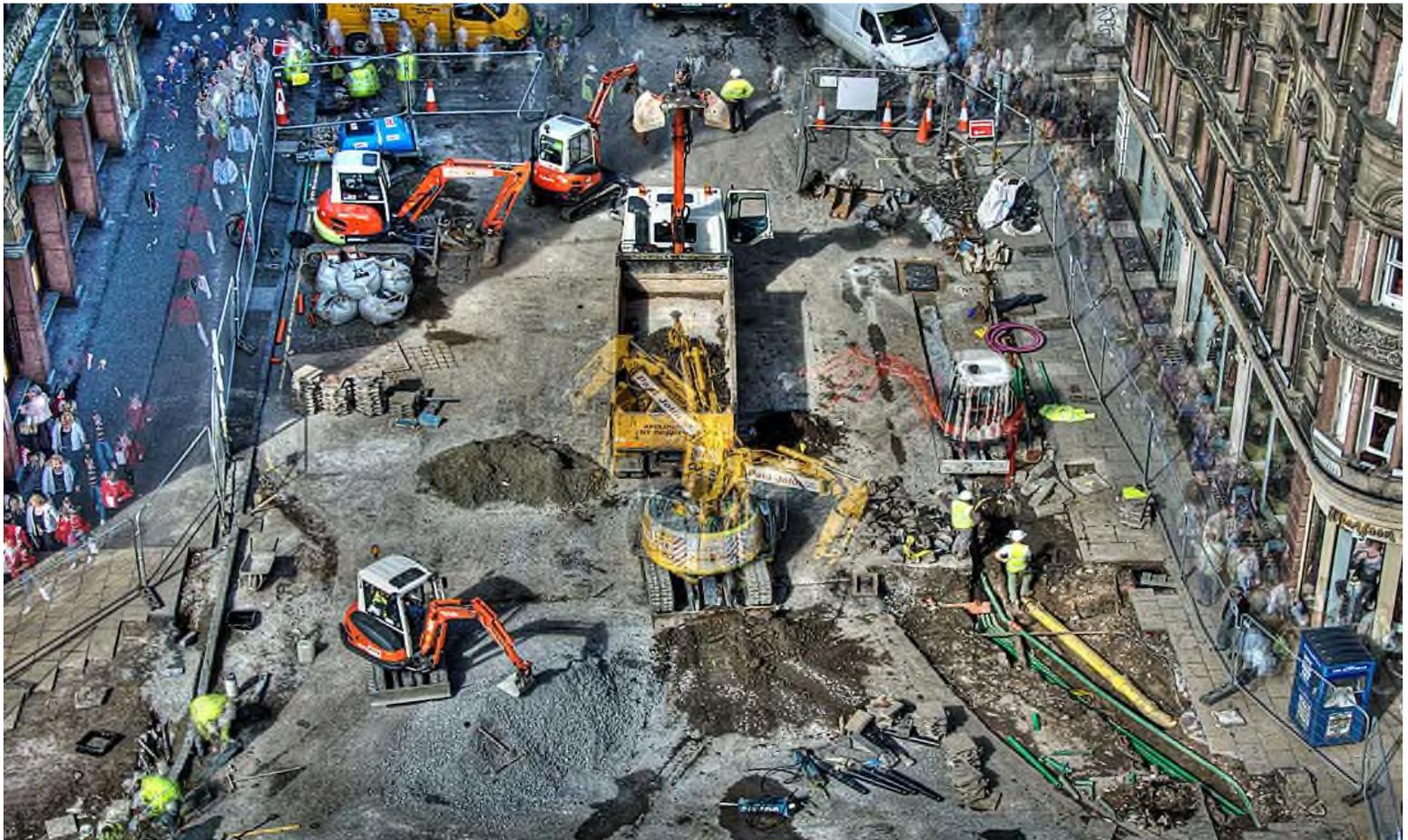


UPDATED GEOTECHNICAL INVESTIGATION  
CASTILLO DE ROSAS  
109 SOUTH 3RD ST (APN 085-150-047)  
LOMPOC, CALIFORNIA

March 10, 2020  
PROJECT  
18-8573

FOR  
TED PRICE  
LGS ARCHITECTS  
1235 FLYNN ROAD, SUITE 405  
CAMARILLO, CA 93012





March 10, 2020  
Project 18-8573

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Ted Price  
LGS Architects  
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Camarillo, CA 93012

Subject: Geotechnical Investigation, Proposed Casitas De Rosas Townhouses, 109 South Third Street (APN 085-150-047), Lompoc, California

Dear Ted:

Pacific Coast Testing (PCT) is pleased to submit this Updated Geotechnical Investigation Report for the proposed townhouses at 109 South Third Street (APN 085-150-047), Lompoc, California. This report was prepared in accordance with the scope of services presented in our proposal. The report provides geotechnical recommendations for site preparation, foundations, slabs-on-grade, retaining walls, pavement sections etc.

As discussed in the report, the primary concerns from a geotechnical standpoint are the soft condition and expansivity of the soils in the upper 2 to 3 feet and the potential for differential movements. It is therefore important that the building pad areas be overexcavated.

Please contact the undersigned if you have any questions concerning the findings or conclusions provided in this report.

Sincerely,

**PACIFIC COAST TESTING INC.**

Ron J. Church  
GE #2184



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**UPDATED GEOTECHNICAL INVESTIGATION  
CASTILLO DE ROSAS  
109 SOUTH THIRD STREET (APN 085-150-047)  
LOMPOC, CALIFORNIA**

**PROJECT 18-8573**

**1.0 INTRODUCTION**

This report presents the results of our updated geotechnical investigation for the proposed Castillo De Rosas Townhomes at 109 South Third Street (APN 085-150-047) in Lompoc, California. A site location map is presented in Figure 1. A geotechnical investigation was previously prepared for the property by GSI Soils Inc (GSI) in 2004 (Project 4-2420, dated May 24, 2004). Pacific Coast Testing performed percolation testing at the site in 2018 (Project 18-8573, dated January 14, 2019).

The property is located west of South Third Street, approximately 200 feet south of the intersection of Cabrillo Highway (Hwy 1) with South Third Street. This area of Lompoc contains mostly of residential and commercial properties. Topographically, the terrain is relatively level. Site elevations in the pad areas are around 101 feet above mean sea level. The property covers an area of approximately 0.96 acres. Based on our recent site visit the property was covered with native grasses and weeds.

It is our understanding that the townhouses will be wood-framed buildings with concrete slab-on-grade floors. Footing loads for the proposed townhouses are presently unavailable. For the purpose of this report, loads on the order of 20 kips (columns) and 1.5 kip per lineal foot (continuous) have been estimated.

The project description is based on a site reconnaissance performed by a Pacific Coast Testing, Inc., engineer and information provided by Ted Price, LGS Architects. The site plan provided forms the basis for the "Site Plan", Figure 2.

In the event that there is change in the nature, design or location of improvements, or if the assumed loads are not consistent with actual design loads, the conclusions and recommendations contained in this report should be reviewed and modified, if required. Evaluations of the soils for hydrocarbons or other chemical properties are beyond the scope of the investigation.

## **2.0 PURPOSE AND SCOPE**

The purpose of this study was to review available soils reports (by GSI & PCT) and to develop updated geotechnical information and design criteria for the proposed project. The scope of this study included the following items.

1. A review of available soil and geologic information for this area of Lompoc.
2. A site reconnaissance and review of GSI & PCT reports.
3. Engineering analysis of the data gathered. Development of updated recommendations for site preparation and grading, and geotechnical design criteria for foundations, slab-on-grade construction, retaining walls, pavement design and underground facilities.
4. Preparation of this report summarizing our findings, conclusions, and recommendations regarding the geotechnical aspects of the project site.

