Geotechnical Engineering Investigation
Proposed Major Remodel for
Existing Four-Unit Residence
3232 Hermosa Avenue
Hermosa Beach, California

Laney LA
725 Cypress Avenue
Hermosa Beach, CA 90254

Attn: Mr. Jacob Sertich

Project Number 25132-25
April 8, 2025

NorCal Engineering

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NorCal Engineering
Soils and Geotechnical Consultants
10641 Humbolt Street Los Alamitos, CA 90720
(562) 799-9469

April 8, 2025 Project Number 25132-25

Laney LA
725 Cypress Avenue
Hermosa Beach, California 90254

Attn.: Mr. Jacob Sertich

RE: **Geotechnical Engineering Investigation** – Proposed Major Remodel for Existing Four-Unit Residence - Located at 3232 Hermosa Avenue, in the City of Hermosa Beach, California

Dear Mr. Sertich:

Pursuant to your request, this firm has conducted a Geotechnical Engineering Investigation for the above-mentioned project in accordance with your approval of our proposal dated February 25, 2025. The purpose of this investigation is to evaluate the geotechnical conditions of the subject site and to provide recommendations for the proposed residential development. The scope of work included the following: 1) site reconnaissance; 2) subsurface geotechnical exploration and sampling; 3) laboratory testing; 4) soils infiltration study; 5) engineering analysis of field and laboratory data; 6) preparation of a geotechnical engineering report.

1.0 Project Description

Plans have not been provided at this time. However, it is proposed to perform a major remodel to the existing two-story four-unit residence. Additional improvements will likely include new hardscape and landscaping and possible additions. Final building plans shall be reviewed by this firm prior to submittal for city approval to determine the need for any additional study and revised recommendations pertinent to the proposed development, if necessary.

2.0 Site Description

The subject site is located within the 3200 block and northeasterly side of Hermosa Avenue, bordered by 33rd Street to the north and Palm Drive to the east, in the City of Hermosa Beach as shown in Figure 1. The generally rectangularly shaped lot is elongated in a northeast to southwest direction and is currently occupied by a two-story, four-unit residence with a detached garage and associated hardscape and landscaping as shown in Figure 2. An approximately 5 feet tall retaining wall is situated on the westerly property line, along Hermosa Avenue, which sits approximately 6 to 8 feet below the subject site.

3.0 Site Exploration

The field investigation consisted of the placement of four (4) subsurface exploratory borings by hand operated auger to depths of 3 and 20 feet below current ground elevations. The explorations were visually classified and logged by a field engineer with locations of the subsurface explorations shown on the attached plan. The exploratory borings revealed the existing earth materials to consist of fill and natural soil. Detailed descriptions of the subsurface conditions are listed on the boring logs in Appendix A with the locations shown on Figures 1 and 3. The transition from one soil type to another as shown on the borings logs is approximate and may in fact be a gradual transition. The soils encountered are described as follows:

Fill: A fill soil classified as a brown, fine to medium grained, slightly silty SAND with occasional gravel was encountered across the site to an approximate depth of 11 to 20 inches below the existing ground surface. The fill soil was noted to be loose and damp.

Natural: An undisturbed native soil classified as a grey brown to brown, fine to medium grained, slightly silty SAND was encountered beneath the fill soils. The native soil was observed to be medium dense and damp.

Groundwater: Groundwater was not encountered to the depth of our borings (20 feet below existing ground surface) and no caving occurred. The *California Department of Conservation – Borehole Database,* reveals that a borehole performed approximately 1.3 miles to the east (Well Name: I11965VZ4. Lat. 33.87249592, Long. -118.3805153) was advanced from an elevation of 100 feet to a depth of 70.5 feet with no groundwater encountered (Figure 3). Additionally, historic high groundwater in the vicinity has been recorded greater than 40 feet, as shown on the Seismic Hazard Zone Report for the Venice 7.5- Minute Quadrangle (Figure 4). The subject site elevation is approximately 41 feet above mean sea level (msl); historical high groundwater depth is likely near 40 feet below existing ground surface and should have no effect on the proposed development.

4.0 Laboratory Tests

Relatively undisturbed samples of the subsurface soils were obtained to perform laboratory testing and analysis for direct shear, consolidation tests, and to determine in-place moisture/densities. These relatively undisturbed ring samples were obtained by driving a thin-walled steel sampler lined with one-inch-long brass rings with an inside diameter of 2.42 inches into the undisturbed soils. The sampler was driven a total of six inches into undisturbed soils. Bulk bag samples were obtained in the upper soils for expansion index tests and maximum density tests. All test results are included in Appendix B, unless otherwise noted.

4.1 **Field Moisture Content** (ASTM: D 2216) and the dry density of the ring samples were determined in the laboratory. This data is listed on the logs of explorations.

4.2 **Maximum Density tests** (ASTM: D 1557) were performed on typical samples of the upper soils. Results of these tests are shown on Table I.

4.3 **Expansion Index tests** (ASTM: D 4829) were performed on remolded samples of the upper soils to determine the expansive characteristics. Results of these tests are provided on Table II.

4.4 **Soluble Sulfate tests** to determine potential corrosive effects of soils on concrete structures were performed in the laboratory. Test results are given in Table III and discussed later in this report.

4.5 **Direct Shear tests** (ASTM: D 3080) were performed on undisturbed and/or remolded samples of the subsurface soils. The test is performed under saturated conditions at loads of 1,000 lbs./sq.ft., 2,000 lbs./sq.ft., and 3,000 lbs./sq.ft. with results shown on Plate A.

4.6 **Consolidation tests** (ASTM: D 2435) were performed on undisturbed samples to determine the differential and total settlement which may be anticipated based upon the proposed loads. Water was added to the samples at a surcharge of one KSF and the settlement curves are plotted on Plates B and C.

5.0 Seismicity Evaluation

The proposed development lies outside of any Alquist-Priolo Special Studies Zone and the potential for damage due to direct fault rupture is considered unlikely. The Palos Verdes Fault is located within 2 kilometers of the site and is capable of producing a Magnitude 7.3 earthquake. Ground shaking originating from earthquakes along other active faults in the region is expected to induce lower horizontal accelerations due to smaller anticipated earthquakes and/or greater distances to other faults.

The seismic design acceleration parameters for the project site are provided on the following page and are based upon the 2022 California Building Code (CBC) Standard ASCE/SEI 7-16. The data was obtained from the American Society of Civil Engineers (ASCE) website, https://asce7hazardtool.online/. The seismic design report is attached to Appendix C.

Seismic Design Acceleration Parameters

Latitude	33.875
Longitude	-118.407
Site Class	D
Risk Category	II
Mapped Spectral Response Acceleration	S_S = 1.916 S_1 = 0.684
Adjusted Maximum Acceleration	S_{MS} = 1.916
Design Spectral Response Acceleration Parameters	S_{DS} = 1.277
Peak Ground Acceleration	PGA_M = 0.921

Use of these values is dependent on requirements of Section 11-4.8, ASCE 7, exception 2 that requires the value of the seismic response coefficient C_s be determined by Equation 12.8.2 for values of $T \leq 1.5T_s$ and taken as equal to 1.5 times the value computed in accordance with either 12.8-3 for $T_L \geq T \geq 1.5T_s$ or Equation 12.8-4 for $T>T_L$. Computations and verification of these conditions is referred to the structural engineer.

6.0 Liquefaction Evaluation

The site is expected to experience ground shaking and earthquake activity that is typical of the Southern California area. It is during severe shaking that loose, granular soils below the groundwater table can liquefy. Based upon information in the California Division of Mines and Geology "Seismic Hazard Zone Map – Venice Quadrangle" dated March 25, 1999, the subject site is *not* situated within an area of historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions to indicate a potential for permanent ground displacement. Therefore, the design of the proposed development in conformance with the latest Building Code provisions for earthquake design is expected to provide mitigation of ground shaking hazards that are typical to Southern California. A copy of the Seismic Hazard Zone Map – Venice Quadrangle is attached in Appendix C.

7.0 Infiltration Characteristics

Infiltration tests within the site were performed to provide preliminary infiltration rates for the purpose of planning and design of an on-site water disposal system. Hand excavation equipment was used to excavate the exploratory test boring to a depth of 3 feet below existing ground surface into the undisturbed native soils. Based upon the results of our testing, the soils encountered in the planned on-site drainage disposal system area exhibit the following infiltration rate with calculations provided in Appendix D.

Boring/Test No.	Depth	Soil Classification	Field Infiltration Rate
B-1/TH-1	3'	Silty SAND	144.4 in/hr

As previously stated, groundwater was not encountered to the depth of our borings (20 feet below existing ground surface) and no caving occurred. The *California Department of Conservation – Borehole Database,* reveals that a borehole performed approximately 1.3 miles to the east (Well Name: I11965VZ4. Lat. 33.87249592, Long. -118.3805153) was advanced from an elevation of 100 feet to a depth of 70.5 feet with no groundwater encountered (Figure 3). Additionally, historic high groundwater in the vicinity has been recorded greater than 40 feet, as shown on the Seismic Hazard Zone Report for the Venice 7.5- Minute Quadrangle (Figure 4). The subject site elevation is approximately 41 feet above mean sea level (msl); historical high groundwater depth is likely near 40 feet below existing ground surface and should have no effect on the proposed development.

All systems must meet the latest city and/or county specifications and the California Regional Water Quality Control Board (CRWQCB) requirements. It is recommended that foundations be setback a minimum distance of 10 feet from the drainage disposal system and the bottom of footing shall be a minimum of 10 feet from the expected zone of saturation. The boundary of the zone of saturation may be assumed to project downward from the top of the permeable portion of the disposal system at an inclination of 1 to 1 or flatter for granular soils, as determined by the geotechnical engineer.

8.0 Conclusions and Recommendations

Based upon our evaluations, the proposed development is acceptable from a geotechnical engineering standpoint. By following the recommendations and guidelines set forth in our report, the structures will be safe from excessive settlements under the anticipated design loadings and conditions. The proposed development shall meet all requirements of the City Building Ordinance and will not impose any adverse effect on existing adjacent structures.

The following recommendations are based upon soil conditions encountered in our field investigation; these near-surface soil conditions could vary across the site. Variations in the soil conditions may not become evident until the commencement of grading operations for the proposed development and revised recommendations from the soils engineer may be necessary based upon the conditions encountered.

It is recommended that site inspections are performed by a representative of this firm during all grading and construction of the development to verify the findings and recommendations documented in this report. The following sections present a discussion of geotechnical related requirements for specific design recommendations of different aspects of the project.

8.1 **Site Grading Recommendations**

Where grading is required for new improvements, all vegetation and demolition debris shall be removed and hauled prior to the start of grading operations. Existing vegetation shall not be mixed or disced into the soil. Any removed soils may be reutilized as compacted fill once any deleterious material or oversized materials (in excess of eight inches) is removed. Grading operations shall be performed in accordance with the attached "Specifications for Placement of Compacted Fill".

All disturbed and/or fill soils (about 11 to 20 inches below ground surface) shall be removed to competent native material, the exposed surface scarified to a depth of 12 inches, brought to within 2% of optimum moisture content and compacted to a minimum of 90% of the laboratory standard (ASTM: D 1557) prior to placement of any additional compacted fill soils, foundations, slabs-on-grade and pavement. Grading shall extend a minimum of five horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater.

Any imported fill material should preferably be soil similar to the upper soils encountered at the subject site. All soil shall be approved by this firm prior to importing at the site and will be subjected to additional laboratory testing to ensure concurrence with the recommendations stated in this report.

Care should be taken to always provide or maintain adequate lateral support for all adjacent improvements and structures during the grading operations and construction phase. Adequate drainage away from the structures, pavement and slopes should always be provided.

8.2 **Temporary Excavations**

Temporary *unsurcharged* excavations in the existing site materials may be made at vertical inclinations up to 4 feet in height unless cohesionless soils are encountered. In areas where soils with little or no binder are encountered, where adverse geological conditions are exposed, or where excavations are adjacent to existing structures, shoring or flatter excavations may be required. The temporary cut slope gradients given above do not preclude local raveling and sloughing. *Additional recommendations regarding site specific excavations required during grading and construction may be provided once plans and details are made available*.

