SOIL
EXPLORATION
COMPANY, INC.

Soil Engineering, Environmental Engineering, Materials Testing, Geology

November 5, 2018

Project No. 18218-01

TO: CJC Design, Inc.
22485 La Palma Ave., Suite 202
Yorba Linda, CA 92887

ATTENTION: Fred Cohen

SUBJECT: Preliminary Soil Investigation and Infiltration Tests Report, Proposed Gas Station, Convenience Store and Car Wash, SWC Mentone Boulevard and Crafton Avenue, San Bernardino County, California

Introduction

In accordance with your authorization, this report presents the results of our preliminary soil investigation and infiltration tests for the subject site (see Figure 1, Site Location Map). The accompanying report presents a summary of our findings, conclusions, recommendations and limitations of our work for construction of the proposed site improvements.

Scope of Work

- Review soils, geologic, seismic, groundwater data and maps in our files.
- Perform exploration of the site by means of three backhoe excavations at readily accessible locations.
- Field Engineer (California Registered RCE) for logging, sampling of select soils, observation of excavation resistance, caving conditions and water seepage (if any).
- Perform basic laboratory testing on select soil samples, expected to include moisture, density, sand equivalent, expansion index and corrosion potential (pH, chlorides, resistivity and water soluble sulfates)
- Perform digitized search of known faults within a 60-mile radius of the site.
- Determine California Building Code (CBC) 2016 seismic parameters for the site.
- Consult with project architect/civil design engineer
- Perform two shallow infiltration tests at locations suggested by you
- Prepare a report of our findings, conclusions and recommendations for site preparation, including overexcavation/removal depth, allowable bearing value, foundation/slab-on-grade depth/thickness recommendations, excavation characteristics, lateral static/seismic earth pressures for retaining walls design, general grading and grading specifications, California Building Code (2016) seismic design coefficient, Cal/OSHA soil classification and infiltration rate in inches/hour.

Existing Site Condition

The rectangular shaped, relatively flat site is located on the southwest corner of Mentone Boulevard and Crafton Avenue in the Mentone area of San Bernardino County, California. Mentone Boulevard is a paved road with curbs, gutters and sidewalks. Crafton Avenue is a paved road with AC curbs. A block wall borders the site on the south side. An existing house is located on adjacent property to the south. The adjacent lot to the west is vacant. Vegetation consists of dense weeds.

The approximate locations of the above and other features are shown on Exploratory Trench and Infiltration Test Location Map Plate 1. The base map is "Boring Sketch" prepared by Anaca Enfdgineering Company of Anaheim California.

Proposed Development

We understand that a gas station, convenience store, car wash and related improvements are proposed for the site. The proposed structures will be steel or wood frame construction with concrete floor slabs supported on prepared subgrade. Based on flat topography of the site modest cut or fill grading and no significant cut or fill slopes may be proposed.

Field Work

Three exploratory trenches were excavated at the site on October 15 2018 utilizing a Case 580 backhoe equipped with a 24-inch bucket. Locations of the exploratory trenches were randomly selected at readily accessible locations (see Exploratory Trench Location Map, Plate 1). In general the exploratory excavations revealed the site soils primarily consist of silty sand, sand with silt and gravel with sand (USCS "SM" "SP-SM" and "GP"). Cobbles up to 10 inches and boulders up to 31 inches were noted in exploratory excavations. Fill was noted to a depth of 3± feet in Trenches T1 and T2. Caving was also noted. Detailed descriptions of earth materials encountered are presentec in the form of Geotechnical Trench Logs in Appendix B.

Based on available data (referenced CDMG Special Report 113, Plate 5B the site soils are mapped as alluvial deposits between 200 and 300 feet thick.

Laboratory Testing

Laboratory tests were performed on select soil samples. The tests consisted primarily of natural moisture contents dry densities corrosion potential (pH, chlorides, resistivity and water soluble sulfates). A summary of laboratory test results are presented in Appendix C, with some of the results also shown in Geotechnical Trench Logs in Appendix B

Groundwater/Liquefaction

Groundwater seepage or wet soils were not encountered in our exploratory excavations, excavated to a maximum depth of 15 feet, at the time this work was performed. Groundwater study is not within the scope of this work. However based on referenced CDMG Special Report 113 (Plate 4B), depth to groundwater at the site is 175± feet below ground surface and referenced Carson and Matti map indicates depth to groundwater in the vicinity of the site to be 150±

Groundwater data from State well in the vicinity of the site is tabulated below (see Figure 1 Site Location Map for location of well):

State Well No.	WSE* (ft)	Date Measured	Distance/Location Relative to Site	Estimated Depth of Water Below Site (ft)
01S02W29C001S	1747.79	4/11/1931	SE/0 6 miles	89.9
	1747.45	10/23/2008		90.24

*WSE = Water Surface Elevation

Liquefaction occurs when loose, fine grained (poorly graded) saturated cohesion less soils are subject to ground shaking during an earthquake of large magnitude. Liquefaction potential in general is relatively high when the ground water table is less than thirty feet below ground surface. Based on the San Bernardino County Land Use Plan, the site is not located in an area of potential liquefaction (see Figure 3)

Seismicity/Faulting

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone.

A computer search of known Quarternary major faults within 50 miles of the site from USGS National Seismic Hazard Map is presented in Appendix D. It is probable that not all active or potentially active faults in the region have been identified. Furthermore, seismic potential of the smaller and less notable faults is not sufficiently developed for assignment of maximum earthquake magnitudes and associated levels of ground shaking that might occur at the site due to these faults.

Conclusions

- All vegetation, weeds, undocumented fills, old foundations, buried abandoned structures, buried utility/irrigation lines and any deleterious materials, etc. would require removal from the proposed building/grading areas.
- Overexcavation and recompaction of surficial soils should be anticipated to remove and recompact undocumented fill and provide adequate and uniform support for the proposed structures and pavement.
- Earth materials encountered during our subsurface exploration can be excavated with conventional grading equipment in good working condition.
- The onsite soils, exclusive of oversize materials (larger than 6 inches) and deleterious materials, can be used as compacted fill.
- Based on observation and soil classification, the expansion potential of the near-surface sandy soils at the site is expected to be very low (EI<20).
- After site preparation the use of shallow spread footings foundations appears feasible for the support of proposed light weight construction.
- The site is located approximately 2.74 miles from the S. San Andreas fault. The site is located in a region of generally high seismicity, as is all of Southern California. During its design life, the site is expected to experience moderate to strong ground motions from earthquakes on regional and/or nearby causative faults.
- There is a 2 percent probability in 50 years (2475 year return period) that peak ground acceleration at the site will exceed 0.795g (see Appendix D).
- Based on San Bernardino County Land Use Plan, General Plan, Geologic Hazard Overlays, the site is not located within area of landslide or liquefaction susceptibility (see Figure 3).
- The flooding potential of the site should be verified by design civil engineer and considered in planning, design and construction.
- No groundwater and/or seepage were encountered during our subsurface work. However, the potential for rain or irrigation water locally seeping through from adjacent/higher areas cannot be entirely precluded.

Recommendations

Site Preparation and Grading

All grading should be performed in accordance with our General Earthwork and Grading Specifications presented in Appendix E, except as modified within the text of this report.

All debris, abandoned utility lines, underground structures, old foundations, weeds, vegetable matter, deleterious materials, etc. should be hauled offsite. Cavities created during site clearance should be backfilled in a controlled manner.

Subsequent to site clearance and debris removal, building areas extending at least 5 feet beyond the building lines in plan (where practical) should be overexcavated and recompacted to remove undocumented fills and provide uniform foundation support. Where the proposed overexcavation is in the vicinity of existing structures. The work should be performed in sections (slots) considered safe by the grading contractor. Based on our exploration, we anticipate removals to extend to at least 4 feet below existing ground or proposed grades, whichever is deeper. The need for deeper removals cannot be precluded and this should be determined by observations and testing during grading.

Deleterious material, etc. should be completely removed if encountered in the bottom of the overexcavation/grading areas. After the required removals, the bottom of the overexcavation should be scarified to a depth of at least 12 inches, mixed, thoroughly watered and recompacted to at least 95 percent of the maximum dry density as determined by ASTM D1557-12, prior to placement of engineered fills. Any loose soils exposed in the bottom of the excavations should be removed and recompacted.

Parking/driveways/pavement areas should be scarified to a depth of at least 12 inches, watered as necessary, and compacted to at least 95 percent relative compaction.

Compacted Fills/Imported Soils

Any soil to be placed as fill, whether presently onsite or import, should be approved by the soil engineer or his representative prior to their placement. All onsite soils to be used as fill should be cleansed of any roots or other deleterious materials. Cobbles larger than 3 inches in diameter should not be placed in the vicinity of foundations and utility lines. All fills should be placed in 6 to 8 inch loose lifts, moisture conditioned to near optimum moisture content, mixed and compacted to at least 90 percent relative compaction.

Any imported soils should be sandy (preferably (USCS "SM" or "SW" and very low in expansion potential, EI<20) and approved by the soil engineer. The soil engineer or his representative should observe the placement of fill and take sufficient tests to verify the moisture content and the uniformity and degree of compaction obtained.

Foundation Design

Conventional Building Foundations

Based on the above site preparation recommendations, very low expansion potential of soils and anticipated loads, an allowable bearing pressure of 2000 psf is recommended for the design of footings. This bearing pressure has been established based on the assumption that the continuous footings will be embedded at least 18-inches below lowest adjacent firm grade and into the compacted fill mat, and measure at least 18-inches in width. This value may be increased for each additional foot of depth or width to a maximum of 3000 psf. The column footings should be at least 24 inches in width and embedded at least 24 inches below lowest adjacent firm grade. A one-third increase in the bearing value may be used when considering short term wind or seismic loads.