## **3.0 SUBSURFACE SOIL CONDITIONS**

The near surface soils encountered in the exploratory borings generally consisted of sandy silts to a depth of 2 to 3 feet. These soils were encountered in a slightly moist to moist state and in a soft condition. The near surface soils are underlain by similar silts to a depth of 6 to 11 feet. These materials were encountered in a slightly moist to moist state and in a firm to stiff condition. Clayey silts were encountered below the sandy silts to a depth of 20 feet. These soils were encountered in a slightly moist to moist state and in a firm to stiff condition. The near surface sandy silts have a low potential for expansivity.

No free ground water was encountered during the field explorations. Based on previous borings and our experience in this area of Lompoc, groundwater depths are typically greater than 50 feet below existing grades. A more detailed description of the soils encountered is presented graphically on the "Boring Logs," B-1 through B-5, P-1 & P-2, Appendix A (from GSI & PCT reports). An explanation of the symbols and descriptions used on the logs are presented on the "Soil Classification Chart".

The soil profile described above is generalized; therefore, the reader is advised to consult the boring logs (Appendix A) for soil conditions at specific locations. Care should be exercised in interpolating or extrapolating subsurface conditions between or beyond borings. On the boring logs the soil type, moisture content, grain size, dry density, and the applicable Unified Soil Classification System Symbol are indicated.

The location of the borings, shown on Site Plan, Figure 2, were approximately determined from features at the site. Hence, accuracy can be implied only to the degree that this method warrants. Surface elevations at the boring locations were not determined.

**4.0 SEISMIC CONSIDERATIONS**

**4.1 Seismic Coefficients**

Structures should be designed to resist the lateral forces generated by earthquake shaking in accordance with the building code and local design practice. This section presents seismic design parameters for use with the California Building Code (CBC) and ASCE 7-16. The site coordinates and ASCE 7 Hazard Tool were used to obtain the seismic design criteria. The peak ground acceleration was estimated for a 2 percent probability of occurrence in 50 years using the USGS online deaggregation tool.

**Seismic Data**

<b>California Building Code Seismic Parameter</b>	<b>Values for Site Class D</b>
Latitude, degrees	34.638200
Longitude, degrees	-120.445850
S <sub>s</sub> Seismic Factor	1.259
S <sub>1</sub> Seismic Factor	0.448
Site Class	Sd, Stiff Soil
F <sub>a</sub> , Short-Period Site Coefficient (@ 0.2-s Period)	1.000
F <sub>v</sub> , Long-Period Site Coefficient (@ 1.0-s Period)	1.900*
S <sub>MS</sub> , Site Specific Response Parameter for Site Class at 0.2 sec	1.259
S <sub>M1</sub> , Site Specific Response Parameter for Site Class at 1 sec	0.851
S <sub>DS</sub> = 2/3 S <sub>MS</sub>	0.839
S <sub>D1</sub> = 2/3 S <sub>M1</sub>	0.568

California Building Code Seismic Parameter	Values for Site Class D
Peak Ground Acceleration (2% probability in 50 years)	0.610
Likely Magnitude (M)	6.8
*Fv is based on Table 11.4.2 of ASCE 7-16 assuming the fundamental period (T) for the proposed structure is taken to be less than or equal to Ts (S <sub>D1</sub> /S <sub>D5</sub> ) and Cs is determined by Eq. 12.8.2 (Exception 2 of 11.4.8). If the structure does not meet with this exception, updated values or a design response spectrum can be prepared, upon request.	

**4.2 Liquefaction Analysis**

Liquefaction is described as the sudden loss of soil shear strength due to a rapid increase of pore water pressures caused by cyclic loading from a seismic event. In simple terms, it means that the soil acts more like a fluid than a solid in a liquefiable event. In order for liquefaction to occur, the following are generally needed; granular soils (sand, silty sand and sandy silt), groundwater and low density (very loose to medium dense) conditions. A liquefaction study was not part of our scope for this project; however, an opinion can be provided based on the results of the soil borings and experience in this area of Lompoc. In general, sandy silts and clayey silts in a stiff condition were found below a depth of 5 feet at the site. Based on our experience, similar sandy silts and clayey silts can be expected to a depth of 50 feet below existing grades with groundwater anticipated at depths greater than 50 feet. This information indicates that the potential for liquefaction would be in the low category. However, this is a preliminary assessment and a detailed liquefaction study would be required to fully investigate the potential for liquefaction.

**4.3 Lateral Spreading**

Due to the near level terrain and the lack of liquefiable soil zones, the potential for lateral spreading displacements would be negligible.

**4.4 Slope Stability**

The building pad areas are located in near level terrain with gradients of less than five (5) percent. There was no visual evidence of overall instability at the site, although, shallow erosion could occur if over-saturated conditions were to

occur. However, the potential for movement to influence the proposed construction would be low to negligible.

#### **4.5 Faulting**

There are no active or potentially active faults in the direct vicinity of the property. The nearest known active fault (Los Alamos-Baseline Fault) is located north and east of the site. The site is not within a State of California Fault Hazards Zone (Alquist-Priolo). It is our opinion that there is a negligible potential for fault rupture to impact the townhomes based on review of the published maps.

### **5.0 CONCLUSIONS AND RECOMMENDATIONS**

1. The site is suitable for the proposed townhomes provided the recommendations presented in this report are incorporated into the project plans and specifications.
2. All grading and foundation plans should be reviewed by Pacific Coast Testing Inc., hereinafter described as the Geotechnical Engineer, prior to contract bidding. This review should be performed to determine whether the recommendations contained within this report are incorporated into the project plans and specifications.
3. The Geotechnical Engineer should be notified at least two (2) working days before site clearing or grading operations commence and should be present to observe the stripping of deleterious material and provide consultation to the Grading Contractor in the field.
4. Field observation and testing during the grading operations should be provided by the Geotechnical Engineer so that a decision can be formed regarding the adequacy of the site preparation, the acceptability of fill materials, and the extent to which the earthwork construction and the degree of compaction comply with the project geotechnical specifications. Any work related to grading performed without the full knowledge of, and under direct observation of the Geotechnical Engineer, may render the recommendations of this report invalid.

### **5.1 Clearing and Stripping**

1. All surface and subsurface deleterious materials should be removed from the proposed building and driveway areas and disposed of off-site. This includes, but is not limited to undocumented fills, tree rootballs, any buried utility lines, loose fills, septic systems, debris, building materials, and any other surface and subsurface structures within proposed building areas. Voids left from site clearing, should be cleaned and backfilled as recommended for structural fill.
  
2. Once the site has been cleared, the exposed ground surface should be stripped to remove surface vegetation and organic soil. The surface may be disced, rather than stripped, if the organic content of the soil is not more than three percent by weight. If stripping is required, depths should be determined by a member of our staff in the field at the time of stripping. Strippings may be either disposed of off-site or stockpiled for future use in landscape areas if approved by the landscape architect.

### **5.2 Site Preparation**

1. The intent of these recommendations is to moisture condition and recompact the soft soils in the upper 2 to 3 feet and support the townhouses on conventional footings.
  