All excavations shall be made in accordance with the requirements of the geotechnical engineer, CAL-OSHA and other public agencies having jurisdiction. Care should be taken to always provide or maintain adequate lateral support for all adjacent improvements and structures during the grading operations and construction phase.

8.3 Foundation Design

All new foundations shall be designed utilizing an allowable soil bearing capacity of 2,000 psf for an embedded depth of 18 inches into approved engineered fill or competent native soils for one and two-story structures. A one-third increase may be used when considering short-term loading and seismic forces. Additional reinforcement due to proposed loadings may be necessary and shall be determined by the project engineers and/or architect. A representative of this firm shall inspect all foundation excavations prior to pouring concrete.

The use of any existing foundation to support new loads shall be reviewed by the project structural engineer. Existing foundations may need to be underpinned if new building loads are placed on such footings and shall be addressed by the project structural engineer. Any such foundation should be verified to be embedded a minimum of 18 inches in depth *and* into 12 inches into competent native soils.

8.4 Settlement Analysis

Resultant pressure curves for the consolidation tests are shown on Plates B and C. Computations utilizing these curves and the recommended allowable soil bearing capacities reveal that the foundations will experience settlements on the order of ¾ inch and differential settlements of less than ¼ inch.

8.5 Lateral Resistance

The following values may be utilized in resisting lateral loads imposed on the structure. Requirements of the California Building Code should be adhered to when the coefficient of friction and passive pressures are combined.

Coefficient of Friction - 0.40

Equivalent Passive Fluid Pressure = 250 lbs./cu.ft.

Maximum Passive Pressure = 2,500 lbs./cu.ft.

The passive pressure recommendations are valid only for approved compacted fill soils or competent native materials.

8.6 Retaining Wall Design Parameters

Active earth pressures against retaining walls will be equal to the pressures developed by the following fluid densities. These values are for ***granular backfill material*** placed behind the walls at various ground slopes above the walls.

Surface Slope of Retained Materials (Horizontal to Vertical	Equivalent Fluid Density (lb./cu.ft.)
Level	30
5 to 1	35
4 to 1	38
3 to 1	40
2 to 1	45

Any applicable short-term construction surcharges and seismic forces should be added to the above lateral pressure values. An equivalent fluid pressure of 45 pcf may be utilized for the restrained wall condition with a level grade behind the wall.

The seismic-induced lateral soil pressure for walls greater than 6 feet may be computed using a triangular pressure distribution with the maximum value at the top of the wall. The maximum lateral pressure of (20 pcf) H where H is the height of the retained soils above the wall footing should be used in final design of retaining walls. Sliding resistance values and passive fluid pressure values may be increased by 1/3 during short-term wind and seismic loading conditions.

All walls shall be waterproofed as needed and protected from hydrostatic pressure by a reliable permanent subdrain system. The subsurface drainage system shall consist of a 4-inch diameter perforated PVC pipe encased with gravel and wrapped with filter fabric. The granular backfill to be utilized immediately adjacent to retaining walls shall consist of an approved granular soil with a sand equivalency greater than 30. This backfill zone of free draining material shall consist of a wedge beginning a minimum of one horizontal foot from the base of the wall extending upward at an inclination of no less than ¾ to 1 (horizontal to vertical).

8.7 **Slab Design**

All concrete slabs including driveway and hardscape shall be a minimum of four inches in thickness and placed on approved subgrade soils. The subgrade soils shall be moisture conditioned over optimum moisture levels in the upper one foot. A vapor retarder should be utilized in areas which would be sensitive to the infiltration of moisture. This retarder shall meet requirements of ASTM E 96, *Water Vapor Transmission of Materials* and ASTM E 1745, *Standard Specification for Water Vapor Retarders used in Contact with Soil or Granular Fill Under Concrete Slabs.* The vapor retarder shall be installed in accordance with procedures stated in ASTM E 1643, *Standard practice for Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill Under Concrete Slabs.*

The moisture retarder may be placed directly upon compacted subgrade soils conditioned to near optimum moisture levels, although one to two inches of sand beneath the membrane is desirable. The subgrade upon which the retarder is placed shall be smooth and free of rocks, gravel or other protrusions which may damage the retarder. Use of sand above the retarder is under the purview of the structural engineer; if sand is used over the retarder, it should be placed in a dry condition.

8.8 **Utility Trench and Excavation Backfill**

Trenches from installation of utility lines and other excavations may be backfilled with on-site soils or approved imported soils compacted to a minimum of 90% relative compaction. All utility lines shall be properly bedded with clean sand having a sand equivalency rating of 30 or more. This bedding material shall be thoroughly water jetted around the pipe structure prior to placement of compacted backfill soils.

8.9 **Corrosion Design Criteria**

Representative samples of the surficial soils, typical of the subgrade soils expected to be encountered within foundation excavations were tested for sulfate potential. According to Table 4.3.1 of ACI 318 Building Code and Commentary, these contents revealed negligible sulfate concentrations. Therefore, a Type II cement according to latest CBC specifications may be utilized for building foundations at this time. It is recommended that additional sulfate tests be performed at the completion of site grading to assure that the as graded conditions are consistent with the recommendations stated in this design. Corrosion test results may be found on the attached Table III.

8.10 Expansive Soil

On-site soils are very low in expansion potential (EI 0-20). When soils have an expansion index (EI) of 20 or more, special attention should be given to the project design and maintenance. The attached *Expansive Soil Guidelines* should be reviewed by the engineers, architects, owner, maintenance personnel and other interested parties and considered during the design of the project and future property maintenance.

9.0 Closure

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase. It is the responsibility of the owner to ensure that all information within this report is submitted to the Architect and appropriate Engineers for the project.

This firm should have the opportunity to review the final plans (72 hours required) to verify that all our recommendations are incorporated. This report and all conclusions are subject to the review of the controlling authorities for the project.

A preconstruction conference should be held between the developer, general contractor, grading contractor, city inspector, architect, and soil engineer to clarify any questions relating to the grading operations and subsequent construction. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied with within the field.

This geotechnical investigation has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. No other warranty expressed or implied is made.

We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

Respectfully submitted,
NORCAL ENGINEERING

REGISTERED PROFESSIONAL ENGINEER
KEITH D. TUCKER
No. 841
Exp. 12/31/2026
GEOTECHNICAL
STATE OF CALIFORNIA

Keith D. Tucker
Project Engineer
R.G.E. 841

Mike Barone
Project Manager

SPECIFICATIONS FOR PLACEMENT OF COMPACTED FILL

Excavation

Any existing low-density soils and/or saturated soils shall be removed to competent natural soil under the inspection of the Geotechnical Engineering Firm. After the exposed surface has been cleansed of debris and/or vegetation, it shall be scarified until it is uniform in consistency, brought to the proper moisture content and compacted to a minimum of 90% relative compaction (in accordance with ASTM: D 1557).

In any area where a transition between fill and native soil or between bedrock and soil are encountered, additional excavation beneath foundations and slabs will be necessary in order to provide uniform support and avoid differential settlement of the structure.

Material for Fill

The on-site soils or approved import soils may be utilized for the compacted fill provided they are free of any deleterious materials and shall not contain any rocks, brick, asphaltic concrete, concrete or other hard materials greater than eight inches in maximum dimensions. Any import soil must be approved by the Geotechnical Engineering firm a minimum of 72 hours prior to importation of site.

Placement of Compacted Fill Soils

The approved fill soils shall be placed in layers not in excess of six inches in thickness. Each lift shall be uniform in thickness and thoroughly blended. The fill soils shall be brought to within 2% of the optimum moisture content, unless otherwise specified by the Geotechnical Engineering firm. Each lift shall be compacted to a minimum of 90% relative compaction (in accordance with ASTM: D 1557) and approved prior to the placement of the next layer of soil. Compaction tests shall be obtained at the discretion of the Geotechnical Engineering firm but to a minimum of one test for every 500 cubic yards placed and/or for every 2 feet of compacted fill placed.

The minimum relative compaction shall be obtained in accordance with accepted methods in the construction industry. The final grade of the structural areas shall be in a dense and smooth condition prior to placement of slabs-on-grade or pavement areas. No fill soils shall be placed, spread or compacted during unfavorable weather conditions. When the grading is interrupted by heavy rains, compaction operations shall not be resumed until approved by the Geotechnical Engineering firm.

Grading Observations

The controlling governmental agencies should be notified prior to commencement of any grading operations. This firm recommends that the grading operations be conducted under the observation of a Geotechnical Engineering firm as deemed necessary. A 24-hour notice must be provided to this firm prior to the time of our initial inspection.

Observation shall include the clearing and grubbing operations to assure that all unsuitable materials have been properly removed; approve the exposed subgrade in areas to receive fill and in areas where excavation has resulted in the desired finished grade and designate areas of overexcavation; and perform field compaction tests to determine relative compaction achieved during fill placement. In addition, all foundation excavations shall be observed by the Geotechnical Engineering firm to confirm that appropriate bearing materials are present at the design grades and recommend any modifications to construct footings.

EXPANSIVE SOIL GUIDELINES

The following expansive soil guidelines are provided for your project. The intent of these guidelines is to inform you, the client, of the importance of proper design and maintenance of projects supported on expansive soils. ***You, as the owner or other interested party, should be warned that you have a duty to provide the information contained in the soil report including these guidelines to your design engineers, architects, landscapers and other design parties in order to enable them to provide a design that takes into consideration expansive soils.***

In addition, you should provide the soil report with these guidelines to any property manager, lessee, property purchaser or other interested party that will have or assume the responsibility of maintaining the development in the future.

Expansive soils are fine-grained silts and clays which are subject to swelling and contracting. The amount of this swelling and contracting is subject to the amount of fine-grained clay materials present in the soils and the amount of moisture either introduced or extracted from the soils. Expansive soils are divided into five categories ranging from "very low" to "very high". Expansion indices are assigned to each classification and are included in the laboratory testing section of this report. *If the expansion index of the soils on your site, as stated in this report, is 21 or higher, you have expansive soils.* The classifications of expansive soils are as follows:

Classification of Expansive Soil*

Expansion Index	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
Above 130	Very High

*From Table 18A-I-B of California Building Code (1988)

When expansive soils are compacted during site grading operations, care is taken to place the materials at or slightly above optimum moisture levels and perform proper compaction operations. Any subsequent excessive wetting and/or drying of expansive soils will cause the soil materials to expand and/or contract. These actions are likely to cause distress of foundations, structures, slabs-on-grade, sidewalks and pavement over the life of the structure. ***It is therefore imperative that even after construction of improvements, the moisture contents are maintained at relatively constant levels, allowing neither excessive wetting or drying of soils.***

Evidence of excessive wetting of expansive soils may be seen in concrete slabs, both interior and exterior. Slabs may lift at construction joints producing a trip hazard or may crack from the pressure of soil expansion. Wet clays in foundation areas may result in lifting of the structure causing difficulty in the opening and closing of doors and windows, as well as cracking in exterior and interior wall surfaces. In extreme wetting of soils to depth, settlement of the structure may eventually result. Excessive wetting of soils in landscape areas adjacent to concrete or asphaltic pavement areas may also result in expansion of soils beneath pavement and resultant distress to the pavement surface.

Excessive drying of expansive soils is initially evidenced by cracking in the surface of the soils due to contraction. Settlement of structures and on-grade slabs may also eventually result along with problems in the operation of doors and windows.

Projects located in areas of expansive clay soils will be subject to more movement and "hairline" cracking of walls and slabs than similar projects situated on non-expansive sandy soils. There are, however, measures that developers and property owners may take to reduce the amount of movement over the life the development. The following guidelines are provided to assist you in both design and maintenance of projects on expansive soils:

- Drainage away from structures and pavement is essential to prevent excessive wetting of expansive soils. Grades should be designed to the latest building code and maintained to allow flow of irrigation and rainwater to approved drainage devices or to the street. Any "ponding" of water adjacent to buildings, slabs and pavement after rains is evidence of poor drainage; the installation of drainage devices or regrading of the area may be required to assure proper drainage. Installation of rain gutters is also recommended to control the introduction of moisture next to buildings. Gutters should discharge into a drainage device or onto pavement which drains to roadways.

