A Report Prepared for:

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GEOTECHNICAL REPORT
PICO RIVERA REGIONAL BIKEWAY PROJECT
PICO RIVERA, CALIFORNIA

Project No. 2018-027

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1 INTRODUCTION

This report presents the results of the geotechnical services performed by Diaz•Yourman & Associates (DYA) for the proposed Pico Rivera Regional Bikeway Project (Project) planned for Mines Avenue (between Paramount Boulevard and west of the spreading grounds that are located west of the San Gabriel River) and Dunlap Crossing Road (between east of the San Gabriel River and Norwalk Boulevard) in Pico Rivera, California. A Class I bike lane is proposed along Mines Avenue, and Class I and II bike lanes are proposed along Dunlap Crossing Road. In addition to the bike lanes, the entire street will be subject to reconstruction. Installations of bioswales and reconfigurations of parking lanes are also proposed. These improvements are part of the overall Project. The Project plans show the proposed improvements and are provided in Appendix A. The other portion of the Project is to construct a pedestrian bridge structure over the San Gabriel River approximately 2,600 feet north of Mines Avenue. The proposed pedestrian bridge will connect the existing Paseo Del Rio, which runs on the west side of the San Gabriel River. BKF Engineers authorized this work on October 25, 2018, with a written contract.

The Project alignment is shown on the Vicinity Map, Figure 1.

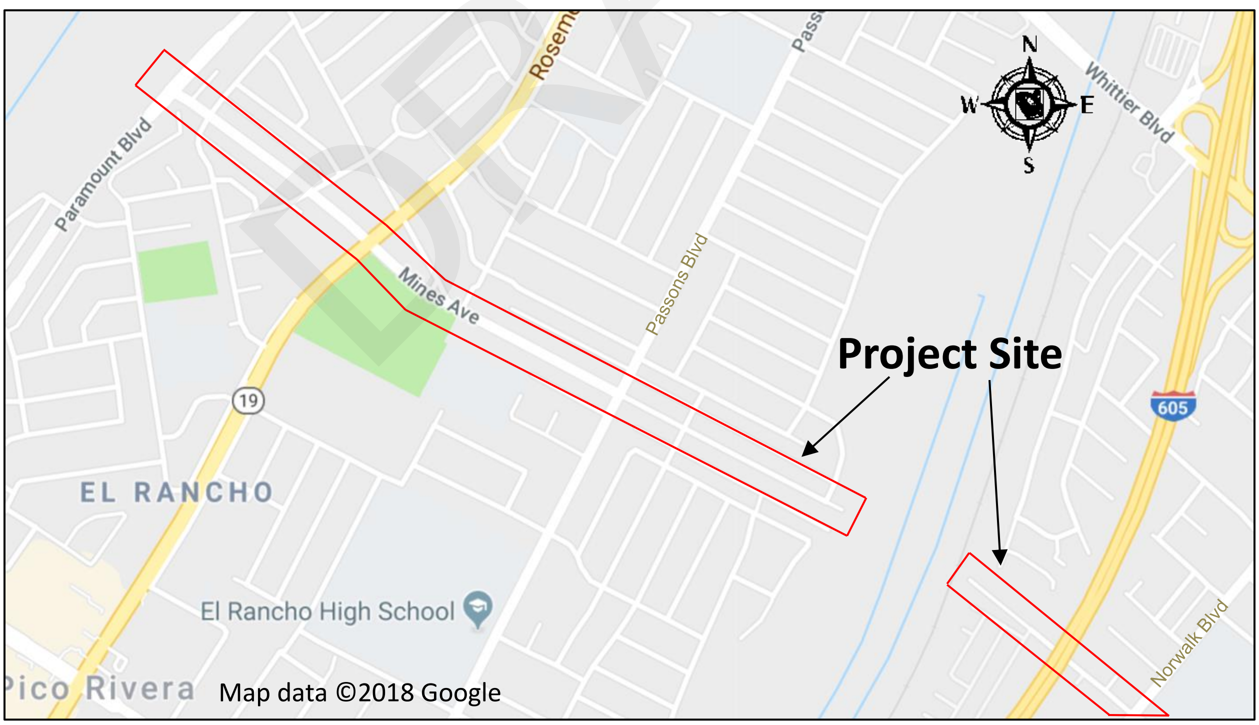


Figure 1 - VICINITY MAP

This report presents the geotechnical recommendations required for the improvements associated with Mines Avenue and Dunlap Crossing Road. A separate report will be prepared to provide the geotechnical information required for the design of the proposed pedestrian bridge over the San Gabriel River.

The purpose of DYA's investigation was to provide geotechnical input for the design of the proposed Project associated with Mines Avenue and Dunlap Crossing Road. The scope of our services consisted of:

- Reviewing available geotechnical data.
- Performing a field exploration.
- Performing a laboratory testing program.
- Performing analyses for new pavement sections, infiltration characteristics, and corrosion potential.
- Preparing a report summarizing our geotechnical findings.

Our scope of services excluded any investigation needed to evaluate the presence of hazardous materials in the soil or water at the Project Site.

2 DATA REVIEW, FIELD EXPLORATION, AND LABORATORY TESTING

2.1 DATA REVIEW

Geotechnical data from the Project vicinity presented in previous reports and state databases were reviewed to supplement site data collected during this exploration. A list of the documents reviewed is presented in the bibliography (Section 7).

2.2 FIELD EXPLORATION

An encroachment permit to perform the borings and infiltration tests was obtained from the City of Pico Rivera on November 27, 2018, prior to performing the field activities.

After obtaining the encroachment permit, the field exploration locations were marked in the field and Underground Service Alert was notified. The selection of the locations of the borings was based on areal coverage of the Project site, site access, underground utility conflicts, and minimizing traffic impacts. The field exploration locations were subsequently checked for underground utilities using geophysical techniques. The geophysical survey was performed by Southwest Geophysics, Inc. During the geophysical survey, at the location of Boring DYB-06, the geophysical survey crew received high responses that were suspected to be indicative of metal objects of some kind. Similar responses were observed when the survey was extended several hundred feet away from this location. Because of this issue, an alternative location (Boring DYB-06A) was selected and drilled using hand-auger techniques for safety concerns.

A total of six borings drilled to a depth of 6.5 feet were proposed for this portion of the Project. The field exploration, conducted on December 6, 2018, and January 29, 2019, consisted of drilling five soil borings using hollow-stem-auger drilling techniques and performing 1 hand-auger boring at the locations shown on Figure 2.

Five borings (DYB-01 through DYB-05) were located along Mines Avenue and one boring (DYB-06A) was on Dunlap Crossing Road. Our field engineer observed the drilling operations and collected drive samples, smaller size samples in ziploc bags, and bulk samples for visual examination and subsequent laboratory testing. Limited numbers of drive samples were collected with a 2.4-inch-inside-diameter (3.0-inch-outside-diameter) modified California split-barrel sampler lined with brass tubes with dimensions in accordance with ASTM International (ASTM) D3550 because of underground utility conflicts. Drive samplers were driven with a 140-pound automatic trip hammer falling 30 inches. The hammer blows required to drive the modified California sampler were converted to equivalent standard penetration test (SPT) N-values by multiplying by 0.65 (N = 0.65 x modified California blows per foot).

At two boring locations (DYB-01 and DYB-05), field permeability tests were performed at depths in the upper 5 feet, in general accordance with the County of Los Angeles Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration (2017).

After borings and infiltration tests were completed, the boreholes were backfilled with soil cuttings and pea gravel. The surfaces of the boreholes were patched with cold patch asphalt.

Details of the field exploration, including sampling procedures and boring logs, are presented in Appendix B.

2.3 LABORATORY TESTING

Soil samples collected from the borings were re-examined in the laboratory to substantiate field classifications. Selected soil samples were tested for density, moisture content, sieve analysis, hydrometer, Atterberg limits, compaction characteristics, permeability, pavement-supporting capacity (R-Value), and corrosion potential. Laboratory test data are summarized on the boring logs provided in Appendix B and are presented on individual test reports in Appendix C.

Figure 2 - SITE PLAN

3 SITE CONDITIONS

3.1 SURFACE CONDITIONS

The entire length of the Project site runs approximately 1.5 miles through a residential zone that mainly includes single-family residences, a shopping center, a public school, and a church. Mines Avenue is aligned northwest to southeast and is the main roadway within the Project limits that provides access to neighboring streets and three major roadways, Paramount Boulevard, Rosemead Boulevard, and Passons Boulevard. In addition, approximately 0.3 miles of roadway on Dunlap Crossing Road is also included within the Project limits. Dunlap Crossing Road is directly in line with Mines Avenue but separated by the San Gabriel River and continues in a northwest to southeast alignment. A majority of Mines Avenue features one lane in each direction with occasional turning lanes at various intersections. Parking stalls are provided along a majority of Mines Avenue. Dunlap Crossing Road also has one lane in each direction and as the road travels northwest towards the San Gabriel River, the westbound lane becomes a gravel road while the eastbound lane continues as asphalt concrete (AC). Based on the site reconnaissance on November 15, 2018, the majority of the pavement surface conditions along Mines Avenue can be considered poor with moderate to severe pavement surface distresses that include longitudinal, transverse, and alligator cracks; except the pavement from Rosemead Boulevard to Lindsey Avenue is considered in good condition. This section looks newly paved or overlaid. The Dunlap Crossing Road segment is considered fair to poor with pavement surface distresses that include severe longitudinal, transverse, and alligator cracks.

Concrete curbs, gutters, and manholes were present along the entire roadway and multiple overhead utility lines crossed within Mines Avenue. No curbs, gutters, or manholes were observed in the Dunlap Crossing Road segment.

The thickness of the existing pavement structural sections along Mines Avenue, based on field exploration, consisted of approximately 1 to 5 inches of AC and 5 to 11 inches of aggregate base (AB), as shown in Table 1. The hand-auger location (Boring DYA-06A) on Dunlap Crossing Road was performed on the gravel road side to avoid underground utility conflicts. During the investigation at this location, it was found that two thin layers of AC, a total of 5 inches, were present beneath the gravel surface.

In the Dunlop Crossing Road segment, especially near the location of Boring DYB-06 and several hundred feet east and west, high responses were observed during the geophysical survey that were suspected to be indicative of metal objects of some kind.

Table 1 - EXISTING PAVEMENT SECTIONS SUMMARY

BORING ID	AC THICKNESS (inches)	AB THICKNESS (inches)
DYB-01	5	11
DYB-02	3	8
DYB-03	2	7
DYB-04	1	5
DYB-05	3.5	6
DYB-06A	5	--

Note(s):

- See Site Plan, Figure 2, for boring locations.
- See Appendix B for boring logs.

3.2 SUBSURFACE CONDITIONS

Based on the current field exploration performed by DYA, the upper 5 feet of the subsurface soils along Mines Avenue and Dunlap Crossing Road predominantly consisted of silty sands with various amounts of silt.

The subsurface soils encountered in the upper 5 feet are considered to have very low expansion potential based on expansion index tests and correlations to Atterberg Limits (United States Bureau of Reclamation [USBR], 1998). Based on a total of five R-value test results, the R-values ranged from 42 to 79. The in situ and optimum moisture contents and in situ and maximum unit weights of the subsurface materials are summarized in Table 2.