2. After clearing and stripping, the native soils should be excavated to a depth of three (3) feet below finish pad grade or lowest existing grade or one (1) foot below the bottom of the deepest footing, whichever is greater. The geotechnical engineer should observe and approve the bottom of the overexcavated areas prior to the placement of fill. The exposed surface should then be scarified to a depth of 12 inches, wetted to slightly above optimum moisture and compacted to at least ninety (90) percent of maximum dry density (ASTM D1557-02). The native soils can then be replaced and similarly compacted; however, the pad areas should be capped with a minimum of 12 inches of a suitable non-expansive import material such as decomposed granite or Class II/III base, compacted to ninety (90) percent. The lateral limits of excavation, scarification and fill placement should be at least 5 feet beyond the perimeter building and

footing lines. Cut and fill slopes should not exceed 2:1 (horizontal:vertical) and should be properly compacted to 90 percent.

3. In order to help minimize potential settlement problems associated with structures supported on non-uniform materials, the soils engineer should be consulted for specific site recommendations during site excavation and grading. In general, all proposed construction should be supported on a uniform thickness of compacted soil.
4. The above grading is based on the strength characteristics of the materials under conditions of normal moisture that would result from rain water and do not take into consideration the additional activating forces applied by seepage from springs or subsurface water. Areas of observed seepage should be provided with subsurface drains to release the hydrostatic pressures.
5. The near-surface soils may become partially or completely saturated during the rainy season. Grading operations during this time period may be difficult since the saturated materials may not be compactable, and they may not support construction equipment. Consideration should be given to the seasonal limit of the grading operations on the site.
6. All final grades should be provided with a positive drainage gradient away from foundations. Final grades should provide for rapid removal of surface water runoff. Ponding of water should not be allowed on building pads or adjacent to foundations.

### **5.3 Preparation of Paved Areas**

1. After clearing and grubbing, the existing soils should be removed to a depth of at least 2 feet below the existing ground surface or 1 foot below the proposed structural section, whichever is deeper. The bottom of the excavation should then be scarified, moisture-conditioned and compacted to at least 90 percent relative compaction (ASTM D1557-02). Native fill materials can then be placed and similarly compacted.

2. The upper 12 inches of subgrade beneath all paved areas should be compacted to at least 95 percent relative compaction. Subgrade soils should not be allowed to dry out or have excessive construction traffic between the time of water conditioning and compaction, and the time of placement of the pavement structural section.

#### **5.4 Structural Fill**

1. On-site soils free of organic and deleterious material are suitable for use as fill below the non-expansive cap. These fills should not contain rocks larger than 3 inches in greatest dimension and should have no more than 15 percent larger than 1.5 inches in greatest dimension.
2. Select import (decomposed granite or Class II/III Base) should be free of organic and other deleterious material and should be non-expansive with a plasticity index of 10 or less and a sand equivalent of at least 30. Before delivery to the site, a sample of the proposed import should be tested in our laboratory to determine its suitability for use as structural fill.
3. Structural fill using on-site inorganic soil or approved import should be placed in layers, each not exceeding eight inches in thickness before compaction. On-site inorganic or imported soil should be conditioned with water, or allowed to dry, to produce a soil water content at approximately optimum value and should be compacted to at least 90 percent relative compaction based on ASTM D1557-02.

#### **5.5 Foundations**

1. Conventional continuous footings and spread footings may be used for support of the proposed townhouses. All of the foundation materials should be competent after preparation in accordance with the grading section of this report.
2. Continuous footings should be at least 15 inches wide and extend a minimum of 24 inches below pad grade (bottom of capillary break) or below adjacent finished grade, whichever is lower. Isolated spread footings should be a minimum of 2 feet square and similarly embedded and tied to the perimeter footings with grade

beams (12" wide by 24" deep). The reinforcement for the footings and grade beams should be designed by the structural engineer; however, a minimum of two (2) No. 5 bars should be provided, one (1) on the top and one (1) on the bottom for continuous footings and grade beams with No. 3 dowels spaced at 18 inches on-center to tie the footings to the slabs.

3. An allowable dead plus live load bearing pressure of 1,800 psf may be used for design. Total settlements of less than 1-inch are anticipated with differential settlements on the order of ½-inch over 20 feet.
4. The above allowable pressures are for support of dead plus live loads and may be increased by one-third for short-term wind and seismic loads.
5. Lateral forces on structures may be resisted by passive pressure acting against the sides of shallow footings and/or friction between the soil and the bottom of the footing. For resistance to lateral loads, a friction factor of 0.30 may be utilized for sliding resistance at the base of the spread footings in engineered fill. A passive resistance of 300 pcf equivalent fluid weight may be used against the side of shallow footings. If friction and passive pressures are combined, the lesser value should be reduced by 33 percent.

#### **5.6 Slab-On-Grade Construction**

1. Concrete slabs-on-grade and flatwork should not be placed directly on unprepared loose fill materials. Preparation of subgrade to receive concrete slabs-on-grade and flatwork should be processed as discussed in the preceding sections of this report.
2. To minimize floor dampness a section of capillary break material at least 4 inches thick and covered with a 15-mil Stego Type vapor barrier should be provided between the floor slabs and compacted soil subgrade. All seams through the vapor barrier should be overlapped and sealed. Where pipes extend through the vapor barrier, the barrier should be sealed to the pipes. The capillary break should be a clean free-draining material such as clean gravel or permeable

aggregate complying with Caltrans Standard Specifications 68, Class I, Type A or Type B, to service as a cushion and a capillary break. It is suggested that a 2-inch thick sand layer be placed on top of the membrane to assist in the curing of the concrete. The sand should be lightly moistened prior to placing concrete.

3. Concrete slabs-on-grade should be a minimum of 4 inches thick and should be reinforced with at least No. 3 reinforcing bars placed at 18 inches on-center both ways at or slightly above the center of the structural section. Reinforcing bars should have a minimum clear cover of 1.5 inches, and hot bars should be cooled prior to placing concrete. The aforementioned reinforcement may be used for anticipated uniform floor loads not exceeding 100 psf. If floor loads greater than 100 psf or heavy wheel loads are anticipated, the slab should be evaluated by a structural engineer.
4. All slabs should be poured at a maximum slump of less than 5 inches. For design of concrete floors, a modulus of subgrade reaction of  $k = 80$  pci per inch would be applicable to on-site engineered fill soils.

**5.7 Retaining Walls**

1. Retaining walls should be designed to resist lateral pressures from adjacent soils and surcharge loads applied behind the walls.

Lateral Pressure and Condition (Compacted Fill)		Equivalent Fluid Pressure, pcf	
		Unrestrained Wall	Rigidly Supported Wall
Active Case, Drained	Level-native soils	45	--
	Level-granular backfill	30	--
At-Rest Case, Drained	Level-native soils	--	60
	Level-sand backfill		45
Passive Case, Drained	Level 2:1 Sloping Down	300	--
		150	
For sloping backfill add 1 pcf for every 2 deg. (Active case) and 1.5 pcf for every 2 deg. (At-rest case)			

2. Isolated retaining wall foundations should extend a minimum depth of 24 inches below lowest adjacent grade. An allowable toe pressure of 2,000 psf is recommended for footings supported on 12 inches of compacted soil. A coefficient of friction of 0.30 may be used between subgrade soil and concrete footings.
3. For retaining walls greater than 6 feet, as measured from the top of the foundation, a seismic horizontal surcharge of  $10H^2$  (pounds per linear foot of wall) may be assumed to act on retaining walls. The surcharge will act at a height of  $0.33H$  above the wall base (where  $H$  is the height of the wall in feet). This surcharge force shall be added to an active design equivalent fluid pressure of 45 pounds per square foot of depth for the seismic condition.
4. In addition to the lateral soil pressure given above, retaining walls should be designed to support any design live load, such as from vehicle and construction surcharges, etc., to be supported by the wall backfill. If construction vehicles are required to operate within 10 feet of a wall, supplemental pressures will be induced and should be taken into account through design.
5. The above-recommended pressures are based on the assumption that sufficient subsurface drainage will be provided behind the walls to prevent the build-up of hydrostatic pressure. To achieve this, we recommend that a filter material be placed behind all proposed walls. The blanket of filter material should be a minimum of 12 inches thick and should extend from the bottom of the wall to within 12 inches of the ground surface. The top 12 inches should consist of water conditioned, compacted native soil. A 4-inch diameter drain pipe should be installed near the bottom of the filter blanket with perforations facing down. The drain pipe should be underlain by at least 4 inches of filter type material. Adequate gradients should be provided to discharge water that collects behind the retaining wall to an adequately controlled discharge system with suitably projected outlets. The filter material should conform to Class I, Type B permeable material as specified in Section 68 of the California Department of

Transportation Standard Specifications, current edition. A typical 1" x #4 concrete coarse aggregate mix approximates this specification.