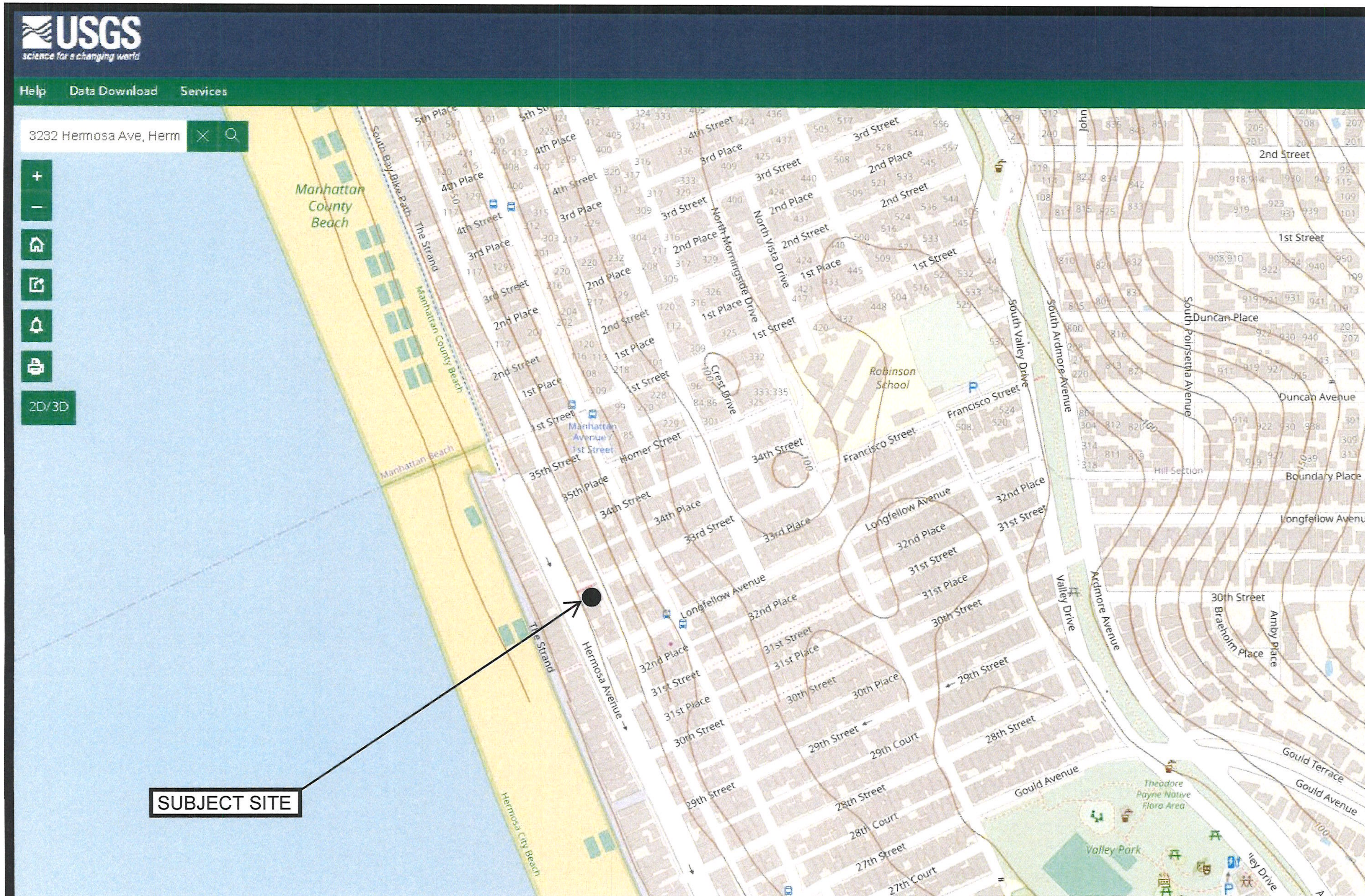
- Irrigation should be strictly controlled around building foundations, slabs and pavement and may need to be adjusted depending upon the season. This control is essential to maintain a relatively uniform moisture content in the expansive soils and to prevent swelling and contracting. Over-watering adjacent to improvements may result in damage to those improvements. NorCal Engineering makes no specific recommendations regarding landscape irrigation schedules.

- Planting schemes for landscaping around structures and pavement should be analyzed carefully. Plants (including sod) requiring high amounts of water may result in excessive wetting of soils. Trees and large shrubs may actually extract moisture from the expansive soils, thus causing contraction of the fine-grained soils.

- Thickened edges on exterior slabs will assist in keeping excessive moisture from entering directly beneath the concrete. A six-inch thick or greater deepened edge on slabs may be considered. Underlying interior and exterior slabs with 6 to 12 inches or more of non-expansive soils and providing presaturation of the underlying clayey soils as recommended in the soil report will improve the overall performance of on-grade slabs.

- Increase the amount of steel reinforcing in concrete slabs, foundations and other structures to resist the forces of expansive soils. The precise amount of reinforcing should be determined by the appropriate design engineers and/or architects.

- Recommendations of the soil report should always be followed in the development of the project. Any recommendations regarding presaturation of the upper subgrade soils in slab areas should be performed in the field and verified by the Soil Engineer.



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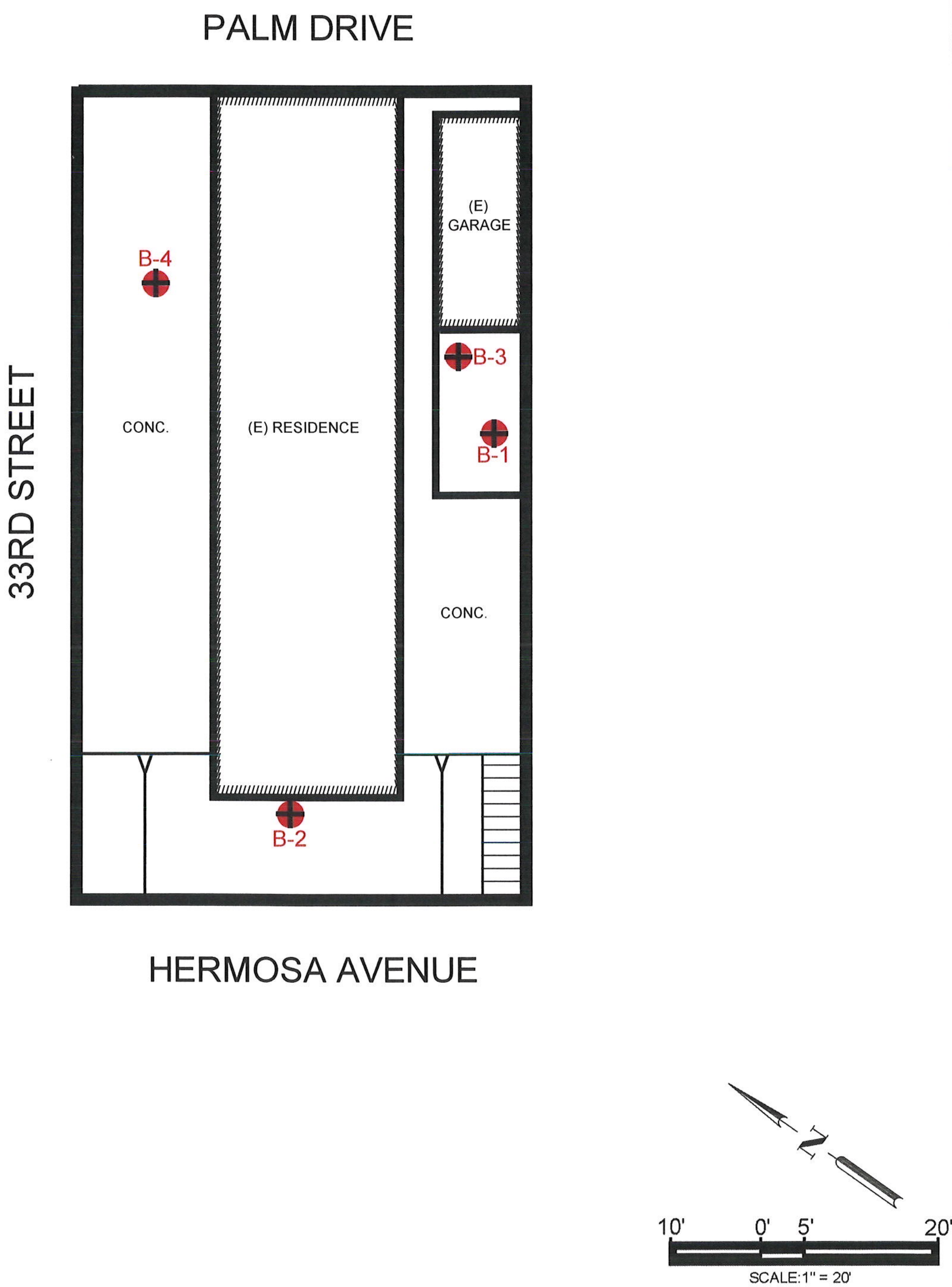
LANEY LA

PROJECT: 25132-25

DATE: APRIL 2025

VICINITY MAP

FIGURE 1



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LANEY LA

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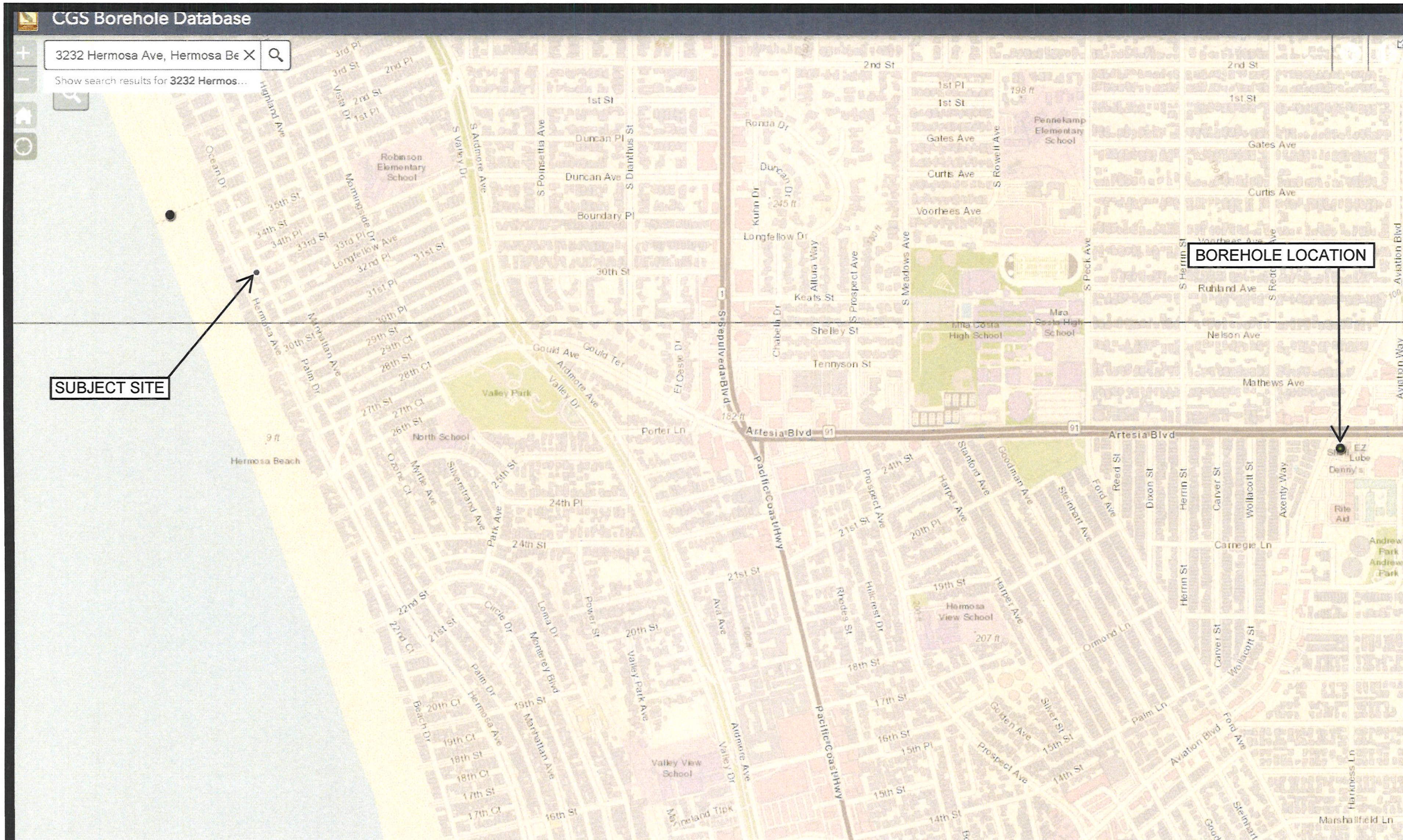
EXISTING SITE PLAN