Canopy Caisson Foundations

Typical canopy caisson should be 2 to 3 feet in diameter and extend to a depth of at least 8 feet below ground surface. An allowable bearing value of 2000 psf and lateral bearing of 300 psf/ft (maximum value 3000) may be used in design.

Continuous footings should be reinforced with at least two No. 5 bars at the top and two at the bottom. Please note foundation design is under the purview of structural design engineer and structural considerations may have other more stringent requirements which should govern.

Concrete Slabs-On-Grade

Concrete floor slabs should be at least 4 inches thick (structural conditions may govern). Slabs to receive flooring should be underlain by a 10-mil Visqueen moisture barrier overlain by 2-inch layer of clean, rolled sand and underlain by additional 2 inches of rolled sand Slabs subject to vehicular traffic/canopy area/storage should be at least 6 inches thick (or thicker). Appropriate recommendations should be made by the project architect if crack sensitive floor covering (such as vinyl or marble tiles) is placed directly on the concrete slab.

All floor slabs should be reinforced with at least No. 3 rebar at 18-inches on center each way. Care should be taken by the contractor to insure that reinforcement is placed at slab mid-height. The use of concrete spacers to raise reinforcement of slabs is highly recommended. However, floor slab thickness and reinforcement should be evaluated by the structural engineer and designed in compliance with applicable codes for the proposed loading. Where slabs will support special loads, such as equipment, etc., the structural engineer should consider these conditions. A modulus of subgrade reaction (k) value of 150 pci may be used in the design.

All concrete flatwork, including slabs subgrade, should be verified to contain 1.2 times the soil optimum moisture content to a depth of 12 inches prior to placement of slab building materials. Moisture content should be tested in the field by the soil engineer.

Concrete Joints

The joints spacing for concrete slabs should be determined by the project architect. Joints should be laid out to form approximately square panels (equal transverse and longitudinal joint spacing). Rectangular panels, with the long dimension no more than one-and-one-half times the short, may be used when square panels are not feasible The depth of longitudinal and transverse joints should be one-fourth the depth of the slab thickness.

Joint layout should be adjusted so that the joints will line up with the corners of structures, small foundations and other built-in structures. Acute angles or small pieces of slab curves as a result of joints layout should not be permitted.

Concrete Curing

Fresh concrete should be cured by protecting it against loss of moisture, rapid temperature change and mechanical injury for at least 3 days after placement. Moist curing, waterproof paper, white polyethylene sheeting, white liquid membrane compound, or a combination thereof may be used. After finishing operations have been completed, the entire surface of the newly place concrete should be covered by whatever curing medium is applicable to local conditions and approved by the engineer. The edges of concrete slabs exposed by the removal of forms should be protected immediately to provide these surfaces with continuous curing treatment equal to the method selected for curing the slab surfaces. The contractor should have at hand, and ready to install before actual placement begins, the equipment needed for adequate curing of the concrete. In hot or windy weather (80° F or 12 mph) the contractor should take appropriate concrete cooling and curing precautions during and after placement of concrete. The use of mechanically compacted low slump concrete (not exceeding 4 inches at the time of placement) is recommended.

Lateral Earth Pressures/Retaining Walls

The following lateral equivalent fluid earth pressures and soil parameters in conjunction with the above allowable bearing value may be used for the design of retaining walls with free draining compacted backfills. In addition, any surcharge loading (such as vehicular traffic) should be considered in design of retaining walls. Wall backfills should be compacted to at least 90 percent relative compaction. We recommend that drainage for retaining walls should be provided in accordance with Plate 2 of this report.

- Active Earth Pressure (P_a), level ground — 40 pcf (EFP), drained, unbraced yielding walls
- At Rest Pressure (P_o) — 60 pcf (EFP), drained, braced non-yielding (part of building walls)
- Passive Earth Pressure (P_p) — 300 pcf (EFP), drained, maximum of 3000 psf (fill or firm native soil)
- Horizontal Coefficient of Friction (μ) — 0.35
- Unit Soil Weight (γ_t) — 120 pcf

Soil resistance developed against lateral structural movement can be obtained from the passive pressure and friction coefficient indicated above. The total resistance may be taken as the sum of the friction and passive resistance provided that the passive portion does not exceed two-thirds of the total resistance.

Expansion Index and Corrosion/Soluble Sulfates

Based on observation and soil classification, the expansion potential of the near surface sandy soils is anticipated to be very low (EI<20).

Results of tests performed by Cal Land Engineering, Inc. of Brea, California on a select soil sample indicate negligible soluble sulfate exposure (less than 0.1 percent water soluble sulfates by weight), pH of 7.97, chlorides of 40 ppm and resistivity of 1500 ohm-cm (see Appendix C). Concrete, mix, placement and curing for concrete should comply with ACI guidelines. Results of resistivity tests indicate highly corrosive soils and ferrous metal/pipes should be protected. Tentatively we recommend Type II cement and concrete slump not exceeding 4 inches at the time of placement. If critical, these should be further verified by your structural or a corrosion engineer.

Seismic Consideration

The site is located approximately 2.74 miles from the S. San Andreas fault. Moderate to strong ground shaking can be expected at the site and there is a 2 percent probability in 50 years (2475 year return period) that peak ground acceleration at the site will exceed 0.795g. The site soil profile is Class D (stiff soil). The structural engineer should consider City/County local codes, the latest requirements of the Structural Engineers Association, California Building Code (CBC 2016) seismic data presented in this report (Appendix D), and any other pertinent data in selecting seismic design parameters.

Groundwater

No groundwater and/or seepage were encountered during our subsurface work. The potential for rain or irrigation water locally seeping through from adjacent areas cannot be precluded. Our experience indicates that surface or near-surface groundwater conditions can develop in areas where groundwater conditions did not exist prior to site development, especially in areas where a substantial increase in surface water infiltration results from landscape irrigation. In addition, changes in local or regional water and management patterns, or both, can significantly raise the water table or create zones of perched water. We therefore recommend that landscape irrigation be kept to the minimum necessary to maintain plant vigor and any leaking pipes/sprinklers, etc. should be promptly repaired. The depth to the groundwater may fluctuate with seasonal changes and from one year to the next. We have no way of predicting future groundwater levels or perched water due to increase in surface water infiltration from rainfall or from landscape irrigation. Subdrains, horizontal drains, toe drains, French drains, heel drains or other devices may be recommended in future for graded areas that exhibit nuisance water seepage conditions.

Erosion Control/Drainage/Planter Areas

The near surface sandy soils may be subject water erosion. Positive drainage should be provided around the perimeter of all structures and all foundations toward streets or approved drainage devices to minimize water infiltrating into the underlying natural and engineered fill soils. In addition, finish subgrade adjacent to exterior footings should be sloped down and away to facilitate surface drainage. Roof drainage should be collected and directed away from foundations via non-erosive devices. Water, either natural or by irrigation, should not be permitted to pond or saturate the foundation soils.

The developer should be made aware of the potential problems, which may result when drainage is altered. Ponded water, leaking irrigation systems, over-watering or other conditions which could lead to ground saturation should be avoided. Area drainage collection should be directed toward the approved drainage devices.

Cal/OSHA Classification/Trench Excavations/Backfills

In general Cal/OSHA classification of onsite soils appears to be Type C.

Temporary trench excavations deeper than 5 feet should be shored or sloped at 1.5:1 or flatter, cobbles/boulders removed from the slope surface, in compliance with Cal/OSHA requirements:

a.) The shoring should be designed by a qualified engineer experienced in the shoring design.

b.) The tops of any temporary unshored excavations should be barricaded to prevent vehicle and storage loads within a 1.5:1 line projected upward from the bottom of the excavation or a minimum of 5 feet, whichever is greater. If the temporary construction embankments, including shored excavations, are to be maintained during the rainy season, berms are suggested along the tops of the excavations where necessary to prevent runoff from entering the excavation and eroding the slope faces.

c.) The soils exposed in the excavations should be inspected during excavation by the soils engineer so that modifications can be made if variations in the soil conditions occur.

d.) All unshored excavations must be stabilized within 30 days of initial excavation.

Backfills in the utility trenches should be compacted to at least 90 percent relative compaction. Onsite earth materials (cleaned of over 3" material) will be suitable for backfills. Clean sandy materials with sand equivalent value of at least 30 must be utilized for the pipe bedding and shading zone. Placement of the trench backfill in lifts and compaction by mechanical effort should be anticipated.

Tentative Pavement Design

On the basis of laboratory classification and testing, we are of the opinion that the tentative new minimum pavement design may be as follows:

AREA	TRAFFIC INDEX	ASPHALT CONCRETE
Auto Parking/Driveways	4 – 4.5	4"AC over compacted native
Canopy Floor	4.5 - 5	6" PCC over compacted native

The upper at least 12 inches of the subgrade soils below new pavements should be compacted to at least 95 percent relative compaction. Maximum dry densities should be determined by the Standard Test Method designated ASTM D1557-12. Final pavement design may be based on laboratory test results of representative soils upon completion of grading.

Foundation Plan Review/Additional Observations and Testing/Quality Control

Soil Exploration Company, Inc. should review the foundations plan and observe and/or test during the following stages of construction:

- During site clearance and removal of any obstructions.
- During all overexcavations, removal of loose compressible soils, in-place processing of soils and all fill placement and compaction.
- During preparation, moisture conditioning, and compaction of subgrades/base for slabs-on-grade and pavement.
- During footing excavations and prior to placement of footings materials.
- During all trench and retaining wall backfills and compaction of curb. gutter, sidewalks subgrade.
- When any unusual conditions are encountered.