6. For hydrostatic loading conditions (i.e. no free drainage behind walls), an additional loading of 45 pcf equivalent fluid weight should be added to the above soil pressures. If it is necessary to design retaining structures for submerged conditions, allowed bearing and passive pressures should be reduced by 50 percent. In addition, soil friction beneath the base of the foundations should be neglected.
7. Precautions should be taken to ensure that heavy compaction equipment is not used immediately adjacent to walls, to prevent undue pressure against, and movement of, the walls. The use of water-stops/impermeable barriers should be considered for any basement construction, and for building walls, which retain earth.

**5.8 Pavement Design**

1. The following table provides recommended pavement sections based on an estimated R-Value of 14 for the near surface soils encountered at the site.

<b>RECOMMENDED MINIMUM ASPHALT CONCRETE PAVEMENT SECTIONS DESIGN THICKNESS</b>		
T.I.	A.C.-in.	A.B.-in.
4.5	2.5	8.0
5.0	2.5	9.5
5.5	3.0	10.0
6.0	3.0	11.5
T.I. = A.C. = A.B. =	<b>Traffic Index Asphaltic Concrete - must meet specifications for Caltrans Type A Asphalt Concrete Aggregate Base - must meet specifications for Caltrans Class II Aggregate Base (R-Value = minimum 78)</b>	

2. R-value samples should be obtained and tested at the completion of rough grading and the pavement sections confirmed or revised. All asphaltic concrete pavement sections and all sections should be crowned for good drainage.

3. All asphalt pavement construction and materials used should conform with Sections 26 and 39 of the latest edition of the Standard Specifications, State of California, Department of Transportation. Aggregate bases and sub-bases should also be compacted to a minimum relative compaction of 95 percent based on ASTM D1557-02.
  
4. Using the R-Value of 14, a Modulus of Rupture for concrete of 550 psi (based on a minimum strength of 3,500 psi) minimum pavement sections are presented in the following table for Traffic Indices (TI) of 4.5 to 7.0.

<b>RECOMMENDED MINIMUM CONCRETE PAVEMENT SECTIONS</b>		
<b>Traffic Index (T.I.)</b>	<b>Concrete inches (ft)</b>	<b>Caltrans Class II Aggregate Base inches* (ft)</b>
4.5	5.5 (.46)	6.0 (.50)
5.0	6.0 (.50)	6.0 (.50)
6.0	6.5 (.54)	6.0 (.50)
7.0	7.0 (.58)	6.0 (.50)

5. Concrete pavement construction should generally comply with the requirements of Sections 40 and 90 of the latest edition of the Standard Specifications, State of California, Department of Transportation.
  
6. Recommendations for mix design, curing, joints and reinforcement should be as promulgated by the Portland Cement Association. Control and construction joints should be used to separate the pavements into approximately square shaped areas at a spacing of no more than 2 times the slab thickness in feet (i.e. 6" slab, joints at 12' o.c.) or 15 feet on-center, each way, whichever is less. A concrete shrinkage of approximately 1/16-inch per 10 feet of length should be anticipated and joints should be designed accordingly.

7. It is recommended that all joints in and adjacent to the PCC pavement be sealed to preclude entry of water into the soils underlying paved areas

### **5.9 Underground Facilities Construction**

1. The attention of contractors, particularly the underground contractors, should be drawn to the State of California Construction Safety Orders for "Excavations, Trenches, Earthwork". Trenches or excavations greater than 5 feet in depth should be shored or sloped back in accordance with OSHA Regulations prior to entry.
2. For purposes of this section of the report, bedding is defined as material placed in a trench up to 1 foot above a utility pipe and backfill is all material placed in the trench above the bedding. Unless concrete bedding is required around utility pipes, free-draining sand should be used as bedding. Sand proposed for use as bedding should be tested in our laboratory to verify its suitability and to measure its compaction characteristics. Sand bedding should be compacted by mechanical means to achieve at least 90 percent relative compaction based on ASTM Test D1557-02.
3. On-site inorganic soil, or approved import, may be used as utility trench backfill. Proper compaction of trench backfill will be necessary under and adjacent to structural fill, building foundations, concrete slabs and vehicle pavements. In these areas, backfill should be conditioned with water (or allowed to dry), to produce a soil water content of about 2 to 3 percent above the optimum value and placed in horizontal layers each not exceeding 8 inches in thickness before compaction. Each layer should be compacted to at least 90 percent relative compaction based on ASTM Test D1557-02. The top lift of trench backfill under vehicle pavements should be compacted to the requirements given in report section 5.3 for vehicle pavement subgrades. Trench walls must be kept moist prior to and during backfill placement.

### **5.10 Surface and Subsurface Drainage**

1. Concentrated surface water runoff within or immediately adjacent to the site should be conveyed in pipes or in lined channels to discharge areas that are relatively level or that are adequately protected against erosion.
2. Water from roof downspouts should be conveyed in pipes that discharge in areas a safe distance away from structures. Surface drainage gradients should be planned to prevent ponding and promote drainage of surface water away from building foundations, edges of pavements and sidewalks. For soil areas, we recommend that a minimum of five (5) percent gradient be maintained.
3. Maintenance of slopes is important to their long-term performance. It is recommended that (where disturbed) slope surfaces be planted with appropriate drought-resistant vegetation as recommended by a landscape architect, and not over-irrigating, a primary source of surficial failures. In addition, an erosion control blanket (Greenfix CF072RR or equivalent) should be placed over the slopes to protect the vegetation while it becomes established. In addition, water should not be allowed to run over the sides of the slopes
4. Careful attention should be paid to erosion protection of soil surfaces adjacent to the edges of roads, curbs and sidewalks, and in other areas where "hard" edges of structures may cause concentrated flow of surface water runoff. Erosion resistant matting such as Miramat, or other similar products, may be considered for lining drainage channels.
5. Subdrains should be placed in established drainage courses and potential seepage areas. The location of subdrains should be determined during grading. The subdrain outlet should extend into a suitable protected area or could be connected to the proposed storm drain system. The outlet pipe should consist of an unperforated pipe the same diameter as the perforated pipe.

**5.11 Percolation Testing**

- Two (2) percolation tests were performed on the property by PCT (see Figure 2 for locations). Sandy silt soils were encountered. The results obtained were 27 min/inch for the 7-foot deep boring and hole, 34 min/inch for the 10-foot boring.

**5.12 Geotechnical Observation and Testing**

- Field exploration and site reconnaissance provides only a limited view of the geotechnical conditions of the site. Substantially more information will be revealed during the excavation and grading phases of the construction. Stripping & clearing of vegetation, overexcavation, scarification, fill and backfill placement and compaction should be reviewed by the geotechnical professional during construction to evaluate if the materials encountered during construction are consistent with those assumed for this report.
- Special inspection of grading should be provided in accordance with California Building Code Section 1705.6 and Table 1705.6. The special inspector should be under the direction of the engineer.

