Appendix C Preliminary Soils Investigation

REPORT

PRELIMINARY SOIL INVESTIGATION

Proposed Subdivision
APN 8126-033-025
NWC of Beverly Drive and Pickering Avenue
Whittier, California 90601

for

Mr. Robert Salamone
15111 Whittier Boulevard, #450
Whittier, California 90603

Project No. GSS-3026-1
August 25, 2021

REPORT

PRELIMINARY SOIL INVESTIGATION

PROPOSED SUBDIVISION

APN 8126-033-025

NWC OF BEVERLY DRIVE AND PICKERING AVENUE

WHITTIER, CALIFORNIA 90601

FOR

MR. ROBERT SALAMONE

INTRODUCTION

The following report presents the results of a preliminary soil investigation conducted on the property located at the northwest corner of Beverly Drive and Pickering Avenue, in the City of Whittier, County of Los Angeles, California. The location of the site relative to surrounding streets and landmarks is shown on Plate 1, Vicinity Map.

The purpose of this investigation is to obtain the geotechnical engineering properties of the subsurface soils at the subject site on which to base conclusions and recommendations for foundations support and other geotechnical matters pertinent to the proposed construction. Implementation of the recommendations made in this report is intended to reduce certain risks associated with construction projects. The scope of this investigation does not include the work related in any way to identify asbestos and/or hazardous waste material, or soil infiltrating test.

This report has been prepared for use in design of the described project. It may not contain sufficient information for other purposes. Our professional services have been performed in accordance with generally accepted engineering procedures under similar circumstances. No other warranty, expressed or implied, is made as to the professional advice included in this report.

PROPOSED DEVELOPMENT

It is understood that the subject property will be subdivided into four lots, and utilized for the development of four single-family residences, one on each lot, at the locations shown on Plate 2. The proposed structures will be split-level style, two stories in height, constructed of concrete wall, wood frame, and stucco with slab on grade.

According to the conceptual grading plan, cut up to 6 to 7 feet and fill up to 4 feet will be required to develop the level building pads and to provide proper site drainage. Retaining wall up to 9 feet will be constructed as building walls and yard walls. No detailed design loads are available at the time of this investigation.

FIELD EXPLORATIONS AND LABORATORY TESTING

Field explorations were performed to establish the geotechnical conditions of the site. Four (4) test borings were excavated at the locations shown on Plate 2. The explorations were logged by our field engineer and relatively undisturbed samples were obtained for laboratory testing and inspection. A detailed description of the exploration procedures and the logs of test borings are presented in the Appendix.

Laboratory tests were performed to evaluate static soil properties. A description of the test procedures and the test results are also presented in the Appendix.

SITE CONDITIONS

The subject property is located at the northwest corner of Beverly Drive and Pickering Avenue, in the City of Whittier, County of Los Angeles, California. The site is bordered by single-family residences on the west, by Honolulu Terrace on the north, and by Beverly Drive on the south.

The site consists of a near triangle-shaped lots that measured approximately 190 feet wide by 270 feet deep in plan dimensions. Topography of the site ascends mildly from west to east. Total relief over the site is approximately 22 feet. At the time of this investigation, the site is vacant. Surface vegetation at the site consists of spares growth of wild grasses, trees, and plants.

SUBSURFACE CONDITIONS

Soil Conditions

In general, the natural soils disclosed in the test borings consist of medium dense to dense, very fine to coarse, silty, slightly porous to non-porous sand to the depth explored of 10 feet in Test Boring No. 1, and to depths of 6 to 8 feet in Test Boring Nos. 2, 3, and 4. Below this in Test Boring Nos. 2, 3, and 4 is firm, very fine to fine sandy siltstone to the depths explored of 10 to 20 feet.

Fill was encountered in all test borings from the existing grade to depths of one to 5 feet. It consists of medium dense, fine to medium, silty sand with gravels, brick, and asphalt pieces.

Groundwater

No groundwater or seepage was encountered in any of the test borings penetrated to a maximum depth of 20 feet. It must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors not evident at the time measurements were made and reported herein.

EARTHQUAKE HAZARDS

Seismicity

The subject property lies within the seismically active southern California region. As with all sites in southern California, the property will probably experience ground shaking from both near and distant earthquake sources during the life of the proposed structure. The type and magnitude of seismic hazard affecting at the site are dependent on the distance of causative faults and the intensity and magnitude of the seismic event.

Surface Rupture

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone. No faults, active or potentially active, are known to exist within the site. The probability of surface rupture at the site is, therefore, considered very low.

Ground Shaking

According to "Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada" by California Department of Conservation, the closest fault zone to the site is the Whittier Fault Zone located at approximately 2.4 km to the east of the site. It is our opinion that the intensity of future ground shaking at the site is not expected to be greater than any other sites in the immediate vicinity. The proposed structures shall be designed in accordance with the Earthquake Regulations of the California Building Code and the seismic design parameters provided in the other section of this report.

Soil Liquefaction Evaluation

Earthquake-induced liquefaction is a phenomenon in which loose to medium dense saturated cohesionless soils undergo extreme losses in shear strength due to earthquake shaking. The liquefaction potential is directly related to the groundwater conditions at the site as well as to the

characteristics of the underlying soil deposits. Loose to medium dense sands below groundwater level are generally considered to be susceptible to liquefaction under strong ground shaking conditions.

The site is not located in the area as delineated by the State Geologist to have potential of soil liquefaction during strong earthquakes. Hence, liquefaction evaluation of the site is not performed. As no groundwater was encountered in any test borings to a maximum depth of 20 feet and the onsite materials consist primarily of dense soil underlain by bedrock, it is our opinion that the potential of soil liquefaction at the site is considered low.

CONCLUSIONS AND RECOMMENDATIONS

General

Based on an evaluation of the site conditions and findings of this investigation, it is concluded that the proposed subdivision and construction of the single-family residences at the site as proposed are feasible from a geotechnical engineering viewpoint provided the following conclusions and recommendations are incorporated into design criteria and project specifications and are implemented during construction.

The onsite surface soils encountered in the test borings to depths around two to five feet are either fill material or medium dense in consistency. These materials are not suitable for foundation support. Also, cut-fill grading transition zone should be eliminated from the proposed building areas. It is recommended that the existing onsite fill and surface material within the proposed building areas be removed to underlying competent dense undisturbed natural soil or bedrock, or to a depth of 3 feet below the base of the proposed foundation, whichever is deeper, and then replaced with properly compacted soils. The removal and recompaction depth of the same building area should be uniform.

Conventional spread footings founded into compacted soil will provide adequate support for the proposed structures. Please refer to 'Subgrade Preparation' and 'Grading Specification' sections of this report for detail removal and recompaction specifications.

Site Preparation

General

Precautions should be taken during the performance of all work under the following sections, especially if construction is performed during the rainy season of approximately October 1 to April 15. Protection should be provided to the work site, particularly excavated areas, from flooding, ponding, and inundation due to poor or improper temporary surface drainage. During periods of impending inclement weather, temporary provisions should be made to adequately direct surface drainage, from all sources, away from and off the work site and to provide adequate pumps and sumps to handle any flow into the excavations.

Site Clearing

Clearing and grubbing should consist of the removal of asphalt, concrete slab, vegetation such as brush, grass, woods, stumps, trees, roots of trees and otherwise deleterious natural materials from the areas to be graded. Clearing and grubbing should extend to the outside of all proposed excavation and fill areas.

Debris generated during clearing, grubbing and/or demolition operations should be wasted from areas to be graded and disposed of off-site. During site grading, laborers should clear any roots, tree branches, and other deleterious materials missed during clearing and grubbing operations from all areas to receive fill.