Final Report

A final grading control report, including geotechnical data gathered, should be prepared when rough grading is completed. The report should include all laboratory test results, a map showing all removal depths, location and depth/elevation of field density tests, test methods and final foundation and pavement design recommendations.

Limitation of Investigation

Our investigation was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable Geotechnical Engineers practicing in this or similar locations. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

The field and laboratory test data are believed representative of the project site; however, soil conditions can vary significantly. As in most projects, conditions revealed during grading may be at variance with preliminary findings. If this condition occurs, the possible variations must be evaluated by the Project Geotechnical Engineer and adjusted as required or alternate design recommended.

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

This firm does not practice or consult in the field of safety engineering. We do not direct the contractor's operations, and we cannot be responsible for other than our own personnel on the site; therefore, the safety of others is the responsibility of the contractor. The contractor should notify the owner if he considers any of the recommended actions presented herein to be unsafe.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or 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.

This report was prepared for the client based on client's needs, directions and requirements at the time. This report is not authorized for use by and is not to be relied upon by any party except the client with whom Soil Exploration Co., Inc. contracted for the work. Use of, or reliance on, this report by any other party is at that party's risk. Unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify Soil Exploration Co., Inc. from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of Soil Exploration Co., Inc.

Closure

If you should have any questions regarding this report, please do not hesitate to call our office. We appreciate this opportunity to be of service.

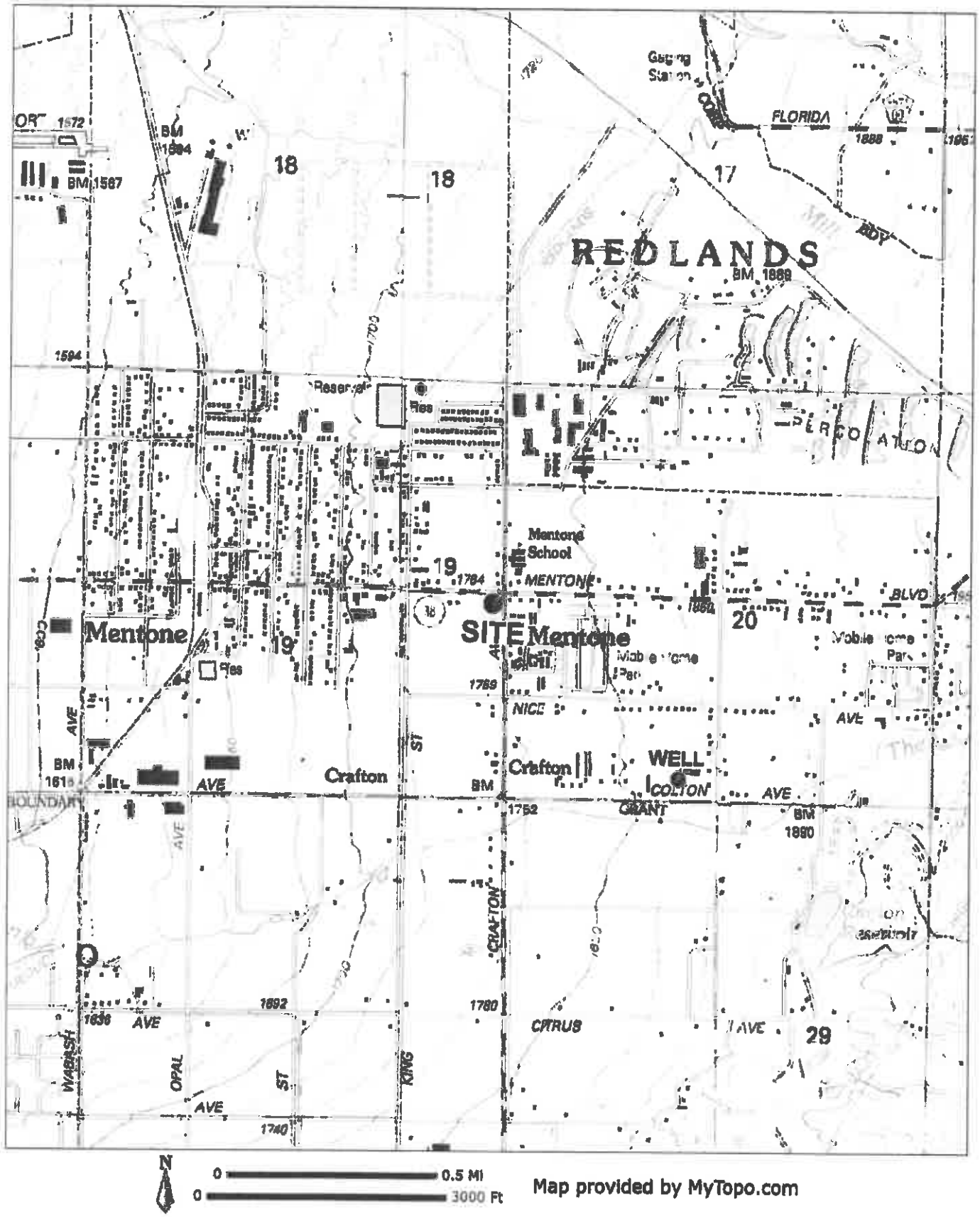
Very truly yours,
Soil Exploration Co., Inc.

Gene K. Luu, PE 53417
Project Engineer

Distribution: [1] Addressee

Attachments:

Figure 1	Site Location Map
Figure 2	USGS Geologic Map
Figure 3	San Bernardino County Land Use Plan. Geologic Hazard Overlays
Figure 4	Fault Activity Map of California
Plate 1	Exploratory Trench and Infiltration Test Location Map
Plate 2	Retaining Wall Backfill and Subdrain Detail
Appendix A	References
Appendix B	Geotechnical Trench Logs
Appendix C	Laboratory Test Results
Appendix D	USGS National Seismic Hazard Maps-Source Parameters and CBC (2016) Seismic Parameters
Appendix E	General Earthwork and Grading Specifications
Appendix F	Infiltration Procedure and Results


REDLANDS
BM 1889
FLORIDA
Gasoline Station
Reservoir
Res
Mentone School
MENTONE
SITE Mentone
Mentone
Crafton
WELL
COLTON
GRANT
NICE
BLVD
AVE
CRAFTON
CITRUS
OPAL
WABASH
KING
ST
BM 1587
BM 1618
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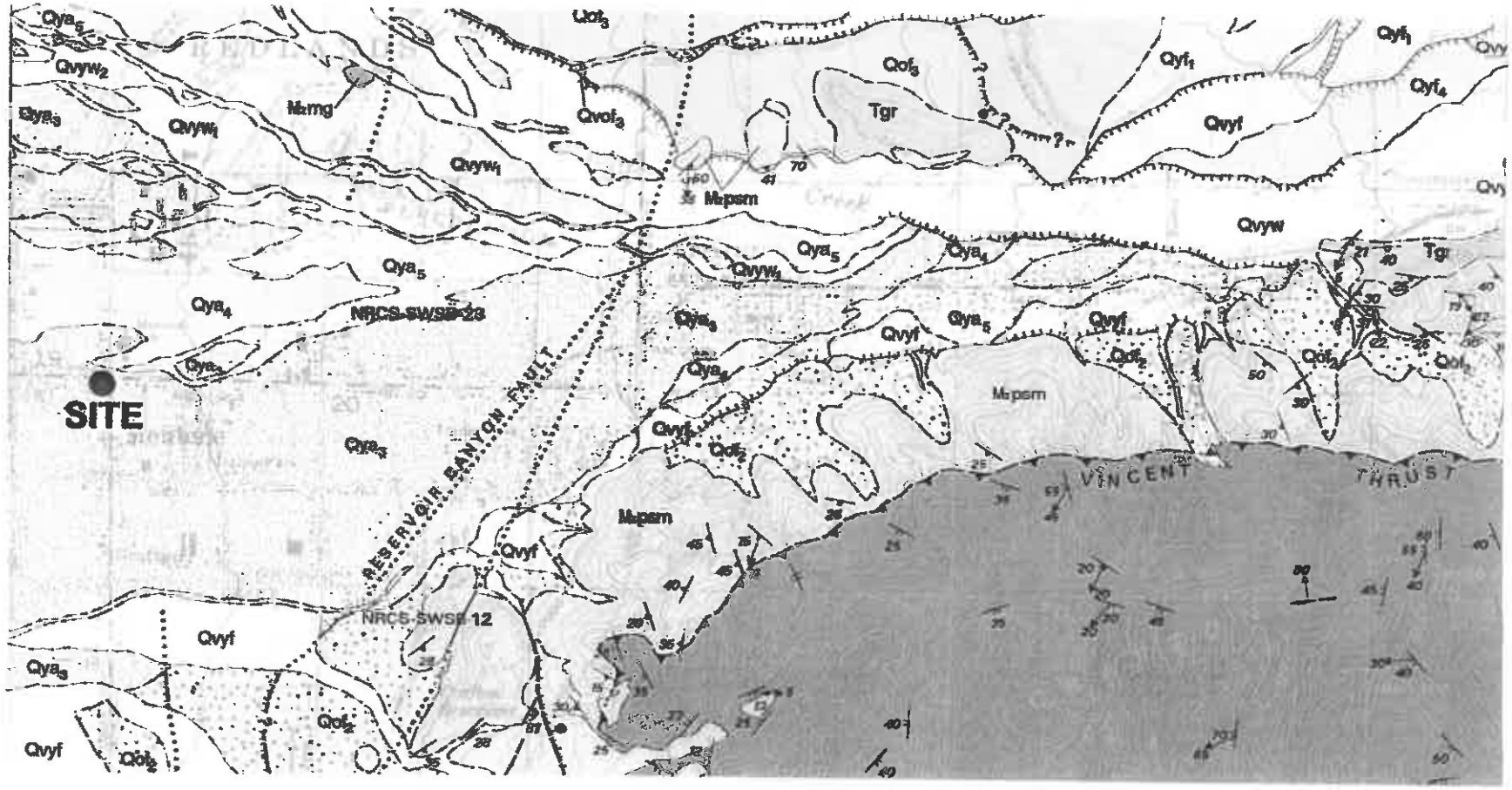
Map provided by MyTopo.com

