the excavation of banks, borrow pits or any other approved source. **The materials used should be free of vegetable matter and other deleterious substances and shall not contain rocks or lumps greater than six inches in maximum dimension.**

PLACING, SPREADING AND COMPACTING FILL MATERIALS

Where natural slopes exceed five horizontal to one vertical, the exposed bedrock shall be benched prior to placing fill.

The selected fill material shall be placed in layers which, when compacted, shall not exceed six inches in thickness. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to ensure uniformity of material and moisture of each layer.

Where moisture of the fill material is below the limits specified by the Soils Engineer, water shall be added until the moisture content is as required to ensure thorough bonding and thorough compaction.

Where moisture content of the fill material is above the limits specified by the Soils Engineer, the fill materials shall be aerated by blading or other satisfactory methods until the moisture content is as specified.

After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to not less than 90 percent of the maximum dry density in accordance with ASTM:D-1557-00 (5 layers -25 blows per layer; 10 lbs. hammer dropped 18 inches; 4" diameter mold) or other density tests which will attain equivalent results.

Compaction shall be by sheepsfoot roller, multi-wheel pneumatic tire roller, track loader or other types of acceptable rollers.

Rollers shall be of such design that they will be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is at the specified moisture content. Rolling of each layer shall be continuous over the entire area and the roller shall make sufficient trips to ensure that the desired density has been obtained. The final surface of the lot areas to receive slabs on grade should be rolled to a dense, smooth surface.

The outside of all fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction operations shall be continued until the outer nine inches of the slope is at least 90 percent compacted. Compacting of the slopes may be progressively in increments of three feet to five feet of fill height as the fill is brought to grade, or after the fill is brought to its total height.

Field density tests shall be made by the Soils Engineer of the compaction of each layer of fill. Density tests shall be made at intervals not to exceed two feet of fill height provided all layers are tested. Where the sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches and density readings shall be taken in the compacted material below the disturbed surface. When these readings indicate that the density of any layer of fill or portion there is below the required 90 percent density, the particular layer or portion shall be reworked until the required density has been obtained.

The grading specifications should be a part of the project specifications.

The Soil Engineer shall review the grading plans prior to grading.

INSPECTION

The Soil Engineer shall provide continuous supervision of the site clearing and grading operation so that he can verify the grading was done in accordance with the accepted plans and specifications.

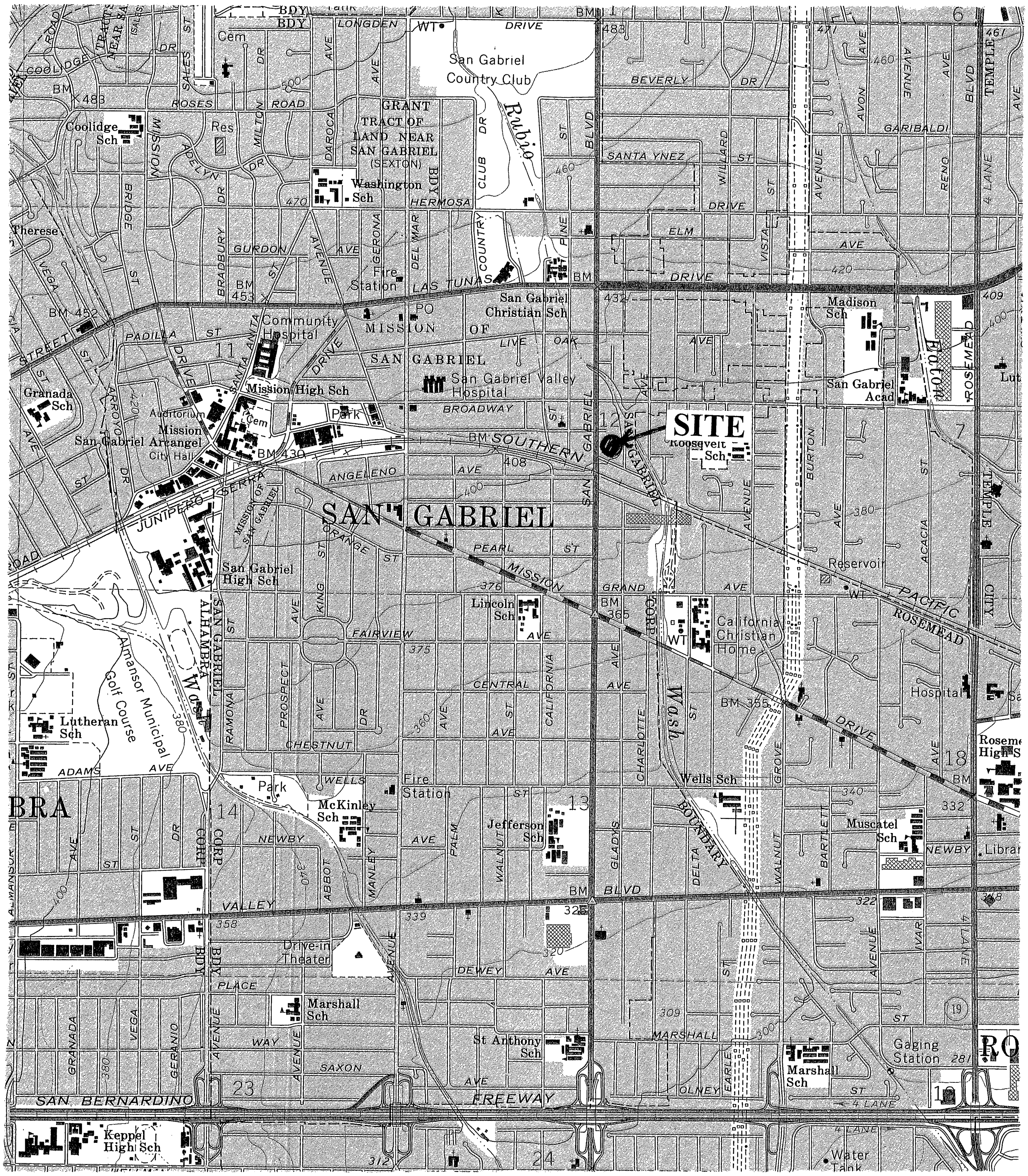
SEASONAL LIMITATIONS

No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until the field tests by the Soils Engineer indicate the moisture content and density of the fill are as previously specified.

EXPANSIVE SOIL CONDITIONS

Whenever expansive soil conditions are encountered, the moisture content of the fill or recompacted soil shall be as recommended in the expansive soil recommendations included herewith.

SITE VICINITY MAP

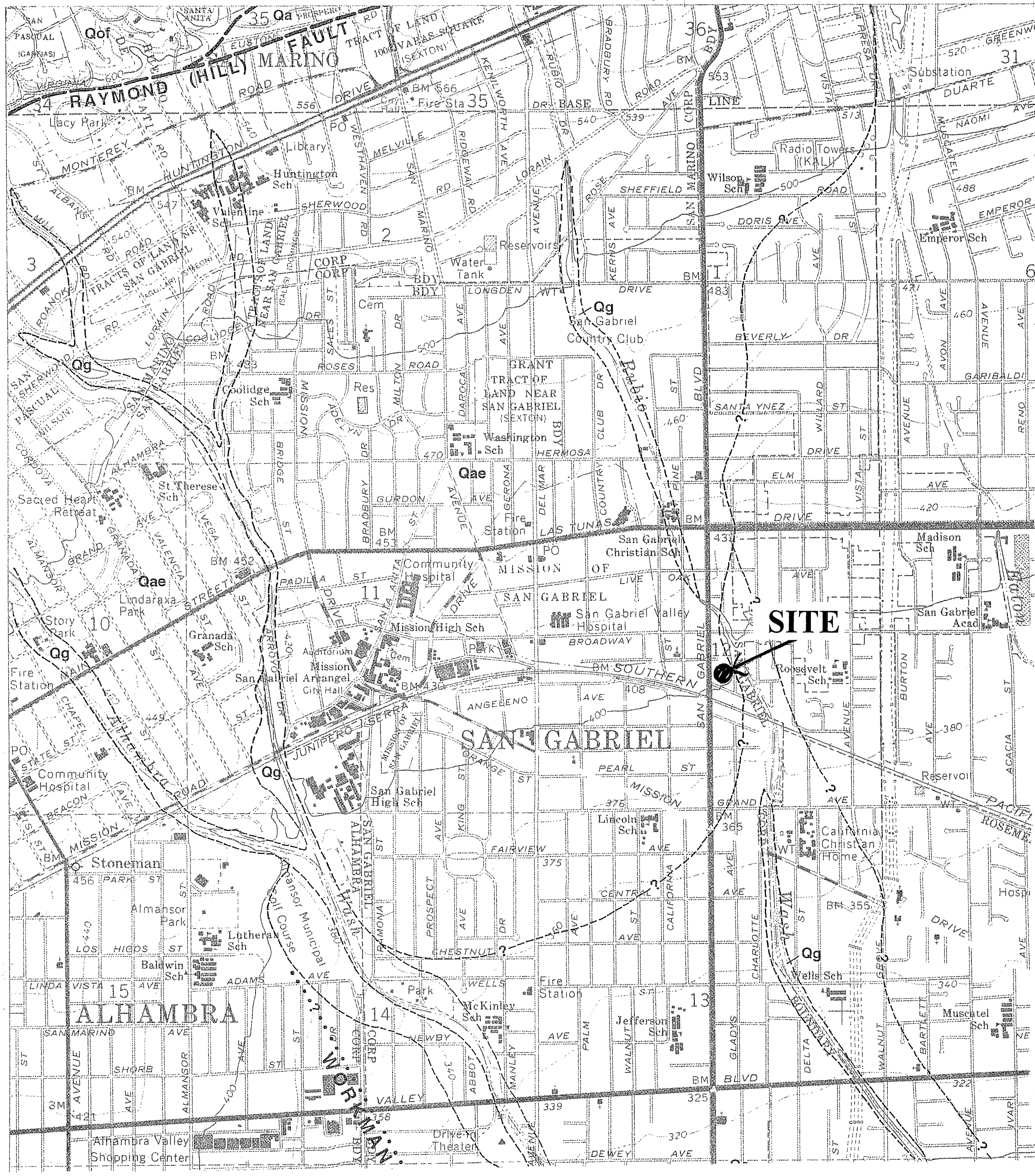


El Monte USGS Topographic Map

COAST GEOTECHNICAL, INC.