FIGURE 2



official_name	well_name	data_source	report_no	site_name	site_id	bh_data_class	operator	job_number	longitude	latitude	ref_elevation	total_depth	remarks
000019_00140_3	I11965VZ4	Los Angeles Region, RWQCB	I11965	Exxon Station No. 72824		SPT	Environmental Resolutions, Inc.	1116	-118.3805153	33.87249592	100	70.5	no GW encountered

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LANEY LA

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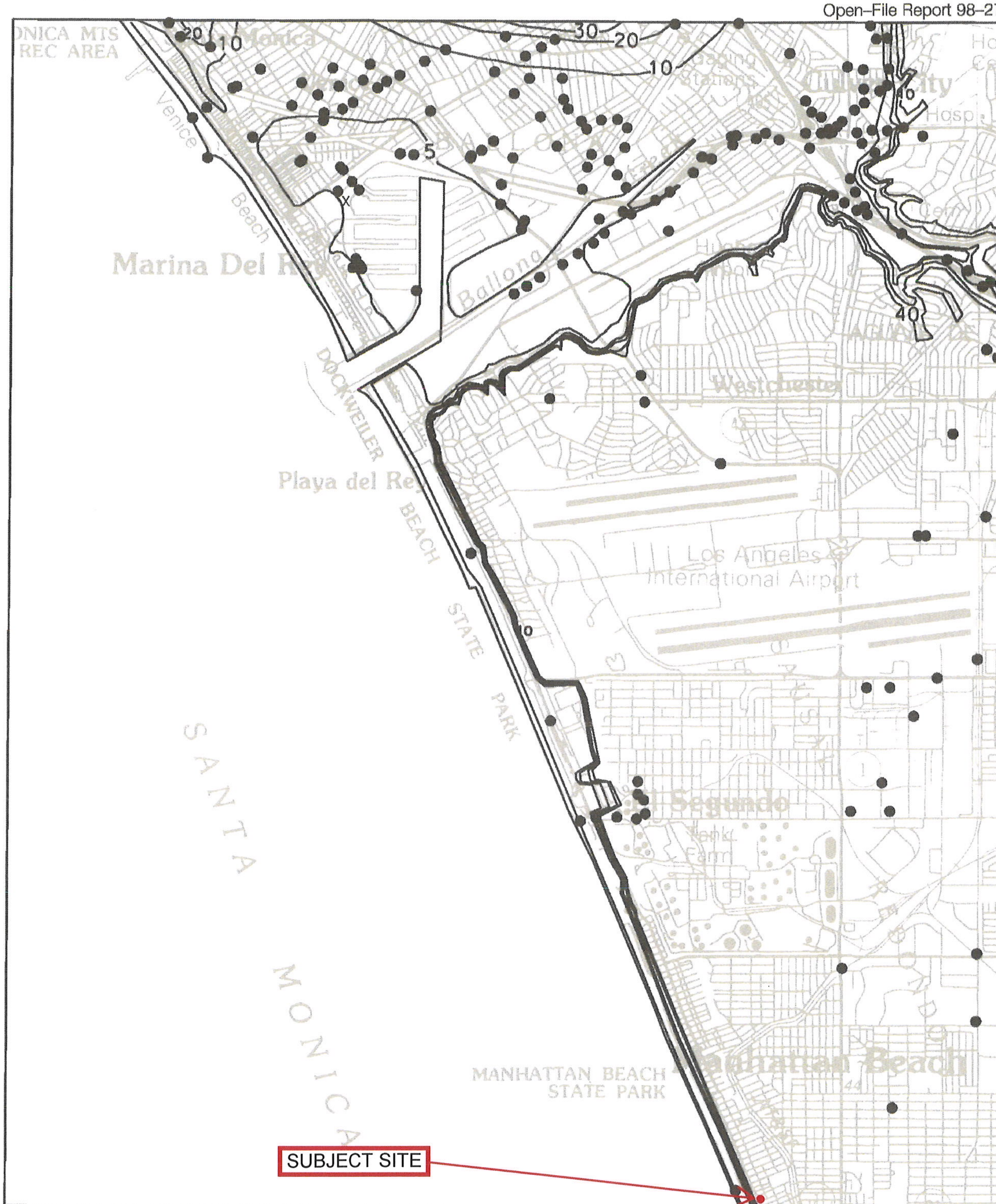
DATE: APRIL 2025

GROUNDWATER MAP

FIGURE 3

Open–File Report 98–27



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, Venice Quadrangle.

● Borehole Site — 30 — Depth to ground water in feet

NorCal Engineering SOILS AND GEOTECHNICAL CONSULTANTS	GROUNDWATER CONTOUR MAP (SEISMIC HAZARD EVALUATION - VENICE 7.5 MIN. QUAD.)
LANEY LA	
PROJECT: 25132-25 DATE: APRIL 2025	FIGURE 4

List of Appendices
(in order of appearance)

Appendix A
Log of Excavations

MAJOR DIVISION			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL, SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINE (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

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KEY:

■ Indicates 2.5-inch Inside Diameter. Ring Sample.

☒ Indicates 2-inch OD Split Spoon Sample (SPT).

⧅ Indicates Shelby Tube Sample.

◫ Indicates No Recovery.

◧ Indicates SPT with 140# Hammer 30 in. Drop.

🖂 Indicates Bulk Sample.

◩ Indicates Small Bag Sample.

◨ Indicates Non-Standard

⧗ Indicates Core Run.

COMPONENT PROPORTIONS

DESCRIPTIVE TERMS	RANGE OF PROPORTION
Trace	1 - 5%
Few	5 - 10%
Little	10 - 20%
Some	20 - 35%
And	35 - 50%

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5mm) to No. 200 (0.074mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074 mm)

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
DAMP	Some perceptible moisture; below optimum
MOIST	No visible water; near optimum moisture content
WET	Visible free water, usually soil is below water table.

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

COHESIONLESS SOILS		COHESIVE SOILS		
Density	N (blows/ft)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	Very Soft	0 to 2	< 250
Loose	4 to 10	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	Very Stiff	15 to 30	2000 - 4000
		Hard	over 30	> 4000

Laney LA
25132-25

Log of Boring B-1

Boring Location: 3232 Hermosa Ave, Hermosa Beach

Date of Drilling: 3/11/2025 | **Groundwater Depth:** None Encountered

Drilling Method: Hand Auger

Hammer Weight: | **Drop:**

Surface Elevation:

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Slighlty Silty (fine to medium grained) SAND with occasional gravel and concrete Brown, loose, dry					
		NATURAL Soil at 20 inches bgs Slightly Silty (fine to medium grained) SAND Grey brown, medium dense, damp			2.8		
5		Boring completed at depth of 3'					

GWT not encountered

NorCal Engineering

Laney LA
25132-25

Log of Boring B-2

Boring Location: 3232 Hermosa Ave, Hermosa Beach

Date of Drilling: 3/11/2025 | **Groundwater Depth:** None Encountered

Drilling Method: Hand Auger

Hammer Weight: | **Drop:**

Surface Elevation:

GWT not encountered

Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0	FILL Slighlty Silty (fine to medium grained) SAND with occasional gravel and concrete Brown, loose, dry					
	NATURAL Soil at 18 inches bgs Slightly Silty (fine to medium grained) SAND Grey brown, medium dense, damp	■		3.7	102.0	
5		■		4.0	102.8	
	Silty (fine to medium grained) SAND Brown, medium dense, damp					
10		■		7.8	105.8	
	Slight decrease in moisture below 12' bgs					
15		■		6.3	102.0	
20		■		3.5	100.8	
	Boring completed at depth of 20.5'					
25						
30						
35						

Laney LA
25132-25

Log of Boring B-3

Boring Location: 3232 Hermosa Ave, Hermosa Beach

Date of Drilling: 3/11/2025 | Groundwater Depth: None Encountered

Drilling Method: Hand Auger

Hammer Weight: | Drop:

Surface Elevation:

Depth (feet)	Lithology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Slighlty Silty (fine to medium grained) SAND with occasional gravel and concrete Brown, loose, dry	■		2.9	100.4	
5	GWT not encountered	NATURAL Soil at 15 inches bgs Slightly Silty (fine to medium grained) SAND Grey brown, medium dense, damp	■		3.0	87.8	
10		Silty (fine to medium grained) SAND Brown, medium dense, damp Boring completed at depth of 10.5'	■		2.1	104.9	
15							
20							
25							
30							
35							

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\25132-25.log Date: 4/9/2025

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Laney LA
25132-25

Log of Boring B-4

Boring Location: 3232 Hermosa Ave, Hermosa Beach

Date of Drilling: 3/11/2025	Groundwater Depth: None Encountered
Drilling Method: Hand Auger	
Hammer Weight:	Drop:
Surface Elevation:	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0	GWT not encountered	FILL Slighlty Silty (fine to medium grained) SAND with occasional gravel and concrete Brown, loose, dry					
5		NATURAL Soil at 11 inches bgs Slightly Silty (fine to medium grained) SAND Grey brown, medium dense, damp	■		2.6	105.3	
		Boring completed at depth of 6'					
10							
15							
20							
25							
30							
35							

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Appendix B
Laboratory Tests

TABLE I
MAXIMUM DENSITY TESTS

Sample	Classification	Optimum Moisture (%)	Maximum Dry Density (lbs/cu.ft)
B-3 @ 2'	Silty SAND	10.0	107.5

TABLE II
EXPANSION TESTS

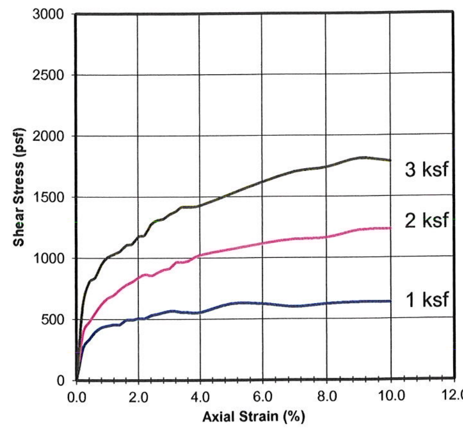
Sample	Classification	Expansion Index
B-3 @ 2'	Silty SAND	00