Figure 1



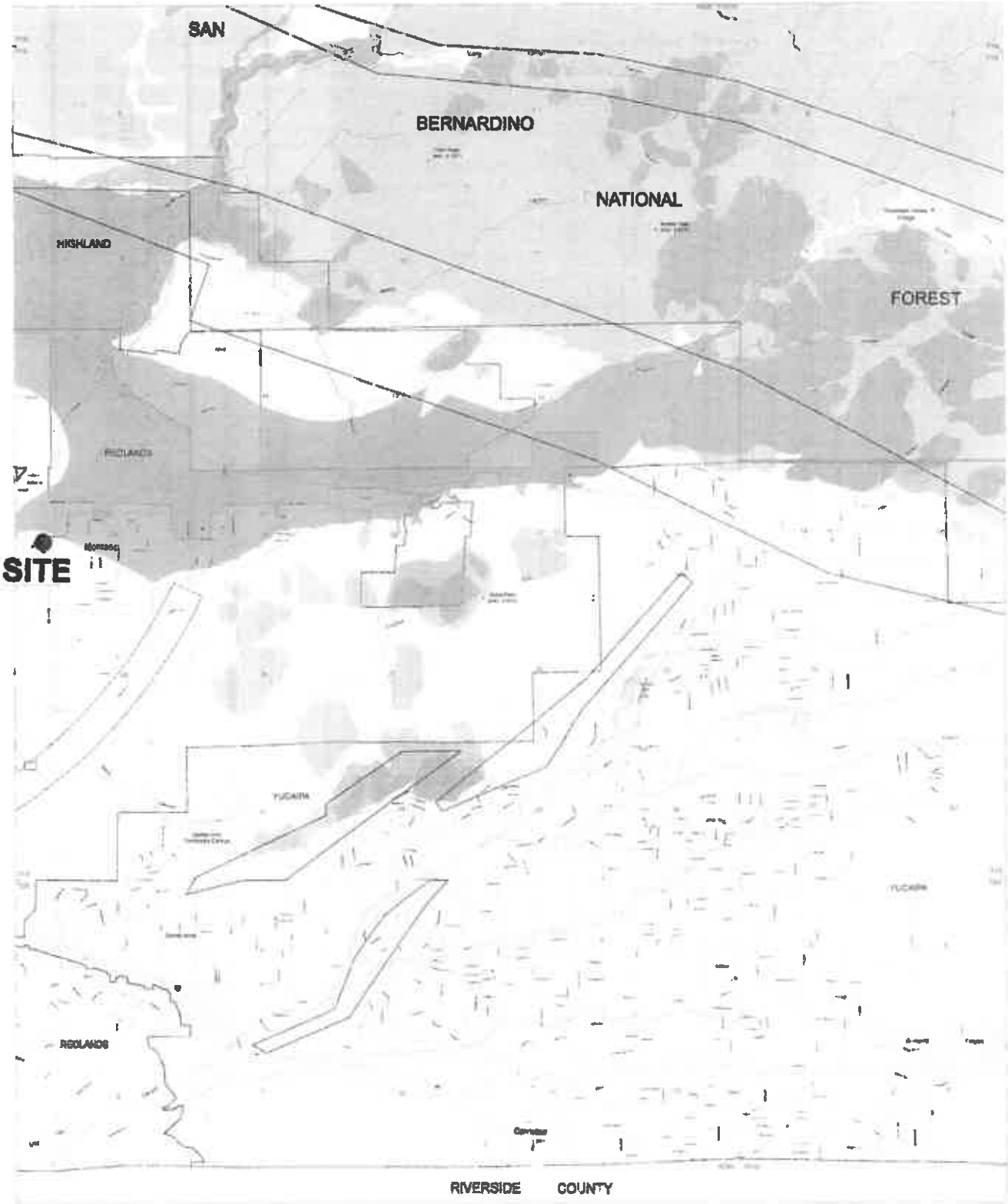
Base Map: USGS Geologic Map of the Yucaipa 7.5' Quadrangle, San Bernardino and Riverside Counties, California.

LEGEND:

Qya: Young axial-valley deposits (Holocene and latest Pleistocene) – Slightly to moderately consolidated silt, sand, and gravel.

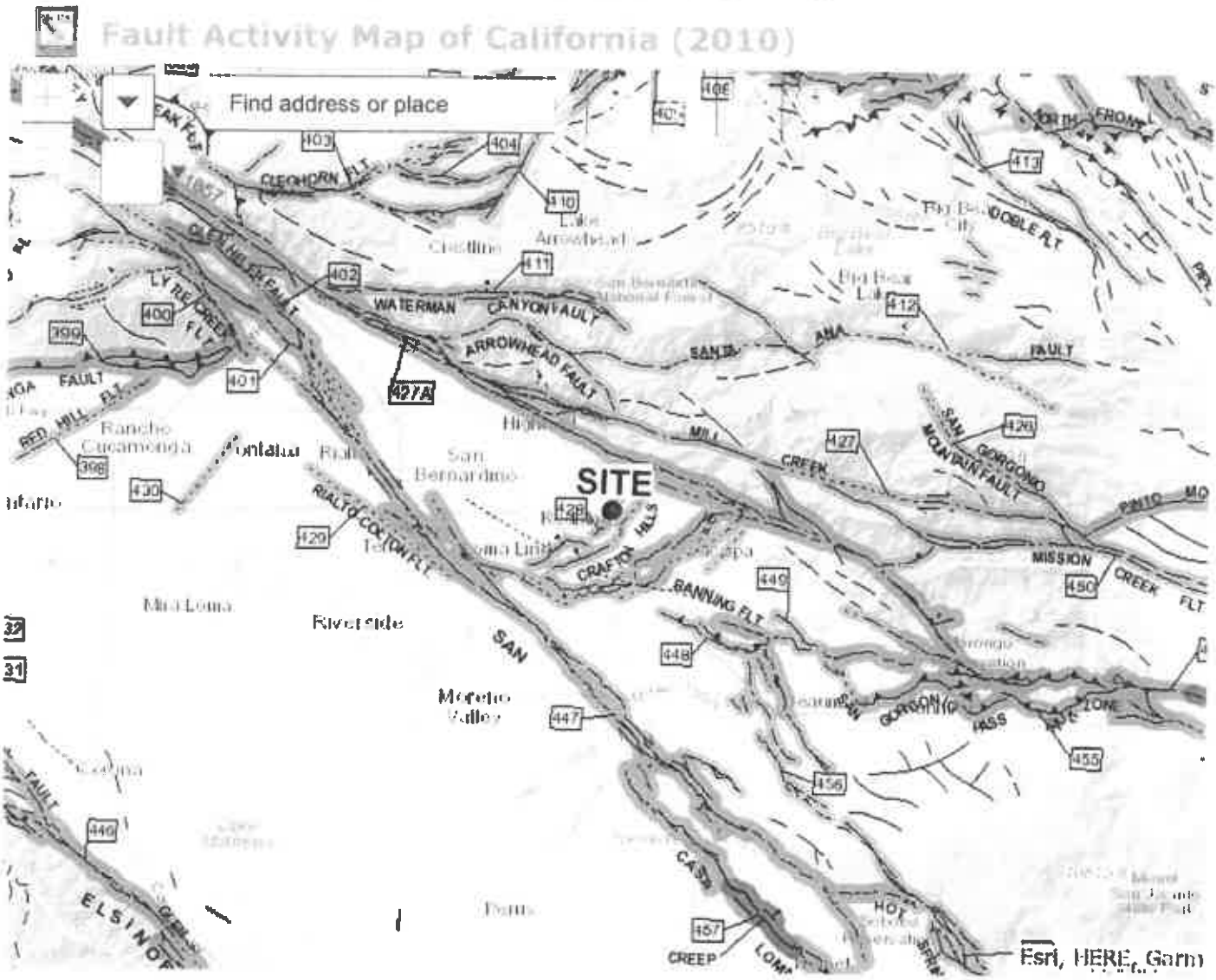
a: Arenaceous (very coarse sand through very fine sand).