W.O. 565718 Figure 1

REGIONAL GEOLOGY MAP



GEOLOGIC MAP OF THE EL MONTE AND BALDWIN PARK QUADRANGLES
LOS ANGELES COUNTY, CALIFORNIA
BY THOMAS W. DIBBLEE, JR., 1999
EDITED BY HELMUT E. EHRENSPECK

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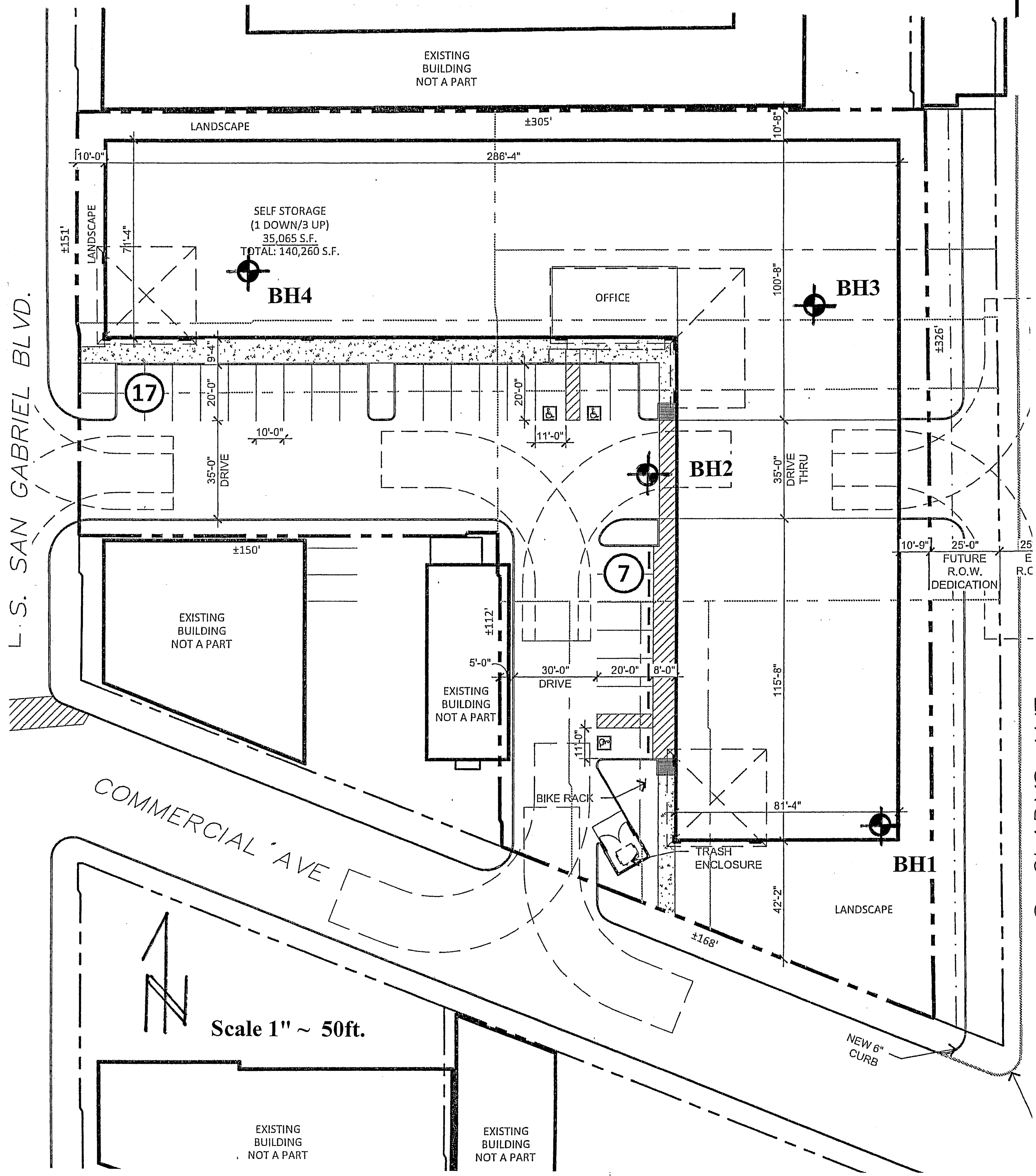
COAST GEOTECHNICAL, INC.

W.O. 565718 Figure 2

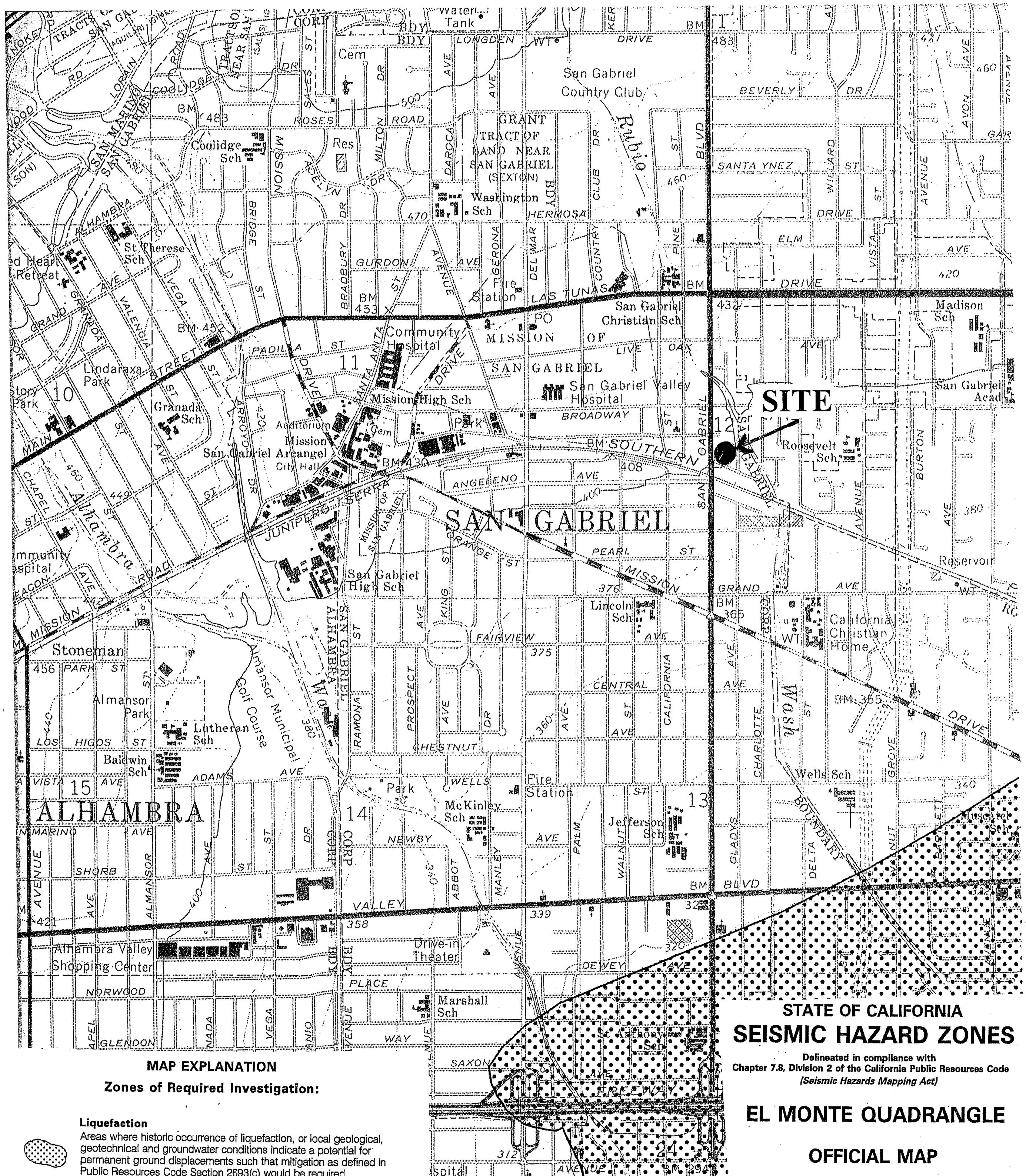
SITE GEOTECHNICAL MAP



COAST GEOTECHNICAL, INC.

W.O. 565718 Figure 3

SEISMIC HAZARD MAP



STATE OF CALIFORNIA

SEISMIC HAZARD ZONES

Delineated in compliance with
Chapter 7.8, Division 2 of the California Public Resources Code
(Seismic Hazards Mapping Act)

EL MONTE QUADRANGLE

OFFICIAL MAP

Released: March 25, 1999

MAP EXPLANATION

Zones of Required Investigation:

Liquefaction
Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Overlapping Liquefaction and Earthquake-Induced Landslides
Areas that lie within zones of required investigation for both liquefaction and earthquake-induced landslides. (See above for explanation of each zone.)