The Soils Engineer should review the depths of excavation during actual construction. Any surface or subsurface obstructions, or questionable material, encountered during grading should be brought immediately to the attention of the Soils Engineer for proper exposure, removal or processing as directed. No underground obstructions or facilities should remain in any structural areas.

Existing On-Site Sewage System

The location of the existing on-site sewage system (septic tank, seepage pits/cesspools), if any, should be determined.

Excavate and remove completely any underground tanks within areas of proposed construction. Contaminated soils resulting from leakage and tank removal will not be suitable for use as structural backfill and should be disposed of off site.

Trees and Surface Vegetation

Removal of designated trees and shrubs in areas of proposed construction should include rootballs. Resultant cavities should be cleansed of loose soils and roots and rolled to a firm unyielding surface prior backfilling.

Grass and weed growth in areas of future construction should be stripped and disposed of off site. Stripping should penetrate three to six inches into surface soils. Any soils sufficiently contaminated with organic matter (such as root systems or stripping mixed into the soils) so as to prevent proper compaction shall be disposed of off site or set aside for future use in landscape areas.

Subgrade Preparation

Prior to receiving of new fill or where compacted soil is to provide support of structural loads, it is recommended that the onsite surface soils within the proposed building areas be removed to underlying competent dense undisturbed natural soil or bedrock, or to a depth of 3 feet below the base of the proposed foundation, whichever is greater, and then replaced with properly compacted fill soils. The area of removal shall extend beyond the outside edge of the footings horizontally to a distance same as the removal depth. The exposed bottom surface in each removal area should first be scarified to a depth of at least 8 inches, processed, watered or air dried as necessary to achieve near optimum moisture conditions, and then compacted in-place to 90 percent of the maximum laboratory dry density. Locally, some areas exposing loose or soft soils may require deeper removal than indicated above. Actual depth of removal is to be determined in the field at the time of grading.

The existing surface soils within the proposed driveway and pavement areas should be removed to a depth of 24 inches below the proposed finish subgrade and recompacted.

Fill Placement

Unless otherwise specified, any new fill shall be brought to near optimum moisture, placed in layers not exceeding 8 inches thick, and compacted to at least 90 percent of the maximum laboratory dry density.

Compaction characteristics of all fill soils shall be determined by ASTM D-1557-12 standard. The field density and degree of compaction shall be determined by ASTM D-1556, or by other ASTM standard methods that are acceptable to the governing public agency.

Cut/Fill Transition

Due to dissimilarities in characteristics of the cut and fill conditions, footing or slab-on-grade should not span from cut to fill. To minimize the effects of differential soil movement, cut/fill transition zones should be eliminated from the building pad areas. Footing or slab should bear entirely on compacted fill or on natural soil. Where grading would cause building slabs to span from cut to fill conditions, the onsite material should be subexcavated and recompacted so as to create at least 3 feet thick soil blanket below the base of the footing.

Seismic Design Parameters

Based on the results of this soil investigation and in accordance with 2019 California Building Code, the following seismic data are applicable to the subject site.

Longitude	-118.042694
Latitude	33.993778
S_s	1.894
S_1	0.675
Site Class	D
F_a	1.0
F_v	1.7*
S_{MS}	1.894
S_{M1}	1.148*
S_{DS}	1.263
S_{D1}	0.765*

(*) Note: F_v = 1.7 may be utilized provided that the Seismic Response Coefficient (C_s) in the structural calculation is determined per ASCE 7-16 Section 11.4.8 Exception No. 2.

Foundation Recommendations

Allowable Bearing Value

Provided the subgrade soils within the proposed building areas are prepared as recommended, an allowable bearing value of 2000 pounds per square foot is recommended for spread footings of at least 15 inches in width, placed at a depth of at least 1.5 feet below the lowest adjacent final grade, founded into compacted soils.

The bearing value is for dead plus live load and may be increased by one-third for momentary wind or seismic loads.

Footing Settlement

Maximum ultimate settlement of footings up to 3 feet wide continuous and 3 feet square or diameter under the recommended bearing pressure is not expected to exceed ¾ an inch. Differential settlement between adjacent footings is not expected to exceed 1/4 of an inch within a span of 40 feet. Settlement will be approximately in direct proportion to the width of the footings and actual applied load.

Footing Reinforcement

Continuous footings should be reinforced with at least four No. 4 bars; two near the top and two near the bottom of the footings. Reinforcement of isolated footings shall be utilized as deemed necessary by the Structural Engineer for the project. This reinforcement is based on soil characteristics and is not intended to be in lieu of reinforcement necessary to satisfy structural considerations.

Footing Inspections

All foundation excavations should be inspected and approved by the Soils Engineer prior to placement of forms, reinforcement or concrete. The excavations should be trimmed neat, level and square. All loose, sloughed and moisture softened materials should be removed prior to the placement of concrete.

Footings should be located below a line measured upward at a 45-degree angle from the bottom of the adjacent footings or utility trench, unless review and approved by the Soils Engineer.

Materials from footings excavations should not be spread in slab-on-grade areas unless they are compacted and tested.

Lateral Design

An allowable lateral bearing value against the sides of footings of 200 pounds per square foot per foot of depth, to a maximum of 2000 pounds per square foot, may be used provided there is positive contact between the vertical bearing surface and compacted soil. Friction between the base of the footings and the underlying soil may be assumed to be 0.4 times the dead load. When combining passive pressure and friction for lateral resistance, the passive component should be reduced by one-third.

Slabs On Grade

Floor Slabs

Slabs on grade should be cast over properly prepared subgrade. Any loosened or over-excavated soils should be wasted from the site or properly compacted in-place.

The subgrade soil beneath the slab areas should be rechecked for disturbance resulting from footing and utility trench excavation prior to concrete pour. All fill soils should be moisture-conditioned to obtain near optimum water content and then compacted to at least 90 percent of the maximum laboratory dry density as determined by the ASTM D-1557-12 compaction test method.

It should be recognized that minor cracks normally occur in concrete slabs due to shrinkage during curing or redistribution of stresses and thus, some cracks should be anticipated. Such cracks are not necessarily indicative of excessive vertical movements.

Slab Reinforcement

Floor slabs constructed on-grade should be supported by a minimum thickness of gravel or crushed rock per Green Code. Slabs shall be a minimum of 5 inches thick and reinforced with No. 4 bars spaced 16 inches on centers, both ways. All slab reinforcement should be supported on concrete chairs or brick to ensure the desired placement near mid-depth.

The above criteria are recommended to minimize potential distress to floor slabs related to the effects of subgrade soil conditions. The Structural Engineer for the project may need to address other factors that may require modification of the above recommendations.

Moisture Barrier

A moisture barrier beneath slabs-on-grade, consisting of a waterproof vapor barrier, such as a plastic membrane of at least 10 mils in thickness, is recommended in areas where slab moisture would be detrimental. The membrane should be overlain by a minimum of 2 inches of clean sands to provide a working surface and aid in concrete curing.

It is important that the soil subgrade, which will support the concrete slab, is maintained at the "as-graded" or has a sufficient soil water content. Prior to slab construction, the water content of the soil subgrade should be measured to verify that the subgrade has not dried out significantly.

It is suggested that slab areas be thoroughly moistened prior to placing of moisture barrier and pouring of concrete.

Retaining Wall

Wall Footings

Building retaining wall footings founded into compacted soil may be designed for the same allowable bearing value as given in the previous sections for building foundations.

For the non-building retaining wall (yard or appurtenant retaining wall), the foundation may be founded into dense undisturbed natural soil or bedrock, and designed for the same allowable bearing value as given in the previous sections for building foundations founded into compacted soil.