SWC Mentone Boulevard and Crafton Avenue **Mentone Area** **San Bernardino County, California**	**Soil Exploration Co., Inc.** **Project No.: 18218-01** **Date: November 5, 2018** **Figure: 2**



San Bernardino County Land Use Plan
GENERAL PLAN
Geologic Hazard Overlays

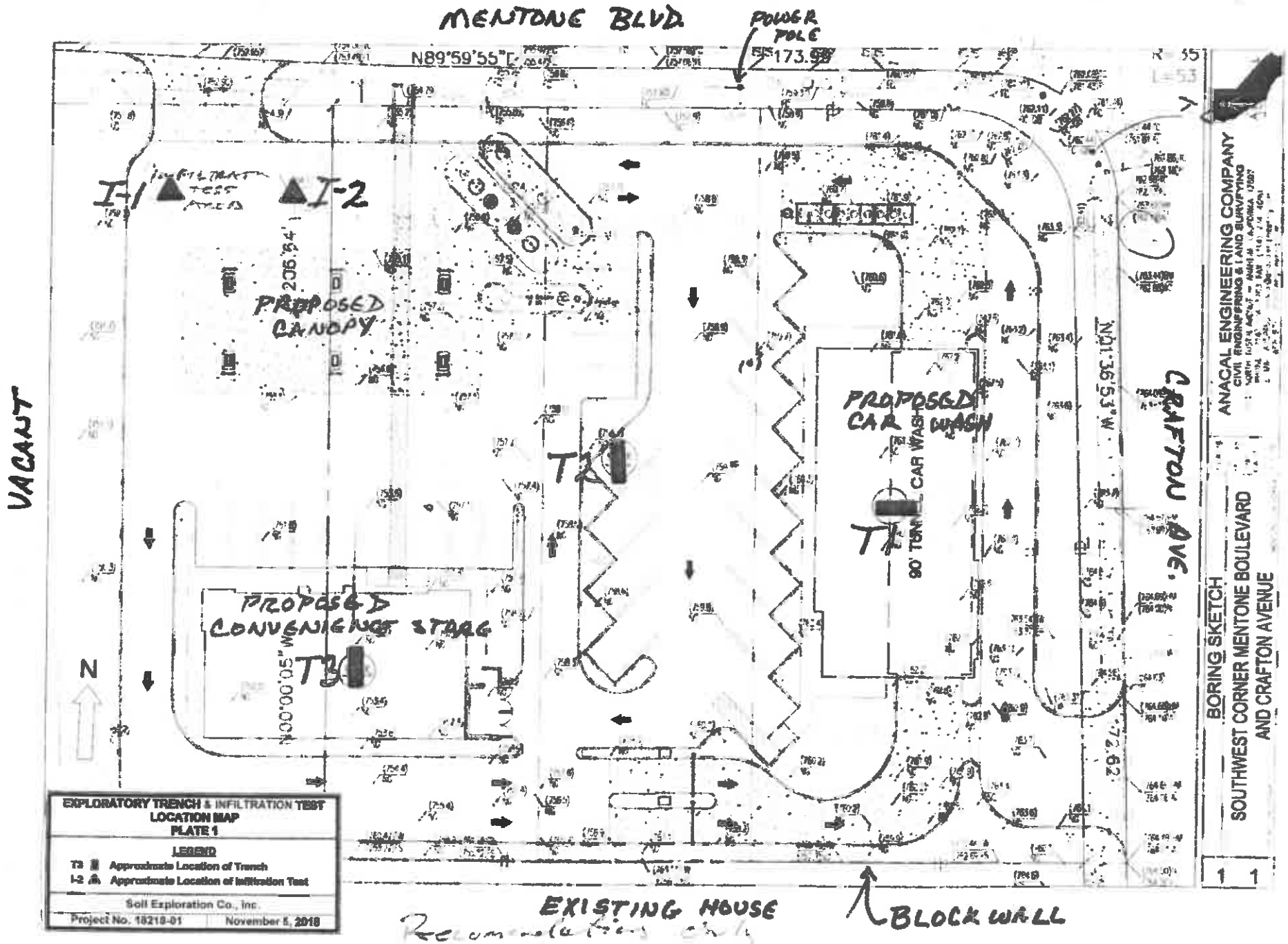
Figure 3



10mi

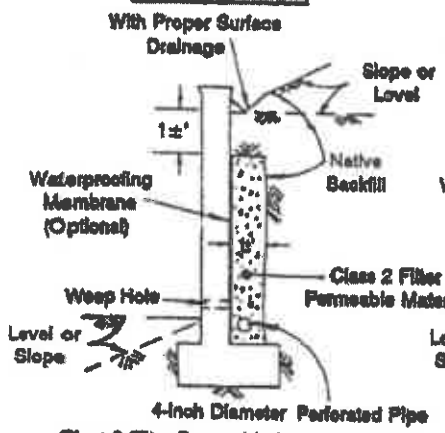
Figure 4

https://maps.conservation.ca.gov/cgs/fam/App/index.html


MENTONE BLVD.
POWER POLE
N89°59'55"E
173.99'
I-1
I-2
INFILTRATION TEST AREA
PROPOSED CANOPY
206.64'
T1
T2
T3
PROPOSED CAR WASH
90' TSN
CAR WASH
N00°13'51"W
277.62'
CRAFTON AVE.
PROPOSED CONVENIENCE STORE
N00°00'05"W
VACANT
N
EXISTING HOUSE
BLOCK WALL
EXPLORATORY TRENCH & INFILTRATION TEST LOCATION MAP
PLATE 1
LEGEND
T3 Approximate Location of Trench
I-2 Approximate Location of Infiltration Test
Soil Exploration Co., Inc.
Project No. 18218-01
November 5, 2018
BORING SKETCH
SOUTHWEST CORNER MENTONE BOULEVARD AND CRAFTON AVENUE
ANACAL ENGINEERING COMPANY
CIVIL ENGINEERING & LAND SURVEYING
1 1

SUBDRAIN OPTIONS FOR NATIVE MATERIAL BACKFILL

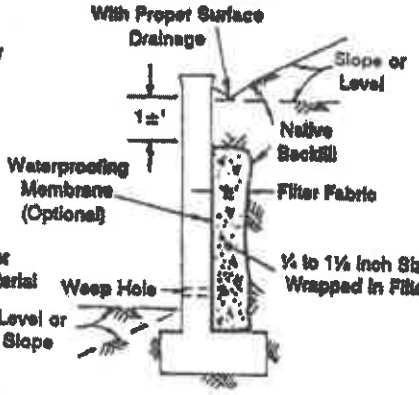
OPTION N2: Pipe Surrounded with Class 2 Material



Class 2 Filter Permeable Material Grading Per Caltrans Specifications

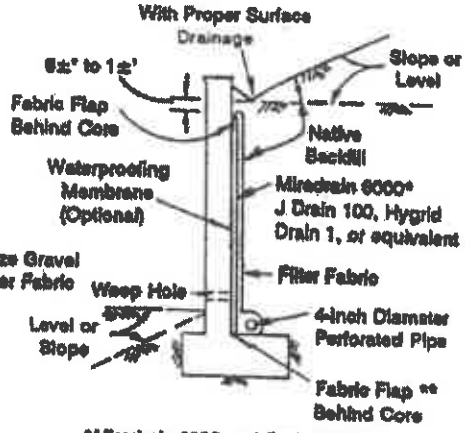
Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

OPTION N1: Gravel Wrapped in Filter Fabric



Proper Outlet Should be Provided for Gravel Subdrain (See Notes)

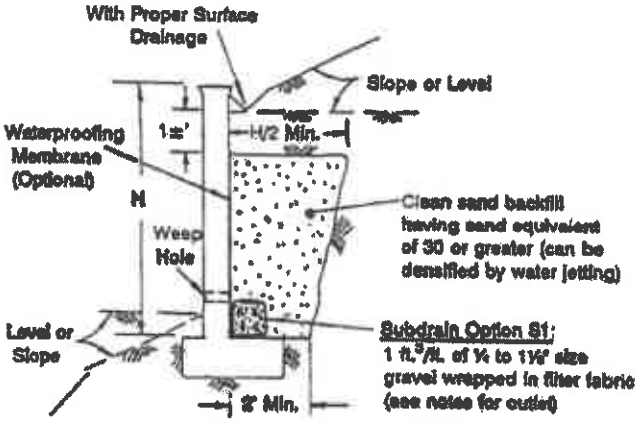
OPTION N3: Geotextile Drain



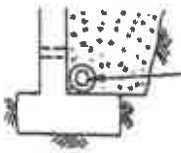
*Miradrain 6000 or J Drain 100 for non-waterproofed walls; Miradrain 6200 or J Drain 200 for completed waterproofed walls

**Peel back the bottom fabric flap, place pipe next to core, wrap fabric around pipe and tuck behind core.

SUBDRAIN OPTIONS FOR CLEAN SAND BACKFILL



Subdrain Option S2:
4" diameter perforated pipe surrounded with 1 ft.³/ft. of Class 2 filter material per Caltrans specifications as above



Subdrain Option S3:
4" diameter perforated pipe wrapped in filter fabric

Notes:

- Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down.
- Filter fabric should be Mirafi 140N, 140NS, Supac 4NP, Amoco 4545, Trevira 1114, or approved equivalent.
- All drains should have a gradient of 1 percent minimum.
- Outlet portion for gravel subdrain should have a 4"-diameter pipe with the perforated portion inserted into the gravel approximately 2' minimum and the nonperforated portion extending approximately 1' outside the gravel. Proper sealing should be provided at the pipe insertion enabling water to run from the gravel portion into rather than outside the pipe.
- Waterproofing membrane may be required for a specific retaining wall such as a stucco or basement wall.
- Weephole should be 2" minimum diameter and provided at 25' minimum in length of wall. If exposure is permitted, weephole should be located at 3±" above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to discharge through the curb face or equivalent should be provided, or for a basement-type wall, a proper subdrain outlet system should be provided. Open vertical masonry joints (i.e., omit mortar from joints of first course above finished grade) at 32" maximum intervals may be substituted for weepholes. Screening such as with a filter fabric should be provided for weepholes/open joints to prevent earth materials from entering the holes/joints.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL

Soil Exploration Co. Inc.

Plate: 2

APPENDIX A

REFERENCES

CDMG, San Bernardino County Planning Department, Southwestern San Bernardino County, Special Report 113, "B" Series. Dated 1974:

- Plate 1B, Generalized Geologic Map
- Plate 2B, Generalized Fault Map
- Plate 3B, Major Landslides and Generalized Relative Slope Stability
- Plate 4B, Generalized Depth to Groundwater
- Plate 5B, Generalized Map Showing Thickness of Alluvium

Department of the Interior, U.S. Geological Survey. Contour Map Showing Minimum Depth to Ground Water, Upper Santa Ana River Valley, California 1973-1979 (Sheet 1 of 2), By Scott E. Carson and Jonathan C. Matti, Dated 1985.