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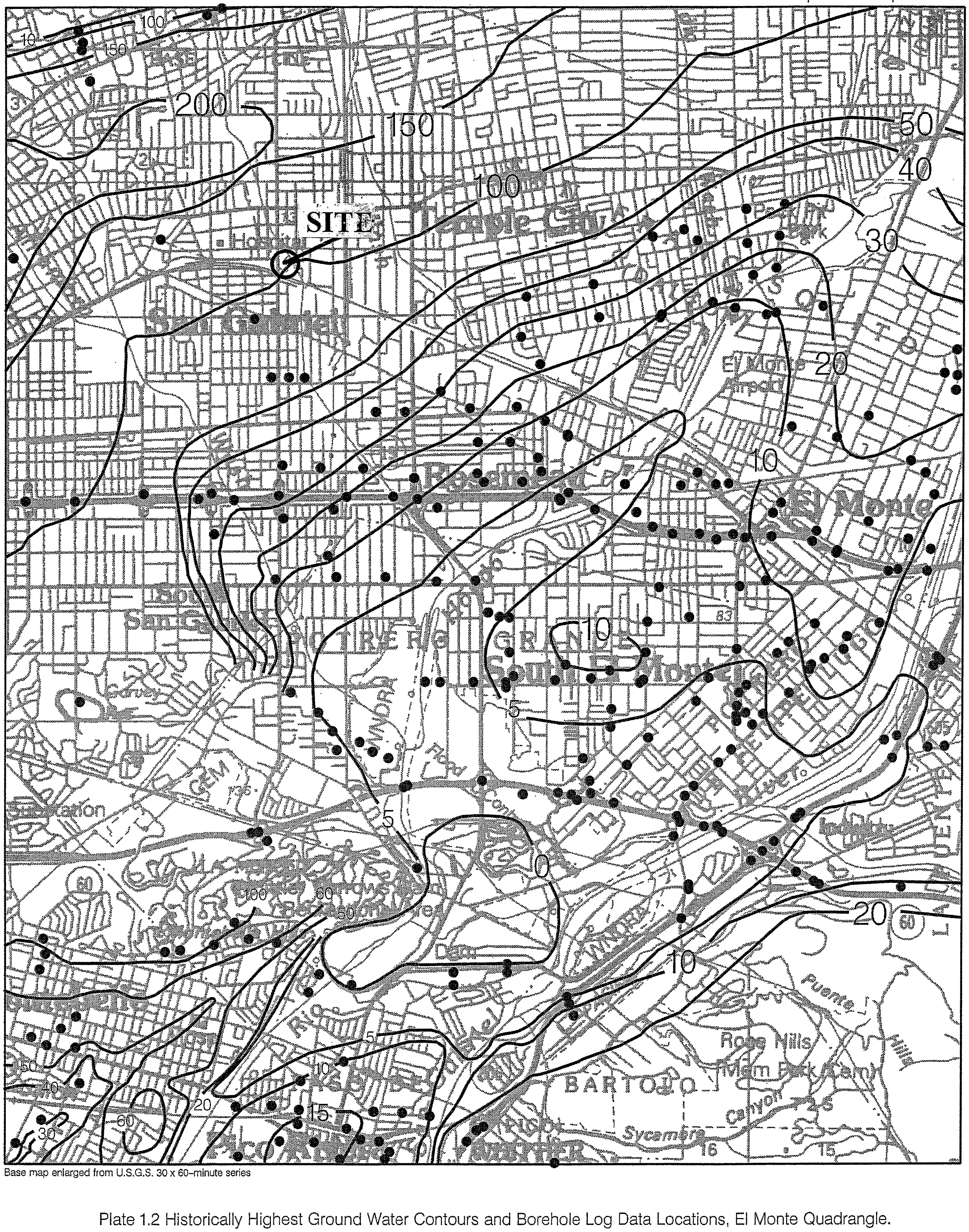
COAST GEOTECHNICAL, INC.

W.O. 565718 ***Figure 4***

HISTORIC HIGH GROUNDWATER MAP

Open–File Report 98–15



Base map enlarged from U.S.G.S. 30 x 60–minute series

Plate 1.2 Historically Highest Ground Water Contours and Borehole Log Data Locations, El Monte Quadrangle.

● Borehole Site

30 Depth to ground water in feet

COAST GEOTECHNICAL, INC.

W.O. 565718 Figure 5

(Text Supercedes)

PLATE A

EXPANSION INDEX	VERY LOW 0 - 20	LOW 21 - 50	MEDIUM 51 - 90	HIGH 91 - 130	VERY HIGH 130+
Footing Width 1 Story 2 Story 3 Story	 12” 15” 18"	 12” 15” 18"	 12” 15” 18"	 15” 15” 18"	 15” 15” 18"
Exterior Footing Depth 1 Story 2 Story	 24” 24”	 24” 24”	 24” 24”	 24” 24”	 30” 36”
Interior Footing Depth 1 Story 2 Story	 24” 24”	 24” 24”	 24” 24”	 24” 24”	 36” 36”
Footing Reinforcement	4 #5 Bars 2 Top 2 Bottom	4 #5 Bars 2 Top 2 Bottom	4 #5 Bars 2 Top 2 Bottom	4 #5 Bars 2 Top 2 Bottom	4 #5 Bars 2 Top 2 Bottom
Slab Thickness	5” Nominal	5” Nominal	5” Nominal	5” Actual	5” Actual
Slab Reinforcement	#4 Bars on 12” Centers Both Ways	#4 Bars on 12” Centers Both Ways	#4 Bars on 12” Centers Both Ways	#4 Bars on 12” Centers Both Ways	#4 Bars on 12” Centers Both Ways
Moisture Barrier (2)	15 mil Vapor Barrier 2” Sand	15 mil Vapor Barrier 2” Sand	15 mil Vapor Barrier 2” Sand	15 mil Vapor Barrier 2” Sand	15 mil Vapor Barrier 2” Sand
Garage Slab Reinforcement	#4 Bars on 12” Centers Both Ways	#4 Bars on 12” Centers Both Ways	#4 Bars on 12” Centers Both Ways	#4 Bars on 12” Center Both Ways Free Floating	#4 Bars on 12” Center Both Ways Free Floating
Grade Beam - Garage Entrance	Same as Adj. Ext. Ftg.	Same as Adj. Ext. Ftg.	Same as Adj. Ext. Ftg.	Same as Adj. Ext. Ftg.	Same as Adj. Ext. Ftg.
Subgrade	4” Clean Aggregate (1/2 inch or larger)	4” Clean Aggregate (1/2 inch or larger)	4” Clean Aggregate (1/2 inch or larger)	4” Clean Aggregate (1/2 inch or larger)	4” Clean Aggregate (1/2 inch or larger)
Presaturation	Not Required	Above Opt. To Depth of Ftg. (No Testing)	110% of Opt M/C to Depth Footing	130% of Opt M/C to Depth Footing	130% of Opt M/C to Depth Footing

1. The surrounding areas should be graded so as to ensure drainage away from the building.
2. Concrete floor slab in areas to be covered with moisture sensitive coverings shall be constructed over a 15 mil Stego Wrap or equivalent. The plastic should be properly lapped, sealed and protected filter fabric (Mirifi 140N) and sand.
3. Two inches of sand over moisture barrier in addition to the four-inches of clean aggregate below the membrane.

SUMMARY OF BORING NO. 1

Date: 12/12/2018

Elevation: E.G.

Drive Energy (Kip-Ft.)	Dry Density (Pcf)	Moisture (% Dry Wt.)	Depth (Ft.)	Description	Color	Consistency
				Artificial FILL: SAND --- fine to medium-grained, silty, clayey, moist	Reddish Brown	Loose
3.2	113	7.5		NATIVE: SAND --- slightly slty, slightly clayey, scattered small rocks, moist	Reddish Dark Brown	Loose to Medium Dense
10.5	117	8.9	5			
12.3	121	9.1	10	SAND --- medium-grained, silty, slightly clayey, gravels, moist	Reddish Brown	Medium Dense
				SAND --- medium-grained, silty, gravels, moist	Tan Buff	Medium Dense
28.0	118	2.3	15	SAND --- medium to coarse-grained, slightly silty, gravels, small rocks, damp	Tan Buff Rust Orange	Very Dense
28.0	120	2.9	20	SAND --- medium to coarse-grained, slightly silty, gravels, damp	Rust Tan Buff Orange	Very Dense
16.1	108	3.4	25	SAND --- fine to medium-grained, slightly silty, scattered small rocks, damp	Tan Rust Buff Orange	Dense
32.9	109	6.1	30	SAND --- fine to medium-grained, slightly silty, moist	Orange Buff Brown Tan	Very Dense
			35	End of boring at 31.5 feet No groundwater No caving		

Samples: U B

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabrial, California

Work Order 565718

Plate B

COAST GEOTECHNICAL, INC.

SUMMARY OF BORING NO. 2

Date: 12/12/2018

Elevation: E.G.

Drive Energy (Kip-Ft.)	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples (U B)	Depth (Ft.)	Description	Color	Consistency
					Artificial FILL: SAND --- fine to medium-grained, silty, scattered rocks and concrete debri,moist	Dark Brown Reddish	Medium Dense
					NATIVE: SAND --- silty, slightly clayey, scattered small rocks, damp to moist	Reddish Dark Brown	Medium Dense
10.6	127	7.6	U	5	SAND --- medium-grained, silty, slightly clayey, gravels, moist	Tan Buff	Medium Dense
28.0	120	3.0	U	10	SAND --- medium to coarse-grained, silty, gravels, scattered rocks, moist	Tan Buff Rust	Medium Dense
					SAND --- coarse-grained, slightly silty, scattered	Tan Buff Rust	Dense
24.9	124	6.3	U	15	SAND --- coarse-grained, slightly silty, rocks, damp	Tan Buff Rust Pink	Dense
16.8	120	3.7	U	20	SAND --- coarse-grained, slightly silty,rocks, damp	Tan Buff Rust	Dense
35.0	121	3.5	U	25	SAND --- medium to coarse-grained, slightly silty, gravels, damp	Rust Tan Brown	Very Dense
17.9	102	8.0	U	30	SAND --- medium to coarse-grained, slightly silty, gravel, silty, moist	Orange Buff Brown Tan	Dense
				35	End of boring at 31.5 feet No groundwater No caving		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabrial, California

Work Order 565718

Plate C

COAST GEOTECHNICAL, INC.

SUMMARY OF BORING NO. 3

Date: 12/12/2018

Elevation: E.G.

Drive Energy (Kip-Ft.)	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples (U B)	Depth (Ft.)	Description	Color	Consistency
					Artificial FILL: SAND --- fine-grained, silty, rootlets, moist	Dark Brown	Medium Dense
					NATIVE: SAND --- silty, slightly clayey, scattered small rocks, damp to moist	Reddish Brown	Medium Dense
7.0	111	2.8	U	5	SAND --- fine to medium-grained, silty, scattered rocks, damp	Tan Buff	Medium Dense
23.5	124	2.0	U	10	SAND --- medium to coarse-grained, silty, gravels, very rock, damp	Buff Rust Tan	Dense
28.0	119	4.1	U	15	SAND --- coarse-grained, slightly silty, gravel, rocks, damp	Buff Rust Orange Tan	Very Dense
22.8	113	7.6	U	20	SAND --- coarse-grained, slightly silty, very rocky, moist	Buff Orange Brown Rust	Dense
21.4	111	9.8	U	25	SAND --- coarse-grained, slightly silty, rocky, moist	Brown Orange Buff Rust	Dense
24.5	104	8.3	U	30	SILT --- sandy, moist	Dark Brown Reddish	Hard
				35	End of boring at 31.5 feet No groundwater No caving		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabrial, California

Work Order 565718

Plate D

COAST GEOTECHNICAL, INC.

SUMMARY OF BORING NO. 4

Date: 12/12/2018

Elevation: E.G.