<b>CBC TABLE 1705.6 REQUIRED VERIFICATION AND INSPECTION OF SOILS</b>		
<b>VERIFICATION AND INSPECTION TASK</b>	<b>CONTINUOUS DURING TASK LISTED</b>	<b>PERIODIC DURING TASK LISTED</b>
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity		X
2. Verify excavations are extended to proper depth and have reached proper material		X
3. Perform classification and testing of compacted fill		X
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill	X	
5. Prior to placement of compacted fill, observe subgrade and verify that site has been prepared properly.		X

- The validity of the recommendations contained in this report are also dependent upon a prescribed testing and observation program. Our firm assumes no responsibility for construction compliance with these design concepts and recommendations unless we have been retained to perform on-site testing and

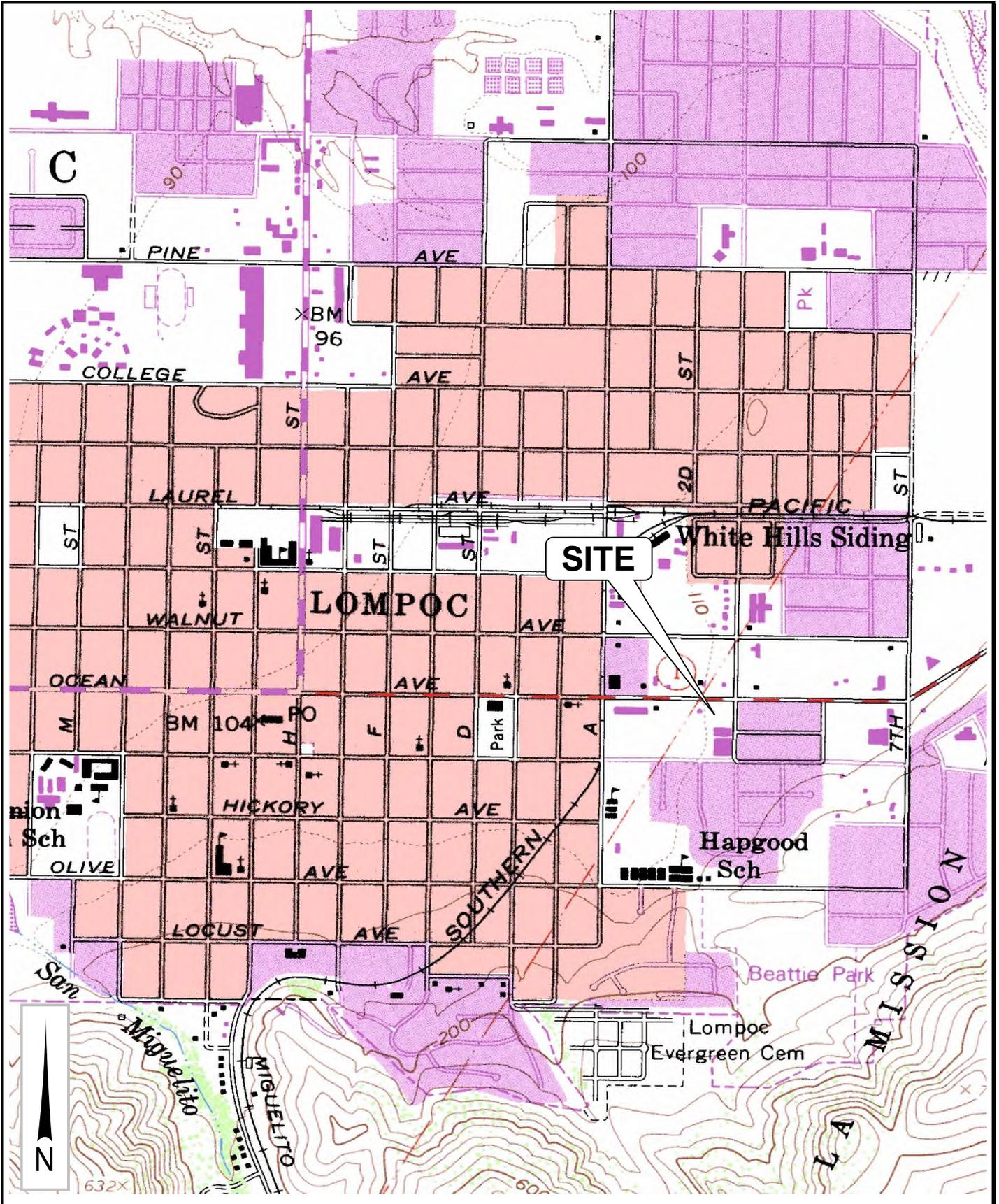
review during all phases of site preparation, grading, and foundation/slab construction. The Geotechnical Engineer should be notified at least two (2) working days before site clearing or grading operations commence to develop a program of quality control.

## **6.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS**

1. It should be noted that it is the responsibility of the owner or his/her representative to notify Pacific Coast Testing Inc. a minimum of 48 hours before any stripping, grading, or foundation excavations can commence at this site.
2. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed during our study. Should any variations or undesirable conditions be encountered during grading of the site, Pacific Coast Testing Inc. will provide supplemental recommendations as dictated by the field conditions.
3. This report is issued with the understanding that it is the responsibility of the owner or his/her representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the project plans and specifications. The owner or his/her representative is responsible for ensuring that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.
4. As of the present date, the findings of this report are valid for the property studied. With the passage of time, changes in the conditions of a property can occur whether they are due to natural processes or to the works of man on this or adjacent properties. Legislation or the broadening of knowledge may result in changes in applicable standards. Changes outside of our control may find this report to be invalid, wholly or partially. Therefore, this report should not be relied upon after a period of three (3) years without our review nor is it applicable for any properties other than those studied.

5. Validity of the recommendations contained in this report is also dependent upon the prescribed testing and observation program during the site preparation and construction phases. Our firm assumes no responsibility for construction compliance with these design concepts and recommendations unless we have been retained to perform continuous on-site testing and review during all phases of site preparation, grading, and foundation/slab construction.