Lateral Earth Pressures

Retaining walls should be designed to resist the lateral earth pressure exerted by the retained soils plus any additional lateral forces that will be applied to the walls due to surface loads placed at or near the wall or from footings behind the walls.

It is recommended that retaining walls that are free to rotate at the top be designed for the following equivalent fluid pressures:

Backfill Slope Gradient (Horizontal to Vertical)	Equivalent Fluid Pressure (pcf)
Level	40
3 to 1	48

Walls that are restrained against movement or rotation at the top should be designed for the at-rest equivalent fluid pressure. An at-rest equivalent fluid pressure of 60 pounds per cubic foot can be used for retaining walls with level backfill.

The lateral earth pressures assume that a permanent drainage system will be installed so that hydrostatic water pressure will not be developed against the walls. If a drainage system is not provided, the walls should be designed to resist an external hydrostatic pressure due to water in addition to the lateral earth pressure.

Seismic Retaining Wall Lateral Pressure Analyses

Retaining wall over six feet in height should be designed to resist additional seismic force per County of Los Angeles Policy S004.0 "Seismic Earth Pressures on Retaining Walls". The following parameters are utilized in the calculation: PGA = $SD_S/2.5$ = 0.505g; γ = 120 pcf.

The equivalent fluid pressure for different wall type and backfill conditions are tabulated as follows:

Type	Seismic Induce EFP (pcf)
basement restrained wall with level backfill	41.2
cantilever wall with level backfill	25.5
cantilever wall with sloping backfill	42.4

The point of the seismic lateral pressure can be assumed at 1/3 H, where H is the retained height.

Wall Drainage

All retaining walls should be waterproofed and/or damp-proofed, depending on the desired moisture protection. The walls should be provided with perforated pipe and gravel subdrain to prevent entrapment of water in the backfill.

Any water that may accumulate in the drainage material should be collected and discharged by a 4-inch diameter, perforated PVC Schedule 40 or ABS SDR-35 pipe placed near the bottom of the drainage material but at least one foot below the interior floor. The pipe should be embedded in at least one-cubic foot of drainage material per linear foot of wall length. The pipe perforations should be placed with the holes down, and should not be greater than 1/4 inch in diameter. The subdrain should outlet at appropriate discharge locations that will ensure all discharge will not scour or erode the surrounding soil, and the pipe will not become damaged or clogged. The outlet pipe should be a solid pipe that meets minimum specification set forth above for the subdrain pipe.

The drainage material that will be used to backfill the wall should consist of 3/4 to 1-1/2 inches clean durable, coarse aggregate. The drainage material should be separated from all adjacent soil by Mirafi 140NL, or approved equivalent. The fabric should be handled in accordance with the respective manufacturer's requirements, and should be constructed such that all fabric overlaps are a minimum of 12 inches.

Waterproofing

Rooms located below grade have a history of moisture intrusion, seepage, and leakage. Conventional waterproofing materials, such as asphalt emulsion, have often proved ineffective. Certain precautions can be taken to reduce the possibility of future seepage problems.

It is possible that retaining walls will form portions of the building interiors. Where this occurs, very special consideration should be given to waterproofing of the walls to prevent damage to the interior of the house. Unless dampness is acceptable on exterior wall faces, waterproofing

should also be incorporated into exterior retaining wall design. Although the project architect is the party who should provide actual waterproofing details, it is suggested the waterproofing consist of a multi-layered system such as an initial generously applied layer of hot-mopped asphalt over which a layer of construction felt could be applied, then thoroughly mopped again with hot asphalt. In the case of all retaining walls, it is suggested that a layer of 10-mil Visqueen be placed as a finish layer. The multi-layered system should be covered with protective foam-board, or similar, to prevent damage during the backfilling operation.

Even though groundwater is not expected to be a significant problem at this site, extreme care should be exercised in sealing walls against water and water vapor migration. Where retaining walls are planned against interior space, continuity should be provided between the aforementioned wall moisture proofing on the back of the retaining wall and the moisture barrier typically placed under slab areas. This waterproofing is necessary to prevent the foundation concrete acting as a wick through which moisture migrates to the interior space despite wall moisture proofing.

Wall Backfill

Prior to backfilling, the excavation between retaining walls and the temporary cut bank should be cleared of all loose materials, debris, and construction materials, etc.

Proper compaction of the backfill will be necessary to reduce settlement of the backfill. Some settlement of the backfill should be anticipated and any utilities and sidewalks supported therein should be designed to accept differential settlement, particularly at the points of entry to the structure.

All wall backfill should be placed in horizontal lifts not more than 4 inches in thickness, watered as necessary to achieve near optimum moisture conditions, and mechanically compacted to at least 90 percent of the ASTM D-1557-12 standard. Flooding or jetting of backfill materials should be avoided. Probing and testing should be performed by the project soils engineer to verify proper compaction.

Where space limitations do not allow for conventional backfill compaction operations, the space between the excavation and wall may be backfilled with concrete as structural fill, or with slurry as non-structural fill. A layer of plastic sheet shall be placed on top of the gravel drain system prior to placing of concrete or slurry to prevent the subdrain system is clogged by concrete.

Contractors should be informed that the use of heavy compaction equipment within close proximity to retaining walls could cause excessive wall movement and/or earth pressure in excess of design values.

Excavation

Excavation should be in accordance with all applicable requirements of the State of California Construction and General Industry Safety Order, the Occupational Safety and Health Act of 1970, the Construction Safety Act, and all other public agencies have jurisdiction. Construction specifications should clearly establish the responsibilities of the contractor for construction safety in accordance with CAL/OSHA requirements.

Temporary excavations up to 12 feet in depth may be required to do the removal and recompction grading and to construct the proposed retaining walls. Temporary excavation for construction purposes may be made vertically in the onsite soil/bedrock to a maximum height of 5 feet without shoring or bracing, provided no surcharge loads or adjacent structures are located within a horizontal distance equal to the depth of excavation. For cuts made to a depth greater than 5 feet, the lower 5 feet can be made vertically and the portion above 5 feet shall be sloped back to an inclination of 1 horizontal to 1 vertical.

Excavated surfaces should be kept moist but not saturated to retard raveling and sloughing during construction. Water should not be allowed to pond on the top of the excavation nor flow towards it.

In areas where excavation will remove lateral support of adjacent structures or wall footings, shoring or bracing shall be provided prior to excavation. The contractor should be responsible for the structural design and safety of the temporary braced shoring system.

For purposes of this report the term of "temporary" shall refer to those excavations that remain unsupported for a period of time not to exceed 30 days.

No excavation shall be made during unfavorable weather. It is recommended that the excavated banks be entirely covered with plastic sheets when threatened by rains. When the excavation is interrupted by rain, operations shall not be resumed until the Soils Engineer indicates that conditions will permit satisfactory results.

Post Grading Considerations

Site Drainage

The provision and maintenance of adequate site drainage and moisture protection of supporting soil is an important design consideration. Foundation recommendations presented herein assume proper site drainage will be established and maintained.

To enhance future site performance, positive drainage devices such as sloping sidewalks, graded swales, and/or area drains should be provided around the building to collect and direct all water away from the structure. Neither rain nor excess irrigation water should be allowed to collect or pond on the property unless approved by the soil engineer. Where slabs or pavement are not feasible adjacent to the buildings, the ground surface should be provided with a minimum gradient away from the structures per 2019 CBC. All drainage should ultimately be directed to street or other designated area.

Water should be transported off the site in approved drainage devices or unobstructed swales. Drainage swales should have a minimum gradient per 2019 CBC. Where necessary, drainage paths could be shortened by use of area drains and collector pipes.