Table 2 - SUBSURFACE SOIL CHARACTERISTICS

BORING ID	DEPTH (feet)	SOIL TYPE	IN SITU MOISTURE CONTENT (%)	OPTIMUM MOISTURE CONTENT[1] (%)	IN SITU DRY UNIT WEIGHT (pcf)	MAXIMUM DRY UNIT WEIGHT[1] (pcf)	RELATIVE COMPACTION (%)
DYB-01	2.5	SM	8.8	5.0	116.1	134.8	86
	5	SM	4.4		95.8		71
DYB-02	2.5	SM	8.3	--	--	--	--
	5	SM	10.1				
DYB-03	2.5	SM	13.4	10.0	--	112.0	--
	5	SM	13.3				
DYB-04	1.5	ML	12.8	--	--	--	--
	3.5	ML	12.3				
DYB-05	2.5	SM	9.9	7.4	--	123.0	--
DYB-06A	2	SM	10.3	7.9	92.3	127.2	73
	4.5	SM	5.4		--		--

Note(s):

1. Based on the bulk samples from the upper 5 feet.

- Soil classification based on ASTM Soil Classification System (ASTM D2487 and 2488).
- We were unable to collect drive samples at Borings DYB-02 through DYB-05 because of safety concerns as we suspected potential underground utilities may be close to our boring locations. In situ moisture contents and in situ dry weights were from laboratory testing. The optimum moisture contents and maximum dry densities were obtained from four samples only. The relative compaction values presented above may be an indication of the subsurface soil conditions but may not represent the actual representation due to sample disturbance during sampling and transportation.
- pcf = pounds per cubic foot.

Two in situ percolation tests based on the County of Los Angeles Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration (2017) were performed at a depth of 5 feet at two boring locations; DYB-01 and DYB-05. In addition to in situ infiltration tests, grain size data and correlations based on the Kozeny-Carman equation (Chapuis and Aubertin, 2003) were used to determine infiltration rates at boring locations DYB-02, DYB-03, DYB-04, and DYB-06A. A summary of the infiltration rates is provided in Table 3. The soil infiltration characteristics are further discussed in Section 4.2.

Table 3 - INFILTRATION RATE SUMMARY

LOCATION	INFILTRATION RATE (inches/hour)
DYB-01[1]	0.4
DYB-02[2]	0.5
DYB-03[2]	0.3
DYB-04[2]	0.2
DYB-05[1]	1.0
DYB-06A[2]	0.4

Note(s):

1. Infiltration rate based on the County of Los Angeles Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration (2017).
2. Correlations to infiltration rate based on the Kozeny-Carman equation (Chapuis and Aubertin, 2003).

3.3 GROUNDWATER

Groundwater was not encountered during our field exploration to the depth explored to 6.5 feet below ground surface (bgs). Based on the review of available data from GeoTracker GAMA (2019) in the vicinity of the Project site, nearby groundwater monitoring wells measured groundwater levels as shallow as 31 feet bgs. However, based on historically highest groundwater data contours published by the California Geological Survey ([CGS], formerly California Division of Mines and Geology [CDMG], 1998), the historically highest groundwater level within the Project limits has been reported between 10 and 18 feet bgs.

4 CONCLUSIONS AND RECOMMENDATIONS

We understand that the entire pavement sections will be removed as part of the Project and new pavement sections will be constructed. Therefore, existing pavement surface conditions will not pose any issues. However, as noted in the Dunlop Crossing Road segment, we recommend, due to the strong signals that the geophysicists encountered during the geophysical survey, that a detailed investigation be conducted to evaluate the potential presence of metal objects beneath the existing pavement.

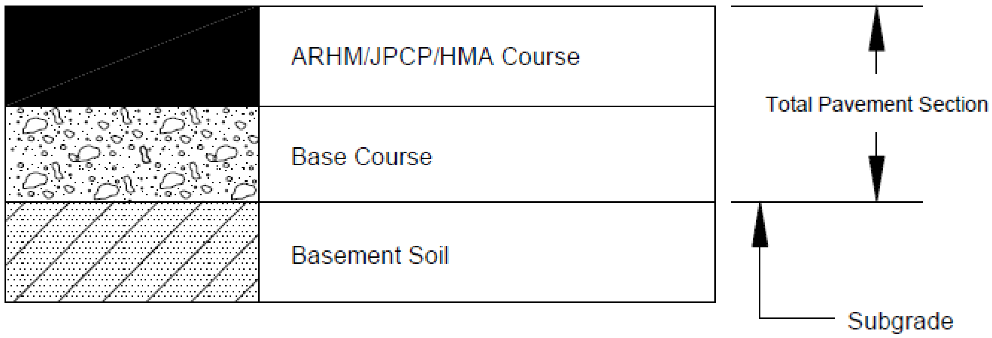
The site soils consisted primarily of silty sand with in situ moisture contents slightly above optimum; see Table 2 for details. Therefore, they will likely require moisture-conditioning (drying) prior to compaction. We do not anticipate major compaction-related issues based on types of soils and in situ moisture contents. Proper moisture-conditioning and recompaction is the key for reconstruction projects.

4.1 NEW PAVEMENT DESIGN

The recommend minimum pavement thicknesses (flexible and rigid) are presented on Figure 3. The recommended minimum pavement sections are based on the following:

- Caltrans design method (2017a, b).
- California R-value of 42.
- Subgrade Type I and South Coast Pavement Climate Region.
- Traffic indices (TIs) of 8 and 9 provided by BKF Engineers.

The minimum thickness of compacted basement soil and aggregate (AB) are outlined on Figure 3. The basement soils should be firm, hard, and unyielding, and not "pumping" prior to placing the AB. The AB requirements and specifications are outlined on Figure 3. If the basement soil cannot be compacted, the soil should be overexcavated as noted in Section 4.3.



COURSE	MINIMUM THICKNESS (inches)						
	ARHM/HMA/AB		**HMA/AB**		**ARHM/HMA**		**JPCP**
	TI = 8	**TI = 9**	**TI = 8**	**TI = 9**	**TI = 8**	**TI = 9**	**TI = 8 and 9 Without Lateral Support**
ARHM[1]	2	2	--	--	2	2	--
HMA/JPCP[2]	3	4	5	6	6.5	7.5	9
Base[3]	7	8	7	8	--	--	6
Basement Soil[4,5]	12	12	12	12	12	12	12

Note(s):

1. Asphalt rubber hot mix (ARHM) should satisfy the requirements of the Standard Specifications for Public Works Construction (Greenbook) Sections 203 and 302 (Building News, 2018).
2. Hot mix asphalt (HMA) and jointed plain concrete pavement (JPCP) should satisfy the requirements of Caltrans Standard Specifications Sections 39 and 40 (Caltrans, 2018a), respectively, or Greenbook Sections 203 and 302, and 201 and 302 (Building News, 2018), respectively.
3. Base course = Type II AB or crushed miscellaneous base (CMB), in accordance with Caltrans Standard Specifications Section 26 (Caltrans, 2018a) or Greenbook Sections 200-2.4 (Building News, 2018), respectively. The minimum relative compaction is 95% in accordance with ASTM D1557.
4. Compacted in-place natural basement soil or fill; at least 95% relative compaction.
5. Basement soil can be replaced if required; see Section 4.3.

Figure 3 - PAVEMENT THICKNESS

4.2 SOIL INFILTRATION CHARACTERISTICS

Based on field percolation tests and the Kozeny-Carman equation, a range of infiltration rates from 0.2 inches to 1 inch per hour were determined. The infiltration rate based on one laboratory test was determined to be an outlier based on subsurface soil types encountered at the site and our experience. Based on percent fines, encountered soil type in the field, and past experience, we consider 0.4 inches per hour as an appropriate design infiltration rate for this site. The County of Los Angeles requires an infiltration rate of 0.3 inches per hour and depth to groundwater (infiltration device invert separation) greater than 10 feet bgs as minimum requirements for infiltration considerations. Any site with potential for previous contamination should be investigated. The soil types should be confirmed in the field during installation of infiltration devices.

4.3 EARTHWORK

Minor earthwork (cuts and fills less than 2 to 3 feet) may be required to construct the new pavement and provide compacted soil beneath pavement.

Prior to the start of construction, the following should be performed:

- All utilities should be located in the field and rerouted, removed, abandoned, or protected.
- Utility owners should be notified of the planned work so that utility work can be performed concurrently with or prior to construction.
- Areas to be graded should be stripped of debris and the material removed from the site.

The bottom of the excavation should then be:

- Scarified to a depth of 8 inches.
- Moisture-conditioned to approximately 2% above optimum moisture content.
- Compacted to at least 95% relative compaction.[1]

The compacted subgrade soils should be firm, hard, and unyielding.

Fill should be compacted by:

- Placing in loose layers less than 8 inches thick.
- Moisture-conditioning to 2% above optimum moisture content.
- Compacting to at least 95% relative compaction.

Import granular materials for fill should meet the criteria in Table 4.

[1] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by ASTM D1557 test method. Optimum moisture content is the moisture content corresponding to the maximum dry density, as determined by the ASTM D1557 test method.

Table 4 - IMPORT FILL CRITERIA

CRITERIA	IMPORT FILL
Maximum particle size (inches)	2
Maximum liquid limit (%)	10
Maximum plasticity index (%)	5
Maximum percentage passing the #200 sieve (%)	30
R-value (minimum)[1]	42
Note(s): 1. Minimum R-value of 42 required for fills for pavement construction. 2. Import fill to the Project site should be tested for corrosion potential and free from contamination.	

Site grading may be accomplished with conventional heavy-duty construction equipment. The fill should be compacted using soil compactors designed specifically for compaction or vibratory padded drum rollers as defined by the latest Caterpillar Performance Handbook or equivalent.

4.4 EXCAVATIONS AND TEMPORARY AND PERMANENT SLOPES

We do not anticipate major excavation or shoring work during construction. However, the stability of temporary excavations is a function of several factors, including the total time the excavation is exposed, moisture condition, soil type and consistency, and contractor's operations. The contractor is responsible for excavation safety. As a guideline, temporary construction excavations should be planned with slopes no steeper than 1.5H:1V (horizontal to vertical). The contractor should strictly adhere to grading requirements of the City of Pico Rivera and/or the County of Los Angeles and applicable health and safety regulations, including those of the Occupational Safety and Health Administration (OSHA).

Permanent compacted fill slopes (if any) should be planned no steeper than 2H:1V. The slopes should be paved or covered with vegetation to reduce surface erosion.

4.5 SOIL CORROSION POTENTIAL

A total of four soil samples collected during the current exploration were tested for pH, soluble chloride and soluble sulfate, and soil electrical resistivity for corrosion potential, as summarized in Table 5. The corrosion potential test results are presented in Appendix C.

Also, presented in Table 5 are Caltrans (2018b) and County of Los Angeles (2013) corrosion criteria. Based on Caltrans and County of Los Angeles standards and the chemical test results, the on-site soils do not present a corrosive environment.

Table 5 - CORROSION POTENTIAL

TEST TYPE	CRITERIA FOR CORROSIVE MATERIALS	RANGE OF TEST VALUE
pH[1]	< 5.5	8.0 - 8.9
Water-Soluble Sulfate Content (ppm)[1]	> 2,000	18 - 60
Water-Soluble Chloride Content (ppm)[1]	> 500	18 - 30
Minimum Electrical Resistivity (ohms-cm)[2]	< 1,000	2,546 - 13,400
Note(s): 1. Caltrans (2018b). 2. County of Los Angeles (2013). • ppm = parts per million.		

Borrow soils imported to the Project site should be tested for corrosion potential.

4.6 CONCRETE FLATWORK

Concrete flatwork (i.e., hardscape, sidewalks, curbs, and gutters) can be adversely influenced if underlain by potentially expansive soils. The on-site soils were classified as having very low potential for expansion; therefore, the potential for the on-site soils to affect any concrete flatwork is considered to be very low.