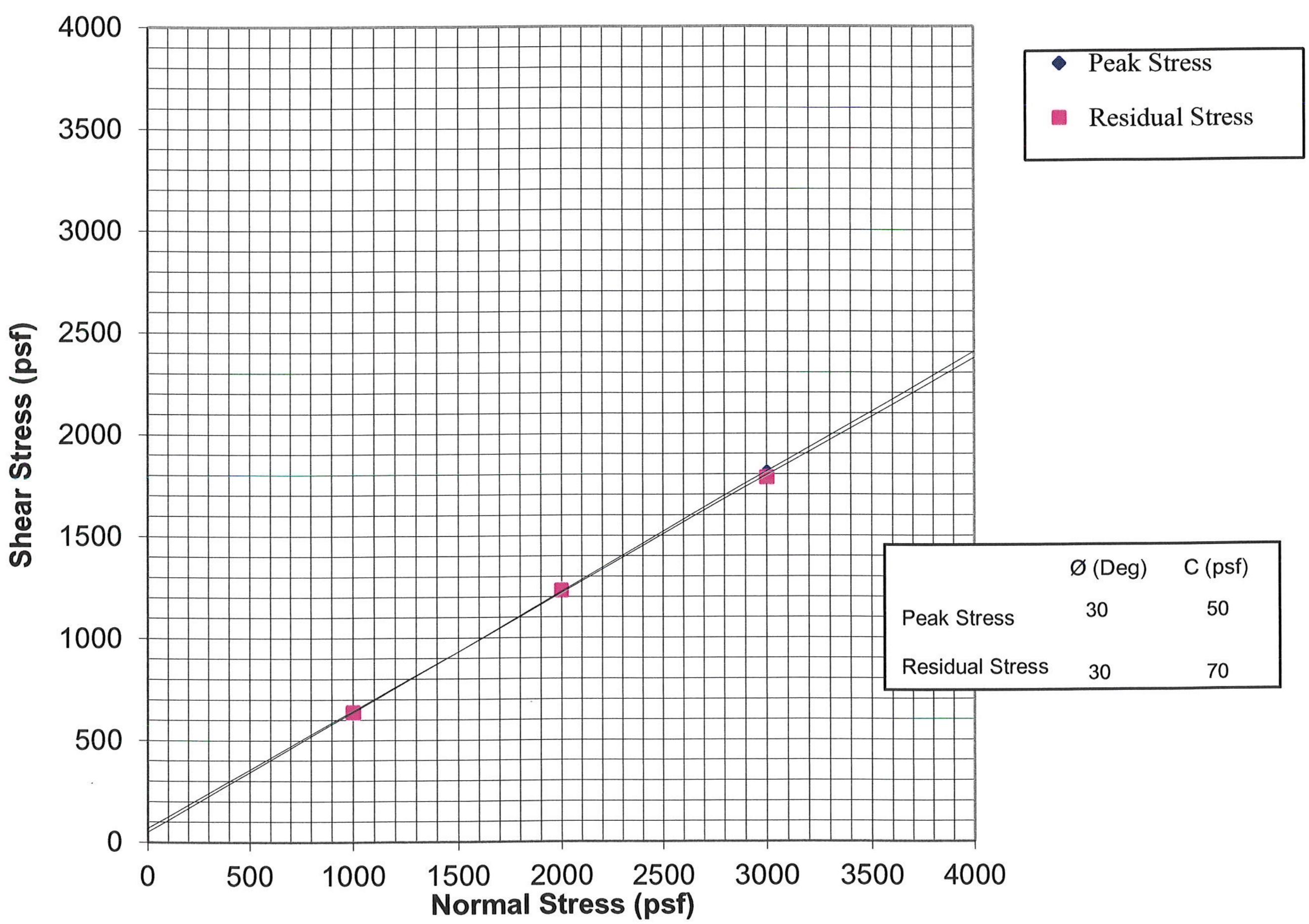
TABLE III
SOLUBLE SULFATE TESTS

Sample	Sulfate (%)
B-2 @ 1'	0.0003

% by weight

Sample No.	B3@2'			
Sample Type:	Undisturbed-Saturated			
Soil Description:	Fine-Medium Grained Sand w/ Trace Silt			
		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	636	1236	1812
Displacement	(in.)	0.225	0.250	0.225
Residual Stress	(psf)	636	1236	1788
Displacement	(in.)	0.250	0.250	0.250
Initial Dry Density	(pcf)	100.4	100.4	100.4
Initial Water Content	(%)	2.9	2.9	2.9
Strain Rate	(in./min.)	0.020	0.020	0.020





	Ø (Deg)	C (psf)
Peak Stress	30	50
Residual Stress	30	70

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SOILS AND GEOTECHNICAL CONSULTANTS

Laney LA

PROJECT NUMBER: 25132-25 DATE: 3/19/2024

DIRECT SHEAR TEST

ASTM D3080

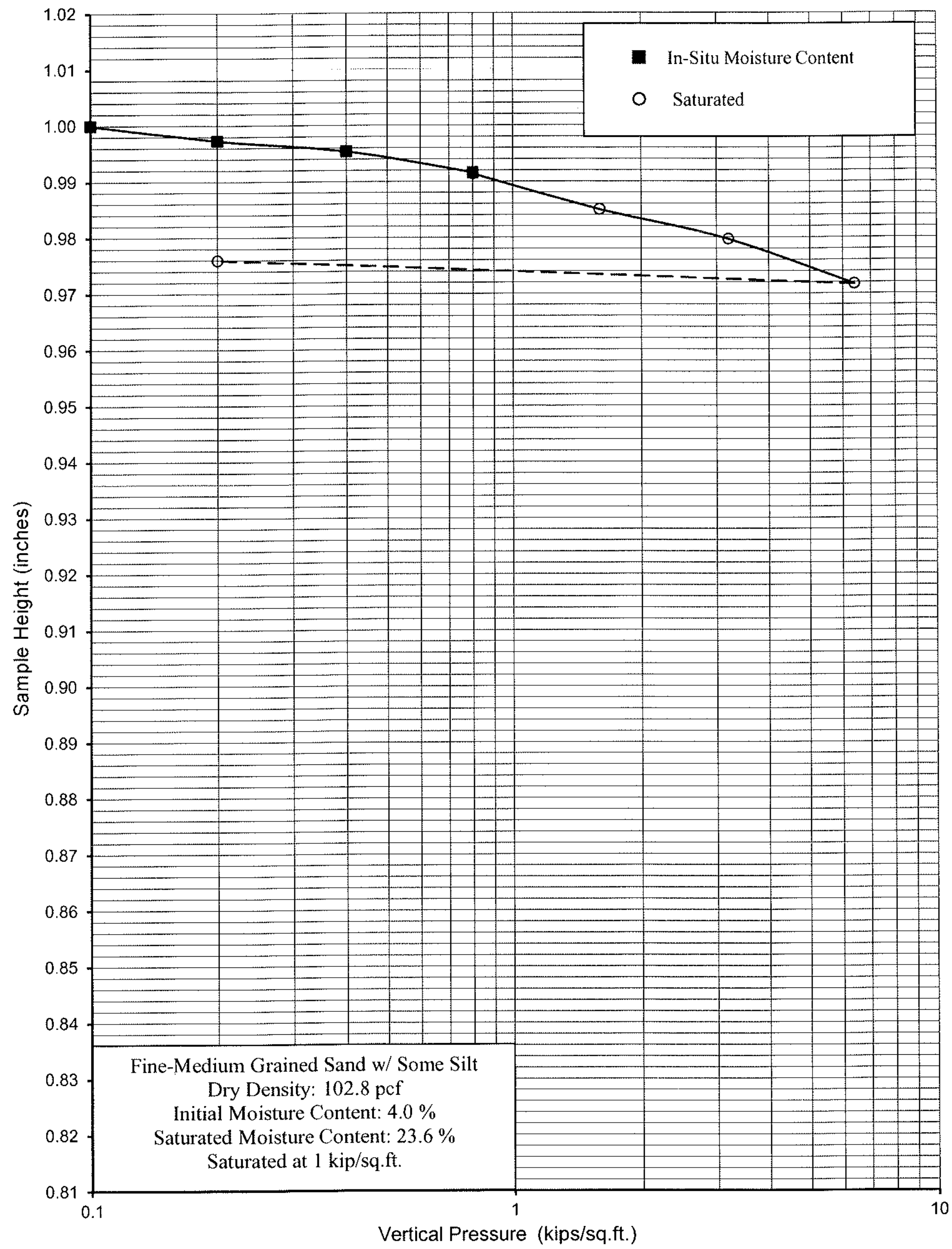
PLATE A

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)
0.1	1.0000	0.0
0.2	0.9973	0.3
0.4	0.9954	0.5
0.8	0.9916	0.8
0.8	0.9914	0.9
1.6	0.9850	1.5
3.2	0.9797	2.0
6.4	0.9717	2.8
0.2	0.9760	2.4

Saturated

Date Tested: 3/18/2025
Sample: B2
Depth: 6'

Sample No. B2 | Depth 6' | Date 3/19/2025



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SOILS AND GEOTECHNICAL CONSULTANTS

Laney LA

PROJECT NUMBER: 25132-25 DATE: 3/19/2025

CONSOLIDATION TEST

ASTM D2435

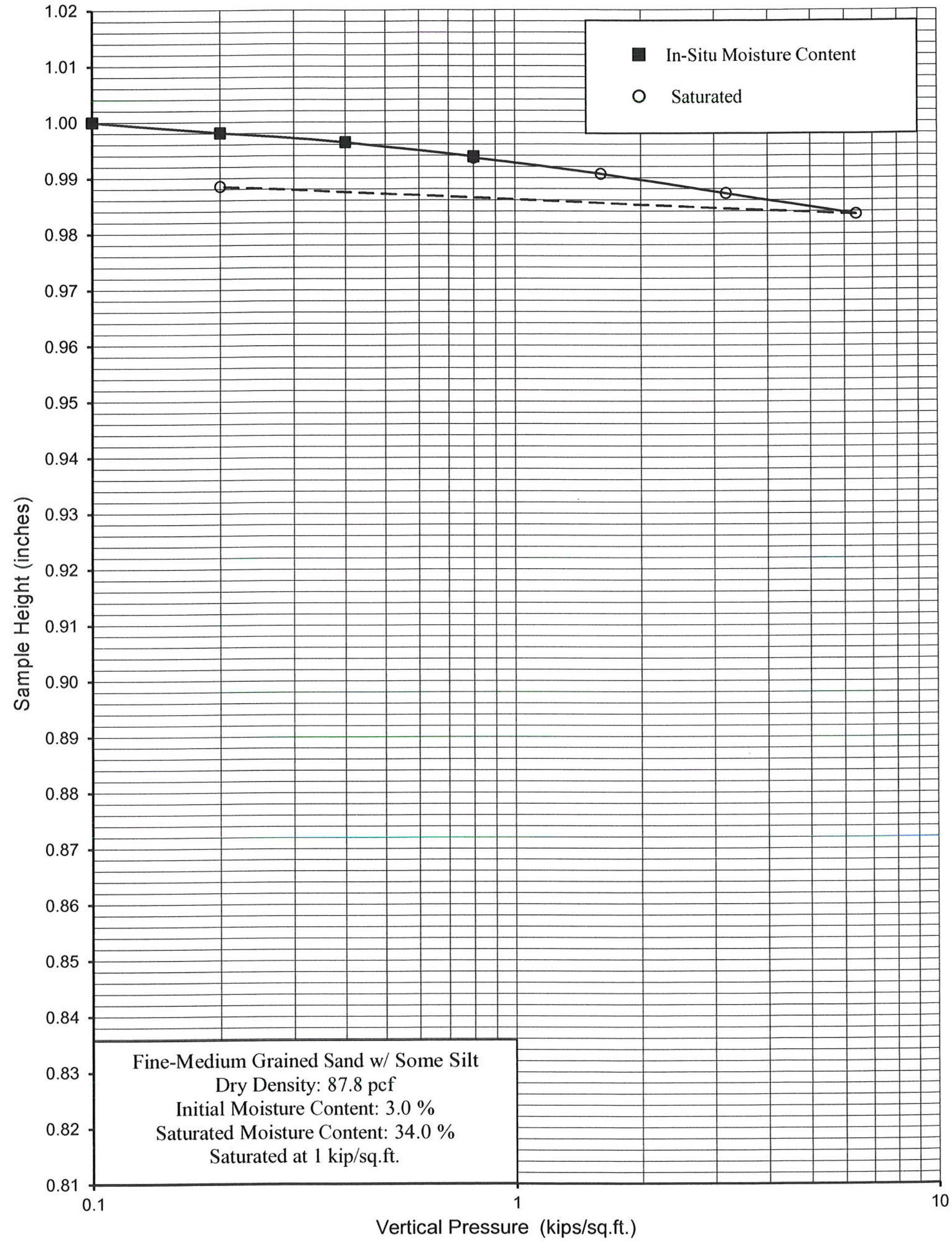
PLATE B

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)
0.1	1.0000	0.0
0.2	0.9981	0.2
0.4	0.9964	0.4
0.8	0.9938	0.6
0.8	0.9936	0.6
1.6	0.9907	0.9
3.2	0.9872	1.3
6.4	0.9835	1.7
0.2	0.9885	1.2