Planters adjacent to buildings should be avoided insofar as possible. Planting areas at grade should be provided with good positive drainage. Wherever possible, exposed soil areas should be above adjacent paved grades. Planters should not be depressed below adjacent paved grades unless provisions for drainage, such as catch basins and pipe drains are made.

Adequate drainage gradient, devices and curbing should be provided to prevent runoff from adjacent pavement or walks into planting areas. Consideration should be given to irrigation methods that will promote uniformity of moisture in planters and beneath adjacent concrete "flat-work". Over-watering and under-watering of landscape areas must be avoided.

All roof and wall surface drainage should be collected and conducted by a non-erosive device to the streets or to a designated area.

Trench Backfill

It is our opinion that utility trench and/or structural backfill consisting of the on-site material types could be best placed by mechanical compaction to a minimum of 90 percent of the maximum laboratory dry density. Density testing, along with probing, should be performed by the project soils engineer, or his representative, to verify proper compaction.

If utility contractors indicate that it is undesirable to use compaction equipment in close proximity to a buried conduit, we would recommend the utilization of lightweight mechanical equipment and/or bedding of conduit with clean granular material prior to initiating mechanical compaction procedures. Other methods of utility trench compaction may also be appropriate as approved by the project geotechnical consultant at the time of construction.

Where utility trenches are proposed parallel to building footings (interior and/or exterior trenches), the bottom of the trench should not extend below a 1 horizontal to 1 vertical plane project downward from the outside bottom edge of the adjacent footing. Where this condition occurs, the adjacent footing should be deepened.

Plan Review

In order to prevent misinterpretation of this report by other consultants it is recommended that the Soils Engineer be provided the opportunity to review the final grading and foundation plans. The Soils Engineer will also determine whether any change in concept may have had any effect on the validity of the Soils Engineer's recommendations, and whether those recommendations have, in fact, been implemented in the design and specifications.

If the Soils Engineer is not accorded the privilege of making this recommended review, he can assume no responsibility for misinterpretation or misapplication of his recommendations or for their validity in the event changes have been made in the original design concept without this prior review.

Geotechnical Inspection

All rough grading of the property must be performed under engineering supervision of the geotechnical consultants. Rough grading includes, but is not limited to, site preparation, cleaning, over-excavation, and fill placement.

The geotechnical consultant should inspect all foundation excavations. Inspections should be made prior to installation of concrete forms and reinforcing steel to verify or modify, if necessary, conclusions and recommendations in this report.

Inspections of the finish grading, utility or other trench backfill, retaining wall backfill, or other earthwork completed for the subject project should also be performed by the geotechnical consultant.

If any of these inspections to verify site geotechnical conditions are not performed by the geotechnical consultant, liability for the safety and stability of the project is limited only to the actual portions of the project approved by the geotechnical consultant.

It should be understood that the contractor shall supervise and direct the work and he shall be responsible for all construction means, methods, techniques, sequences and procedures. The contractor will be solely and completely responsible for conditions at the job site, including safety of all persons and property during the performance of the work. Periodic or continuous inspection by GSS Engineering, Inc. is not intended to include verification of dimensions or review of the adequacy of the contractor's safety measures in, on or near the construction site.

GRADING SPECIFICATIONS

The following guidelines may be used in preparation of the grading plan and job specifications.

1) All site grading operations should conform to the local building and safety codes and to the rules and regulations of those governmental agencies having jurisdiction over the subject construction.

2) The grading contractor is responsible to notify governmental agencies, as required, and the Soils Engineer prior to initiating grading operations and any time grading is resumed after an interruption.

3) A diligent search for septic tanks, cesspools or underground lines should be performed during grading operations. Any abandoned water or oil wells encountered should be properly capped and treated in accordance with best-accepted practices.

4) Please refer to 'Subgrade Preparation' of this report for detail removal and recompaction specifications.

5) Where import materials are required for use on site, the Soils Engineer should be notified at least 48 hours in advance of importing in order to sample and test materials from proposed borrow sites. No import materials should be delivered for use on site without prior sampling and testing by the Soils Engineer.

6) The on-site soils are suitable for use in compacted, provided all trash, vegetation and other deleterious materials are removed prior to placement.

7) All new fill shall consist of approved clean on-site or similar earth material, free of trash or debris, roots, vegetation or other deleterious material and shall be placed in thin horizontal lifts not exceeding 8 inches in loose thickness prior to compaction. Each lift should be watered or dried as needed, thoroughly blended to achieve near optimum moisture conditions then thoroughly compacted by mechanical methods.

8) No rock over 3 inches in greatest dimension shall be used in fill unless otherwise approved by the Soils Engineer.

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

10) No jetting or water tamping of fill soils shall be permitted.

11) Unless otherwise specified, all other fills and backfills should be compacted to at least 90 percent of maximum laboratory dry density.

12) The compaction characteristics of all fill soils shall be determined by ASTM D-1557-12 standard. The field density and degree of compaction shall be determined by ASTM D-1556, or by other ASTM standard methods that are acceptable to the governing public agency.

13) Observation and testing of all compaction shall be under the direction of the Soils Engineer. The Soils Engineer shall advise the owner and grading contractor immediately if any unsatisfactory soils related conditions exist and shall have the

authority to reject the compacted fill ground until such time as corrective measures necessary are taken to comply with the specifications.

14) The Soils Engineer should be notified at least 2 days in advance of the start of grading. A joint meeting between a representative of the client, the contractor, and the Soils Engineer is recommended prior to grading to discuss specific procedures and scheduling.

INVESTIGATION LIMITATIONS

The conclusions and recommendations contained in this report are based on the data obtained from the test borings at the dates and locations indicated in the logs and the site plan. It is assumed that the soil conditions at the other areas do not deviate significantly from those disclosed in the test borings. If any variations, or undesirable conditions are encountered during construction, or if the proposed construction will differ from that planned at the present time, this office should be notified so as to consider the need for modifications.

No responsibility for construction compliance with the design concepts, specifications, or recommendations is assumed unless an on-site review by a representative of this office is performed during the course of construction that pertains to the specific areas covered by the recommendations contained herein.

This report has been compiled for the exclusive use of Mr. Robert Salamone, or his authorized agent. It shall not be transferred to any other party or to any other project without the consent and/or thorough review of this office.

The findings of this report are valid as of the present date. However, changes in the conditions of the property can occur with the passage of time, whether they are due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated, wholly or partially, by

changes outside of our control. Therefore, this report is subject to review and should not be relied upon after a period of one year without such a review.

This report is issued with the understanding that it is the responsibility of the owner, or the proper representative thereof, to ensure that the information and recommendations contained herein are called to the attention of all parties interested in the project and that the necessary steps are taken to see that the contractors and subcontractors carry out such recommendations in the field.