5 PLAN REVIEW, CONSTRUCTION OBSERVATION, AND TESTING

DYA should be retained to review the finished grading earthwork and specifications for conformance with the intent of our recommendations. The review will enable DYA to modify the recommendations if final design conditions are different than presently understood.

During construction, DYA should provide field observation and testing to check that the site and subgrade preparation, base material quality, and compaction conform to the intent of these recommendations and the job specifications. This would allow DYA to develop supplemental recommendations as appropriate for the actual soil conditions encountered and the specific construction techniques used by the contractor.

As needed during construction, DYA should be retained to consult on geotechnical questions, construction problems, and unanticipated site conditions.

6 LIMITATIONS

This report has been prepared for this Project in accordance with generally accepted geotechnical engineering practices common to the local area. No other warranty, expressed or implied, is made.

The analyses and recommendations contained in this report are based on the field exploration and laboratory testing conducted in the area. The results of the field investigation indicate subsurface conditions only at the specific locations and times, and only to the depths penetrated. They do not necessarily reflect strata variations that may exist between such locations. Although subsurface conditions have been explored as part of the investigation, we have not conducted chemical laboratory testing on the samples obtained, nor evaluated the site with respect to the presence or potential presence of contaminated soil or groundwater conditions.

The validity of our recommendations is based in part on assumptions about the stratigraphy. Observations during construction can help confirm such assumptions. If subsurface conditions different from those described are noted during construction, recommendations in this report must be reevaluated. DYA should be retained to observe earthwork construction in order to help confirm that our assumptions and recommendations are valid or to modify them accordingly. In accordance with California Building Code Chapter 17 Section 1704A, DYA cannot assume responsibility or liability for the adequacy of recommendations if we do not observe construction.

This report is intended for use only for the project described. In the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by DYA.

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APPENDIX A -
PROJECT PLANS
(**Not Available**)

APPENDIX B -
FIELD EXPLORATION

APPENDIX B - FIELD EXPLORATION

The current field exploration for the Project consisted of drilling six borings (DYB-01 through DYB-06A). The approximate boring locations are shown on the Site Plan, Figure 2.

Prior to drilling the borings, the field exploration locations were marked in the field and Underground Service Alert (USA) was notified. The field exploration locations were subsequently checked for underground utilities using geophysical techniques. During the geophysical survey, the geophysics team picked up strong signals indicating metal and suspected reinforcement rebar to be present beneath the asphalt over the entirety of the USA marked location. The boring location DYB-06 had to be abandoned and a new boring location, DYB-06A, was surveyed and marked for hand auguring. The geophysical survey was performed by Southwest Geophysics, Inc.

Five borings were drilled by 2R Drilling, Inc., on December 6th, 2018, with a truck-mounted CME-75 drill rig using hollow-stem-auger drilling techniques to a maximum depth of 6.5 feet, and one boring was drilled using a hand auger (DYB-06A) due to underground utility conflicts. Our field engineer observed the drilling operations and collected drive samples for visual examination and subsequent laboratory testing. Drive samples were collected with a 2.4-inch-inside-diameter (3.0-inch-outside-diameter) modified California split-barrel sampler lined with stainless steel tubes in accordance with ASTM International (ASTM) D1586. The California split-barrel sampler was driven with a 140-pound automatic trip hammer falling 30 inches. The hammer used during the field exploration had an efficiency rating of 80% per 2R Drilling, Inc.

The hammer blows required to drive the modified California sampler were converted to equivalent standard penetration test (SPT) N-values by multiplying by 0.65 (N = 0.65 x modified California blows per foot).

Soils encountered in the borings were classified in general accordance with the ASTM International (ASTM) Soil Classification System (ASTM D2487 and 2488), summarized on Plate B1. Boring logs presented on Plates B2 through B7 were prepared from visual examination of the samples, cuttings obtained during drilling operations, and results of laboratory tests.

Groundwater was not encountered during the field exploration. Borings were backfilled with soil cuttings along with pea gravel and the surface patched with cold patch asphalt.

SOIL CLASSIFICATION SYSTEM-ASTM D2487

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY GRADED SANDS, GRAVELLY SAND, 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 SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

"Push" Sampler

Split Barrel "Drive" Sampler With Liner

Standard Penetration Test (SPT) Sampler

Dual-Mass Dynamic Cone Penetration (DCP) Test

Concrete/Rock Core

Groundwater Surface

SPT "N" = 0.65 x modified California blows per foot

NP = Nonplastic
EI = Expansion Index Test
SG = Specific Gravity
SE = Sand Equivalent
UC = Unconfined Comp.
CD = Consol. Drained Triaxial.
CU = Consol. Undrained Triaxial.
UU = Undrained, Unconsol. Triaxial.
RV = R-Value
CA = Chemical Analysis
DS = Direct Shear
CN = Consolidation
CP = Collapse Potential
SA = Grain size; HD = Hydrometer
MD = Compaction Test
HC = Hydraulic Conductivity Test
CBR = California Bearing Ratio
[PID] Reading in ppm above background

PLATE
B1

BORING LOCATION: See Figure No. 2		**ELEVATION (feet):** 167	
LATITUDE: 33.99497		**LONGITUDE:** -118.09468	
DRILLING EQUIPMENT: CME-75		**DRILLING METHOD:** Hollow Stem Auger	
BORING DIAMETER (inches): 8		**BORING DEPTH (feet):** 6.5	
DATE STARTED: 12-6-18	**COMPLETED:** 12-6-18	**HAMMER TYPE:** Automatic	**EFFICIENCY:** 80%
DRILLING CONTRACTOR: 2R Drilling, Inc.		**HAMMER DROP:** 30 inches	**WEIGHT:** 140 lbs
LOGGED BY: BH	**CHECKED BY:** GR	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N60 Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							ASPHALT CONCRETE (AC): black; - 5 inches			NP	NP	13	CA MD SA HD PI RV
							SILTY SAND with GRAVEL (SM): grayish brown; moist; medium dense; medium to fine SAND; coarse to fine GRAVEL; AB - 11 inches; FILL						
165							SILTY SAND (SM): brown; moist; medium dense; nonplastic; fine SAND; micaceous; NATURAL						
				9 11 15	23			116	9				HC
	5			9 10 15	21		POORLY GRADED SAND with SILT (SP-SM): pale brown; moist; medium dense; nonplastic; coarse to fine SAND; trace coarse to fine GRAVEL	96	4				
							SILTY SAND (SM): brown; moist; medium dense; nonplastic; fine SAND; trace coarse to fine GRAVEL; micaceous						
160							End of boring at 6.5 feet No groundwater encountered Boring used for percolation test Backfilled with cuttings and Pea Gravel Patched with cold patch asphalt.						
	10												
155													

LOG OF BORING DYB-01

Pico Rivera Regional Bikeway Project
Project No. 2018-027

PLATE
B2

BORING LOCATION:	See Figure No. 2	**ELEVATION (feet):**	171
LATITUDE:	33.99259	**LONGITUDE:**	-118.09066
DRILLING EQUIPMENT:	CME-75	**DRILLING METHOD:**	Hollow Stem Auger
BORING DIAMETER (inches):	8	**BORING DEPTH (feet):**	5
DATE STARTED: 12-6-18	**COMPLETED:** 12-6-18	**HAMMER TYPE:**	Automatic
DRILLING CONTRACTOR:	2R Drilling, Inc.	**HAMMER DROP:** 30 inches	**WEIGHT:** 140 lbs
LOGGED BY: BH	**CHECKED BY:** GR	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N60 Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							ASPHALT CONCRETE (AC): black; - 3 inches					33	SA HD RV
170							SILTY SAND with GRAVEL (SM): grayish brown; moist; medium dense; medium to fine SAND; coarse to fine GRAVEL; AB - 8 inches; FILL						
							SILTY SAND (SM): brown; moist; medium dense; nonplastic; medium to fine SAND; micaceous; NATURAL		8	NP	NP		PI
	5						End of boring at 5 feet. No groundwater encountered. Backfilled with cuttings and Pea Gravel. Patched with cold patch asphalt.		10				
165													
	10												
160													

LOG OF BORING DYB-02

Pico Rivera Regional Bikeway Project
Project No. 2018-027

PLATE
B3

BORING LOCATION: See Figure No. 2	**ELEVATION (feet):** 171
LATITUDE: 33.99042	**LONGITUDE:** -118.08726
DRILLING EQUIPMENT: CME-75	**DRILLING METHOD:** Hollow Stem Auger
BORING DIAMETER (inches): 8	**BORING DEPTH (feet):** 5
DATE STARTED: 12-6-18 **COMPLETED:** 12-6-18	**HAMMER TYPE:** Automatic
DRILLING CONTRACTOR: 2R Drilling, Inc.	**HAMMER DROP:** 30 inches **WEIGHT:** 140 lbs
LOGGED BY: BH **CHECKED BY:** GR	**DRIVE SAMPLER DIAMETER (inches) ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N60 Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							ASPHALT CONCRETE (AC): black; - 2 inches					49	MD EI SE SA HD CA
170							SILTY SAND with GRAVEL (SM): brown; moist; medium dense; AB - 7 inches; FILL						
							SILTY SAND (SM): grayish brown; moist; medium dense; nonplastic; fine SAND; micaceous; NATURAL						
									13	NP	NP		PI
	5						End of boring at 5 feet. No groundwater encountered. Backfilled with cuttings and Pea Gravel. Patched with cold patch asphalt.		13				
165													
	10												
160													

LOG OF BORING DYB-03

Pico Rivera Regional Bikeway Project
Project No. 2018-027

PLATE
B4

BORING LOCATION: See Figure No. 2		**ELEVATION (feet):** 169	
LATITUDE: 33.98872		**LONGITUDE:** -118.08312	
DRILLING EQUIPMENT: CME-75		**DRILLING METHOD:** Hollow Stem Auger	
BORING DIAMETER (inches): 8		**BORING DEPTH (feet):** 5	
DATE STARTED: 12-6-18	**COMPLETED:** 12-6-18	**HAMMER TYPE:** Automatic	
DRILLING CONTRACTOR: 2R Drilling, Inc.		**HAMMER DROP:** 30 inches	**WEIGHT:** 140 lbs
LOGGED BY: BH	**CHECKED BY:** GR	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N60 Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							ASPHALT CONCRETE (AC): black; - 1 inch					70	SA HD RV
							POORLY GRADED GRAVEL (GP): dark brown; moist; medium dense; coarse GRAVEL; AB - 5 inches; FILL						
							SILT with SAND (ML): brown; moist; medium dense; low plasticity; fine SAND; NATURAL		13	30	6		PI
									12				
165													
	5						End of boring at 5 feet. No groundwater encountered. Backfilled with cuttings and Pea Gravel. Patched with cold patch asphalt.						
160													
	10												
155													

LOG OF BORING DYB-04

Pico Rivera Regional Bikeway Project
Project No. 2018-027

PLATE
B5

BORING LOCATION:	See Figure No. 2	**ELEVATION (feet):**	169
LATITUDE:	33.98689	**LONGITUDE:**	-118.07897
DRILLING EQUIPMENT:	CME-75	**DRILLING METHOD:**	Hollow Stem Auger
BORING DIAMETER (inches):	8	**BORING DEPTH (feet):**	5
DATE STARTED: 12-6-18	**COMPLETED:** 12-6-18	**HAMMER TYPE:**	Automatic
DRILLING CONTRACTOR:	2R Drilling, Inc.	**HAMMER DROP:** 30 inches	**WEIGHT:** 140 lbs
LOGGED BY: BH	**CHECKED BY:** GR	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N60 Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							ASPHALT CONCRETE (AC): black; - 3.5 inches					29	MD SA HD CA RV
							SILTY SAND with GRAVEL (SM): dark brown; moist; medium dense; medium to fine SAND; coarse to fine GRAVEL; AB - 6 inches; FILL						
							SILTY SAND (SM): light brown; moist; medium dense; nonplastic; fine SAND; NATURAL						
									10	NP	NP		PI
165													
	5						End of boring at 5 feet No groundwater encountered Boring used for percolation test Backfilled with cuttings and Pea Gravel Patched with cold patch asphalt.						
160													
	10												
155													