Drive Energy (Kip-Ft.)	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples (U B)	Depth (Ft.)	Description	Color	Consistency
					Artificial FILL: SAND --- fine-grained, silty, clayey,moist	Dark Brown	Loose
10.3	112	8.1	U		NATIVE: SAND --- fine-grained, silty, slightly clayey, scattered small rocks, damp to moist	Dark Reddish Brown	Loose
10.8	117	8.8	U	5	SAND --- fine to medium-grained, silty, clayey, rocky, moist	Reddish Brown	Loose to Dense
					SAND --- medium to coarse-grained, silty, rocky, damp	Tan Buff	Dense
19.3	127	2.5	U	10	SAND --- medium to coarse-grained, silty, very rocky, gravels, damp	Tan Buff Rust Pink	Dense
30.1	116	5.0	U	15	SAND --- coarse-grained, silty, rocky, damp	Tan Buff Orange Rust	Very Dense
23.8	117	4.5	U	20	SAND --- medium to coarse-grained, slightly silty, gravels, damp	Rust Tan Buff Orange	Dense
28.0	119	3.4	U	25	SAND --- coarse-grained, slightly silty rocky, damp	Buff Rust Brown	Very Dense
25.2	118	7.2	U	30	SAND --- fine to medium-grained, silty, moist	Dark Brown Rust Buff	Dense
				35	End of boring at 31.5 feet No groundwater No caving		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabrial, California

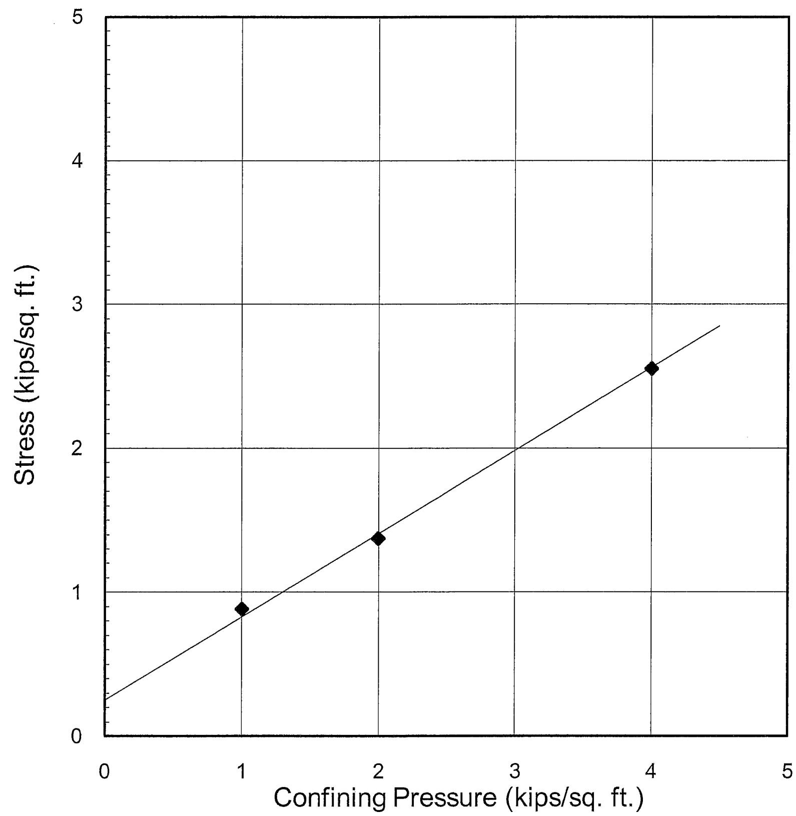
Work Order 565718

Plate E

COAST GEOTECHNICAL, INC.

SHEAR TEST RESULT

Boring No.1 @ 0 to 5 Feet (Remolded to 90%)



Remolded soil samples were tested at saturated conditions.

The sample had a dry density of 113 lbs./cu.ft. and a moisture content of 17.8 %.

Cohesion = 250 psf

Friction Angle = 30 degrees

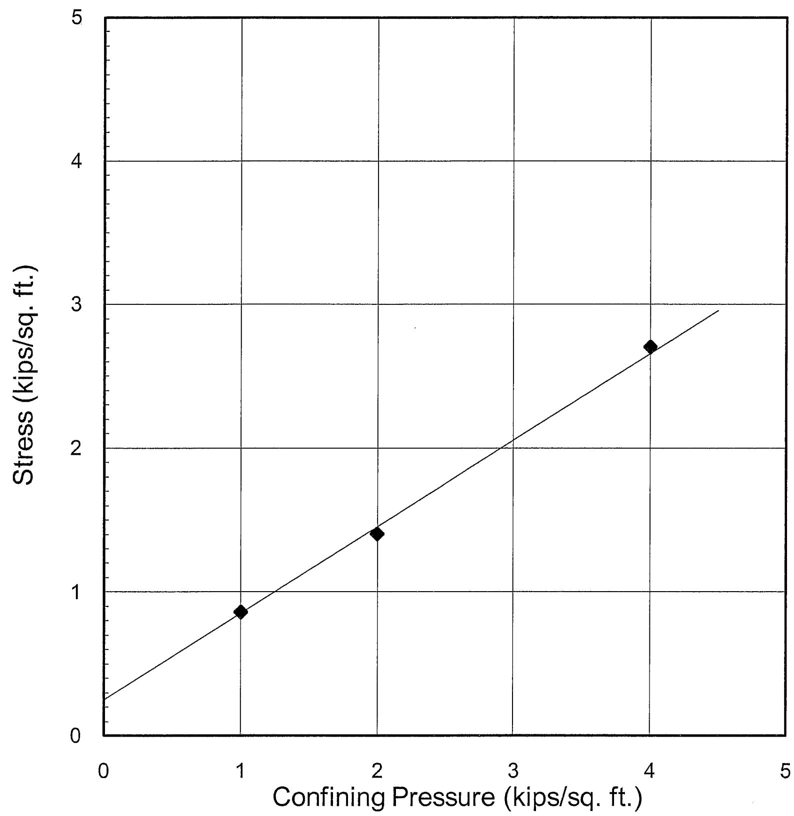
Based on 80% peak strength or ultimate strength, whichever is lower

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, CA	Work Order 565718
	Plate F

COAST GEOTECHNICAL, INC.

SHEAR TEST RESULT

Boring No. 1 @ 10 Feet



Native samples were tested at saturated conditions.

The sample had a dry density of 121 lbs./cu.ft. and a moisture content of 14.2 %.

Cohesion = 250 psf

Friction Angle = 31 degrees

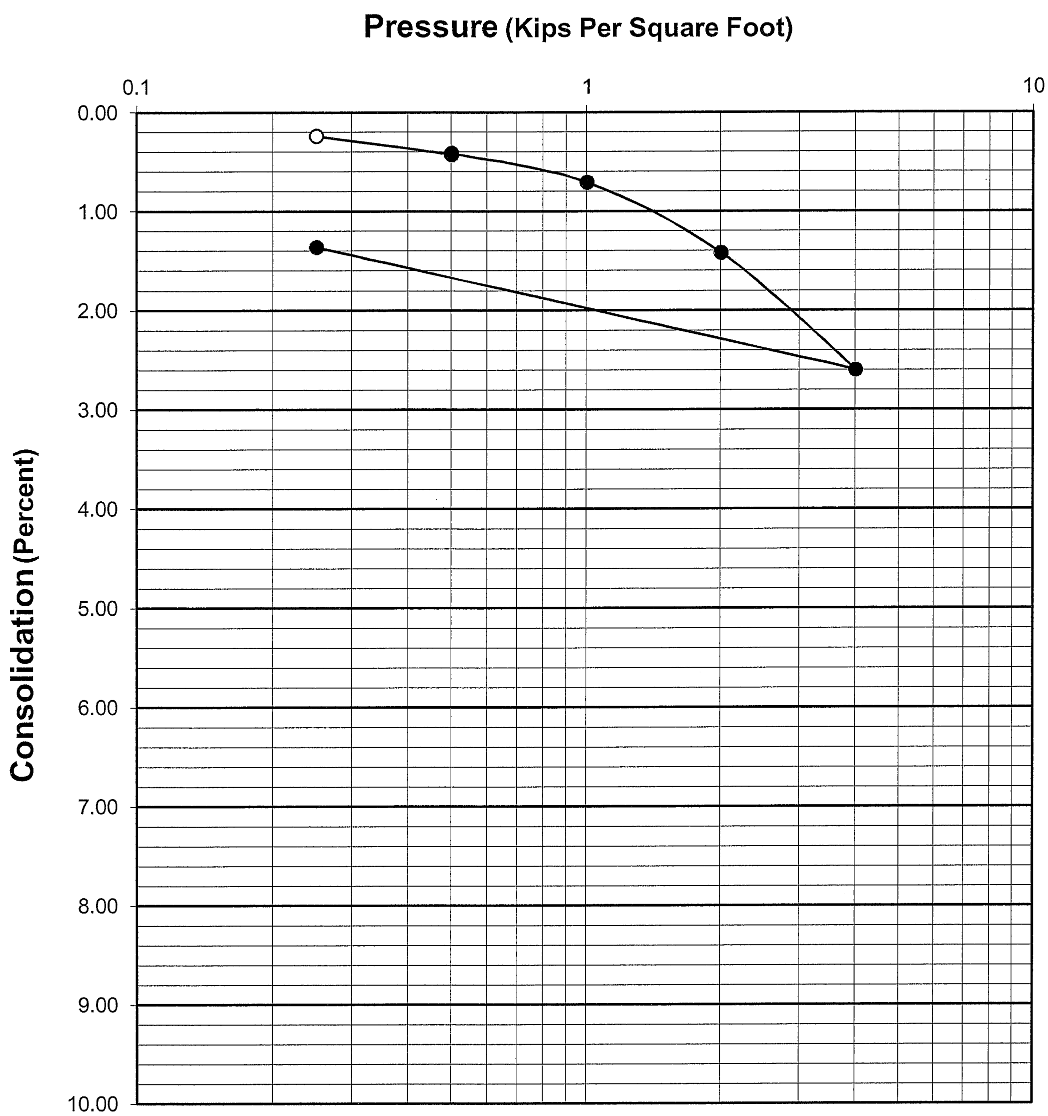
Based on 80% peak strength or ultimate strength, whichever is lower

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, CA	Work Order	565718
	Plate	G

COAST GEOTECHNICAL, INC.