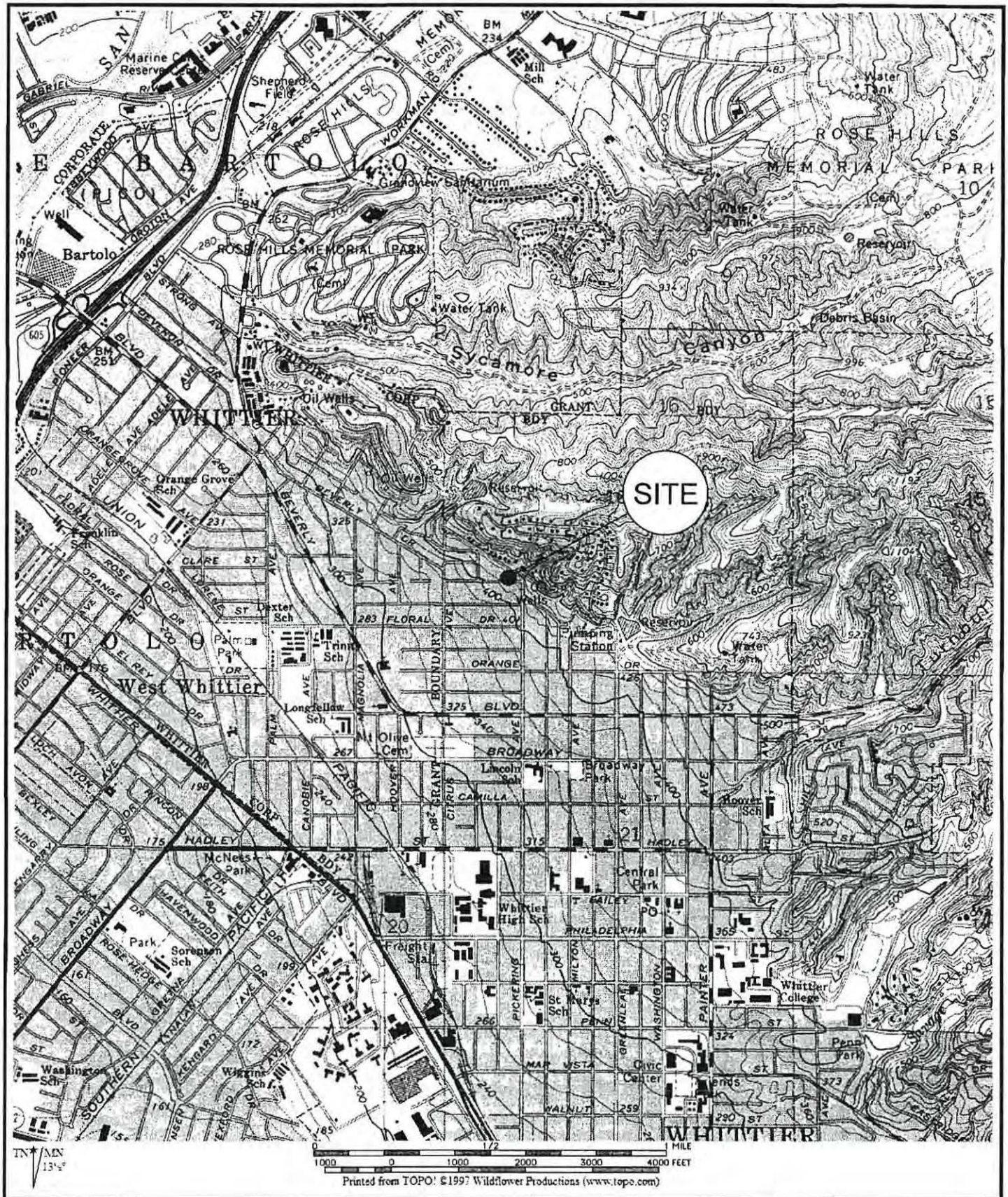
Final approval of plans and reports by all consultants, and issuance of any building and grading permits, rests with the controlling agencies. As the circumstances, which control the decision process, are clearly beyond the control of this facility, we cannot assume any responsibility for the success of obtaining proper authorizations, nor for the costs involved.

All exploratory borings used for subsurface exploration were backfilled with reasonable effort to restore the areas to their original condition. As with any backfill, some consolidation and subsidence of the backfill soils may result in time, causing some depression of the boring area and possibly a potentially hazardous condition. The client and/or owner of the property are advised to periodically examine the boring areas, and if necessary, backfill any resulting depressions. GSS Engineering, Inc. shall not be liable for any resulting injury or damage.

The report is subject to review by controlling public agencies having jurisdiction.

Respectfully submitted,
GSS ENGINEERING, INC.

Allen Lee, GE
Principal Engineer



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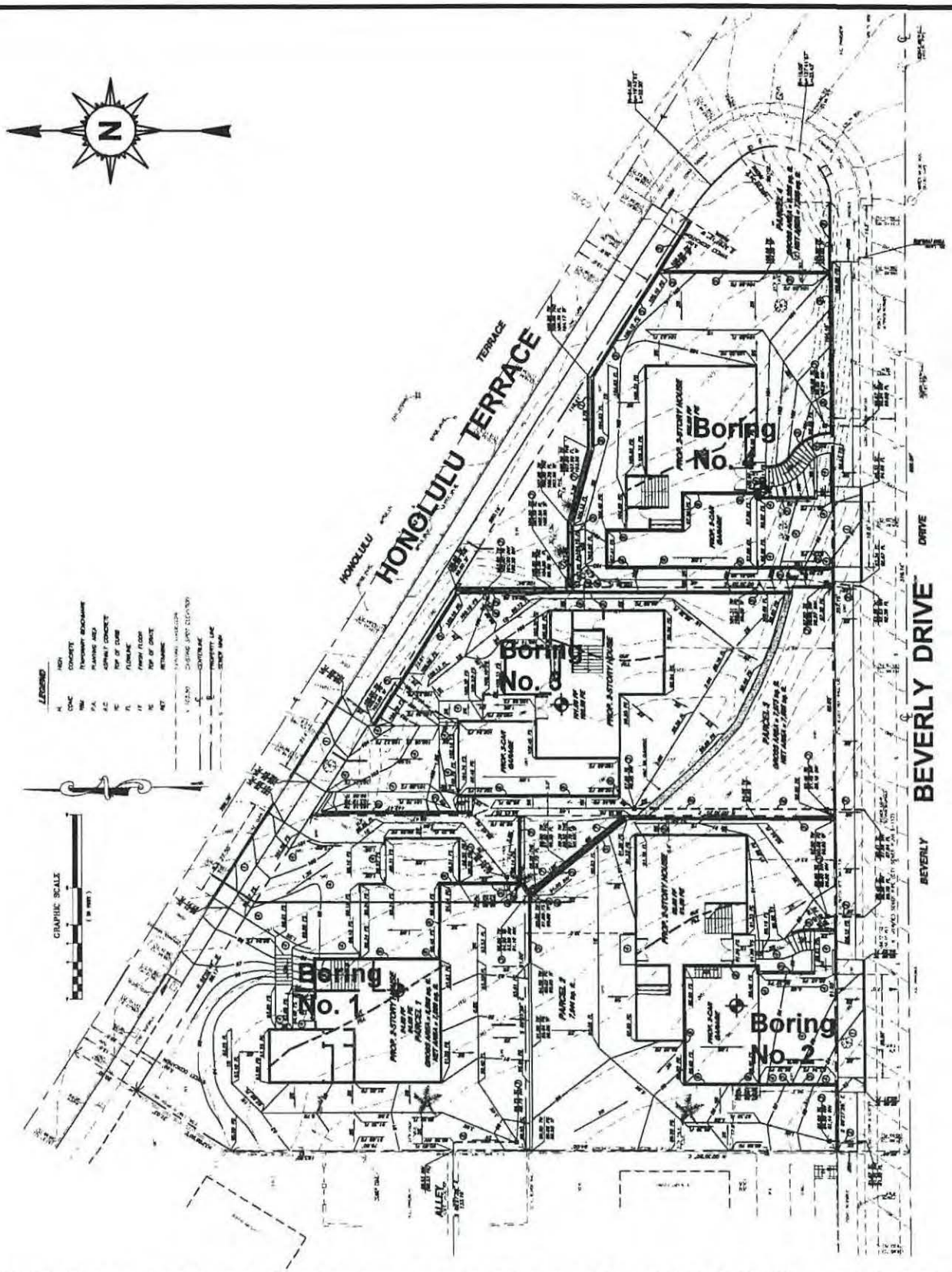
VICINITY MAP	Proposed Subdivision NWC Beverly Drive & Pickering Ave Whittier, California
GSS ENGINEERING, INC. *Geotechnical Engineering Consultants*	**PROJECT No.** GSS-3026-1 **PLATE** 1