CDMG, Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada, Dated February 1998.

USGS Geologic Map of the Yucaipa 7.5' Quadrangle, San Bernardino and Riverside Counties, California.

San Bernardino County Land Use Plan. General Plan, Geologic Hazard Overlays.

California Geological Survey, Fault Activity Map of California (2010).

San Bernardino County, Technical Guidance Document for Water Quality Management Plans, Appendix D-Section VII, Approval Date: June 21, 2013, Effective Date: September 19, 2013.

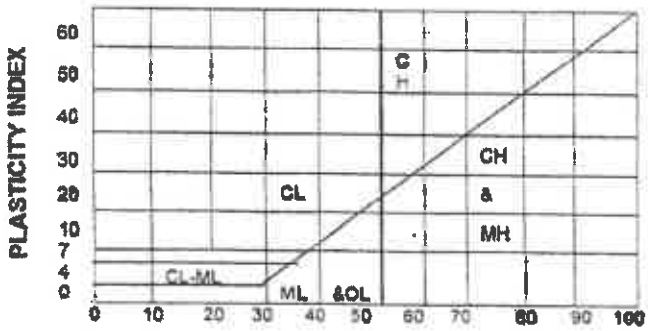
APPENDIX B

MAJOR DIVISIONS		SYMBOLS		TYPICAL NAMES
COARSE-GRAINED SOILS (More than ½ of soil < No. 200 sieve)	GRAVELS (More than ½ of coarse fraction > No. 4 sieve size)	GW		Well-graded gravels or gravel-sand mixtures, little or no fines
		GP		Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM		Silty gravels, gravel-sand-silt mixtures
		GC		Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than ½ of coarse fraction < No. 4 sieve size)	SW		Well-graded sands or gravely sands, little or no fines
		SP		Poorly graded sands or gravelly sands, little or no fines
		SM		Silty sands, sand-silt mixtures
		SC		Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (More than ½ of soil < No. 200 sieve)	SILTS & CLAYS LL < 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 & CLAYS LL > 50	MH		Inorganic silts, caceous or diatonaceous fine sandy or silty soils, elastic silts
		CH		Inorganic clays of medium to high plasticity, organic silty clays, organic silts
		OH		Organic clays of medium to high plasticity, organic silty clays, organic silts
	HIGHLY ORGANIC SOILS	Pt		Peat and other highly organic soils

CLASSIFICATION CHART
(UNIFIED SOIL CLASSIFICATION SYSTEM)

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDER	ABOVE 12"	ABOVE 305
COBBLES	3" to 12"	305 to 76.2
GRAVEL	3" to No. 4	762 to 4.76
COARSE	3" TO ¾"	76.2 to 19.1
FINE	¾"to No. 4	19.1 to 4.76
SAND	No. 4 to 200	4.76 to 0.074
COARSE	No. 4 to 10	4.76 to 2.00
MEDIUM	No. 10 to 40	2.00 to 0.420
FINE	No. 40 to 200	0 420 to 0.074
SILT & CLAY	BELOW No. 200	BELOW 0.074

GRAIN SIZE CHART



PLASTICITY CHART

Ring Sample	Bag Sample	NR No Recovery
SPT Sample	Seepage	

Classification in accordance with ASTM D2487
Description and visual observation in accordance with ASTM D2488
All Sieve Sizes shown are US Standard
SPT Refusal is defined as one of the following:
10 blows for no apparent displacement
50 blows for less than 6 inches advancement
100 blows for 6 to 18 inches advancement

GEOTECHNICAL TRENCH LOGS

Trench No 1

Date: October 15, 2018 | Project No. 18218-01

Project Name: Mentone Blvd. & Crafton Ave., San Bdno Co. | Equipment Type: Case 580 with 24" bucket

Equipment Company: Can-Do Backhoe | Elevation: Existing ground

DEPTH (feet)	EARTH MATERIAL	TYPE OF TEST	DRY DENSITY	MOISTURE (%)	SOIL CLASSIFICATION	Description Logged By GL Sampled By GL
1	Fill				SM	**SILTY SAND:** Light brown, fine to medium grained, dry, dense, asphalt
2						
3						
4			111.3	4.2	SM	**SILTY SAND:** Gray brown, fine to coarse grained, dry, medium dense, gravel, cobbles to 10 inches in size
5						
6						Boulders to 13 inches in size
7						Boulders to 18 inches in size
8					SP-SM	**SAND WITH SILT:** Yellowish/light brown, fine to coarse grained, dry, medium dense, cobbles, boulders to 21 inches in size
9						
10						
11						
12						
13						
14						TOTAL DEPTH = 15 FEET NO GROUNDWATER MODERATE CAVING (BOULDERS) TRENCH BACKFILLED
15						

Soil Exploration Co., Inc.

GEOTECHNICAL TRENCH LOGS

Trench No. 2

Date: October 15, 2018 Project No. 18218-01

Project Name: Mentone Blvd. & Crafton Ave., San Bdno Co. Equipment Type: Case 580 with 24" bucket

Equipment Company: Can-Do Backhoe Elevation: Existing ground

DEPTH (feet)	EARTH MATERIAL	TYPE OF TEST	DRY DENSITY	MOISTURE (%)	SOIL CLASSIFICATION	Description Logged By GL Sampled By GL
1	Fill				SM	**SILTY SAND:** Light brown, fine to medium grained, dry, dense, asphalt
2						
3						
4			103.5	3.0	SM	**SILTY SAND:** Grayish brown, fine to coarse grained, dry, medium dense, gravel, boulders to 24 inches in size
5						
6			107.4	3.5		Boulders to 31 inches in size
7						
8						
9						Yellowish brown
10						
11						
12						
13						TOTAL DEPTH = 11 FEET NO GROUNDWATER CAVING (BOULDERS) TRENCH BACKFILLED
14						
15						

Soil Exploration Co., Inc.

GEOTECHNICAL TRENCH LOGS

Trench No. 3

Date: October 15, 2018 | Project No. 18218-01

Project Name: Mentone Blvd. & Crafton Ave., San Bdno Co. | Equipment Type: Case 580 with 24" bucket

Equipment Company: Can-Do Backhoe | Elevation: Existing ground

DEPTH (feet)	EARTH MATERIAL	TYPE OF TEST	DRY DENSITY	MOISTURE (%)	SOIL CLASSIFICATION	Description Logged By GL Sampled By GL
1					SM	**SILTY SAND:** Light brown, fine to medium grained, dry, medium dense, gravel, cobbles
2						
3					GP	**GRAVEL WITH SAND:** Pale brown, dry, medium dense. cobbles, boulders to 16 inches in size Boulders to 20 inches in size
4						
5						
6						
7						
8						
9						
10						
11						TOTAL DEPTH = 10 FEET NO GROUNDWATER CAVING (BOULDERS) TRENCH BACKFILLED
12						
13						
14						
15						

Soil Exploration Co., Inc.

APPENDIX C

Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental & Civil Engineering

October 25, 2018

Soil Exploration Company Inc.
7535 Jurupa Avenue, Unit C
Riverside, California 92504

Attn: Mr. Gene Luu

RE: LABORATORY TEST RESULTS/REPORT
Client: CJC Design
Project: Corrosion Potential
Project No.: 18218-01
QCI Job No.: 18-183-010k

Gentlemen:

We have completed the testing program conducted on sample for above project. The tests were performed in accordance with testing procedures as follows:

TEST	METHOD
Corrosion Potential	CT- 417, CT- 422, CT- 532 (643)

Enclosed is Summary of Laboratory Test Results.

We appreciate the opportunity to provide testing services to Soil Exploration Company Inc. Should you have any questions, please call the undersigned.

Sincerely yours,
Cal Land Engineering, Inc. (CLE)
dba Quartech Consultants (QCI)

Meng-Lun Wu
Project Engineer

Enclosure

576 E Lambert Road, Brea, CA 92821, Tel: 714-671-1050, Fax 714-671-1090

APPENDIX D

U.S. Geological Survey - Earthquake Hazards Program

2008 National Seismic Hazard Maps - Source Parameters

New Search

Distance in Miles	Name	State	Pref Slip Rate (mm/yr)	Dip (degrees)	Dip Dir	Slip Sense	Rupture Top (km)	Rupture Bottom (km)
2.74	S. San Andreas;CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13
2.74	S. San Andreas;SSB+BG+CO	CA	n/a	77		strike slip	0.2	12
2.74	S. San Andreas;CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	86		strike slip	0	14
2.74	S. San Andreas;CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14
2.74	S. San Andreas;SSB	CA	16	90	V	strike slip	0	13
2.74	S. San Andreas;SM+NSB+SSB+BG+CO	CA	n/a	83		strike slip	0.1	13
2.74	S. San Andreas;SM+NSB+SSB+BG	CA	n/a	81		strike slip	0	13
2.74	S. San Andreas;SM+NSB+SSB	CA	n/a	90	V	strike slip	0	13
2.74	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13
2.74	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	86		strike slip	0.1	13
2.74	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0.1	13
2.74	S. San Andreas;NSB+SSB+BG	CA	n/a	75		strike slip	0	14
2.74	S. San Andreas;BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	85		strike slip	0.1	13
2.74	S. San Andreas;NSB+SSB	CA	n/a	90	V	strike slip	0	13
2.74	S. San Andreas;NM+SM+NSB+SSB+BG+CO	CA	n/a	84		strike slip	0.1	13
2.74	S. San Andreas;NM+SM+NSB+SSB+BG	CA	n/a	83		strike slip	0	14
2.74	S. San Andreas;NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	13