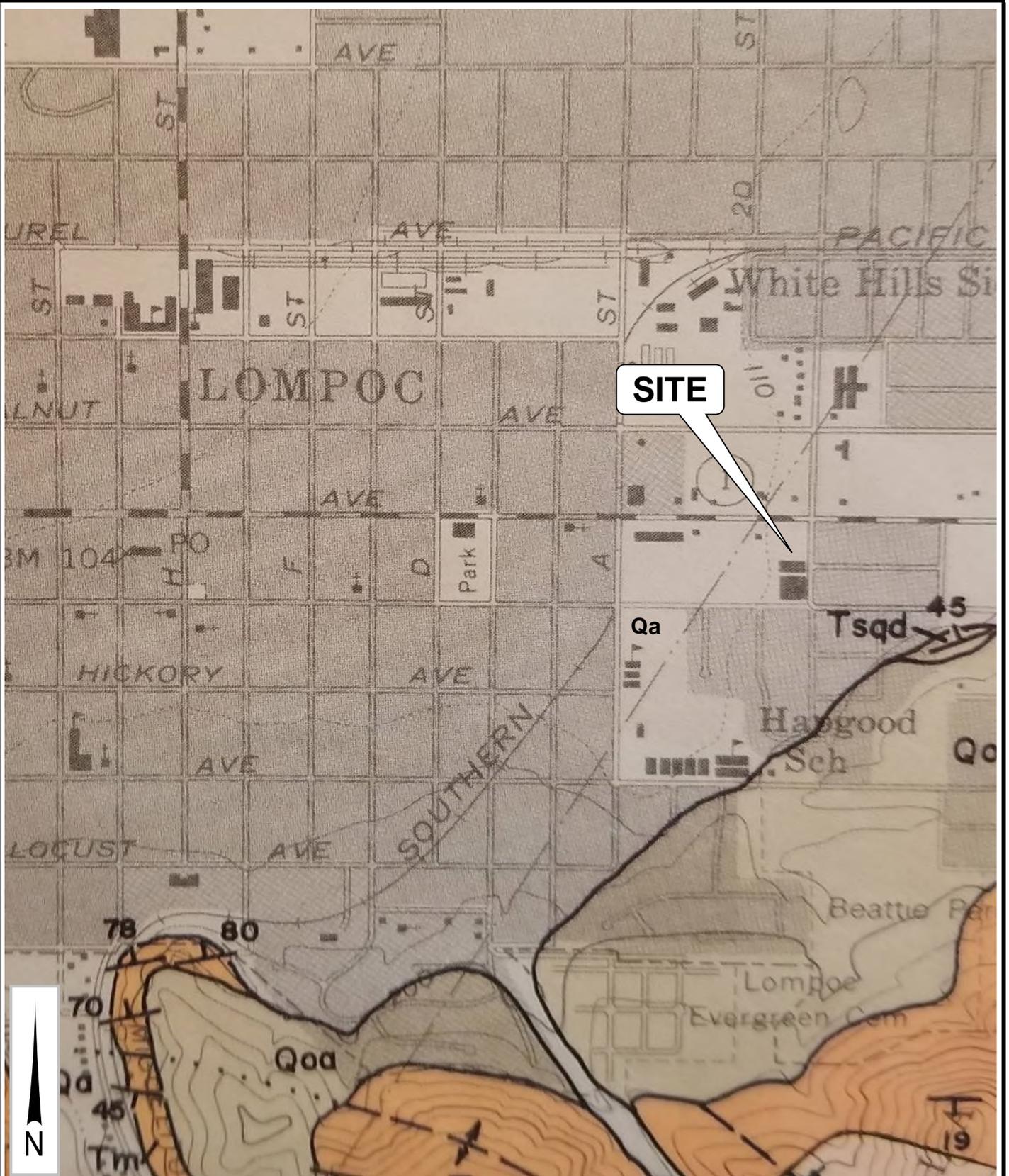
## FIGURES



**SITE MAP**  
**CASTILLO DE ROSAS**  
**109 SOUTH 3RD ST (APN 085-150-047)**  
**LOMPOC, CALIFORNIA**

Project No.	Figure No.
18-8573	1





Geology Map of LompoC and Surf Quadrangles, by Dibblee, 1988; Qoa - Older Dissected Surficial Sediments, Qa - Valley & Floodplain Deposits, Qg - Stream Channel Deposits

 <b>Pacific Coast Testing, Inc.</b>	<b>SITE PLAN</b> <b>CASTILLO DE ROSAS</b> <b>109 SOUTH 3RD ST (APN 085-150-047)</b> <b>LOMPOC, CALIFORNIA</b>	<b>Project No.</b>	<b>Figure No.</b>
		18-8573	3

**APPENDIX A**

Field Investigation  
Key to Boring Logs  
Boring Logs

## **FIELD INVESTIGATION**

### **Test Hole Drilling**

The exploratory borings and percolation borings were conducted by GSI and PCT in 2004 and 2018. Five exploratory borings and two (2) percolation borings were drilled at the approximate locations indicated on the Site Plan, Figure 2. The locations of these borings were approximated in the field.

Undisturbed and bulk samples were obtained at various depths during test hole drilling. The undisturbed samples were obtained by driving a 2.4-inch inside diameter sampler into soils. Bulk samples were also obtained during drilling.

### **Logs of Boring**

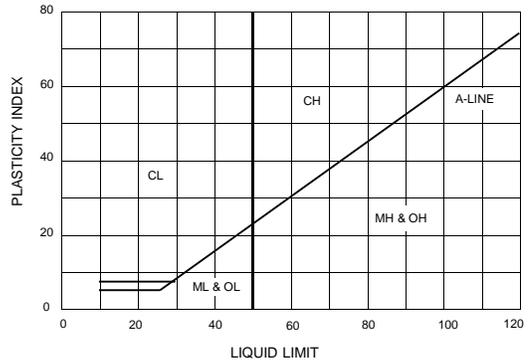
A continuous log of soils, as encountered in the borings was recorded at the time of the field investigation. The Exploration Boring Logs are attached.

Locations and depth of sampling, in-situ soil dry densities and moisture contents are tabulated in the Boring Logs.

## UNIFIED SOIL CLASSIFICATION SYSTEMS

MAJOR DIVISION		SYMBOLS	TYPICAL NAMES	
COARSE GRAINED SOILS Over 50% > #200 sieve	GRAVELS Over 50% > #4 sieve	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES	
			GP POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES	
		GRAVELS WITH OVER 12% FINES	GM SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES	
			GC CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES	
	SANDS Over 50% < #4 sieve	CLEAN SANDS WITH LITTLE OR NO FINES	SW WELL GRADED SANDS, GRAVELLY SANDS	
			SP POORLY GRADED SANDS, GRAVELLY SANDS	
		SANDS WITH OVER 12% FINES	SM SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES	
			SC CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES	
FINE GRAINED SOILS Over 50% < #200 sieve	SILTS AND CLAYS Liquid limit < 50	ML INORGANIC SILTS, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY		
		CL INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS		
		OL ORGANIC CLAYS AND ORGANIC SILTS WITH SLIGHT PLASTICITY		
		MH INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS		
	SILTS AND CLAYS Liquid limit > 50	CH INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS		
		OH ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS		
HIGHLY ORGANIC CLAYS	Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS		

### PLASTICITY CHART USED FOR CLASSIFICATION OF FINE GRAINED SOILS



### SOIL GRAIN SIZE

BOULDERS		COBBLES		GRAVEL			SAND			SILT	CLAY
				COARSE	FINE	COARSE	MEDIUM	FINE			
150		75		19	4.75	2.0	0.425	0.075	0.002		

U.S. STANDARD SIEVE  
6"      3"      3/4"      4      10      40      200  
SOIL GRAIN SIZE IN MILLIMETERS

### SAMPLE DRIVING RECORD

BLOWS PER FOOT	DESCRIPTION
25	25 BLOWS DROVE SAMPLER 12 INCHES, AFTER INITIAL 6 INCHES OF SEATING
50/7"	50 BLOWS DROVE SAMPLER 7 INCHES, AFTER INITIAL 6 INCHES OF SEATING
Ref/3"	50 BLOWS DROVE SAMPLER 3 INCHES DURING OR AFTER INITIAL 6 INCHES OF SEATING

NOTE: TO AVOID DAMAGE TO SAMPLING TOOLS, DRIVING IS LIMITED TO 50 BLOWS PER 6 INCHES DURING OR AFTER SEATING INTERVAL

### KEY TO TEST DATA

<b>B</b>	Bag Sample	CONS	Consolidation (ASTM D2435)
	Drive, No Sample Collected	DS	Cons. Drained Direct Shear (ASTM D3080)
	2 1/2" O.D. Mod. California Sampler, Not Tested	PP	Pocket Penetrometer
	2 1/2" O.D. Mod. California Sampler, Tested	GSD	Grain Size Distribution (ASTM D422)
	Standard Penetration Test	CP	Compaction Test (ASTM D1557)
	Sample Attempted with No Recovery	EI	Expansion Index (ASTM D4829)
	Water Level at Time of Drilling	LL	Liquid Limit (in percent)
	Water Level after Drilling	PI	Plasticity Index