REFERENCE: "Conceptual Grading Plan", prepared by Landevelopment Eng., dated 12/16/20. SCALE: 1" = 40'

PLOT PLAN AND BORING LOCATION	Proposed Subdivision NWC Beverly Drive & Pickering Ave Whittier, California

GSS ENGINEERING, INC. *Geotechnical Engineering Consultants*	**PROJECT NO.** GSS-3026-1	**PLATE** 2

APPENDIX

FIELD EXPLORATION AND LABORATORY TESTING

FIELD EXPLORATIONS

The subsurface conditions at the site were explored by excavating four (4) test borings at the locations shown on the Plot Plan, Plate 2. The test borings were excavated by means of an 8-inch diameter hollow stem auger to the depths of 10 and 20 feet below the existing ground surface. The approximate locations of the test borings were determined by tape measurements from the existing facilities and property boundaries. The locations of the test boring should be considered accurate only to the degree implied by the method used.

The soils encountered during excavation were logged by the field engineer. The soils are classified in accordance with the Unified Soil Classification System described on Plate A-1. Undisturbed samples of soils were extracted at selected intervals from the test borings in a barrel sampler with tapered cutting shoe. The undisturbed soil retained in 2.5-inch diameter by one-inch rings within the sampler were secured in moisture resistant bags and plastic sample cans as soon as taken to minimize the loss of field moisture while being transported to the laboratory for testing. The relative sampler penetration resistance exhibited by the soil types encountered is tabulated in the Blow per Foot column of the Log of Boring. Detailed logs of test boring are presented on Plates A-2 through A-5, Log of Test Boring.

The lines designating the interface between soil materials on the logs of test boring represent approximate boundaries. The transition between materials may be gradual.

LABORATORY TESTING

Moisture-Density

The field moisture content and dry density of the materials encountered were determined by performing tests on selected undisturbed samples to aid in the classification and correlation of the soil and to obtain qualitative information relative to their strengths and compressibility. The field moisture content and dry density of the samples were determined in accordance with ASTM-2216 and ASTM D-2937 standard. The results of the tests are shown on the Log of Test Boring, Plates A-2 through A-5.

Direct Shear Tests

Direct shear tests were performed in accordance with ASTM D-3080 standard on selected undisturbed samples of the onsite material to evaluate shear strength and supporting capacity of the foundation materials. Shear tests were made with a direct shear machine of the displacement control type at a displacement rate of approximately 0.005 inches per minute. The samples were soaked in water for at least 24 hours to approximately saturated moisture condition and then sheared under various normal stresses. The residual shear strength values determined from the tests are presented on Plate A-6, Direct Shear Test.

Consolidation Tests

Consolidation tests were performed on representative undisturbed samples of the natural soils in accordance with ASTM D-2435 standard to evaluate the volume changes of soil subjected to increased loads. Deformations of the specimen are recorded at selected intervals. The results of pressure consolidation curves, which are used to estimate the probable magnitude and rate of settlement of the tested soil under applied loads, are presented on Plates A-7 and A-8, Consolidation Test.

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels and gravel - sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel - sand mixtures, little or no fines
		GRAVELS WITH FINES (Appreciable Amount of fines)	GM	Silty gravels, gravel - sand - silt mixtures
			GC	Clayey gravels, gravel - sand - clay mixtures
	SANDS (More than 50% of coarse fraction is SMALLER than No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		SANDS WITH FINES (Appreciable Amount of fines)	SM	Silty sands, sand - silt mixtures
			SC	Clayey sands, sand - clay mixtures
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	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
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt	Peat, muck and other highly organic soils

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

Reference: The Unified Soil Classification System, Corps of Engineers, U. S. Army Technical Memorandum No. 3 - 357, Vol 1, March, 1953 (Revised April, 1960)

UNIFIED SOIL CLASSIFICATION SYSTEM

Proposed Subdivision
NWC Beverly Drive & Pickering Ave
Whittier, California

GSS ENGINEERING, INC. *Geotechnical Engineering Consultants*

PROJECT No. GSS-3026-1 **PLATE** A-1

NOTE: The data presented on this log is a simplification of actual subsurface conditions encountered and applies only at the location of this boring and the date of drilling. It is not warranted to be representative of subsurface conditions at other locations and times.

BORING NO. 1

Elevation: N/A

Depth In Feet	Blow per Foot	Field Molsture % of Dry Weight	Dry Density lbs./cu.ft.	Shear Resistance kips/sq.ft.	Confining Pressure kips/sq.ft.	Unified Classification	Soil Symbol					
	14	8.0	87.3			SM		FILL	SAND, fine to medium, silty, slightly porous w/ gravel, brick & asphalt pieces	lt brn & brown mix	sl moist	medium dense
	13	10.2	83.4								sl moist to moist	
5						SM		SAND	fine to medium, silty	gray brown	slightly moist	dense
	22	4.2	110.1									
									fine to coarse, silty, gravelly			
10	23	4.8	101.6						End of Test Boring @ 10'			

Date Drilled: 8/18/2021
Drilling Equipment: 8-inch diameter hollow stem auger
Driving Weight: 140 lbs @ 30-inch drop
Water Depth: not encountered

LOG OF TEST BORING	Proposed Subdivision NWC Beverly Drive & Pickering Ave Whittier, California	
GSS ENGINEERING, INC. *Geotechnical Engineering Consultants*	**PROJECT No.** GSS-3026-1	**PLATE** A-2

NOTE: The data presented on this log is a simplification of actual subsurface conditions encountered and applies only at the location of this boring and the date of drilling. It is not warranted to be representative of subsurface conditions at other locations and times.

BORING NO. 2

Elevation: N/A

Depth in Feet	Blow per Foot	Field Moisture % of Dry Weight	Dry Density lbs./cu.ft.	Shear Resistance kips/sq.ft.	Confining Pressure kips/sq.ft.	Unified Classification	Soil Symbol					
						SM		FILL	SAND, very fine to fine, silty, w/ gravels	lt brn	sl moist	m dense
	11	9.9	98.8			SM		SAND	very fine to fine, silty, slightly porous	brown	moist	medium dense
5	22	8.3	112.5						very fine to fine, silty			dense
	31	14.8	96.8					BEDROCK	SILTSTONE, very fine to fine sandy	light brown	moist to very moist	firm
10	41	12.1	103.2									
15	38	16.2	103.6									

End of Test Boring @ 15'

Date Drilled: 8/18/2021
Drilling Equipment: 8-inch diameter hollow stem auger
Driving Weight: 140 lbs @ 30-inch drop
Water Depth: not encountered

LOG OF TEST BORING	Proposed Subdivision NWC Beverly Drive & Pickering Ave Whittier, California	
GSS ENGINEERING, INC. *Geotechnical Engineering Consultants*	**PROJECT No.** GSS-3026-1	**PLATE** A-3

NOTE: The data presented on this log is a simplification of actual subsurface conditions encountered and applies only at the location of this boring and the date of drilling. It is not warranted to be representative of subsurface conditions at other locations and times.