Saturated

Date Tested: 3/18/2025
Sample: B3
Depth: 5'

Sample No. B3 | Depth 5' | Date 3/19/2025



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SOILS AND GEOTECHNICAL CONSULTANTS

Laney LA

PROJECT NUMBER: 25132-25 DATE: 3/19/2025

CONSOLIDATION TEST

ASTM D2435

PLATE C

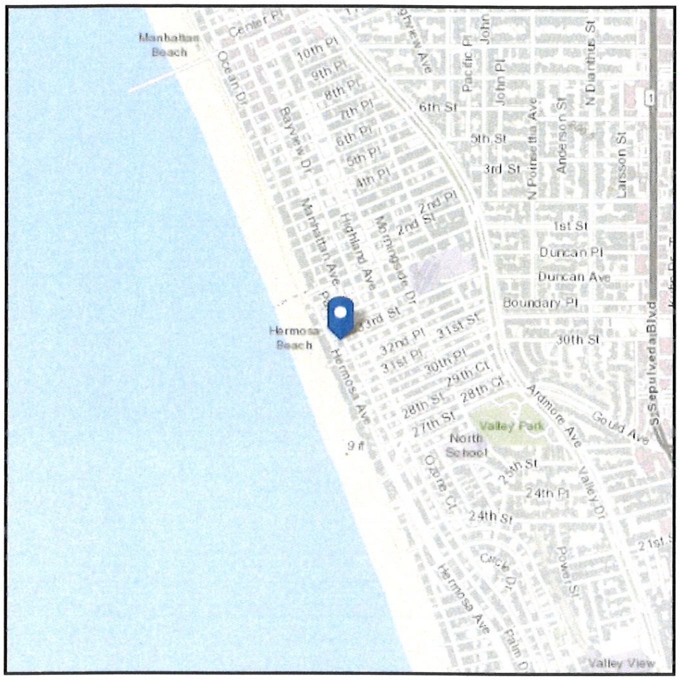
Appendix C
Seismic Hazards Report

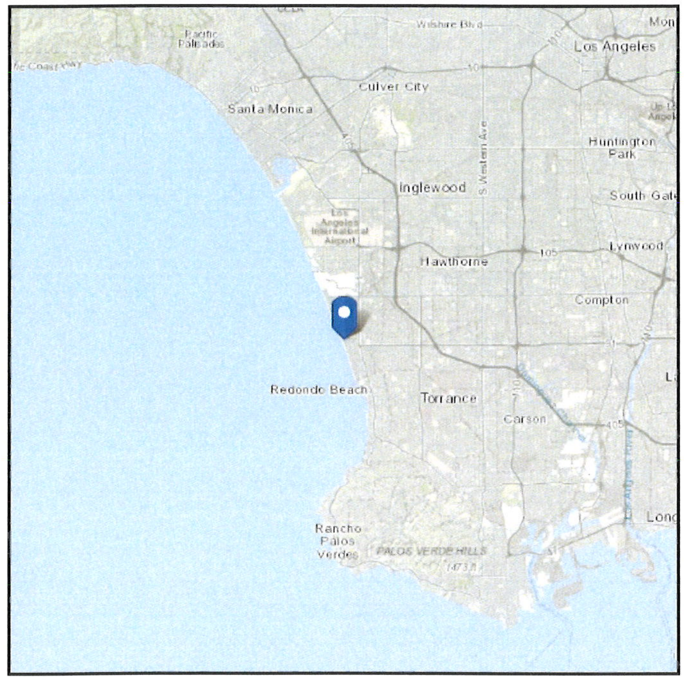
ASCE Hazards Report

Address:
3232 Hermosa Ave
Hermosa Beach, California
90254

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Stiff Soil

Latitude: 33.875987
Longitude: -118.4071
Elevation: 41.27689991666128 ft (NAVD 88)





ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Seismic

Site Soil Class: D - Stiff Soil

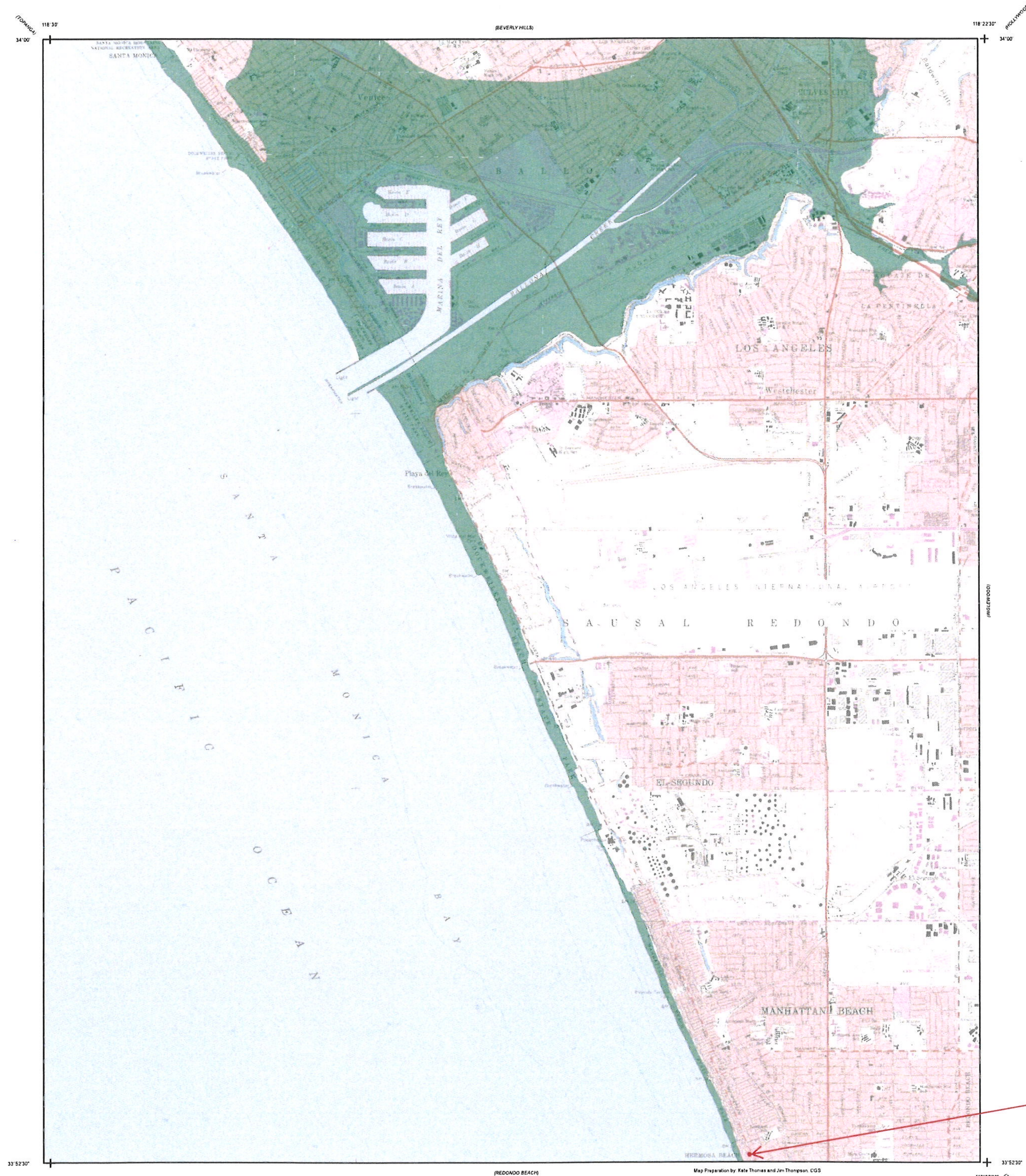
Results:

S_S :	1.916	S_{D1} :	N/A
S_1 :	0.684	T_L :	8
F_a :	1	PGA :	0.837
F_v :	N/A	PGA_M :	0.921
S_{MS} :	1.916	F_{PGA} :	1.1
S_{M1} :	N/A	I_e :	1
S_{DS} :	1.277	C_v :	1.483

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Tue Apr 08 2025

Date Source: USGS Seismic Design Maps



Map Preparation by: Kate Thomas and Jon Thompson, CGS

Earthquake Zones of Required Investigation Venice Quadrangle

California Geological Survey

This Map Shows Seismic Hazard Zones
Alquist-Priolo Earthquake Fault Zones Have Not Been Prepared For The Venice Quadrangle

This map shows the location of Seismic Hazard Zones, referred to here as Earthquake Zones of Required Investigation. The Geographic Information System (GIS) digital files of these regulatory zones released by the California Geological Survey (CGS) are the "Official Maps." GIS files are available at the GGS website http://maps.conservation.ca.gov/cgs/informationwarehouse/. These zones will assist cities and counties in fulfilling their responsibilities for protecting the public from the effects of earthquake-triggered ground failure as required by the Seismic Hazards Mapping Act (Public Resources Code Sections 2690-2699.6) and the Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code Sections 2621-2630). For information regarding the general approach and recommended methods for preparing these zones, see CGS Special Publication 118, *Recommended Criteria for Delineating Seismic Hazard Zones in California*, and Special Publication 42, *Earthquake Fault Zones, a Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California*, Appendix C.

For information regarding the scope and recommended methods to be used in conducting required site investigations refer to CGS Special Publication 117A, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, and CGS Special Publication 42. For a general description of the Seismic Hazards Mapping and Alquist-Priolo Earthquake Fault Zoning acts, the zonation programs, and related information, please refer to the website at www.conservation.ca.gov/cgs/.

MAP EXPLANATION

SEISMIC HAZARD ZONES

Liquefaction Zones
Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground water 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 Landslide Zones
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.

ADDITIONAL INFORMATION

For additional information on the zones of required investigation presented on this map, the data and methodology used to prepare them, and additional references consulted, please refer to the following

Seismic Hazard Zone Report for the Venice 7.5-Minute Quadrangle, Los Angeles County, California. California Geological Survey, Seismic Hazard Zone Report 036.
http://gmw.conservation.ca.gov/SHP/EZRIM/Reports/SHZR/SHZR_036_Venice.pdf

For more information on the Seismic Hazards Mapping Act please refer to
http://www.conservation.ca.gov/cgs/shzp/Pages/SHMPpgminfo.aspx

Click the link below to learn how to take greater advantage of the GeoPDF format of this map after downloading.
http://gmw.conservation.ca.gov/SHP/EZRIM/Docs/TerragoUserGuide.pdf

VENICE QUADRANGLE

SEISMIC HAZARD ZONES

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

OFFICIAL MAP

Released: March 25, 1999

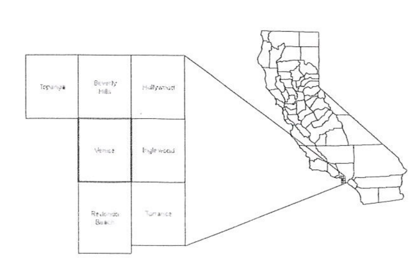
STATE GEOLOGIST

Study area defined by USGS quadrangle boundaries using NAD 27, represented by the visible map extent. Data are maintained and distributed in California Albers (meters), NAD 83 [EPSG:3310], as shown by tics and coordinates.
Shaded topographic relief derived from USGS 10 meter NED (2013).
Topographic base map from USGS 1964, photorevised 1981.
Street data from US Census Bureau TIGER/Line, 2016.

N.T.S.

Contour Interval 10 Feet

12° TRUE NORTH MAGNETIC NORTH
Approximate Declination, 2016



California Geological Survey
Geologic Information and Publications
801 K Street, MS 14-34
Sacramento, CA 95814-3532
www.conservation.ca.gov/cgs

IMPORTANT

PLEASE NOTE THE FOLLOWING FOR ZONES SHOWN ON THIS MAP

1) This map may not show all faults that have the potential for surface fault rupture, either within the Earthquake Fault Zones or outside their boundaries. Additionally, this map may not show all areas that have the potential for liquefaction, landsliding, strong earthquake ground shaking or other earthquake and geologic hazards. Also, a single earthquake capable of causing liquefaction or triggering landside failure will not uniformly affect the entire area zoned.