CONSOLIDATION TEST RESULTS

Boring No.1 @ 5 Feet



○ Test Specimen at In-Situ Moisture

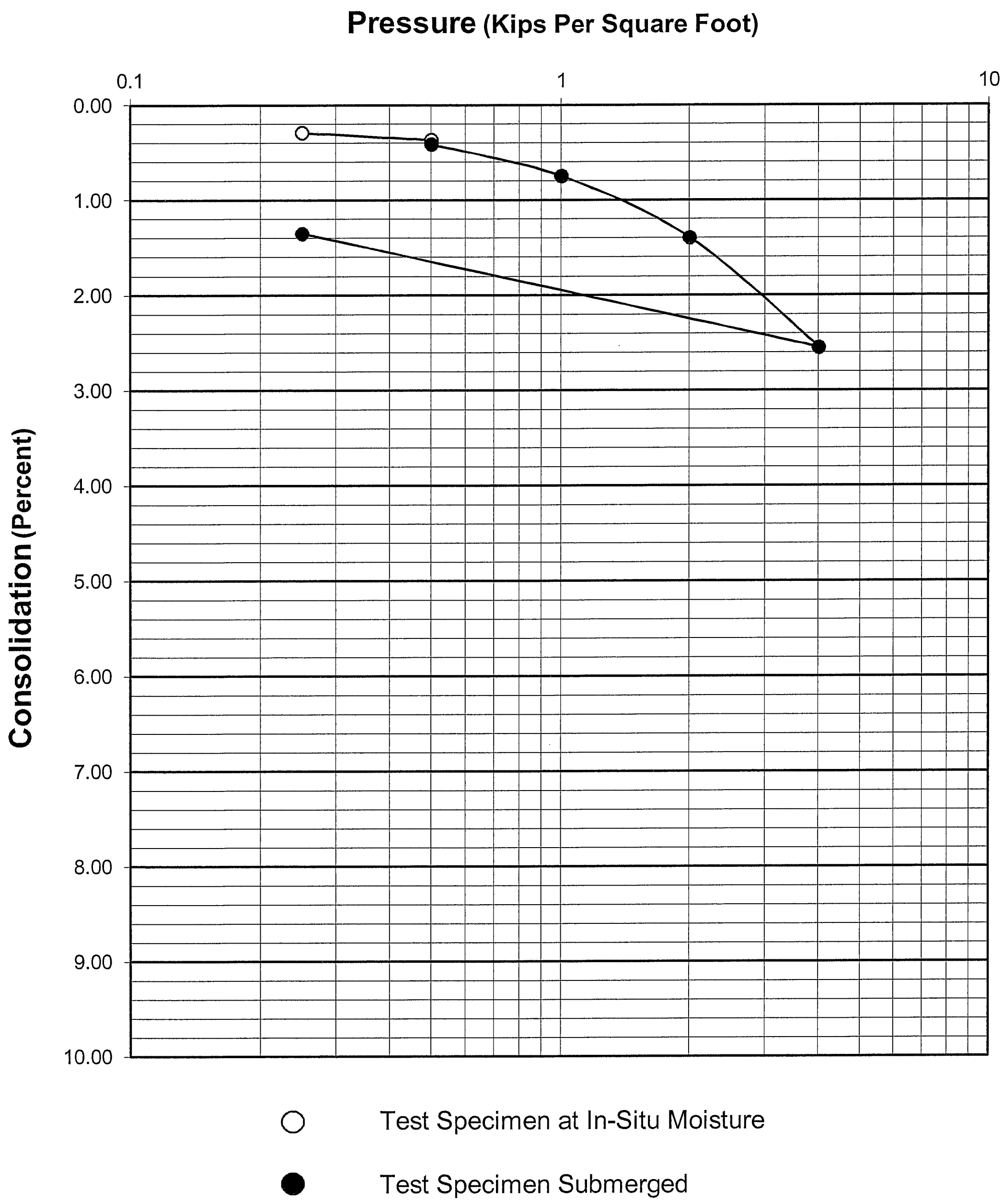
● Test Specimen Submerged

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718
	Plate No. H

COAST GEOTECHNICAL, INC.

CONSOLIDATION TEST RESULTS

Boring No.1 @ 10 Feet



Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718
	Plate No. I

COAST GEOTECHNICAL, INC.

ALLOWABLE BEARING CAPACITY

Bearing Capacity Calculations are based on "Terzaghi's Bearing Capacity Theory"

Bearing Material: Compacted fill

Properties:

Wet Density (γ)	=	125	pcf
Cohesion (C)	=	250	psf
Angle of Friction (ϕ)	=	30	degrees
Footing Depth (D)	=	2	feet
Footing Width (B)	=	1.0	foot
Factor of Safety	=	3.0	

Calculations - Ultimate Bearing Capacity

from Table 3.1 on page 127 of "Foundation Engineering Handbook", 1975

$N_c = 30.14$ $N_q = 18.4$ $N_\gamma = 22.4$

$Q_u = 1.3\, C\, N_c + \gamma\, D\, N_q + 0.4\, \gamma\, B\, N_\gamma$ (Square Footing)

$= 1.3 * 250 * 30.14 + 125 * 2 * 18.4 + 0.4 * 125 * 1 * 22.4$

$= 9795 + 4600 + 1120 = 15515$ psf

Allowable Bearing Capacity for Square Footing

$Q_{all} = Q_u / F.S. =$ 5171 psf

Use 2000 psf

$Q_u = 1.0\, C\, N_c + \gamma\, D\, N_q + 0.5\, \gamma\, B\, N_\gamma$ (Continuous Footing)

$= 1.0 * 250 * 30.14 + 125 * 2 * 18.4 + 0.5 * 125 * 1 * 22.4$

$= 7535 + 4600 + 1400 = 13535$ psf

Allowable Bearing Capacity for Continuous Footing

$Q_{all} = Q_u / F.S. =$ 4511 psf

Use 2000 psf

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718 Plate J

COAST GEOTECHNICAL, INC.

CALCULATION OF SUBGRADE REACTION

Subgrade reaction calculations are based on "Foundation Analysis and Design" Fourth Edition, by Joseph E. Bowles.

$Ks = 24\ q_{ult}$ (for ΔH = 1/2 inch)

Where:

Ks = subgrade reaction in k / ft^3

q_{ult} = ultimate bearing capacity

For q_{ult} = 9.4 ksf (from bearing capacity calculations)

Ks = 24 * 9.4 k / ft^3

= 225.6* 1000 / (12 * 12 * 12) lb / in^3

= 130.6 lb / in^3

Use 100 pound per cubic inch

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718
	Plate No. K

COAST GEOTECHNICAL

LATERAL EARTH PRESSURE CALCULATIONS

Retaining structures such as retaining walls, basement walls, and bulk-heads are commonly used in foundation engineering, and they support almost vertical slopes of earth masses. Proper design and construction of these structures require a through knowledge of the lateral forces acting between the retaining structures and the soil masses being retained. These lateral forces are due to lateral earth pressure.

Properties of earth material: Compacted fill

Wet Density (γ)	=	125	pcf
Cohesion (C)	=	250	psf
Angle of Friction (ϕ)	=	30	degrees

Coefficient of Friction = tan ϕ

Therefore,

Coefficient of Friction = tan ϕ

= tan ϕ = 0.577 Use 0.35

Assumed H = 5 feet

$Pp = 0.5 \gamma H^2 \tan^2 (45^0 + \phi / 2) + 2 C H \tan (45^0 + \phi / 2)$

= 0.5 * 125 * 25 * 3 + 2 * 250 * 5 * 1.732

= 4688 + 4330 = 9018 lbs / LF

$1/2$ EFP H^2 = 9018 EFP: passive pressure

EFP = 721 psf / LF

Allowable Passive Pressure = 300 psf / LF (with F.S. = 2.4)

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718 Plate L

COAST GEOTECHNICAL, INC.

LATERAL EARTH PRESSURE CALCULATIONS

Retaining structures such as retaining walls, basement walls, and bulk-heads are commonly used in foundation engineering, and they support almost vertical slopes of earth masses. Proper design and construction of these structures require a through knowledge of the lateral forces acting between the retaining structures and the soil masses being retained. These lateral forces are due to lateral earth pressure.

Properties of earth material: Native soil

Wet Density (γ)	=	125	pcf
Cohesion (C)	=	250	psf
Angle of Friction (ϕ)	=	31	degrees

Coefficient of Friction = tan ϕ

Therefore,

Coefficient of Friction = tan ϕ

= tan ϕ = 0.601 Use 0.35

Assumed H = 5 feet

$Pp = 0.5 \gamma H^2 \tan^2 (45^0 + \phi / 2) + 2 C H \tan (45^0 + \phi / 2)$

= 0.5 * 125 * 25 * 3.122 + 2 * 250 * 5 * 1.767

= 4878 + 4418 = 9296 lbs / LF

1/2 EFP H^2 = 9296 EFP: passive pressure

EFP = 744 psf / LF

Allowable Passive Pressure = 300 psf / LF (with F.S. = 2.48)

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718 Plate M

COAST GEOTECHNICAL, INC.

ACTIVE EARTH PRESSURE BY COULOMB THEORY

The total active thrust can be expressed as

$P_A = 0.5\ K_A\ \gamma\ H^2$

where the active earth pressure coefficient, K_A, is given by

$$K_A = \frac{\cos^2(\phi - \theta)}{\cos^2\theta\ \cos(\delta + \theta)\ \left\{ 1 + \left[\frac{\sin(\delta + \phi)\ \sin(\phi - \beta)}{\cos(\delta + \theta)\ \cos(\beta - \theta)} \right]^{0.5} \right\}^2}$$

Where:

θ = slope of the back of the wall with respect to the vertical

δ = angle of friction between the wall and the soil

β = slope of the backfill with respect to the horizontal

Properties of earth material:

Wet Density (γ)	=	125	pcf
Cohesion (C)	=	250	psf
Angle of Friction (ϕ)	=	30	degrees
θ	=	0	
δ	=	20	

Caculate K_A based on slope of the backfill

Surface Slope	Slope Angle (β)	K_A	EFP [$= \gamma * K_A$], pcf
Level	0.0	0.297	37.2
5:1 (H:V)	11.3	0.347	43.4
4:1 (H:V)	14.0	0.364	45.5
3:1 (H:V)	18.4	0.399	49.8
2:1 (H:V)	26.6	0.524	65.6
1.5:1 (H:V)	33.7	0.798	99.8

LATERAL EARTH PRESSURE CALCULATIONS

Retaining structures such as retaining walls, basement walls, and bulk-heads are commonly used in foundation engineering, and they support almost vertical slopes of earth masses. Proper design and construction of these structures require a through knowledge of the lateral forces acting between the retaining structures and the soil masses being retained. These lateral forces are due to lateral earth pressure.