BORING NO. 3

Elevation: N/A

Depth in Feet	Blow per Foot	Field Moisture % of Dry Weight	Dry Density lbs./cu.ft.	Shear Resistance kips/sq.ft.	Confining Pressure kips/sq.ft.	Unified Classification	Soil Symbol				
	12	11.3	86.2			SM		**FILL**	SAND, very fine to fine, silty, occ. gravels slightly porous	dark brown	sl moist to moist	medium dense
	17	11.1	101.6			SM		**SAND**	very fine to fine, silty	brown	moist	dense
5												
	38	22.4	95.2					**BEDROCK**	SILTSTONE, very fine to fine sandy	light brown	moist to very moist	firm
10	42	15.3	99.0									

End of Test Boring @ 10'

Date Drilled: 8/18/2021
Drilling Equipment: 8-inch diameter hollow stem auger
Driving Weight: 140 lbs @ 30-inch drop
Water Depth: not encountered

LOG OF TEST BORING	Proposed Subdivision NWC Beverly Drive & Pickering Ave Whittier, California	
GSS ENGINEERING, INC. *Geotechnical Engineering Consultants*	**PROJECT No.** GSS-3026-1	**PLATE** A-4

NOTE: The data presented on this log is a simplification of actual subsurface conditions encountered and applies only at the location of this boring and the date of drilling. It is not warranted to be representative of subsurface conditions at other locations and times.

BORING NO. 4

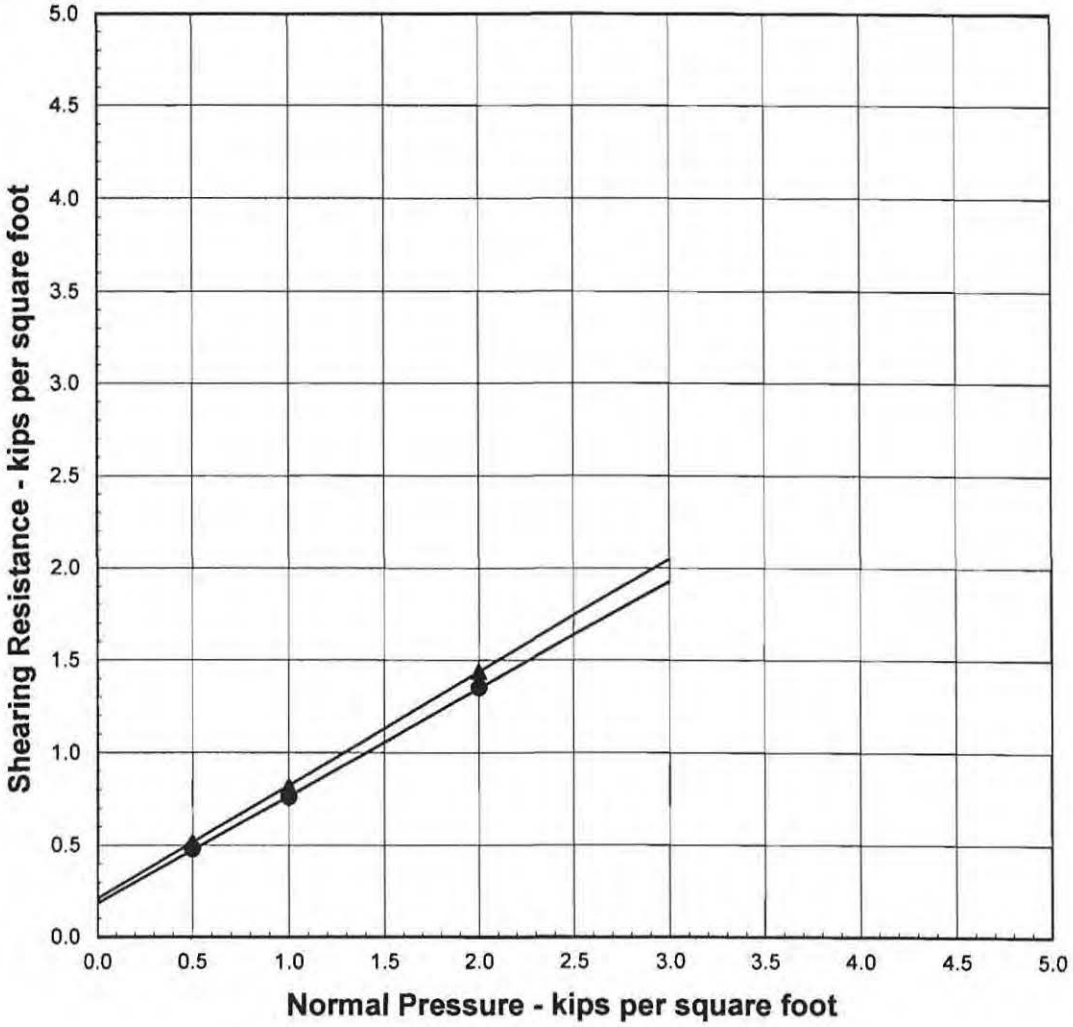
Elevation: N/A

Depth in Feet	Blow per Foot	Field Moisture % of Dry Weight	Dry Density lbs./cu.ft.	Shear Resistance kips/sq.ft.	Confining Pressure kips/sq.ft.	Unified Classification	Soil Symbol				
	11	9.1	89.1			SM		**FILL**	SAND, very fine to fine, silty, occ. gravels	dark brown	sl moist to moist	medium dense
	14	10.1	91.1			SM		**SAND**	very fine to fine, silty, slightly porous	brown	moist	medium dense
5									very fine to fine, silty	light brown		dense
	20	9.0	99.4									
								BEDROCK	SILTSTONE, very fine to fine sandy	light brown	moist to very moist	firm
10	28	12.3	95.8									
15	50	16.3	102.8						SILTSTONE, fine sandy			
20	50	16.1	105.1									

End of Test Boring @ 20'

Date Drilled: 8/18/2021
Drilling Equipment: 8-inch diameter hollow stem auger
Driving Weight: 140 lbs @ 30-inch drop
Water Depth: not encountered

LOG OF TEST BORING	Proposed Subdivision NWC Beverly Drive & Pickering Ave Whittier, California	
GSS ENGINEERING, INC. *Geotechnical Engineering Consultants*	**PROJECT No.** GSS-3026-1	**PLATE** A-5



Samples were tested under saturated and drained conditions.

	Boring No.	Depth (feet)	UC	Initial Water Content (% of dry wt.)	Final Water Content (% of dry wt.)	Dry Density (lbs / cu.ft.)	Cohesion (lbs / sq. ft.)	Angle of Friction (degrees)
●	2	4	SM	8.3	17.1	112.5	190 residual shear strength	30
▲	4	7	SM	9.0	25.1	99.4	210 residual shear strength	32