LOG OF BORING DYB-05

Pico Rivera Regional Bikeway Project
Project No. 2018-027

PLATE
B6

BORING LOCATION: See Figure No. 2		**ELEVATION (feet):** 165	
LATITUDE: 33.98454		**LONGITUDE:** -118.07424	
DRILLING EQUIPMENT: CME-75		**DRILLING METHOD:** Hand Auger	
BORING DIAMETER (inches): 4		**BORING DEPTH (feet):** 6	
DATE STARTED: 1-29-19	**COMPLETED:** 1-29-19	**HAMMER TYPE:** N/A	**EFFICIENCY:** N/A%
DRILLING CONTRACTOR: DYA		**HAMMER DROP:** N/A inches	**WEIGHT:** N/A lbs
LOGGED BY: BH	**CHECKED BY:** GR	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N60 Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							SILTY SAND with GRAVEL (SM): brown; moist; coarse to fine SAND; coarse to fine GRAVEL; FILL - two thin layers of Asphaltic Concrete (AC) underneath gravel surface					23	CA SA RV
							SILTY SAND (SM): gray; moist; medium to fine SAND; micaceous; NATURAL brown; fine SAND	92	10				HD
							oxidation						
160	5						grayish brown; micaceous		5				
							End of boring at 6 feet No groundwater encountered Backfilled with cuttings						
155	10												

LOG OF BORING DYB-06A

Pico Rivera Regional Bikeway Project
Project No. 2018-027

PLATE
B7

PROJECT NO.	2018-027
DATE	12/7/2018
FIELD DATA BY	OB
COMPUTED BY	BH
CHECKED BY	OB

PROJECT: 2018-027

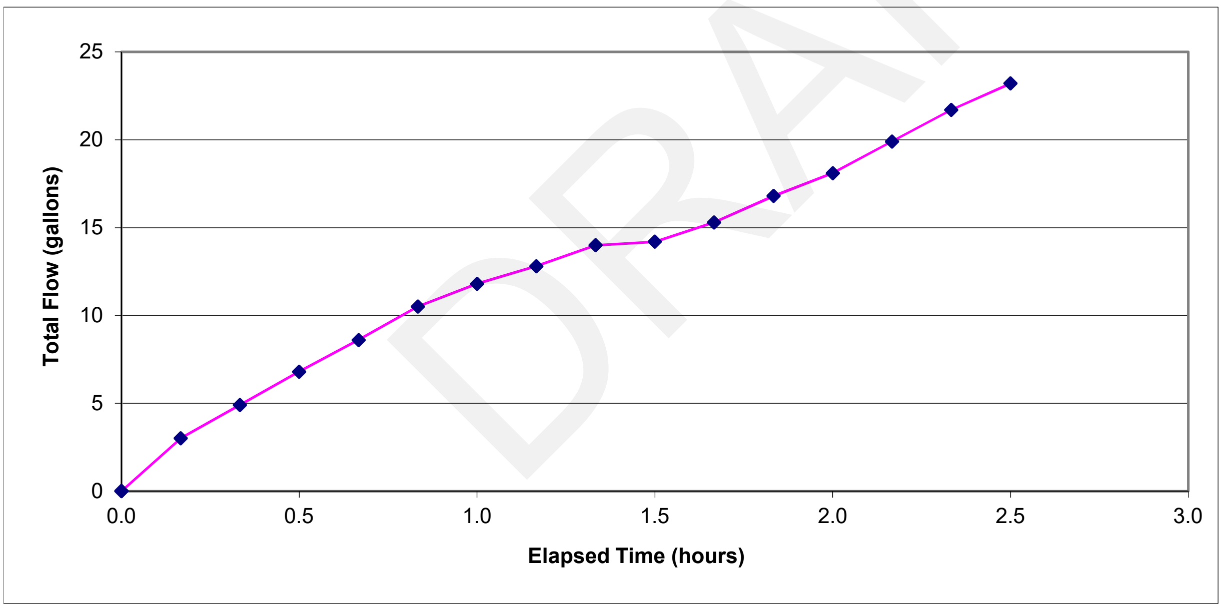
SUBJECT: Percolation Rate

LOCATION: Pico Rivera (DYB-01)   DATE OF TEST: 12/6/2018

Purpose: Calculate percolation rate in accordance with LADPW guidelines.

Reference: LADPW Guidelines

Height of water in well, h	58	inches
Depth to bottom of well	5	feet
Radius of well, r	4	inches
Discharge rate of water from the well for steady-state condition, q	8.36	gallons per hour
Water temperature, T	54	deg. F



Note: Line shows data considered to have achieved 'steady state' flow.

Percolation Rate	1.3	inches per hour
Infiltration Rate (max per LADPW)	0.43	inches per hour

PROJECT NO.	2018-027
DATE	12/7/2018
FIELD DATA BY	GR
COMPUTED BY	B.H.
CHECKED BY	OB

PROJECT: 2018-027

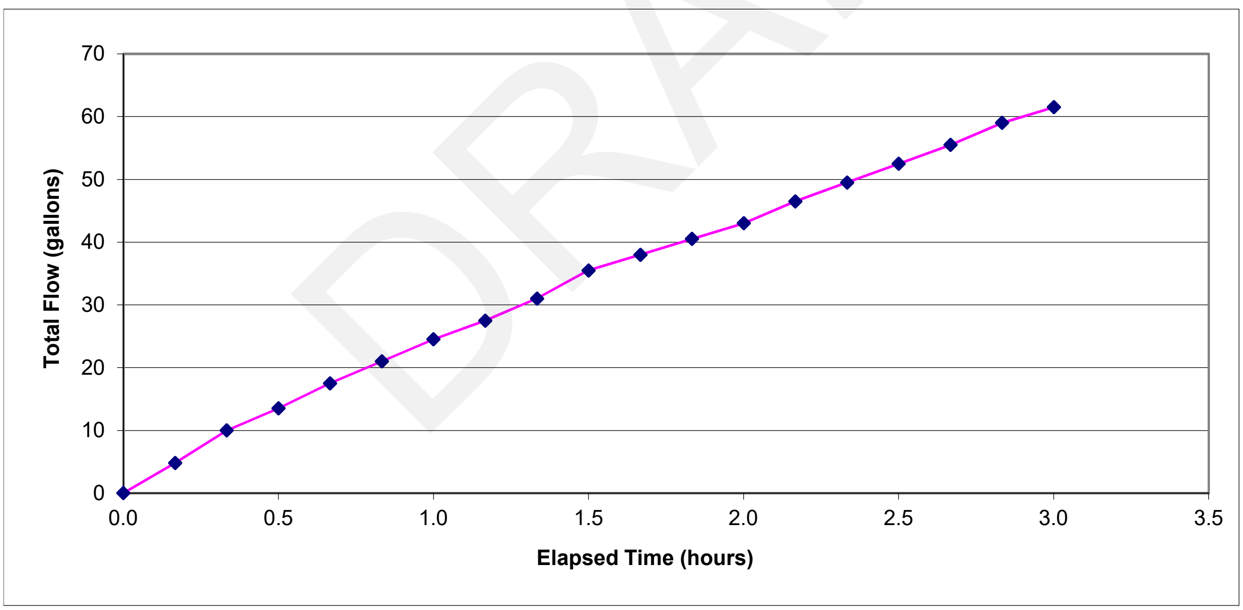
SUBJECT: Percolation rate

LOCATION: Pico Rivera (DYB-05) DATE OF TEST: 12/6/2018

Purpose: Calculate percolation rate in accordance with LADPW guidelines.

Reference: LADPW Guidelines

Height of water in well, h	58	inches
Depth to bottom of well	5	feet
Radius of well, r	4	inches
Discharge rate of water from the well for steady-state condition, q	19.90	gallons per hour
Water temperature, T	54	deg. F



Note: Line shows data considered to have achieved 'steady state' flow.

Percolation Rate	3.05	inches per hour
Infiltration Rate (max per LADPW guidelin	1.02	inches per hour

APPENDIX C -
LABORATORY TESTING

APPENDIX C - LABORATORY TESTING

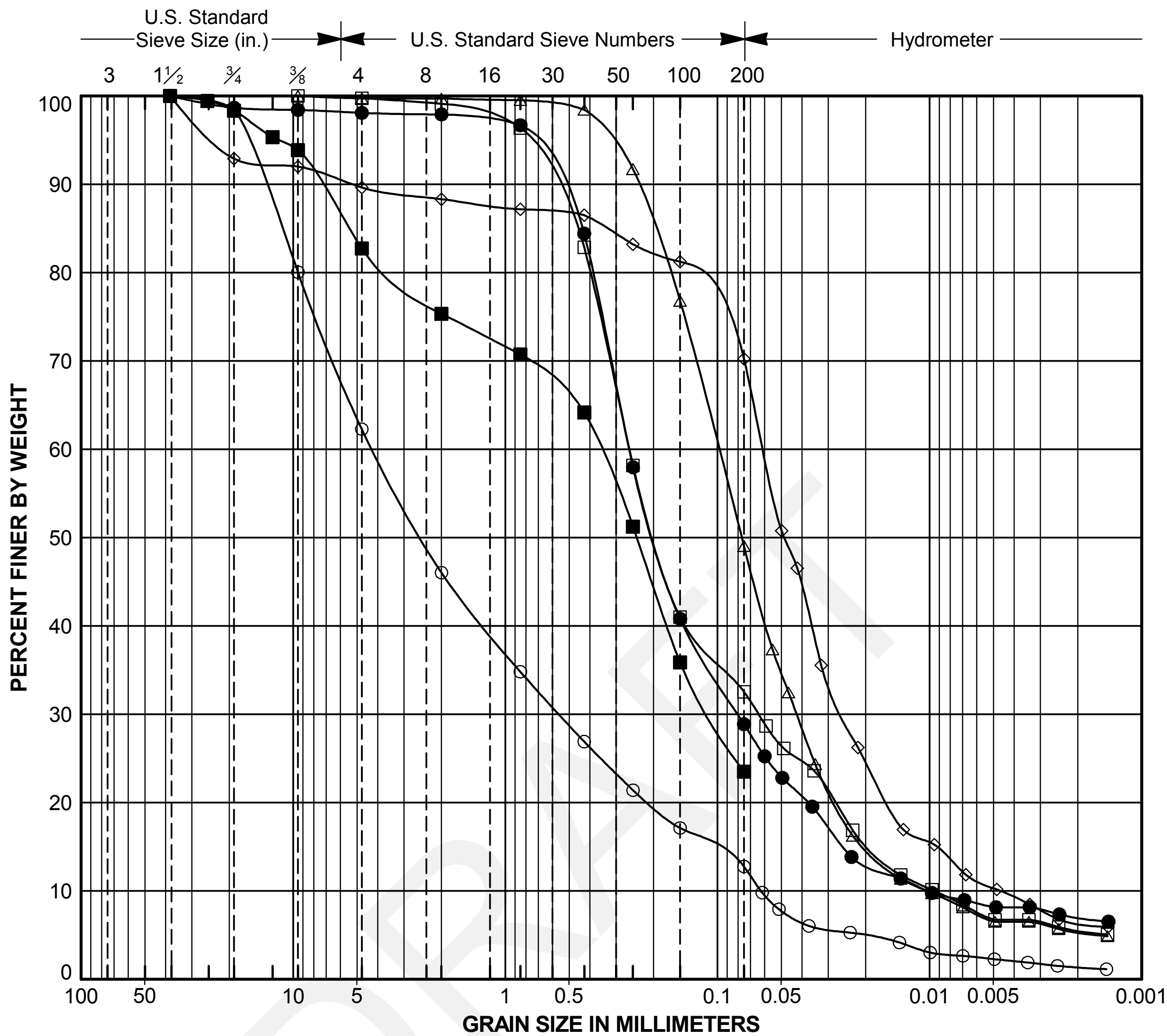
Diaz•Yourman & Associates selected soil samples to be tested and tests to be performed on the selected samples. Laboratory testing was performed by Hushmand Associates, Inc. Laboratory data are summarized on the boring logs and presented on Plates C1 through C21. A summary of the geotechnical laboratory testing is presented in Table C1.