#### RELATIVE DENSITY

SANDS, GRAVELS, AND NON PLASTIC SILTS	BLOWS/FOOT
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

#### RELATIVE DENSITY

CLAYS AND PLASTIC SILTS	STRENGTH	BLOWS/FOOT
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32



PROJECT NO.: 18-8573

DATE DRILLED: ---

**SOIL CLASSIFICATION CHART  
AND BORING LOG LEGEND**

**CASTILLO DE ROSAS  
LOMPOC, CALIFORNIA**

FIGURE NO.  
**A-1**

LOGGED BY: **JF**

DRILL RIG: **Simco 2400**

BORING NO.: **B-1**

ELEVATION: **110'**

BORING DIAMETER (INCH): **4**

DATE DRILLED: **7 May 2004**

GROUNDWATER DEPTH (FT):

ELEVATION (FT)	DEPTH (FT)	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION	SOIL TYPE	SAMPLE	CONV. SPT BLOW COUNT	WATER CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT	PLASIT. INDEX	UNC. COMP. STRENGTH (PSF)	COMMENTS AND ADDITIONAL TESTS
109	1		Sandy Silt: brown, slightly moist to moist, fine grained, soft  firm	ML-SM	B		12.5					
108	2											
107	3											
106	4											
105	5											
104	6											
103	7											
102	8											
101	9											
100	10											
99	11											
98	12											
97	13											
96	14											
95	15											
94	16											
93	17											
92	18											
91	19											
90	20											

**EXPLORATORY BORING LOGS**



**LAS CASITAS  
115 SOUTH THIRD STREET**

PROJECT NO.  
**4-2420**

DATE  
---

FIGURE NO.  
**A-2**

LOGGED BY: **JF**

DRILL RIG: **Simco 2400**

BORING NO.: **B-2**

ELEVATION: **110'**

BORING DIAMETER (INCH): **4**

DATE DRILLED: **7 May 2004**

GROUNDWATER DEPTH (FT):

ELEVATION (FT)	DEPTH (FT)	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION	SOIL TYPE	SAMPLE	CONV. SPT BLOW COUNT	WATER CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT	PLASIT. INDEX	UNC. COMP. STRENGTH (PSF)	COMMENTS AND ADDITIONAL TESTS
109	1		Sandy Silt: brown, slightly moist, fine grained, soft	ML-SM								
108	2		firm to stiff		B		7.2					
107	3				▲	11	8.7	101.7				
106	4											
105	5											
104	6											
103	7		Clayey Silt: brown, moist, trace fine grained sand, stiff	ML								
102	8				B							
101	9					9	14.8					
100	10											
99	11											
98	12											
97	13				B		14.8					
96	14											
95	15					16	16.7					
94	16											
93	17											
92	18				B							
91	19			firm to stiff		19	14.0					
90	20		Boring terminated at 20 feet									

**EXPLORATORY BORING LOGS**



**LAS CASITAS  
115 SOUTH THIRD STREET**

PROJECT NO.  
**4-2420**

DATE  
---

FIGURE NO.  
**A-3**

LOGGED BY: **JF**

DRILL RIG: **Simco 2400**

BORING NO.: **B-3**

ELEVATION: **110'**

BORING DIAMETER (INCH): **4**

DATE DRILLED: **7 May 2004**

GROUNDWATER DEPTH (FT):

ELEVATION (FT)	DEPTH (FT)	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION	SOIL TYPE	SAMPLE	CONV. SPT BLOW COUNT	WATER CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT	PLASIT. INDEX	UNC. COMP. STRENGTH (PSF)	COMMENTS AND ADDITIONAL TESTS	
109	1		Sandy Silt: brown, slightly moist to moist, fine grained, trace clay, soft  firm	ML-SM									
108	2				<b>B</b>	10.2							
107	3					8	11.7	98.6					
106	4												
105	5												
104	6												
103	7		Clayey Silt: brown, moist, trace fine grained sand, stiff	ML									
102	8				<b>B</b>	13.2							
101	9												
100	10					9	16.9						
99	11	Boring terminated at 11 feet											
98	12												
97	13												
96	14												
95	15												
94	16												
93	17												
92	18												
91	19												
90	20												

**EXPLORATORY BORING LOGS**



**LAS CASITAS  
115 SOUTH THIRD STREET**

PROJECT NO.  
**4-2420**

DATE  
---

FIGURE NO.  
**A-4**

LOGGED BY: **JF**

DRILL RIG: **Simco 2400**

BORING NO.: **B-4**

ELEVATION: **110'**

BORING DIAMETER (INCH): **4**

DATE DRILLED: **7 May 2004**

GROUNDWATER DEPTH (FT):

ELEVATION (FT)	DEPTH (FT)	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION	SOIL TYPE	SAMPLE	CONV. SPT BLOW COUNT	WATER CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT	PLASIT. INDEX	UNC. COMP. STRENGTH (PSF)	COMMENTS AND ADDITIONAL TESTS	
109	1		Sandy Silt: brown, slightly moist, fine grained, trace clay, soft	ML-SM	B		9.7						
108	2		moist, firm to stiff										
107	3												
106	4				▲	11	10.2	100.7					
105	5												
104	6												
103	7												
102	8				B								
101	9					12	10.4						
100	10												
99	11												
98	12		Clayey Silt: brown, moist, trace fine grained sand, stiff	ML	B		14.4						
97	13												
96	14												
95	15				14	16.1							
94	16		Boring terminated at 16 feet										
93	17												
92	18												
91	19												
90	20												

**EXPLORATORY BORING LOGS**



**LAS CASITAS  
115 SOUTH THIRD STREET**

PROJECT NO.  
**4-2420**

DATE  
---

FIGURE NO.  
**A-5**

LOGGED BY: **JF**

DRILL RIG: **Simco 2400**

BORING NO.: **B-5**

ELEVATION: **110'**

BORING DIAMETER (INCH): **4**

DATE DRILLED: **7 May 2004**

GROUNDWATER DEPTH (FT):

ELEVATION (FT)	DEPTH (FT)	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION	SOIL TYPE	SAMPLE	CONV. SPT BLOW COUNT	WATER CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT	PLASIT. INDEX	UNC. COMP. STRENGTH (PSF)	COMMENTS AND ADDITIONAL TESTS
109	1		Sandy Silt: brown, slightly moist, fine grained, trace clay, soft	ML-SM								
108	2		firm to stiff		B		7.8					
107	3											
106	4											
105	5					▲	13	8.3	104.7			
104	6											
103	7											
102	8		Clayey Silt: brown, slightly moist, trace fine grained sand, stiff	ML								
101	9											
100	10						11	9.6				
99	11											
98	12											
97	13											
96	14					B						
95	15					14	10.0					
94	16		Boring terminated at 16 feet									
93	17											
92	18											
91	19											
90	20											

**EXPLORATORY BORING LOGS**



**LAS CASITAS  
115 SOUTH THIRD STREET**

PROJECT NO.  
**4-2420**

DATE  
---

FIGURE NO.  
**A-6**

LOGGED BY: **JM** DRILL RIG: **Simco 2400** BORING NO.: **P-1**  
 ELEVATION: **110'** BORING DIAMETER (INCH): **6** DATE DRILLED: **14 December 2018**