2.74	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	86		strike slip	0	14
2.74	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB	CA	n/a	99	V	strike slip	0	14
2.74	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13
2.74	S. San Andreas;SSB+BG	CA	n/a	71		strike slip	0	13
2.74	S. San Andreas;NSB+SSB+BG+CO	CA	n/a	79		strike slip	0.2	12
2.74	S. San Andreas;BB+NM+SM+NSB+SSB+BG	CA	n/a	84		strike slip	0	14
2.74	S. San Andreas;BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14
7.09	San Jacinto;SJV	CA	16	90	V	strike slip	0	16
7.09	San Jacinto;SBV+SJV+A	CA	n/a	90	V	strike slip	0	16
7.09	San Jacinto;SBV+SJV+A+C	CA	n/a	90	V	strike slip	0	17
7.09	San Jacinto;SJV+A+C	CA	n/a	90	V	strike slip	0	17
7.09	San Jacinto;SBV+SJV+A+CC	CA	n/a	90	V	strike slip	0	16
7.09	San Jacinto;SBV+SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15
7.09	San Jacinto;SBV+SJV+A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15
7.09	San Jacinto;SJV+A+CC	CA	n/a	90	V	strike slip	0	16
7.09	San Jacinto;SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15
7.09	San Jacinto;SJV+A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15
7.09	San Jacinto;SJV+A	CA	n/a	90	V	strike slip	0	17
7.09	San Jacinto;SBV+SJV	CA	n/a	90	V	strike slip	0	16
7.56	San Jacinto;SBV	CA	6	90	V	strike slip	0	16
8.02	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0.1	13

8.02	S. San Andreas:NM+SM+NSB	CA	n/a	90	V	strike slip	0	13
8.02	S. San Andreas:SM+NSB	CA	n/a	90	V	strike slip	0	13
8.02	S. San Andreas:BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14
8.02	S. San Andreas:CH+CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14
8.02	S. San Andreas:CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14
8.02	S. San Andreas:NSB	CA	22	90	V	strike slip	0	13
12.33	San Jacinto:A+CC+B	CA	n/a	90	V	strike slip	0.1	15
12.33	San Jacinto:A	CA	9	90	V	strike slip	0	17
12.33	San Jacinto:A+C	CA	n/a	90	V	strike slip	0	17
12.33	San Jacinto:A+CC	CA	n/a	90	V	strike slip	0	16
12.33	San Jacinto:A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15
15.46	Cleghorn	CA	3	90	V	strike slip	0	16
19.06	North Frontal (West)	CA	1	49	S	reverse	0	16
19.68	Cucamonga	CA	5	45	N	thrust	0	8
20.03	S. San Andreas:BG+CC	CA	n/a	72		strike slip	0.3	12
20.03	S. San Andreas:BG	CA	n/a	58		strike slip	0	13
23.02	Pinto Mtn	CA	2.5	90	V	strike slip	0	16
24.86	Helendale-So Lockhart	CA	0.6	90	V	strike slip	0	13
26.06	North Frontal (East)	CA	0.5	41	S	thrust	0	16
29.73	Elsinore:W+GI+T	CA	n/a	84	NE	strike slip	0	14
29.73	Elsinore:W+GI+T+J	CA	n/a	84	NE	strike slip	0	16
29.73	Elsinore:W+GI+T+J+CM	CA	n/a	84	NE	strike slip	0	16

29.73	Elsinore:GI+T	CA	5	90	V	strike slip	0	14
29.73	Elsinore:GI+T+J	CA	n/a	86	NE	strike slip	0	17
29.73	Elsinore:GI+T+J+CM	CA	n/a	86	NE	strike slip	0	16
29.73	Elsinore:W+GI	CA	n/a	81	NE	strike slip	0	14
29.73	Elsinore:GI	CA	5	90	V	strike slip	0	13
29.83	S. San Andreas:CH+CC+BB+NM+SM	CA	n/a	90	V	strike slip	0	14
29.83	S. San Andreas:NM+SM	CA	n/a	90	V	strike slip	0	14
29.83	S. San Andreas:CC+BB+NM+SM	CA	n/a	90	V	strike slip	0	14
29.83	S. San Andreas:SM	CA	29	90	V	strike slip	0	13
29.83	S. San Andreas:BB+NM+SM	CA	n/a	90	V	strike slip	0	14
29.83	S. San Andreas:PK+CH+CC+BB+NM+SM	CA	n/a	90	V	strike slip	0.1	13
30.60	Chino, alt 2	CA	1	65	SW	strike slip	0	14
31.16	Chino, alt 1	CA	1	50	SW	strike slip	0	9
31.61	Elsinore:W	CA	2.5	75	NE	strike slip	0	14
31.67	Elsinore:T+J+CM	CA	n/a	85	NE	strike slip	0	16
31.67	Elsinore:T	CA	5	90	V	strike slip	0	14
31.67	Elsinore:T+J	CA	n/a	86	NE	strike slip	0	17
32.76	San Jose	CA	0.5	74	NW	strike slip	0	15
33.53	Lenwood-Lockhart-Old Woman Springs	CA	0.9	90	V	strike slip	0	13
35.67	Sierra Madre Connected	CA	2	51		reverse	0	14
35.67	Sierra Madre	CA	2	53	N	reverse	0	14
39.51	Johnson Valley (No)	CA	0.6	90	V	strike slip	0	16

2016 CBC – SEISMIC PARAMETERS		
Site Coordinates	**Latitude**	**Longitude**
	34.0695	**-117.1222**
Mapped Spectral Response Acceleration	S_s = 2.023	S_1 = 0.979
Site Coefficients (Class "D")	F_a = 1.00	F_v = 1.50
Maximum Considered Earthquake (MCE) Spectral Response Acceleration	S_{MS} = 2.023	S_{M1} = 1.468
Design Spectral Response Acceleration Parameters	S_{DS} = 1.348	S_{D1} = 0.979
Seismic Design Category	E	
Peak Ground Acceleration (PGA)	0.795g	

References:

- Earthquake.usgs.gov/research/hazmaps/design
- 2016 California Building Code, California Code of Regulations, Title 24, Part 2, Volume 2 of 2, Section 1613, Earthquake Loads

APPENDIX E

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1.0 GENERAL INTENT

These specifications present general procedures and requirements for grading and earthwork as shown on the approved grading plans, including preparation of areas to be filled, placement of fill, installations of subdrains, and excavations. The recommendations contained in the geotechnical report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict. Evaluations performed by the consultant during the course of grading may result in new recommendations which could supersede these specifications or the recommendations of the geotechnical report.

2.0 EARTHWORK OBSERVATIONS AND TESTING

Prior to the commencement of grading, a qualified geotechnical consultant (soils engineer and engineering geologist, and their representatives) shall be employed for the purpose of observing earthwork procedures and testing the fills for conformance with the recommendations of the geotechnical report and these specifications. It will be necessary that the consultant provide adequate testing and observations so that he may determine that the work was accomplished as specified. It shall be the responsibility of the contractor to assist the consultant and keep him apprised of work schedules and changes so that he may schedule his personnel accordingly.

It shall be the sole responsibility of the contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and approved grading plans. If, in the opinion of the consultant, unsatisfactory conditions, such as questionable soil, poor moisture conditions, inadequate compaction, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the consultant will be empowered to reject the work and recommend that construction be stopped until the unsatisfactory conditions are rectified.

Maximum dry density tests used to determine the degree of compaction will be performed in accordance with the American Society of Testing and Materials, test method ASTM D1557-12.

3.0 PREPARATION OF AREAS TO BE FILLED

3.1 Clearing and Grubbing

All brush, vegetation, and debris shall be removed or piled and otherwise disposed of.

3.2 Processing

The existing ground which is determined to be satisfactory for support of fill shall be scarified to a minimum depth of 6 inches. Existing ground which is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until the soils are broken down and free of large clay lumps or clods and until the working surface is reasonably uniform and free of uneven features which would inhibit uniform compaction.

3.3 Overexcavation

Soft, dry, spongy, highly fractured or otherwise unsuitable ground, extending to such depth that surface processing cannot adequately improve the condition, shall be overexcavated down to firm ground, approved by the consultant.

3.4 Moisture Conditioning

Overexcavated and processed soils shall be watered, dried-back, blended, and/or mixed, as required to attain a uniform moisture content near optimum.

3.5 Recompaction

Overexcavation and processed soils which have been properly mixed and moisture-conditioned shall be recompacted to a minimum relative compaction of 90 percent.

3.6 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal : vertical), the ground shall be stepped or benched. The lowest bench shall be a minimum of 15 feet wide, shall be at least 2 feet deep, shall expose firm materials, and shall be approved by the consultant. Other benches shall be excavated in firm materials for a minimum width of 4 feet. Ground sloping flatter than 5:1 (horizontal : vertical) shall be benched or otherwise overexcavated when considered necessary by the consultant.

3.7 Approval

All areas to receive fill, including processed areas, removal areas and toe-of-fill benches shall be approved by the consultant prior to fill placement.

4.0 FILL MATERIAL

4.1 General

Material to be placed as fill shall be free of organic matter and other deleterious substances, and shall be approved by the consultant. Soils of poor gradation, expansion, or strength characteristics shall be placed in areas designated by consultant or shall be mixed with other soils to serve as satisfactory fill material.