Table C1 - LABORATORY TESTING SUMMARY

TEST NAME	PROCEDURE	PURPOSE	LOCATION
Percent Passing the No. 200 Sieve	ASTM D1140	Classification, index properties	Boring Logs
Moisture Content, Dry Density	ASTM D2216	Classification, index properties	Boring Logs
Grain-Size Distribution	ASTM D422	Classification, index properties	Plate C1
Atterberg Limits	ASTM D4318	Expansion potential, classification, index properties	Plate C2
Expansion Index	ASTM D4829	Potential for expanding soil	Plate C3
Sand Equivalent	CTM 217	Proportion of fine material	Plate C4
Hydraulic Conductivity	ASTM D5084-10	Hydraulic conductivity of soil	Plate C5
Compaction	ASTM D1557	Earthwork	Plates C6 through C9
Resistance (R-) Value	ASTM D2844 CTM 301	Pavement thickness design	Plates C10 through C19
pH	CTM 532	Corrosion potential	Plates C20 and C21
Resistivity	CTM 532	Corrosion potential	Plates C20 and C21
Soluble Sulfates	CTM 417-B	Corrosion potential	Plates C20 and C21
Soluble Chlorides	CTM 422	Corrosion potential	Plates C20 and C21

Note(s):

- ASTM = ASTM International.
- CTM = California (Caltrans) Test Method.



COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Laboratory Testing by:

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB-01	1.5	SILTY SAND (SM)		NP	NP	13
□	DYB-02	1.5	SILTY SAND (SM)				33
△	DYB-03	1.5	SILTY SAND (SM)				49
◇	DYB-04	1.5	SILT WITH SAND (ML)	13	30	6	70
●	DYB-05	1.5	SILTY SAND (SM)				29
■	DYB-06A	1.5	SILTY SAND (SM)				23

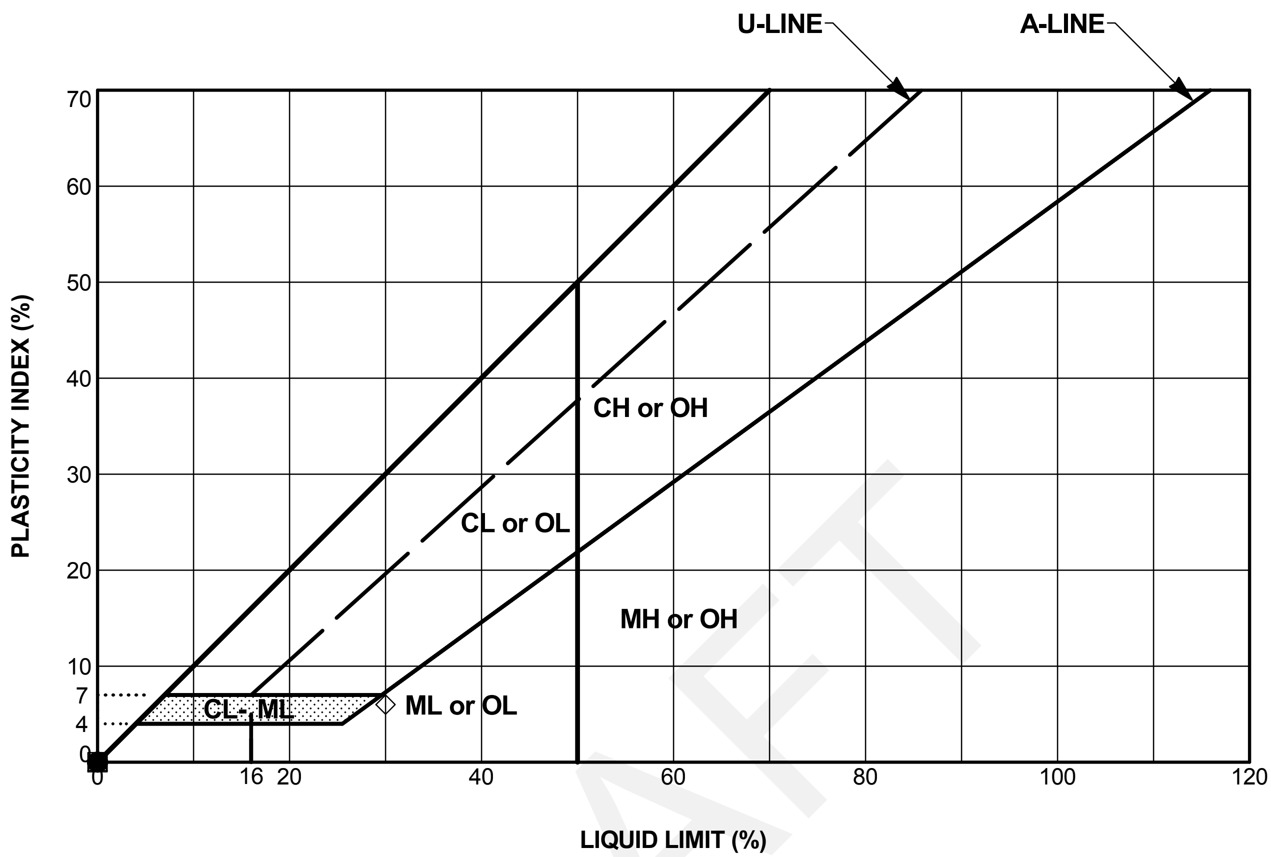
PARTICLE SIZE ANALYSIS

Pico Rivera Regional Bikeway Project

Project No. 2018-027

PLATE

C1



Laboratory Testing by:

Test Method: ASTM D4318

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
⊙	DYB-01	1.5	SILTY SAND (SM)		NP	NP	NP	13
□	DYB-02	2.5	SILTY SAND (SM)	8	NP	NP	NP	
△	DYB-03	2.5	SILTY SAND (SM)	13	NP	NP	NP	
◇	DYB-04	1.5	SILT WITH SAND (ML)	13	30	24	6	70
●	DYB-05	2.5	SILTY SAND (SM)	10	NP	NP	NP	

PLASTICITY CHART

Pico Rivera Regional Bikeway Project

Project No. 2018-027

PLATE
C2

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

EXPANSION INDEX

ASTM D4829

Client:	Diaz yourman	***HAI Project No.:***	DYAL-18-025
Project Name:	Pico Rivera Bikeway	***Apparatus #:***	1
Project No.:	2018-027		
Boring No.:	DYB-03	***Tested by:***	MB
Sample No.:	BULK	***Checked by:***	KL
Depth (ft):	0-5	***Date:***	1/2/2019
Soil Description:	Brown, Silty Sand (SM)		

INITIAL SPECIMEN INFO		
Wt. of wet soil + cont.	164.78	g
Wt. of dry soil + cont.	148.04	g
Wt. of container	11.70	g
Wt. of water	16.74	g
Wt. of dry soil	136.34	g
Moisture Content	**12.28**	**%**
Wt. of wet soil + ring	569.24	g
Wt. of ring	190.76	g
Wt. of wet soil	378.48	g
Wet density of soil	114.7	pcf
Dry density of soil	102.1	pcf
Specific gravity of soil	2.68	
Saturation	**51.6**	**%**

FINAL SPECIMEN INFO		
Wt. of wet soil + cont.	596.05	g
Wt. of dry soil + cont.	527.85	g
Wt. of container	190.76	g
Wt. of water	68.20	g
Wt. of dry soil	337.09	g
Moisture Content	**20.2**	**%**

Date & Time	Elapsed Time (min)	Dial Reading	Δh, Expansion
1/8/2019 9:24	0	0	-
1/8/2019 9:34	10	0.0000	-
Add Distilled Water to Sample			
1/9/2019 9:24	1440	0.0000	0.0000

Expansion Index = 0

PLATE C3

SAND EQUIVALENT TEST
CTM 217

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Client: Diaz yourman
Project Name: Pico Rivera Bikeway
Project No.: 2018-027
Boring No.: DYB-03
Sample No.: Bulk
Soil Description: Brown, Silty Sand (SM)

HAI Project No.: DYAL-18-025
Tested by: KL
Checked by: KL/MJ
Date: 01/02/19

T1	T2	T3	T4	R1	R2	SE	Average SE
10:00	10:10	10:11	10:31	8.30	1.80	22	**24**
10:03	10:13	10:14	10:34	7.60	1.90	25	
10:06	10:16	10:17	10:37	7.80	1.80	24	

T1 = Starting Time
T2 = (T1 + 10 min) Begin Agitation
(100 cycles in 30 sec)

T3 = Settlement Starting Time
T4 = (T3 + 20 min) Take Clay Reading (R1)
and Sand Reading (R2)

Sand Equivalent = R2 / R1 * 100
Record SE as Next Higher Integer

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

HYDRAULIC CONDUCTIVITY

ASTM D5084-10

Client:	Diaz yourman	***HAI Project No.:***	DYAL-18-025
Project Name:	Pico Rivera Bikeway	***Tested by:***	KL
Project No.:	2018-027	***Checked by:***	KL
Boring No.:	DYB-01	***Date:***	1/2/2019
Sample No:	1		
Sample Type:	Undisturbed Tube		
Sample Description:	Brown, Silty Sand (SM)		

1. SPECIMEN INFORMATION

Specimen Information	Initial		Final	
Average Diameter (D):	2.399 in	6.09 cm	2.419 in	6.14 cm
Average Height (H):	3.105 in	7.89 cm	3.000 in	7.62 cm
Sample Area (A)	4.520 in^2	29.16 cm^2	4.596 in^2	29.65 cm^2
Total Volume (V):	14.035 in^3	229.99 cm^3	13.787 in^3	225.94 cm^3
Wt. Wet soil (gr)	455.86		485.04	
Wt. Dry soil (gr)	410.74		410.74	
Moisture Content (%)	8.8		18.1	
Wet Density (pcf)	123.7		134.0	
Dry Density (pcf)	111.5		113.4	

2. SATURATION PHASE (B VALUE)

APPLIED PRESSURE	Initial (i)	Final (f)	Δ (i-f)	B (%)
Cell Pressure	56	61	5	100%
Back Pressure	53.1	58.1	5	

3. CONSOLIDATION PHASE

Cell Pressure	61.0	Effective Pressure	2.1	(psi)
Back Pressure	58.9			

Time (min)	Volume Reading (cc)			Cell	
	Top	Bottom	ΔV (cc)	Reading	ΔV (cc)
0	7.8	7.1	0	8.0	0
1159	6.0	6.9	2.0	8.2	0.8