GROUNDWATER DEPTH (FT):

ELEVATION (FT)	DEPTH (FT)	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION	SOIL TYPE	SAMPLE	CONV. SPT BLOW COUNT	WATER CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT	PLASIT. INDEX	UNC. COMP. STRENGTH (PSF)	COMMENTS AND ADDITIONAL TESTS
109	1		Sandy Silt: brown, moist, fine grained sand, some clay, soft	ML								
108	2				B		16.8					
107	3											
106	4			firm to stiff								
105	5											
104	6					B		15.9				
103	7											
102	8											
101	9					B		14.6				
100	10			Boring terminated at 10 feet								
99	11											
98	12											
97	13											
96	14											
95	15											
94	16											
93	17											
92	18											
91	19											
90	20											

**EXPLORATORY BORING LOGS**

 <b>Pacific Coast Testing, Inc.</b>	<b>CASTILLO DE ROSAS</b> <b>109 S. THIRD ST (APN 085-015-047)</b>		
	PROJECT NO. <b>18-8573</b>	DATE ---	FIGURE NO. <b>A-7</b>

LOGGED BY: **JM** DRILL RIG: **Simco 2400** BORING NO.: **P-2**  
 ELEVATION: **110'** BORING DIAMETER (INCH): **6** DATE DRILLED: **14 December 2018**

GROUNDWATER DEPTH (FT):

ELEVATION (FT)	DEPTH (FT)	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION	SOIL TYPE	SAMPLE	CONV. SPT BLOW COUNT	WATER CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT	PLASIT. INDEX	UNC. COMP. STRENGTH (PSF)	COMMENTS AND ADDITIONAL TESTS		
109	1	[Vertical line with horizontal dashes representing soil texture]	Sandy Silt: brown, moist, fine grained sand, trace to some clay, soft											
108	2					<b>B</b>		15.3						
107	3													
106	4													
105	5													
104	6							<b>B</b>		15.1				
103	7													
			Boring terminated at 7 feet											
102	8													
101	9													
100	10													
99	11													
98	12													
97	13													
96	14													
95	15													
94	16													
93	17													
92	18													
91	19													
90	20													

**EXPLORATORY BORING LOGS**

 <b>Pacific Coast Testing, Inc.</b>	<b>CASTILLO DE ROSAS</b> <b>109 S. THIRD ST (APN 085-015-047)</b>		
	PROJECT NO. <b>18-8573</b>	DATE ---	FIGURE NO. <b>A-8</b>

## **APPENDIX B**

Moisture-Density Tests  
Direct Shear Test  
R-Value Test  
Expansion Index Tests

## **LABORATORY TESTING**

### **Moisture-Density Tests**

The field moisture content, as a percentage of the dry weight of the soil, was determined by weighing samples before and after oven drying. Dry densities, in pounds per cubic foot, were also determined for the undisturbed samples. Results of these determinations are shown in the Exploration Drill Hole Logs.

### **Direct Shear Test**

A direct shear test was performed (by GSI) on undisturbed samples, to determine strength characteristics of the soil. The test specimens were soaked prior to testing. Results of the shear strength test is attached

### **Resistance (R) Value Test**

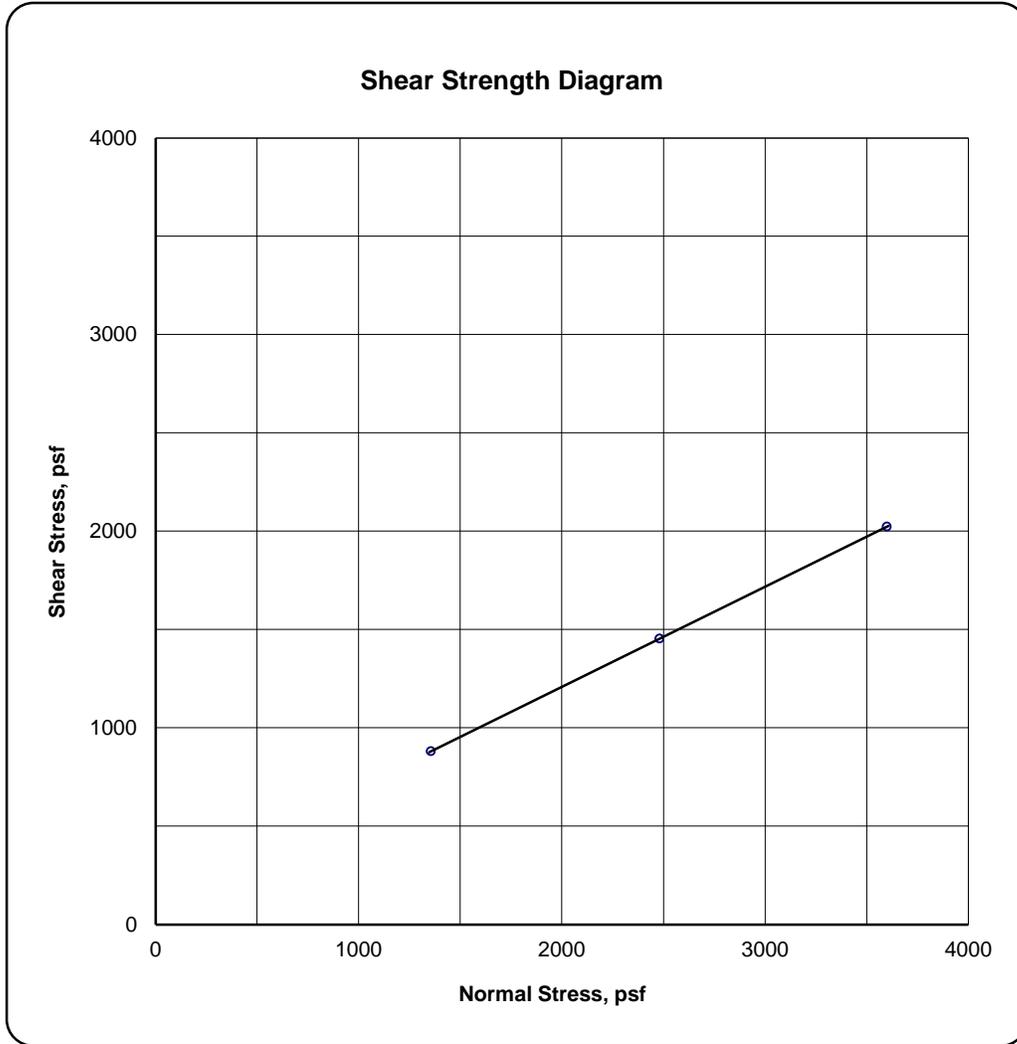
An R-Value test was estimated (by GSI) based on sieve analysis and plasticity on a bulk sample obtained from boring B-4. The results of the tests indicate that the sandy silt soils have an R-Value of 14.

### **Expansion Index Test**

Expansion indices of 16 and 41 were obtained (by GSI) for the near surface sandy silts and underlying clayey silt soils encountered in boring B-1. The test procedure was performed in accordance with ASTM D4829 – Standard Test Method for Expansion Index of Soils.

# DIRECT SHEAR TEST

ASTM D3080-90 (Modified for unconsolidated-undrained conditions)



Project: LAS CASITAS

Project No. 4-2420

Sample Location: B-2 @ 3 feet

Initial Dry Density (pcf) 101.7

Soil Description: **Sandy Silt**

Initial Moisture (%) 8.7

Sample Type:  Remolded  
 Ring

**Peak Shear Angle 27**  
**Cohesion (psf) 190**