2) Boundaries of Earthquake Fault Zones, if included on this map, are based on interpreted Holocene-active fault traces.

3) The identification and location of these faults are based on the best available data. However, the quality of data used is varied. Traces have been depicted as accurately as possible at a map scale of 1:24,000.

4) Liquefaction zones may also contain areas susceptible to the effects of earthquake-induced landslides. This situation typically exists at or near the toes of existing landslides, downslope from rockfall or debris flow source areas, or adjacent to steep stream banks.

5) Landslide zones on this map were determined, in part, by adapting methods first developed by the U.S. Geological Survey (USGS). Landslide hazard maps prepared by the USGS typically use experimental approaches to assess earthquake-induced and other types of landslide hazards. Although aspects of these new methodologies may be incorporated in future CGS seismic hazard zone maps, USGS maps should not be used as substitutes for these Official SEISMIC HAZARD ZONES maps.

6) USGS base map standards provide that 90 percent of cultural features be located within 40 feet (horizontal accuracy) at the scale of this map. The identification and location of liquefaction and earthquake-induced landslide zones are based on available data. However, the quality of data used is varied. The zone boundaries depicted have been drawn as accurately as possible at this scale.

7) Information on this map is not sufficient to serve as a substitute for the geologic and geotechnical site investigations required under Chapters 7.5 and 7.8 of Division 2 of the California Public Resources Code.

8) Seismic Hazard Zones identified on this map may include developed land where delineated hazards have already been mitigated to city or county standards. Check with your local building/planning department for information regarding the location of such mitigated areas.

9) DISCLAIMER: The State of California and the Department of Conservation make no representations or warranties regarding the accuracy of the data from which these maps were derived. Neither the State nor the Department shall be liable under any circumstances for any direct, indirect, special, incidental or consequential damages with respect to any claim by any user or any third party on account of or arising from the use of this map.

Appendix D
Soil Infiltration Data

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Laney La	**Tested By**: J.S.
Project No.: 25132-25	**Date Tested**: 3.11.2025
Test Hole: 1	**Caving**:
Depth of Test Hole: 3' (36")	**Notes**:
Diameter of Test Hole: 6"	
Date Excavated: 3.11.2025	

PRE-SOAK

TIME	PRE-SOAK NO.	TIME INTERVAL	TOTAL ELAPSED TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	CHANGE IN WATER LEVEL
11:00 11:01	1	1	1	24.0	36.0	12.0
11:03 11:04	2	1	2	24.0	36.0	12.0

PERCOLATION TEST

TIME	TEST NO.	TIME INTERVAL	TOTAL ELAPSED TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	CHANGE IN WATER LEVEL
11:02 11:03	1	1	1	24.0	36.0	12.0
11:03 11:04	2	1	2	24.0	36.0	12.0
11:04 11:05	3	1	3	24.0	36.0	12.0
11:05 11:06	4	1	4	24.0	36.0	12.0
11:06 11:07	5	1	5	24.0	36.0	12.0
11:07 11:08	6	1	6	24.0	36.0	12.0
11:08 11:09	7	1	7	24.0	36.0	12.0
11:09 11:10	8	1	8	24.0	36.0	12.0
11:10 11:11	9	1	9	24.0	36.0	12.0
11:11 11:12	10	1	10	24.0	36.0	12.0
11:12 11:13	11	1	11	24.0	36.0	12.0
11:12 11:13	12	1	12	24.0	36.0	12.0

TIME	TEST NO.	TIME INTERVAL	TOTAL ELAPSED TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	CHANGE IN WATER LEVEL
11:14 11:15	13	1	13	24	36.0	12.0
11:15 11:16	14	1	14	24	36.0	12.0
11:16 11:17	15	1	15	24	36.0	12.0
11:17 11:18	16	1	16	24	36.0	12.0
11:18 11:19	17	1	17	24	36.0	12.0
11:19 11:20	18	1	18	24	36.0	12.0
11:20 11:21	19	1	19	24	36.0	12.0
11:21 11:22	20	1	20	24	36.0	12.0
11:22 11:23	21	1	21	24	36.0	12.0
11:23 11:24	22	1	22	24	36.0	12.0
11:24 11:25	23	1	23	24	36.0	12.0
11:25 11:26	24	1	24	24	36.0	12.0
11:26 11:27	25	1	25	24	36.0	12.0
11:27 11:28	26	1	26	24	36.0	12.0
11:28 11:29	27	1	27	24	36.0	12.0
11:29 11:30	28	1	28	24	36.0	12.0
11:30 11:31	29	1	29	24	36.0	12.0
11:31 11:32	30	1	30	24	36.0	12.0
11:32 11:33	31	1	31	24	36.0	12.0
11:33 11:34	32	1	32	24	36.0	12.0

TIME	TEST NO.	TIME INTERVAL	TOTAL ELAPSED TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	CHANGE IN WATER LEVEL
11:34	33	1	33	24.0	36.0	12.0
11:35						
11: 35	34	1	34	24.0	36.0	12.0
11:36						
11: 36	35	1	35	24.0	36.0	12.0
11:37						
11:37	36	1	36	24.0	36.0	12.0
11:38						
11:38	37	1	37	24.0	36.0	12.0
11:39						
11:39	38	1	38	24.0	36.0	12.0
11:40						
11:40	39	1	39	24.0	36.0	12.0
11:41						
11:41	40	1	40	24.0	36.0	12.0
11:42						
11:42	41	1	41	24.0	36.0	12.0
11:43						
11:43	42	1	42	24.0	36.0	12.0
11:44						
11:44	43	1	43	24.0	36.0	12.0
11:45						
11:45	44	1	44	24.0	36.0	12.0
11:46						
11:46	45	1	45	24.0	36.0	12.0
11:47						
11:47	46	1	46	24.0	36.0	12.0
11:48						
11:48	47	1	47	24.0	36.0	12.0
11:49						
11:49	48	1	48	24.0	36.0	12.0
11:50						
11:50	49	1	49	24.0	36.0	12.0
11:51						
11:51	50	1	50	24.0	36.0	12.0
11:52						
11:52	51	1	51	24.0	36.0	12.0
11:53						
11:53	52	1	52	24.0	36.0	12.0
11:54						
11:54	53	1	53	24.0	36.0	12.0
11:55						

TIME	TEST NO.	TIME INTERVAL	TOTAL ELAPSED TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	CHANGE IN WATER LEVEL
11:55 11:56	54	1	54	24.0	36.0	12.0
11:56 11:57	55	1	55	24.0	36.0	12.0
11:57 11:58	56	1	56	24.0	36.0	12.0
11:58 11:59	57	1	57	24.0	36.0	12.0
11:59 12:00	58	1	58	24.0	36.0	12.0
12:00 12:01	59	1	59	24.0	36.0	12.0
12:01 12:02	60	1	60	24.0	36.0	12.0
12:02 12:03	61	1	61	24.0	36.0	12.0
12:03 12:04	62	1	62	24.0	36.0	12.0
12:04 12:05	63	1	63	24.0	36.0	12.0
12:05 12:06	64	1	64	24.0	36.0	12.0
12:06 12:07	65	1	65	24.0	36.0	12.0
12:07 12:08	66	1	66	24.0	36.0	12.0
12:08 12:09	67	1	67	24.0	36.0	12.0
12:09 12:10	68	1	68	24.0	36.0	12.0
12:10 12:11	69	1	69	24.0	36.0	12.0
12:11 12:12	70	1	70	24.0	36.0	12.0
12:12 12:13	71	1	71	24.0	36.0	12.0
12:13 12:14	72	1	72	24.0	36.0	12.0
12:14 12:15	73	1	73	24.0	36.0	12.0
12:15 12:16	74	1	74	24.0	36.0	12.0

TIME	TEST NO.	TIME INTERVAL	TOTAL ELAPSED TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	CHANGE IN WATER LEVEL
12:16 12:17	75	1	75	24.0	36.0	12.0
12:17 12:18	76	1	76	24.0	36.0	12.0
12:18 12:19	77	1	77	24.0	36.0	12.0
12:19 12:20	78	1	78	24.0	36.0	12.0
12:20 12:21	79	1	79	24.0	36.0	12.0
12:21 12:22	80	1	80	24.0	36.0	12.0
12:22 12:23	81	1	81	24.0	36.0	12.0
12:23 12:24	82	1	82	24.0	36.0	12.0
12:24 12:25	83	1	83	24.0	36.0	12.0
12:25 12:26	84	1	84	24.0	36.0	12.0
12:26 12:27	85	1	85	24.0	36.0	12.0
12:27 12:28	86	1	86	24.0	36.0	12.0
12:28 12:29	87	1	87	24.0	36.0	12.0
12:29 12:30	88	1	88	24.0	36.0	12.0
12:30 12:31	89	1	89	24.0	36.0	12.0
12:31 12:32	90	1	90	24.0	36.0	12.0
12:32 12:33	91	1	91	24.0	36.0	12.0
12:33 12:34	92	1	92	24.0	36.0	12.0
12:34 12:35	93	1	93	24.0	36.0	12.0
12:35 12:36	94	1	94	24.0	36.0	12.0
12:36 12:37	95	1	95	24.0	36.0	12.0

TIME	TEST NO.	TIME INTERVAL	TOTAL ELAPSED TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	CHANGE IN WATER LEVEL
12:37 12:38	96	1	96	24.0	36.0	12.0
12:38 12:39	97	1	97	24.0	36.0	12.0
12:39 12:40	98	1	98	24.0	36.0	12.0
12:40 12:41	99	1	99	24.0	36.0	12.0
12:41 12:42	100	1	100	24.0	36.0	12.0
12:42 12:43	101	1	101	24.0	36.0	12.0
12:43 12:44	102	1	102	24.0	36.0	12.0
12:44 12:45	103	1	103	24.0	36.0	12.0
12:45 12:46	104	1	104	24.0	36.0	12.0
12:46 12:47	105	1	105	24.0	36.0	12.0
12:47 12:48	106	1	106	24.0	36.0	12.0
12:48 12:49	107	1	107	24.0	36.0	12.0
12:49 12:50	108	1	108	24.0	36.0	12.0
12:50 12:51	109	1	109	24.0	36.0	12.0
12:51 12:52	110	1	110	24.0	36.0	12.0
12:52 12:53	111	1	111	24.0	36.0	12.0
12:53 12:54	112	1	112	24.0	36.0	12.0
12:54 12:55	113	1	113	24.0	36.0	12.0
12:55 12:56	114	1	114	24.0	36.0	12.0
12:56 12:57	115	1	115	24.0	36.0	12.0
12:57 12:58	116	1	116	24.0	36.0	12.0

TIME	TEST NO.	TIME INTERVAL	TOTAL ELAPSED TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	CHANGE IN WATER LEVEL
12:58 12:59	117	1	117	24.0	36.0	12.0
12:59 1:00	118	1	118	24.0	36.0	12.0
1:00 1:01	119	1	119	24.0	36.0	12.0
1:01 1:02	120	1	120	24.0	36.0	12.0
1:02 1:03	121	1	121	24.0	36.0	12.0
1:03 1:04	122	1	122	24.0	36.0	12.0
1:04 1:05	123	1	123	24.0	36.0	12.0
1:05 1:06	124	1	124	24.0	36.0	12.0
1:06 1:07	125	1	125	24.0	36.0	12.0
1:07 1:08	126	1	126	24.0	36.0	12.0
1:08 1:09	127	1	127	24.0	36.0	12.0
1:09 1:10	128	1	128	24.0	36.0	12.0
1:10 1:11	129	1	129	24.0	36.0	12.0
1:11 1:12	130	1	130	24.0	36.0	12.0
1:12 1:13	131	1	131	24.0	36.0	12.0
1:13 1:14	132	1	132	24.0	36.0	12.0
1:14 1:15	133	1	133	24.0	36.0	12.0
1:15 1:16	134	1	134	24.0	36.0	12.0
1:16 1:17	135	1	135	24.0	36.0	12.0
1:17 1:18	136	1	136	24.0	36.0	12.0
1:18 1:19	137	1	137	24.0	36.0	12.0