4. HYDRAULIC CONDUCTIVITY TEST (Method C)

Test No.	Elapsed Time Δt (sec)	Δh_1 (cm)	Δh_2 (cm)	K (cm/s)
1	3180	167.35	166.79	1.25E-07
2	3240	166.79	166.34	9.88E-08
3	6900	166.34	165.55	8.15E-08
4	10380	165.55	164.42	7.79E-08
5	7680	164.42	163.63	7.41E-08
6	67740	163.63	157.43	6.74E-08

Test Temp (ºC): 21

Correction factor for Temp Tº: 0.9810

Hydraulic Conductivity (cm/sec): **7.52E-08**

Corrected Hydraulic Conductivity for Tº (cm/sec): 7.38E-08

5. Permeability Phase

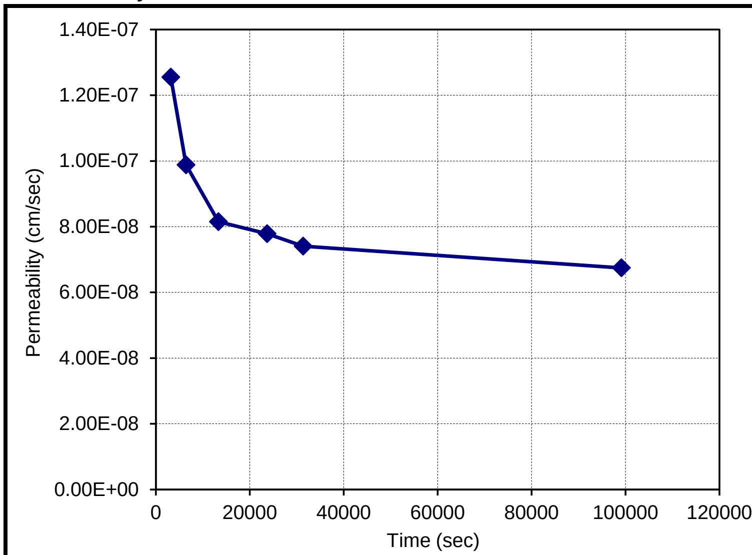


PLATE C5

COMPACTION CHARACTERISTICS OF SOILS
ASTM D1557

Client :	Diaz yourman	***HAI Project No.:***	DYAL-18-025
Project Name:	Pico Rivera Bikeway	***Tested by:***	GA
Project Number:	2018-027	***Checked by:***	KL
Boring Number:	DYB-01	***Date:***	01/02/19
Sample No:	Bulk	***Mold size (in):***	6"
Depth (ft) :	0-5	***Procedure:***	C
Soil Description:	Brown, Silty Sand with Gravel (SM)	***% Ret. on 3/4":***	1.4

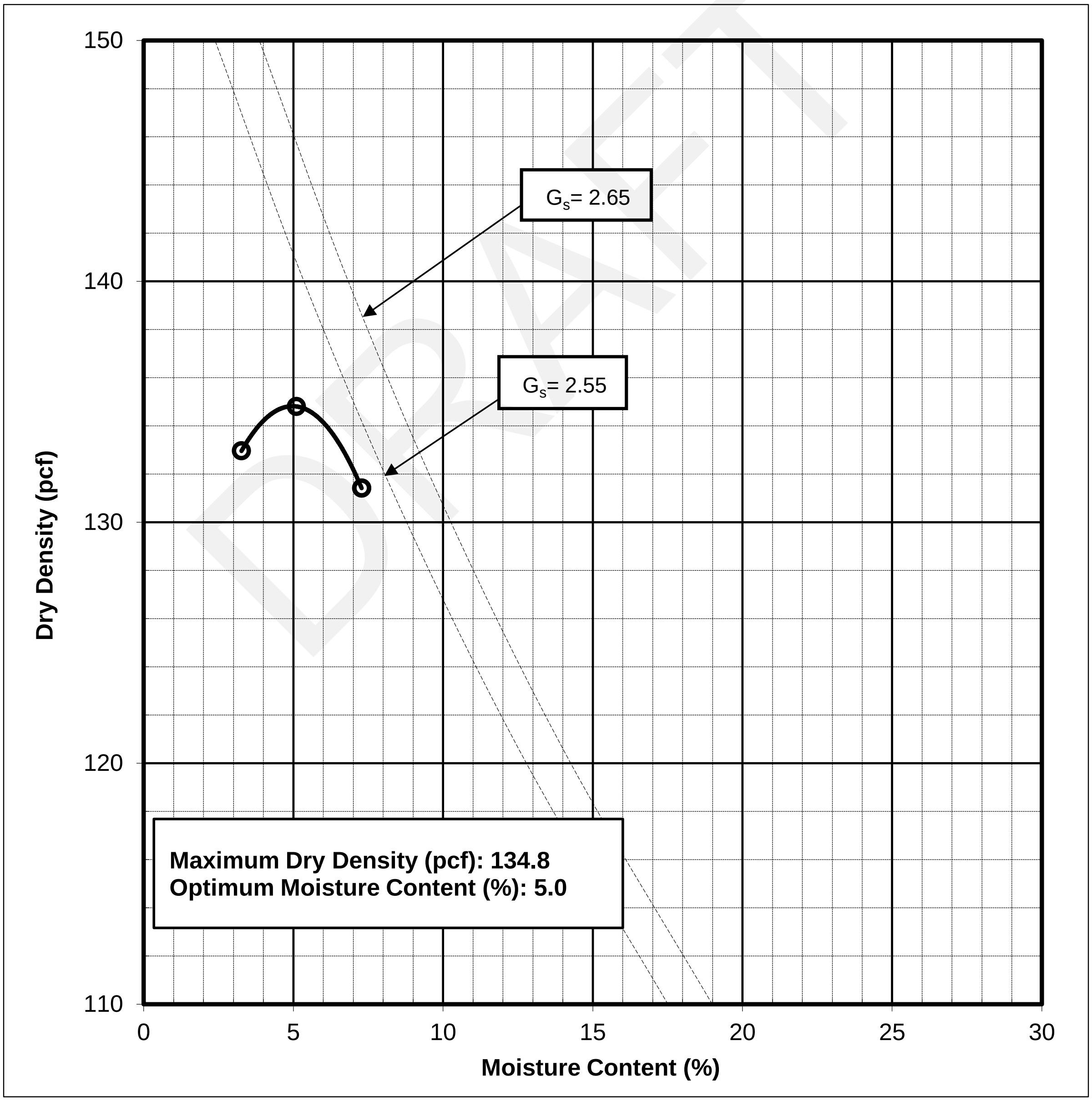


PLATE C6

COMPACTION CHARACTERISTICS OF SOILS
ASTM D1557

Client :	Diaz yourman	***HAI Project No.:***	DYAL-18-025
Project Name:	Pico Rivera Bikeway	***Tested by:***	GA
Project Number:	2018-027	***Checked by:***	KL
Boring Number:	DYB-03	***Date:***	01/02/19
Sample No:	Bulk	***Mold size (in):***	4"
Depth (ft) :	0-5	***Procedure:***	A
Soil Description:	Brown, Silty Sand (SM)	***% Ret. On #4:***	0.3

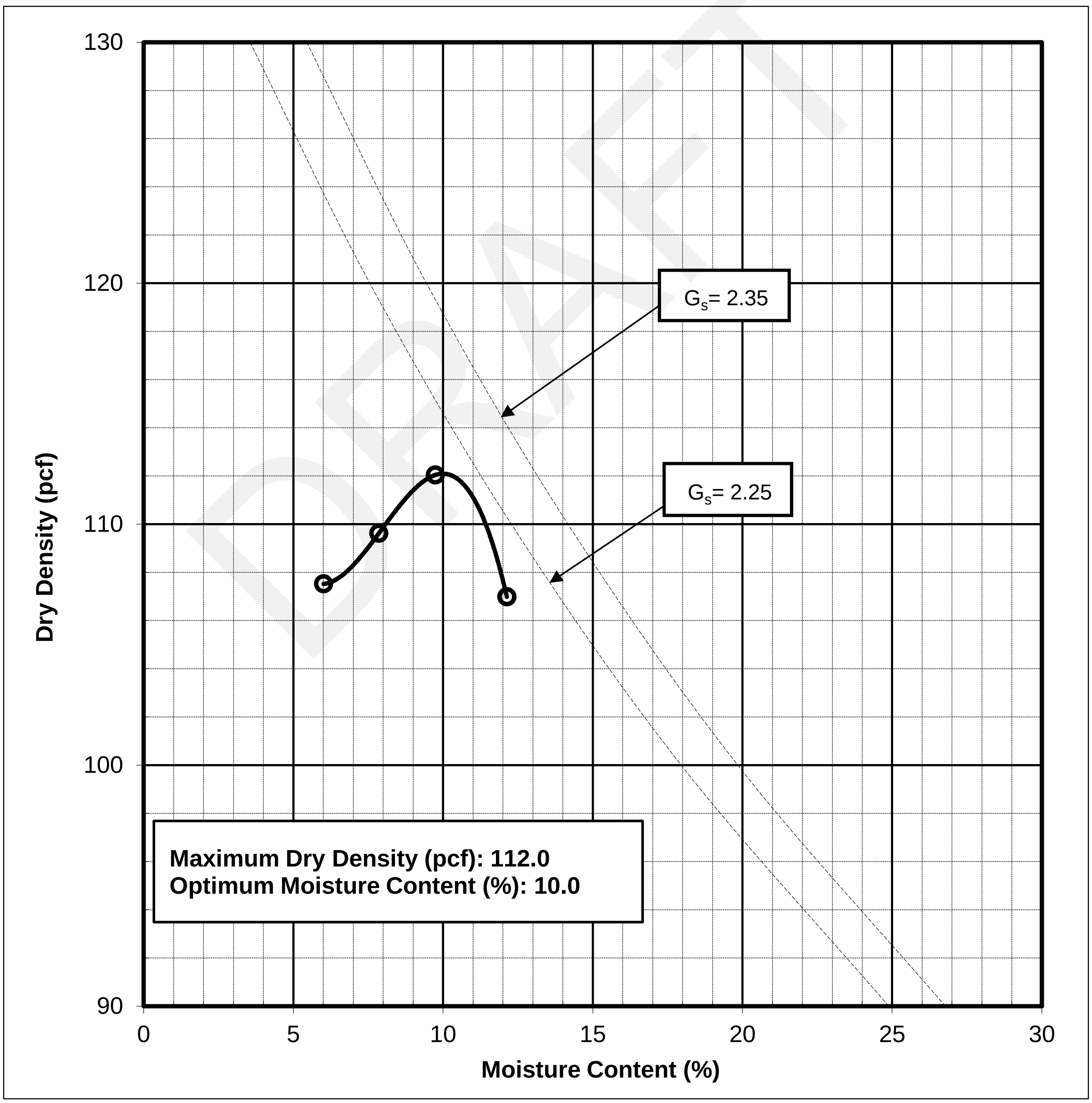
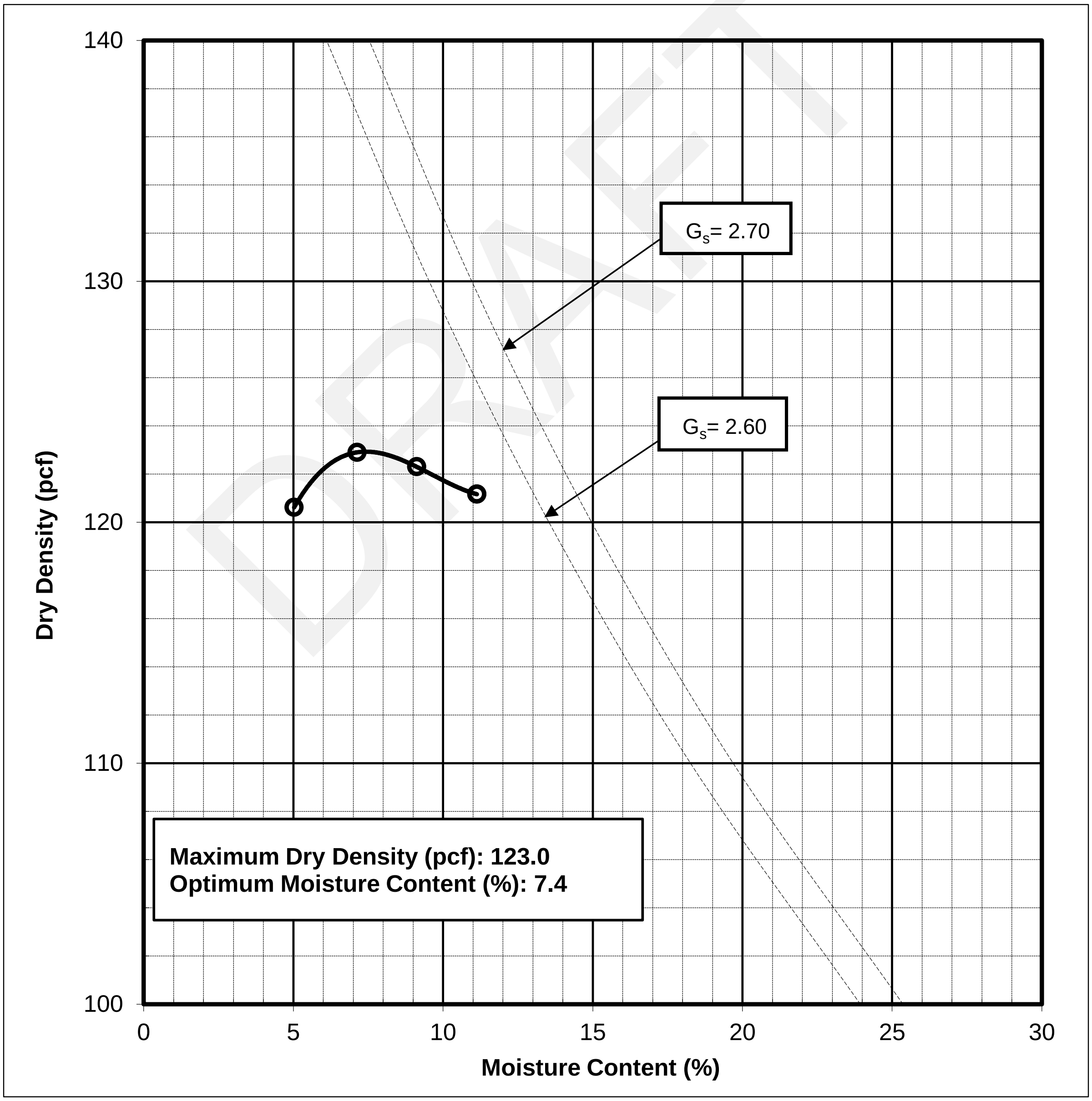