Properties of earth material:

Wet Density (γ)	=	125	pcf
Cohesion (C)	=	250	psf
Angle of Friction (ϕ)	=	30	degrees

Coefficient of earth pressure at rest (Jaky, 1944), $K_0 = 1 - \sin\phi$

K_0 = 0.500

Therefore,

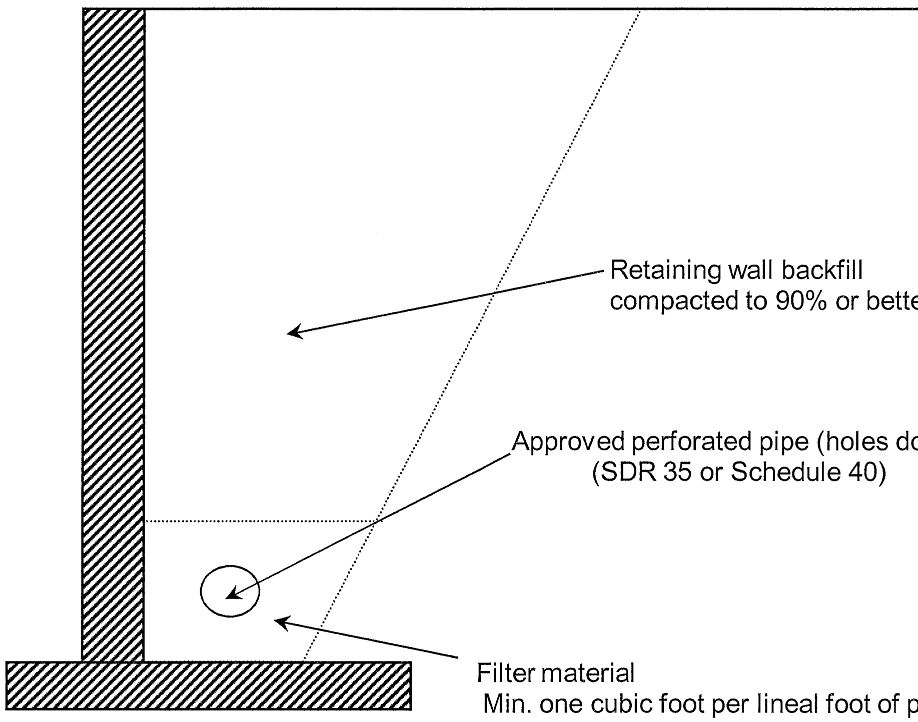
Earth pressure at rest

= γK_0 = 62.5 psf / LF

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718 Plate O

COAST GEOTECHNICAL, INC.

TYPICAL RETAINING WALL SUBDRAIN DETAIL



Filter material to meet following specification or approved equal:

Sieve Size	Percentage 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

Alternate is to place pipe in 3/4-inch gravel blanket which is wrapped in filter cloth. Filter cloth shall be Mirafi 140N, Amoco 4537 or product equivalent approved by COAST GEOTECHNICAL.

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718 Plate No. P

COAST GEOTECHNICAL, INC.

APPENDIX B

Seismic design data output

OSHPD

420 S San Gabriel Blvd, San Gabriel, CA 91776, USA

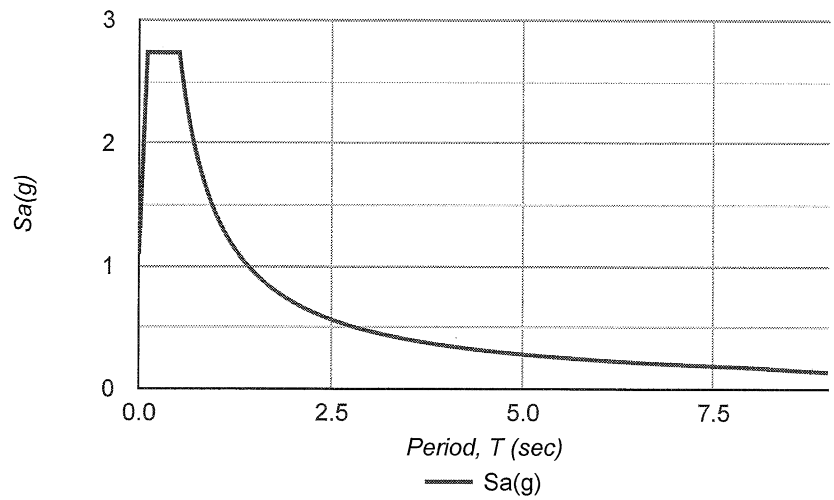
Latitude, Longitude: 34.097145, -118.09051999999997

Date	1/9/2019, 8:18:07 AM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	D - Stiff Soil

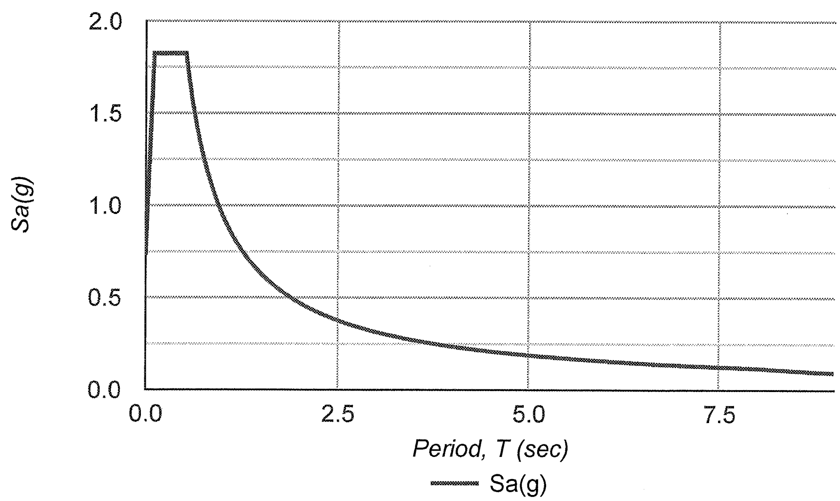
Type	Value	Description
S_S	2.737	MCE_R ground motion. (for 0.2 second period)
S_1	0.939	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.737	Site-modified spectral acceleration value
S_{M1}	1.409	Site-modified spectral acceleration value
S_{DS}	1.825	Numeric seismic design value at 0.2 second SA
S_{D1}	0.939	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	E	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	1.031	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	1.031	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.737	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.894	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.882	Factored deterministic acceleration value. (0.2 second)
S1RT	0.946	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.992	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.939	Factored deterministic acceleration value. (1.0 second)
PGAd	1.101	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.946	Mapped value of the risk coefficient at short periods
C_{R1}	0.954	Mapped value of the risk coefficient at a period of 1 s