4.2 Oversize

Oversize materials defined as rock, or other irreducible material with maximum dimension greater than 12 inches, shall not be buried or placed in fills, unless the location, materials, and disposal methods are specifically approved by the consultant. Oversize disposal operations shall be such that nesting of oversize material does not occur, and such that the oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 feet vertically of finish grade or within the range of future utilities or underground construction, unless specifically approved by the consultant.

4.3 Import

If importing of fill material is required for grading, the import material shall meet the requirements of Section 4.1.

5.0 FILL PLACEMENT and COMPACTION

5.1 Fill Lifts

Approved fill material shall be placed in areas prepared to receive fill in near-horizontal layers not exceeding 6 inches in compacted thickness. The consultant may approve thicker lifts if testing indicates the grading procedures are such that adequate compaction is being achieved with lifts of greater thickness. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to attain uniformity of material and moisture in each layer.

5.2 Fill Moisture

Fill layers at a moisture content less than optimum shall be watered and mixed, and wet fill layers shall be aerated by scarification or shall be blended with drier material. Moisture conditioning and mixing of fill layers shall continue until the fill material is at a uniform moisture content at or near optimum.

5.3 Compaction of Fill

After each layer has been evenly spread, moisture-conditioned, and mixed, it shall be uniformly compacted to not less than 90 percent of maximum dry density. Compaction equipment shall be adequately sized and shall be either specifically designed for soil compaction or of proven reliability, to efficiently achieve the specified degree of compaction.

5.4 *Fill Slopes*

Compacting of slopes shall be accomplished, in addition to normal compacting procedures, by backrolling of slopes with sheepsfoot rollers at frequent increments of 2 to 3 feet in fill elevation gain, or by other methods producing satisfactory results. At the completion of grading, the relative compaction of the slope out to the slope face shall be at least 90 percent.

5.5 *Compaction Testing*

Field-tests to check the fill moisture and degree of compaction will be performed by the consultant. The location and frequency of tests shall be at the consultant's discretion. In general, the tests will be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of embankment.

6.0 SUBDRAIN INSTALLATION

Subdrain systems, if required, shall be installed in approved ground to conform to the approximate alignment and details shown on the plans or herein. The subdrain location or materials shall not be changed or modified without the approval of the consultant. The consultant, however, may recommend and upon approval, direct changes in subdrain line, grade or material. All subdrains should be surveyed for line and grade after installation and sufficient time shall be allowed for the surveys, prior to commencement of filling over the subdrain.

7.0 EXCAVATION

Excavations and cut slopes will be examined during grading. If directed by the consultant, further excavation or overexcavation and refilling of cut areas shall be performed, and/or remedial grading of cut slopes shall be performed. Where fill-over-cut slopes are to be graded, unless otherwise approved, the cut portion of the slope shall be made and approved by the consultant prior to placement of materials for construction of the fill portion of the slope.

8.0 TRENCH BACKFILLS

Trench excavations for utility pipes shall be backfilled under engineering supervision.

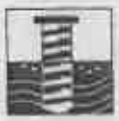
After the utility pipe has been laid, the space under and around the pipe shall be backfilled with clean sand or approved granular soil to a depth of at least one foot over the top of the pipe. The sand backfill shall be uniformly jetted into place before the controlled backfill is placed over the sand.

The onsite materials, or other soils approved by the soil engineer, shall be watered and mixed as necessary prior to placement in lifts over the sand backfill.

The controlled backfill shall be compacted to at least 90 percent of the maximum dry density as determined by the ASTM D1557-12 test method.

Field density tests and inspection of the backfill procedures shall be made by the soil engineer during backfilling to see that proper moisture content and uniform compaction is being maintained. The contractor shall provide test holes and exploratory pits as required by the soil engineer to enable sampling and testing.

APPENDIX F



Infiltration Test (Percolation Test Procedure)

Infiltration tests were performed in accordance with Guidelines outlined in referenced San Bernardino County Technical Guidance Document for WQMP, effective September 19, 2013.

Two 8-inch diameter, 4-feet deep test holes (I-1 and I-2) were excavated at the suggested locations. The soils at the test locations were visually classified as gravel (USCS "GP"). To mitigate any possible caving or sloughing of the test holes, an 8-inch diameter perforated PVC pipe was placed in each hole. The bottom of the test holes was covered with 2 inches of gravel.

The testing was conducted after presoaking. Water level was adjusted to 20 inches above the bottom of the test hole. Two consecutive measurements showed that 6 inches of water seeped away in less than 25 minutes. The tests were run for an additional one hour with measurements taken at 10 minute intervals. The drop that occurred during the final reading was used for design purposes.

Tabulated Test Results

Test No.	Depth of Test (feet)	Earth Material	Infiltration Rate (in/hr)
I-1	4	Gravel (GP)	19.3
I-2	4	Gravel (GP)	16.2

We recommend that a conservative/suitable factor of safety should be applied to the rate in the design of the system.

INFILTRATION TEST DATA
(Boring Percolation Test Procedure)

Project: CJC Design — Project No.: 18218-01
Test Hole No.: I-1 — Date Excavated: 10/15/18
Depth of Test Hole: 4' — Soil Classification: SP
Diameter: 8" — Presoak: Yes
Tested By: JR — Date: 10/18/18

SANDY SOIL CRITERIA TEST

Trial No.	Time	Time Interval (min)	Initial Water Level (inches)	Final Water Level (inches)	Δ in Water Level (inches)	Greater Than or Equal to 6" (Y/N)
1	9:19:50 9:27:50	8	214	194	20	Y
2	9:29:37 9:38:37	9	11	11	11	Y

Use Normal Sandy (Circle One) Soil Criteria

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	Do Initial Depth to Water (in.)	Df Final Depth to Water (in.)	ΔD Change in Water Level (in.)	Infiltration Rate (in./hr.)
1	9:45:40	9:47:40	10	214	194 1/8		
2	9:57:56	10:07:56	11	11	194 1/4		
3	10:09:17	10:19:17	11	11	11		
4	10:21:23	10:31:23	11	11	194 3/8		
5	10:33:52	10:43:52	11	11	11		
6	10:45:32	10:55:32	11	11	11	19.625	19.3
7							
8							
9							
10							
11							
12							

COMMENTS:
Infiltration Rate: $\frac{4 \times 60 \times 19.625}{10 \times [20 + (11 - 19.625)]} = 19.3$ in/hr

INFILTRATION TEST DATA
(Boring Percolation Test Procedure)

Project: CJC Deeg. Project No.: 18218-19
Test Hole No.: I-2 Date Excavated: 10/15/18
Depth of Test Hole: 4' Soil Classification: GP
Diameter: 8" Presoak: Yes
Tested By: JR Date: 10/18/18

SANDY SOIL CRITERIA TEST

Trial No.	Time	Time Interval (min)	Initial Water Level (inches)	Final Water Level (inches)	Δ in Water Level (inches)	Greater Than or Equal to 6" (Y/N)
1	10:17:56 10:27:56	10	92	72	20	Y
2	10:29:45 10:39:45	"	"	"	"	"

Use Normal Sandy (Circle One) Soil Criteria

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	Do Initial Depth to Water(in.)	Df Final Depth to Water(in.)	ΔD Change in Water Level (in.)	Infiltration Rate (in./hr.)
1	10:40:47	10:50:47	10	92	72		
2	10:54:17	11:04:17	"	"	74		
3	11:14:45	11:24:45	"	"	74 1/8		
4	11:26:07	11:36:07	"	"	74 1/8		
5	11:38:59	11:48:59	"	"	"		
6	11:51:13	12:01:13	"	"	74 1/4	17.75	16.2
7							
8							
9							
10							
11							
12							

COMMENTS:

Infiltration Rate = $\frac{4 \times 60 \times 17.75}{10[4+(20+(20-17.75))]} = 16.2$ in/hr

OPERATIONS AND MAINTENANCE PLAN
FOR VEGETATED SWALE, CATCH BASIN INSERTS
AND INFILTRATION TRENCH
MENTONE BLVD. AND AGATE ST.

The Operation and Maintenance Program will include the following key components:

1. INSPECTION PROCEDURES

The condition of the vegetated swale will be inspected at least twice annually for erosion, damage to vegetation, and sediment and debris accumulation. During the rainfall season, the vegetated swale will be inspected within 48 hours of a significant rain event to ensure there is no standing water in the swale. Any evidence of clogging of the underlying soil interface shall be investigated and promptly addressed.

New Installations – The condition of the catch basin inserts and stormchamber cleanouts will be checked after the first major runoff event after installation. The visual inspection will ascertain that the system is functioning properly and no flooding or standing water is occurring.

Ongoing Operation – The catch basin inserts and stormchamber cleanouts will be inspected at the beginning of the rain season and within 72 hours of a significant rain event to ensure there is no standing water. Inspection will be recorded in a maintenance log. The catch basin inserts are to be replaced if torn.

2. MAINTENANCE

Watering of plant material will be performed as needed to ensure survival. Sediment will be removed when it builds up to 3-inches at any spot along the vegetated swale. Sediment which accumulates within the swale(s) will be manually removed and the planting material reestablished. If accumulated sediment has clogged the surface pores of the swale, reducing or eliminating the infiltration capacity, then the surface will be tilled and re-stabilized. Drilling or punching small holes into the surface layer can be used instead of tilling, if desired.

The storm drain inserts shall be inspected and cleaned prior to and as required on a monthly basis during the rainy season October through May and replaced if damaged in accordance with manufacturer's recommendations.

The stormchamber units shall be inspected once yearly and sediment removed when the trap is 1/3 full in accordance with manufacturer's instructions.

3. MAINTENANCE LOG

Keep a log of all inspections and maintenance performed on the vegetated swale, catch basin inserts and infiltration trench.