PLATE
C7

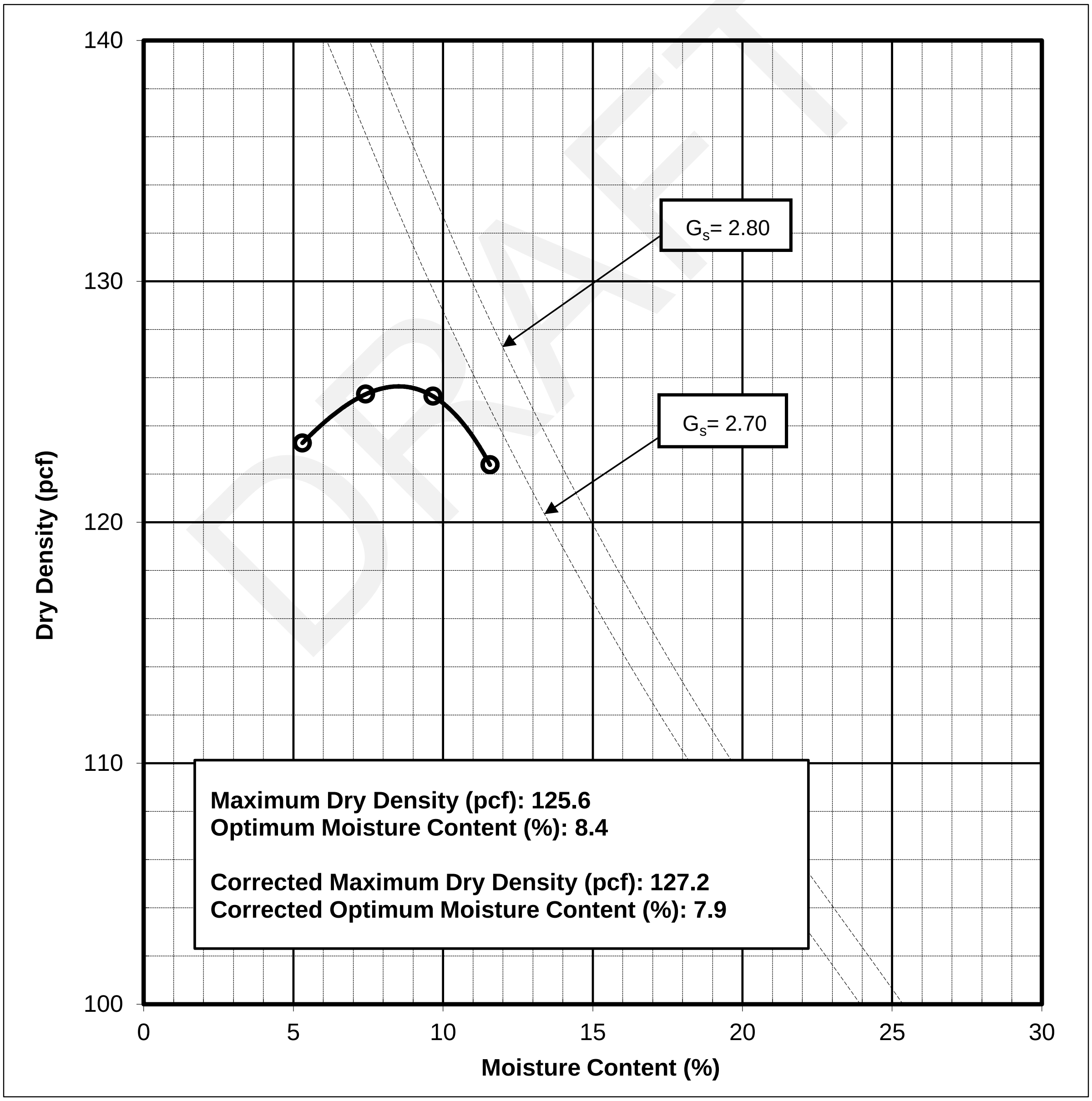
COMPACTION CHARACTERISTICS OF SOILS
ASTM D1557

Client :	Diaz yourman	***HAI Project No.:***	DYAL-18-025
Project Name:	Pico Rivera Bikeway	***Tested by:***	GA
Project Number:	2018-027	***Checked by:***	KL
Boring Number:	DYB-05	***Date:***	01/02/19
Sample No:	Bulk	***Mold size (in):***	4"
Depth (ft) :	0-5	***Procedure:***	A
Soil Description:	Brown, Silty Sand (SM)	***% Ret. On #4:***	1.9



COMPACTION CHARACTERISTICS OF SOILS
ASTM D1557

Client :	Diaz yourman	***HAI Project No.:***	DYAL-18-025-2
Project Name:	Pico Rivera Bikeway	***Tested by:***	GA/MB
Project Number:	2018-027	***Checked by:***	KL
Boring Number:	DYB-06A	***Date:***	01/30/19
Sample No:	Bulk	***Mold size (in):***	4"
Depth (ft) :	0-5	***Procedure:***	B
Soil Description:	Brown, Silty Sand with Gravel (SM)	***% Ret. on 3/8":***	6.3



Maximum Dry Density (pcf): 125.6
Optimum Moisture Content (%): 8.4

Corrected Maximum Dry Density (pcf): 127.2
Corrected Optimum Moisture Content (%): 7.9

LaBelle Marvin

R - VALUE DATA SHEET

PROJECT No. 44522

DATE: 1/9/2019

BORING NO. DYB-01 Bulk @ 0'-5'

Pico Rivera Bikeway

P.N. DYAL 18-025 / 2018-027

SAMPLE DESCRIPTION: Brwon Gravelly Sand

R-VALUE TESTING DATA | CA TEST 301

	SPECIMEN ID		
	a	b	c
Mold ID Number	13	15	6
Water added, grams	30	35	32
Initial Test Water, %	6.1	6.6	6.3
Compact Gage Pressure,psi	350	350	350
Exudation Pressure, psi	625	171	315
Height Sample, Inches	2.43	2.46	2.44
Gross Weight Mold, grams	3078	3062	3070
Tare Weight Mold, grams	1968	1943	1958
Sample Wet Weight, grams	1110	1119	1112
Expansion, Inches x 10exp-4	0	0	0
Stability 2,000 lbs (160psi)	9 / 16	11 / 19	10 / 18
Turns Displacement	4.74	5.24	4.98
R-Value Uncorrected	83	78	80
R-Value Corrected	82	78	79
Dry Density, pcf	130.4	129.3	129.9

DESIGN CALCULATION DATA

Traffic Index Assumed:	4.0	4.0	4.0
G.E. by Stability	0.18	0.23	0.22
G. E. by Expansion	0.00	0.00	0.00

Equilibrium R-Value	**79** by EXUDATION	Examined & Checked: 1 /9/ 19
REMARKS:	Gf = 1.25 1.4% Retained on the 3/4" Sieve. Baskets Used. Partial Free Drainage.	REGISTERED PROFESSIONAL ENGINEER STEVEN R. MARVIN C 30659 CIVIL STATE OF CALIFORNIA Steven R. Marvin, RCE 30659

The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

R-VALUE GRAPHICAL PRESENTATION

PROJECT NO. 44522

DATE: 1 /9/ 19

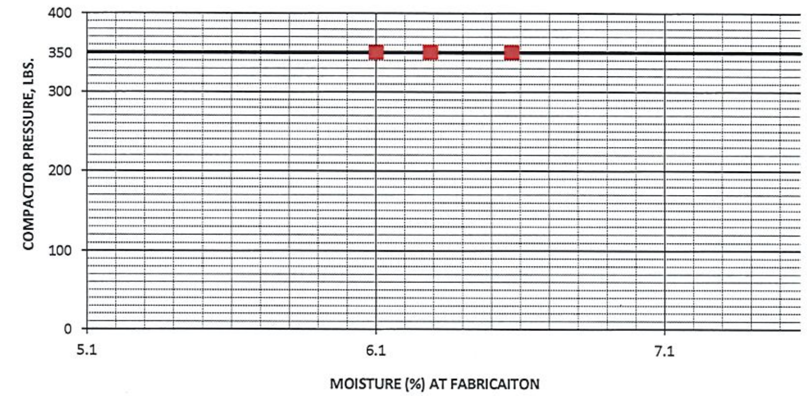
REMARKS:

BORING NO. DYB-01 Bulk @ 0'-5'