MCER Response Spectrum

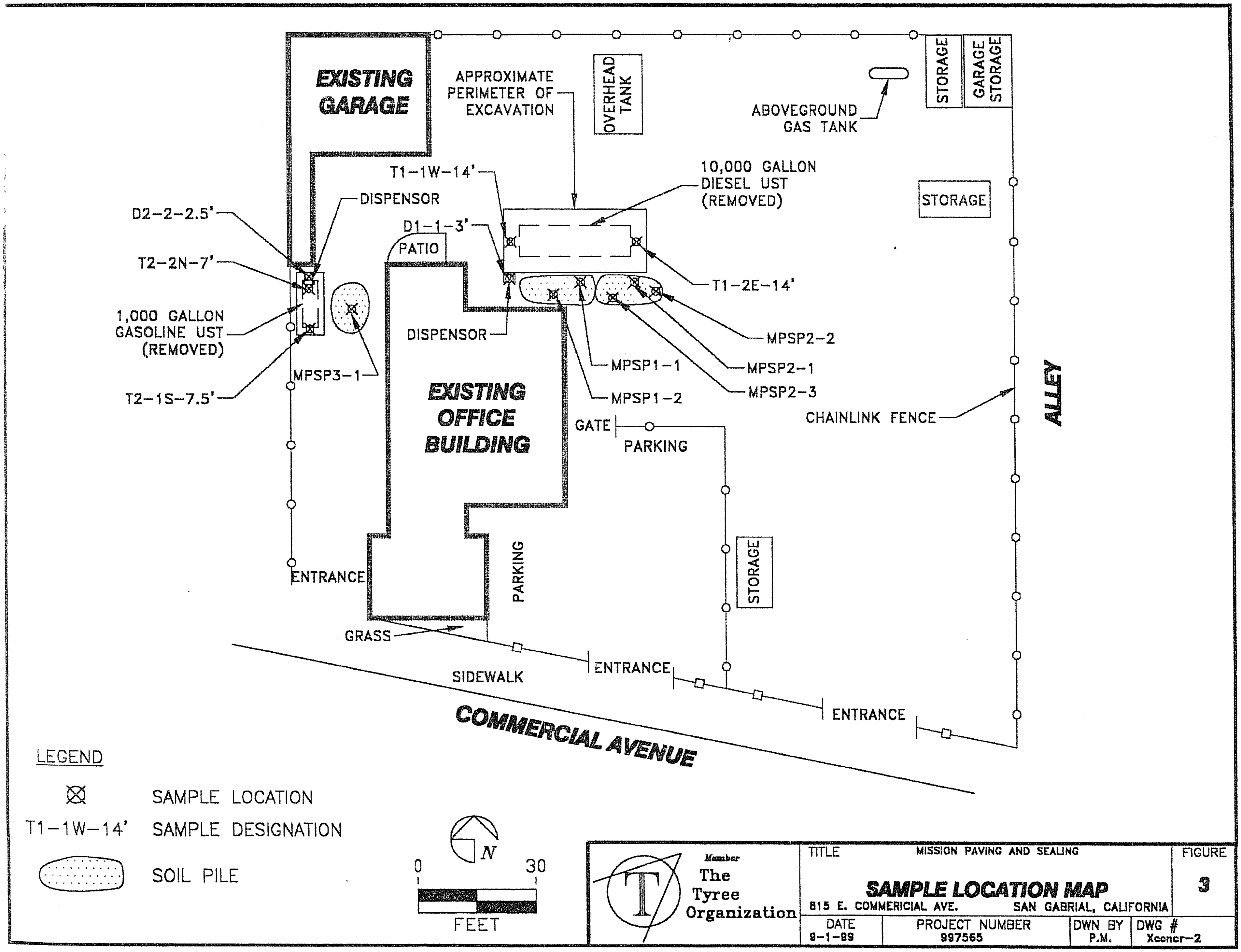


Design Response Spectrum



APPENDIX C

Records


EXISTING GARAGE
APPROXIMATE PERIMETER OF EXCAVATION
OVERHEAD TANK
ABOVEGROUND GAS TANK
STORAGE
GARAGE STORAGE
10,000 GALLON DIESEL UST (REMOVED)
STORAGE
T1-1W-14'
DISPENSOR
D2-2-2.5'
D1-1-3'
PATIO
T2-2N-7'
1,000 GALLON GASOLINE UST (REMOVED)
T1-2E-14'
DISPENSOR
MPSP2-2
MPSP3-1
MPSP1-1
MPSP2-1
MPSP2-3
T2-1S-7.5'
MPSP1-2
EXISTING OFFICE BUILDING
GATE
PARKING
CHAINLINK FENCE
ALLEY
STORAGE
ENTRANCE
PARKING
GRASS
SIDEWALK
ENTRANCE
ENTRANCE
COMMERCIAL AVENUE
LEGEND
SAMPLE LOCATION
T1-1W-14' SAMPLE DESIGNATION
SOIL PILE
N
0
30
FEET
Member
The Tyree Organization
TITLE
MISSION PAVING AND SEALING
SAMPLE LOCATION MAP
815 E. COMMERICIAL AVE.
SAN GABRIAL, CALIFORNIA
FIGURE
3
DATE
9-1-99
PROJECT NUMBER
997565
DWN BY
P.M.
DWG #
Xconcr-2

COAST GEOTECHNICAL, INC.
1200 West Commonwealth Ave., Fullerton, CA 92833 ▪ Ph: (714) 870-1211 ▪ Fax: (714) 870-1222 ▪ e-mail: coastgeotec@sbcglobal.net

May 5, 2020 W.O. 565718-03

Mr. Kelly McKone
1784 Capitol Holdings, LLC
8777 North Gainey Drive, Suite 191
Scottsdale, AZ 85250

Subject: Response to Outside Geotechnical Review Sheet for Proposed Self Storage Facility at 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue, San Gabriel, California

References:

1. Geotechnical Engineering Investigation for Proposed Self Storage Facility at 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue, San Gabriel, California; by COAST GEOTECHNICAL, W.O. 565718-01, dated January 16, 2019.

2. Geotechnical Assessment of Stockpiled Import Material at 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue, San Gabriel, California; by COAST GEOTECHNICAL, W.O. 565718-02, dated September 25, 2019.

Dear Mr. McKone:

In accordance with your request, this report has been prepared to address geotechnical comments issued by Ninyo and Moore in their letter dated April 2, 2020. The review sheet is attached and our responses follow.

Comment #1

Based on the review of the Preliminary Grading Plan by Blue Peak Engineering, dated October 31, 2019, project grading recommendations within Reference 1 are still applicable without revision. Final grading plans will be reviewed at a later date when submitted to this consultant. Project grading recommendations are subject to change based on review of final documents.

Comment #2

The Phase II Subsurface Investigation report referenced by the reviewer was read.

Our Reference 1 contains recommendations for removal of earth materials where adjacent property could be affected in the following bullet points from page 8 of Reference 1.

- Care shall be taken during site construction not to remove lateral and or vertical support from adjacent properties.

- Construction cuts that cannot be made within the guidelines of this report will need to be supported with designed shoring. The shoring design would need to take into account removal depths needed for site grading and surcharges.

Specifically, removal of undocumented UST backfill shall be to competent native earth materials. Competent native earth materials shall be field determined by Coast Geotechnical. The exposed bottom shall be moisture conditioned, and mechanically compacted to a minimum of 90% relative compaction.

Subsequent backfill of the area may be with fill soils placed in accordance with Reference 1, or alternate material approved by Coast Geotechnical, Inc.

Comment #3

Report sections updated to the 2019 CBC follow:

SEISMIC DESIGN

Based on the 2019 CBC the following seismic design parameters are provided. These seismic design values were determined utilizing latitude 34.097145 and longitude -118.09052, and data from the USGS Seismic Design Maps through a third party application by SEA. The data output by SEA is appended.

- Site Class = D
- Mapped 0.2 Second Spectral Response Acceleration, Ss = 2.046g
- Mapped One Second Spectral Response Acceleration S_1 = 0.724g
- Site Coefficient from Table 1613A5.3(1), Fa = 1.0
- Site Coefficient from Table 1613A5.3(2), Fv = (1)
- Maximum Design Spectral Response Acceleration for short period, S_{MS} = 2.046
- Maximum Design Spectral Response Acceleration for one-second period, S_{M1} = (1)
- 5% Design Spectral Response Acceleration for short period, S_{DS} = 1.364g
- 5% Design Spectral Response Acceleration for one-second period, S_{D1} = (1)

(1) null-see section 11.4.8 of ASCE 7-16

SEISMIC DESIGN VALUE

Code requires that retaining walls with more than six feet of backfill be designed for a seismic load.

For a retaining wall under earthquake loading the designed equivalent fluid pressure is sensitive to the ground motion value and seismic coefficient (Kh) value utilized in analysis. Regulating jurisdictions in the area differ on how these values are arrived at and some regulating agencies recognize that the calculated ground motion value and the seismic coefficient utilized in analysis of seismic loads are not equivalent and allow the use of a seismic coefficient that is less than the ground motion value.

Where local policy is not present most jurisdictions allow the geotechnical engineer to use their best judgment in arriving at a usable seismic design value. Many jurisdictions allow the use of PGAm as the ground motion value, and 1/3PGAm for use as the seismic coefficient. We concur with the use of this method in design of seismic forces on retaining walls. Based on the 2019 CBC, the PGAm for the site is 0.979g, with 1/3 of that value being 0.326g.

For this project, assessment of seismic loads on retaining walls shall utilize a seismic coefficient (Kh) of 0.326g.

Utilizing a simplified approach for determination of seismic design loads of $\Delta P_{AE} = 3/4\ \gamma$ Kh, a value of $\Delta P_{AE} = 30.573$ pcf was determined. This seismic design load value shall be added to the static design loads. The client is advised that if through review it becomes evident that the City requires an alternate seismic design analysis that differing design values could be required.

Comment #4

The text of the report is corrected as follows:

Artificial fills encountered consisted of dark brown silty sand, moist, and loose to medium dense. Artificial fills are opinioned undocumented and require mitigation for support of future improvements and or fills.

Comment #5

A legend for the boring logs is as follows:

U	Undisturbed sample by California split spoon sampler
B	Bulk bag sample
3/4/5	Blows counts per six inches of driven length

Comment #6

The boring logs, from Reference 1, have been reformatted to satisfy the reviewer's need to show blow counts. The revised boring logs are attached.

Comment #7

The boring logs, from Reference 1, have been reformatted to satisfy the reviewer's demand that their terminology of Apparent Density be used for a column heading instead of Consistency. The revised boring logs are attached.

COAST GEOTECHNICAL, INC.

Comment #8

The reviewer is correct. The text should refer to the San Fernando/Sylmar earthquake.

Comment #9

The comment by the reviewer is acknowledged. When shoring plans have been prepared they shall be forwarded to this office for review and comment.

Comment #10

The referenced recommendation is common to our reports to address where basement walls are backfilled with gravels, and is intended to mitigate foundation bottoms designed over a gravel backfill zone, from bearing on the gravel backfill and or being excavated into the gravel backfill.

Comment #11

The statement is acknowledged.

The civil engineer will need to modify his final design to comply with the applicable CBC and our project reports, or seek from the building official approval of a non-complying design.

Comment #12

The use of infiltration methods of storm water disposal is technically feasible based on the granular nature of subsurface earth materials; however, a letter from the Los Angele Regional Water Quality Control Board dated May 30, 2019 raises issue that residual petroleum hydrocarbons may be present onsite. With this risk present the use of infiltration methods of storm water disposal are not recommended as the infiltrated waters could mobilize potential petroleum hydrocarbons.

Comment #13

The statement is acknowledged.

We appreciate this opportunity to be of service to you.

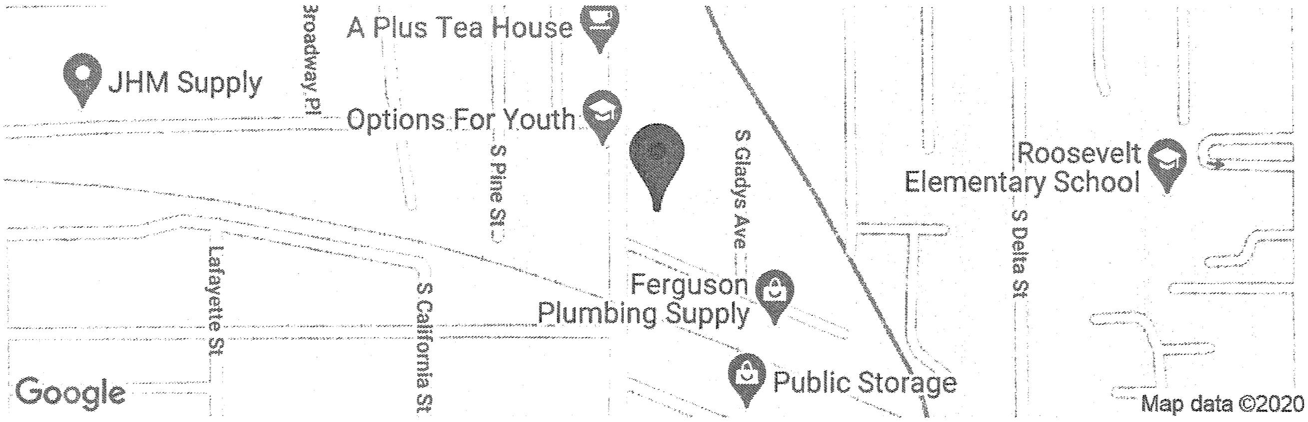
Respectfully submitted:
COAST GEOTECHNICAL

Ming-Tarng Chen
RCE 54011

REGISTERED PROFESSIONAL ENGINEER
MING-TARNG CHEN
No. 54011
Exp. 12/31/21
CIVIL
STATE OF CALIFORNIA

OSHPD

Latitude, Longitude: 34.097145, -118.09052



Date	5/4/2020, 4:32:19 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	2.046	MCE_R ground motion. (for 0.2 second period)
S_1	0.724	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.046	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.364	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.89	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.979	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.046	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.319	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.398	Factored deterministic acceleration value. (0.2 second)
S1RT	0.74	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.834	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.724	Factored deterministic acceleration value. (1.0 second)
PGAd	0.955	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.882	Mapped value of the risk coefficient at short periods
C_{R1}	0.887	Mapped value of the risk coefficient at a period of 1 s

SUMMARY OF BORING NO. 1

Date: 12/12/2018

Elevation: E.G.