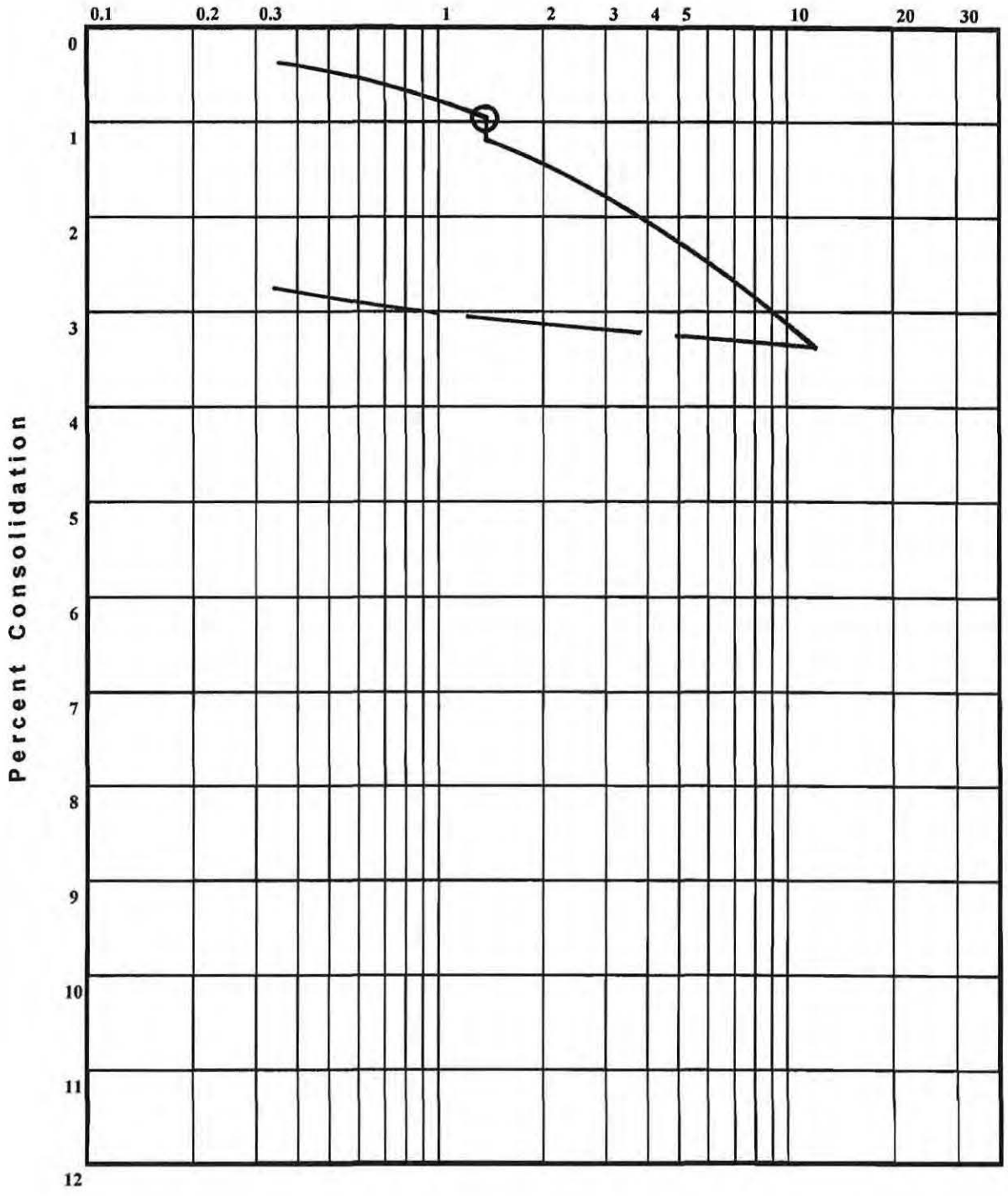
DIRECT SHEAR TEST DATA

Proposed Subdivision
NWC Beverly Drive & Pickering Ave
Whittier, California

GSS ENGINEERING, INC. *Geotechnical Engineering Consultants*

PROJECT No. GSS-3026-1 **PLATE** A-6

Normal Load - kips per square foot

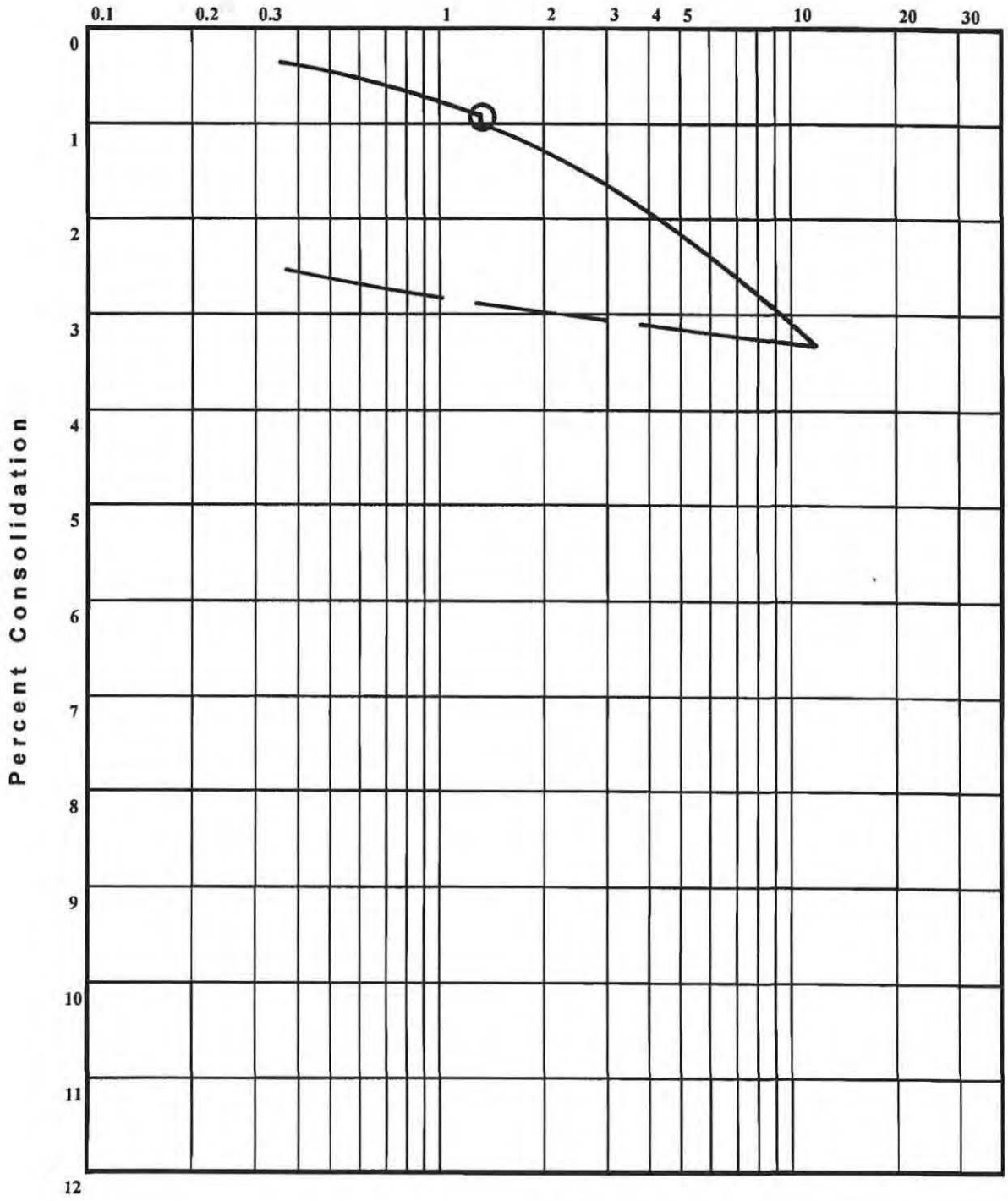


Boring No. 1 @ 7.0

O Water Permitted to Contact Sample

CONSOLIDATION TEST	Proposed Subdivision NWC Beverly Drive & Pickering Ave Whittier, California	
GSS ENGINEERING, INC. *Geotechnical Engineering Consultants*	**PROJECT No.** GSS-3026-1	**PLATE** A-7

Normal Load - kips per square foot



Boring No. 3 @ 4.0

O Water Permitted to Contact Sample

CONSOLIDATION TEST	Proposed Subdivision NWC Beverly Drive & Pickering Ave Whittier, California	
GSS ENGINEERING, INC. *Geotechnical Engineering Consultants*	**PROJECT No.** GSS-3026-1	**PLATE** A-8