TIME	TEST NO.	TIME INTERVAL	TOTAL ELAPSED TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	CHANGE IN WATER LEVEL
1:19	138	1	138	24.0	36.0	12.0
1:20						
1:20	139	1	139	24.0	36.0	12.0
1:21						
1:21	140	1	140	24.0	36.0	12.0
1:22						
1:22	141	1	141	24.0	36.0	12.0
1:23						
1:23	142	1	142	24.0	36.0	12.0
1:24						
1:24	143	1	143	24.0	36.0	12.0
1:25						
1:25	144	1	144	24.0	36.0	12.0
1:26						
1:26	145	1	145	24.0	36.0	12.0
1:27						
1:27	146	1	146	24.0	36.0	12.0
1:28						
1:28	147	1	147	24.0	36.0	12.0
1:29						
1:29	148	1	148	24.0	36.0	12.0
1:30						
1:30	149	1	149	24.0	36.0	12.0
1:31						
1:31	150	1	150	24.0	36.0	12.0
1:32						
1:32	151	1	151	24.0	36.0	12.0
1:33						
1:33	152	1	152	24.0	36.0	12.0
1:34						
1:34	153	1	153	24.0	36.0	12.0
1:35						
1:35	154	1	154	24.0	36.0	12.0
1:36						
1:36	155	1	155	24.0	36.0	12.0
1:37						
1:37	156	1	156	24.0	36.0	12.0
1:38						
1:38	157	1	157	24.0	36.0	12.0
1:39						
1:39	158	1	158	24.0	36.0	12.0
1:40						

TIME	TEST NO.	TIME INTERVAL	TOTAL ELAPSED TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	CHANGE IN WATER LEVEL
1:40 1:41	159	1	159	24.0	36.0	12.0
1:41 1:42	160	1	160	24.0	36.0	12.0
1:42 1:43	161	1	161	24.0	36.0	12.0
1:43 1:44	162	1	162	24.0	36.0	12.0
1:44 1:45	163	1	163	24.0	36.0	12.0
1:45 1:46	164	1	164	24.0	36.0	12.0
1:46 1:47	165	1	165	24.0	36.0	12.0
1:47 1:48	166	1	166	24.0	36.0	12.0
1:48 1:49	167	1	167	24.0	36.0	12.0
1:49 1:50	168	1	168	24.0	36.0	12.0
1:50 1:51	169	1	169	24.0	36.0	12.0
1:51 1:52	170	1	170	24.0	36.0	12.0
1:52 1:53	171	1	171	24.0	36.0	12.0
1:53 1:54	172	1	172	24.0	36.0	12.0
1:54 1:55	173	1	173	24.0	36.0	12.0
1:55 1:56	174	1	174	24.0	36.0	12.0
1:56 1:57	175	1	175	24.0	36.0	12.0
1:57 1:58	176	1	176	24.0	36.0	12.0
1:58 1:59	177	1	177	24.0	36.0	12.0
1:59 2:00	178	1	178	24.0	36.0	12.0
2:00 2:01	179	1	179	24.0	36.0	12.0

TIME	TEST NO.	TIME INTERVAL	TOTAL ELAPSED TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	CHANGE IN WATER LEVEL
2:01	180	1	180	24.0	36.0	12.0
2:02						
2:02	181	1	181	24.0	36.0	12.0
2:03						
2:03	182	1	182	24.0	36.0	12.0
2:04						
2:04	183	1	183	24.0	36.0	12.0
2:05						
2:05	184	1	184	24.0	36.0	12.0
2:06						
2:06	185	1	185	24.0	36.0	12.0
2:07						
2:07	186	1	186	24.0	36.0	12.0
2:08						
2:08	187	1	187	24.0	36.0	12.0
2:09						
2:09	188	1	188	24.0	36.0	12.0
2:10						
2:10	189	1	189	24.0	36.0	12.0
2:11						
2:11	190	1	190	24.0	36.0	12.0
2:12						
2:12	191	1	191	24.0	36.0	12.0
2:13						
2:13	192	1	192	24.0	36.0	12.0
2:14						
2:14	193	1	193	24.0	36.0	12.0
2:15						
2:15	194	1	194	24.0	36.0	12.0
2:16						
2:16	195	1	195	24.0	36.0	12.0
2:17						
2:17	196	1	196	24.0	36.0	12.0
2:18						
2:18	197	1	197	24.0	36.0	12.0
2:19						
2:19	198	1	198	24.0	36.0	12.0
2:20						
2:20	199	1	199	24.0	36.0	12.0
2:21						
2:21	200	1	200	24.0	36.0	12.0
2:22						

TIME	TEST NO.	TIME INTERVAL	TOTAL ELAPSED TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	CHANGE IN WATER LEVEL
2:22	201	1	201	24.0	36.0	12.0
2:23						
2:23	202	1	202	24.0	36.0	12.0
2:24						
2:24	203	1	203	24.0	36.0	12.0
2:25						
2:25	204	1	204	24.0	36.0	12.0
2:26						
2:26	205	1	205	24.0	36.0	12.0
2:27						
2:27	206	1	206	24.0	36.0	12.0
2:28						
2:28	207	1	207	24.0	36.0	12.0
2:29						
2:29	208	1	208	24.0	36.0	12.0
2:30						
2:30	209	1	209	24.0	36.0	12.0
2:31						
2:31	210	1	210	24.0	36.0	12.0
2:32						
2:32	211	1	211	24.0	36.0	12.0
2:33						
2:33	212	1	212	24.0	36.0	12.0
2:34						
2:34	213	1	213	24.0	36.0	12.0
2:35						
2:35	214	1	214	24.0	36.0	12.0
2:36						
2:36	215	1	215	24.0	36.0	12.0
2:37						
2:37	216	1	216	24.0	36.0	12.0
2:38						
2:38	217	1	217	24.0	36.0	12.0
2:39						
2:39	218	1	218	24.0	36.0	12.0
2:40						
2:40	219	1	219	24.0	36.0	12.0
2:41						
2:41	220	1	220	24.0	36.0	12.0
2:42						
2:42	221	1	221	24.0	36.0	12.0
2:43						

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TIME	TEST NO.	TIME INTERVAL	TOTAL ELAPSED TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	CHANGE IN WATER LEVEL
2:43 2:44	222	1	222	24.0	36.0	12.0
2:44 2:45	223	1	223	24.0	36.0	12.0
2:45 2:46	224	1	224	24.0	36.0	12.0
2:46 2:47	225	1	225	24.0	36.0	12.0
2:47 2:48	226	1	226	24.0	36.0	12.0
2:48 2:49	227	1	227	24.0	36.0	12.0
2:49 2:50	228	1	228	24.0	36.0	12.0
2:50 2:51	229	1	229	24.0	36.0	12.0
2:51 2:52	230	1	230	24.0	36.0	12.0
2:52 2:53	231	1	231	24.0	36.0	12.0
2:53 2:54	232	1	232	24.0	36.0	12.0
2:54 2:55	233	1	233	24.0	36.0	12.0
2:55 2:56	234	1	234	24.0	36.0	12.0
2:56 2:57	235	1	235	24.0	36.0	12.0
2:57 2:58	236	1	236	24.0	36.0	12.0
2:58 2:59	237	1	237	24.0	36.0	12.0
2:59 3:00	238	1	238	24.0	36.0	12.0
3:00 3:01	239	1	239	24.0	36.0	12.0
3:01 3:02	240	1	240	24.0	36.0	12.0

Test Hole	Time Period (min)	Water Drop (in)	Volume of Water (in³)	Flow Rate (in³/min)	Ave. Head of Water (in)	Perimeter Area (in²)	Perc. Rate (in/hr)
#1	1	12.0	339.6	339.6	6.0	141.1	144.4

Vol. of Water $= \pi(3'')^2(\Delta h) = (28.3\ in^2)\Delta h$

Perimeter Area $= \pi(3'')^2 + \pi(6'')\Delta z = 28.3\ in^2 + (18.8\ in)\Delta z$

NorCal Engineering

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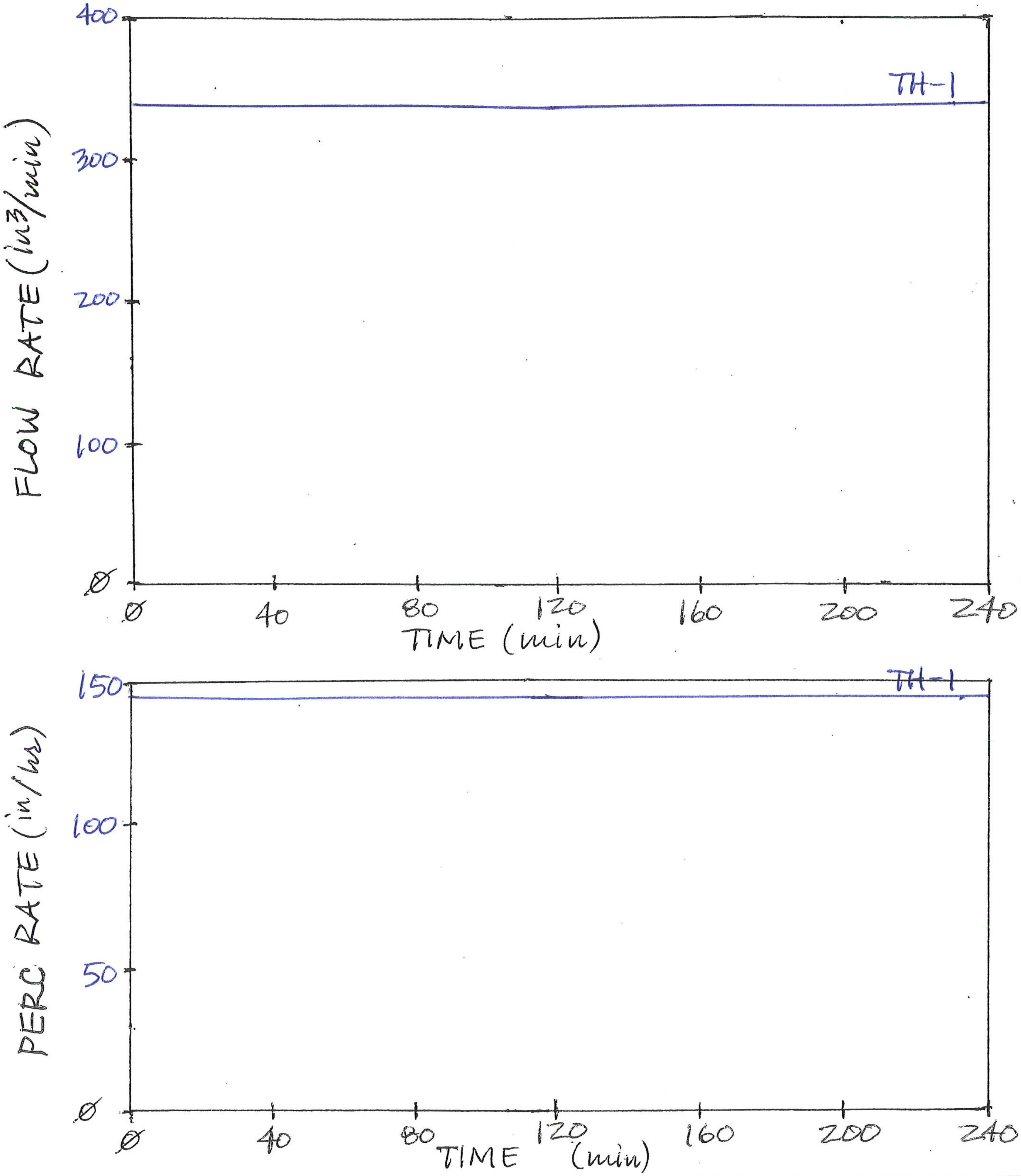
LANEY LA

PROJECT 25132-25 | DATE APRIL 2025

INFILTRATION CALCULATIONS



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PROJECT: 25132-25 | DATE: APRIL 2025

INFILTRATION CALCULATIONS