Blow Counters	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples (U B)	Depth (Ft.)	Description	Color	Apparent Density
					Artificial FILL: SAND --- fine to medium-grained, silty, clayey, moist	Reddish Brown	Loose
3/4/5	113	7.5			NATIVE: SAND --- slightly slty, slightly clayey, scattered small rocks, moist	Reddish Dark Brown	Loose to Medium Dense
3/5/7	117	8.9		5			
7/12/23	121	9.1		10	SAND --- medium-grained, silty, slightly clayey, gravels, moist	Reddish Brown	Medium Dense
					SAND --- medium-grained, silty, gravels, moist	Tan Buff	Medium Dense
23/30/50	118	2.3		15	SAND --- medium to coarse-grained, slightly silty, gravels, small rocks, damp	Tan Buff Rust Orange	Very Dense
20/35/45	120	2.9		20	SAND --- medium to coarse-grained, slightly silty, gravels, damp	Rust Tan Buff Orange	Very Dense
12/16/30	108	3.4		25	SAND --- fine to medium-grained, slightly silty, scattered small rocks, damp	Tan Rust Buff Orange	Dense
26/47/47	109	6.1		30	SAND --- fine to medium-grained, slightly silty, moist	Orange Buff Brown Tan	Very Dense
				35	End of boring at 31.5 feet No groundwater No caving by California split spoon sampler		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabriel , California

Work Order 565718

Plate B (Revised)

COAST GEOTECHNICAL, INC.

SUMMARY OF BORING NO. 2

Date: 12/12/2018

Elevation: E.G.

Blow Counters	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples (U B)	Depth (Ft.)	Description	Color	Apparent Density
					Artificial FILL: SAND --- fine to medium-grained, silty, scattered rocks and concrete debri,moist	Dark Brown Reddish	Medium Dense
					NATIVE: SAND --- silty, slightly clayey, scattered small rocks, damp to moist	Reddish Dark Brown	Medium Dense
12/14/14	127	7.6		5	SAND --- medium-grained, silty, slightly clayey, gravels, moist	Tan Buff	Medium Dense
17/30/50	120	3.0		10	SAND --- medium to coarse-grained, silty, gravels, scattered rocks, moist	Tan Buff Rust	Medium Dense
					SAND --- coarse-grained, slightly silty, scattered	Tan Buff Rust	Dense
18/38/33	124	6.3		15	SAND --- coarse-grained, slightly silty, rocks, damp	Tan Buff Rust Pink	Dense
19/30/18	120	3.7		20	SAND --- coarse-grained, slightly silty,rocks, damp	Tan Buff Rust	Dense
28/50/50	121	3.5		25	SAND --- medium to coarse-grained, slightly silty, gravels, damp	Rust Tan Brown	Very Dense
14/25/26	102	8.0		30	SAND --- medium to coarse-grained, slightly silty, gravel, silty, moist	Orange Buff Brown Tan	Dense
				35	End of boring at 31.5 feet No groundwater No caving by California split spoon sampler		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabriel , California

Work Order 565718

Plate C (Revised)

COAST GEOTECHNICAL, INC.

SUMMARY OF BORING NO. 3

Date: 12/12/2018

Elevation: E.G.

Blow Counters	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples U B	Depth (Ft.)	Description	Color	Apparent Density
					Artificial FILL: SAND --- fine-grained, silty, rootlets, moist	Dark Brown	Medium Dense
					NATIVE: SAND --- silty, slightly clayey, scattered small rocks, damp to moist	Reddish Brown	Medium Dense
7/9/11	111	2.8		5	SAND --- fine to medium-grained, silty, scattered rocks, damp	Tan Buff	Medium Dense
18/27/40	124	2.0		10	SAND --- medium to coarse-grained, silty, gravels, very rock, damp	Buff Rust Tan	Dense
16/38/42	119	4.1		15	SAND --- coarse-grained, slightly silty, gravel, rocks, damp	Buff Rust Orange Tan	Very Dense
15/30/35	113	7.6		20	SAND --- coarse-grained, slightly silty, very rocky, moist	Buff Orange Brown Rust	Dense
15/26/36	111	9.8		25	SAND --- coarse-grained, slightly silty, rocky, moist	Brown Orange Buff Rust	Dense
12/25/45	104	8.3		30	SILT --- sandy, moist	Dark Brown Reddish	Hard
				35	End of boring at 31.5 feet No groundwater No caving by California split spoon sampler		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabriel, California

Work Order 565718

Plate D (Revised)

COAST GEOTECHNICAL, INC.

SUMMARY OF BORING NO. 4

Date: 12/12/2018

Elevation: E.G.

Blow Counters	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples (U B)	Depth (Ft.)	Description	Color	Apparent Density
					Artificial FILL: SAND --- fine-grained, silty, clayey,moist	Dark Brown	Loose
2/3/3	112	8.1			NATIVE: SAND --- fine-grained, silty, slightly clayey, scattered small rocks, damp to moist	Dark Reddish Brown	Loose
4/5/9	117	8.8		5	SAND --- fine to medium-grained, silty, clayey, rocky, moist	Reddish Brown	Loose to Dense
					SAND --- medium to coarse-grained, silty, rocky, damp	Tan Buff	Dense
9/27/28	127	2.5		10	SAND --- medium to coarse-grained, silty, very rocky, gravels, damp	Tan Buff Rust Pink	Dense
13/33/50	116	5.0		15	SAND --- coarse-grained, silty, rocky, damp	Tan Buff Orange Rust	Very Dense
15/28/40	117	4.5		20	SAND --- medium to coarse-grained, slightly silty, gravels, damp	Rust Tan Buff Orange	Dense
22/30/50	119	3.4		25	SAND --- coarse-grained, slightly silty rocky, damp	Buff Rust Brown	Very Dense
17/22/50	118	7.2		30	SAND --- fine to medium-grained, silty, moist	Dark Brown Rust Buff	Dense
				35	End of boring at 31.5 feet No groundwater No caving by California split spoon sampler		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabriel , California

Work Order 565718

Plate E (Revised)

COAST GEOTECHNICAL, INC.

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

April 2, 2020
Project No. 211378001

Ms. Alicia E. Gonzalez
Michael Baker International
5 Hutton Center Drive, Suite 500
Santa Ana, California 92707

Subject: Geotechnical Review for Proposed Self-Storage Facility
414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue
San Gabriel, California

References: Blue Peak Engineering, Inc., 2019, Preliminary Grading Plan, Proposed Self Storage, NEC San Gabriel Blvd. and Commercial Ave., San Gabriel, California, Sheet 1, dated October 31.

Coast Geotechnical, Inc., 2019, Geotechnical Engineering Investigation for Proposed Self Storage Facility at 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue, San Gabriel, California, dated January 16.

Dear Ms. Gonzalez:

In accordance with your request, we have performed a geotechnical review of the referenced geotechnical report prepared by Coast Geotechnical, Inc., pertaining to the proposed self-storage facility located at the northeast corner of South San Gabriel Boulevard and Commercial Avenue in San Gabriel, California. Our review is based on the standards presented in the 2019 California Building Code (CBC) and current standards of practice.

We have noted items that should be addressed by the geotechnical consultant for the project. Our comments are presented below:

1. The geotechnical consultant should review the referenced Preliminary Grading Plan (Blue Peak Engineering, Inc., 2019), as well as final grading plans for the project, and provide updated recommendations, as appropriate.

2. The geotechnical consultant should review the Phase II Subsurface Investigation Report that was submitted to the City that includes additional subsurface exploration data (boring logs) as well as locations of former underground storage tanks (USTs). The consultant recommends that existing UST backfill should be removed and replaced as compacted fill. The consultant should provide specific remedial grading recommendations for the UST backfill that is located adjacent to a property boundary and existing offsite building that could be undermined during remedial excavations to remove such bakfill.

3. The geotechnical consultant should provide updated seismic design criteria in accordance with the 2019 California Building Code.

4. On Page 4 of the report, the geotechnical consultant describes the fill materials as soft to firm sandy silt. This description does not match the description of fill on the boring logs. The fill materials are described on the boring logs as loose to medium dense silty sand. The consultant should correct this discrepancy.

5. The consultant shall include a Legend page for the boring logs describing the symbols and abbreviations used on the logs.

6. The boring logs should be modified to show the sampler blowcounts.

7. The boring logs should be modified to include a column that describes the "Apparent Density" of the soil samples collected. In its current form, it only includes a "Consistency" column which applies to soils with plasticity only. The soil descriptions provided under the "Consistency" column represent granular, non-plastic soils in every boring. The word "Consistency" is not applicable to such soils.

8. In the Seismicity section of the report, the consultant mentions the 1971 San Francisco earthquake. The consultant should clarify if they are referring to the 1971 San Fernando/Sylmar earthquake that resulted in the Alquist-Priolo Earthquake Fault Zoning Act.

9. As indicated on Page 12 of the report, the shoring plans should be reviewed by the geotechnical consultant to confirm that they have been prepared in accordance with their recommendations and that the shoring system has been designed such that it will protect adjacent commercial building structures and City streets/utilities.

10. The consultant should clarify the statement on Page 17 of the report regarding the retaining wall backfill soil cap being a minimum of two and a half feet thick or "one foot below footing bottoms, whichever is deeper".

11. The surface drainage conditions shown on the referenced Preliminary Grading Plan adjacent to the buildings do not meet the CBC guidelines or recommendations of the geotechnical consultant (Page 19 of the report) for a 2 percent slope away from structures for hardscape areas.

12. The consultant should confirm whether or not stormwater infiltration is planned as part of the re-development project. Appropriate percolation tests should be provided for the proposed infiltration system and submitted to the City for review.

13. In addition to reviewing the precise grading plans and shoring plans, prior to approval for construction, the geotechnical consultant should review final building foundation plans and landscape structure plans and provide updated geotechnical recommendations, as appropriate.

Sincerely,
NINYO & MOORE

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