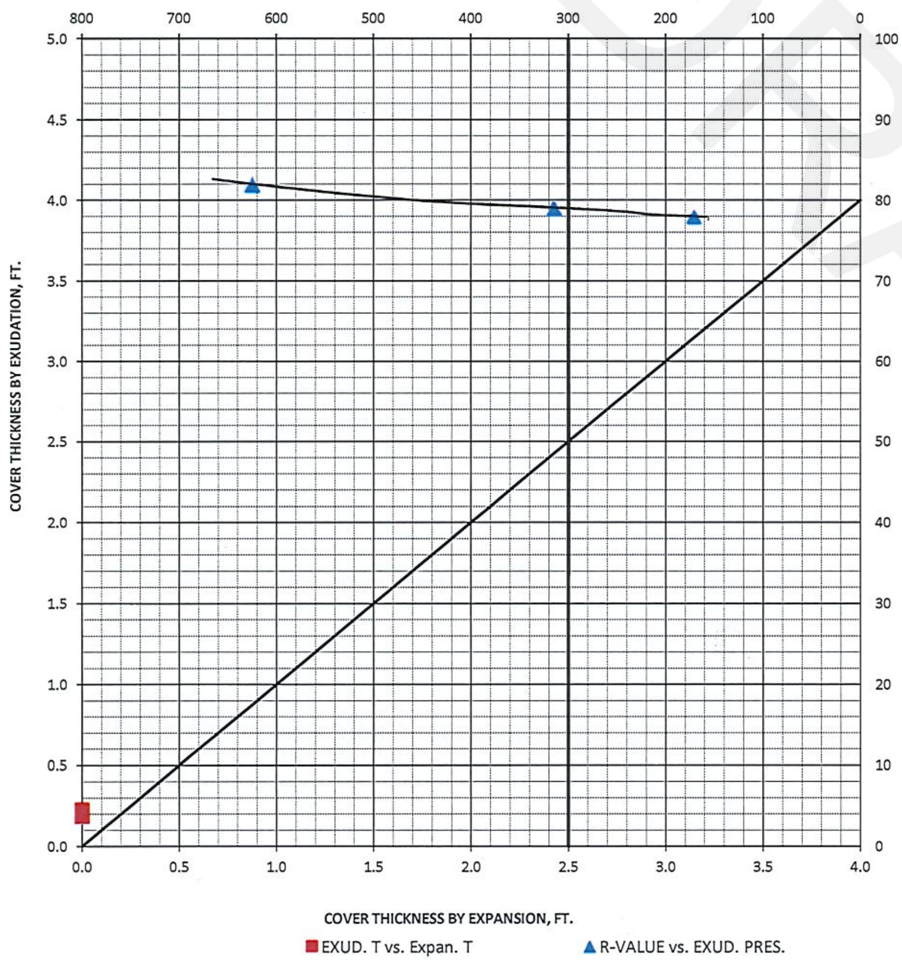
Pico Rivera Bikeway

P.N. DYAL 18-025 / 2018-027

COMPACTOR PRESSURE vs MOISTURE %



COVER THICKNESS BY EXUDATION vs COVER THICKNESS BY EXPANSION



COVER THICKNESS vs MOISTURE %

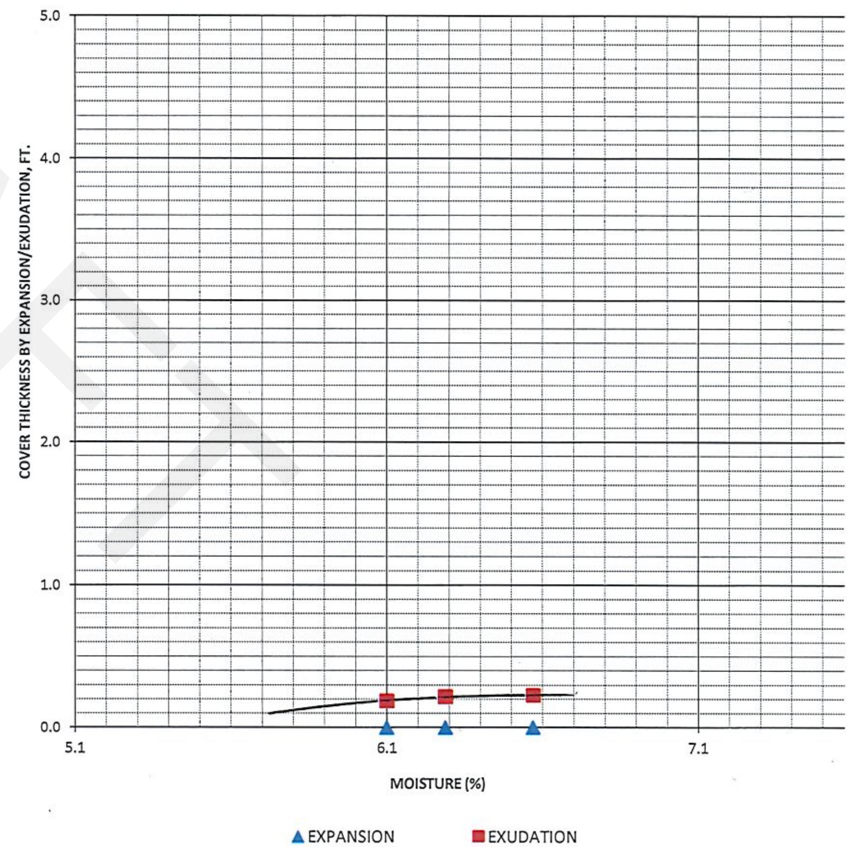


PLATE C11

LaBelle Marvin

R - VALUE DATA SHEET

PROJECT No. 44522

DATE: 1/9/2019

BORING NO. DYB-02 Bulk @ 0'-5'

Pico Rivera Bikeway

P.N. DYAL 18-025 / 2018-027

SAMPLE DESCRIPTION: Brown Silty Sand

R-VALUE TESTING DATA | CA TEST 301

	SPECIMEN ID		
	a	b	c
Mold ID Number	10	11	12
Water added, grams	20	10	5
Initial Test Water, %	12.5	11.5	10.9
Compact Gage Pressure,psi	250	350	350
Exudation Pressure, psi	184	386	657
Height Sample, Inches	2.48	2.40	2.39
Gross Weight Mold, grams	3030	3009	3003
Tare Weight Mold, grams	1947	1952	1948
Sample Wet Weight, grams	1083	1057	1055
Expansion, Inches x 10exp-4	15	20	33
Stability 2,000 lbs (160psi)	17 / 35	16 / 33	15 / 28
Turns Displacement	5.58	5.30	5.18
R-Value Uncorrected	62	64	69
R-Value Corrected	62	62	67
Dry Density, pcf	117.6	119.7	120.6

DESIGN CALCULATION DATA

Traffic Index Assumed:	4.0	4.0	4.0
G.E. by Stability	0.39	0.39	0.34
G. E. by Expansion	0.50	0.67	1.10

Equilibrium R-Value	**61** by EXPANSION	Examined & Checked: 1 /9/ 19
REMARKS:	Gf = 1.25 0.0% Retained on the 3/4" Sieve.	REGISTERED PROFESSIONAL ENGINEER STEVEN R. MARVIN C 30659 CIVIL STATE OF CALIFORNIA Steven R. Marvin, RCE 30659

The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

R-VALUE GRAPHICAL PRESENTATION

PROJECT NO. 44522

DATE: 1 /9/ 19

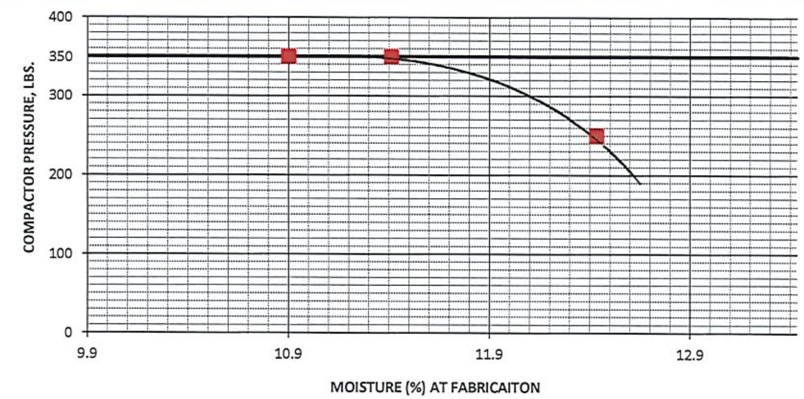
REMARKS:

BORING NO. DYB-02 Bulk @ 0'-5'

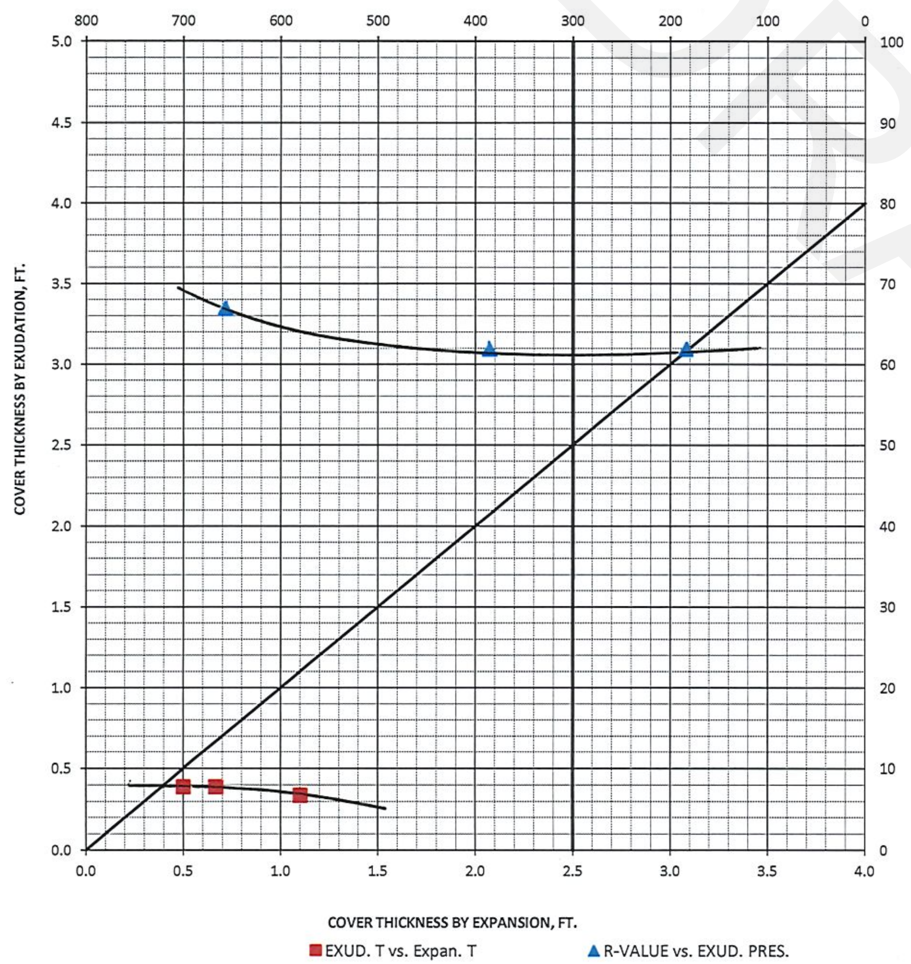
Pico Rivera Bikeway

P.N. DYAL 18-025 / 2018-027

COMPACTOR PRESSURE vs MOISTURE %



COVER THICKNESS BY EXUDATION vs COVER THICKNESS BY EXPANSION



COVER THICKNESS vs MOISTURE %

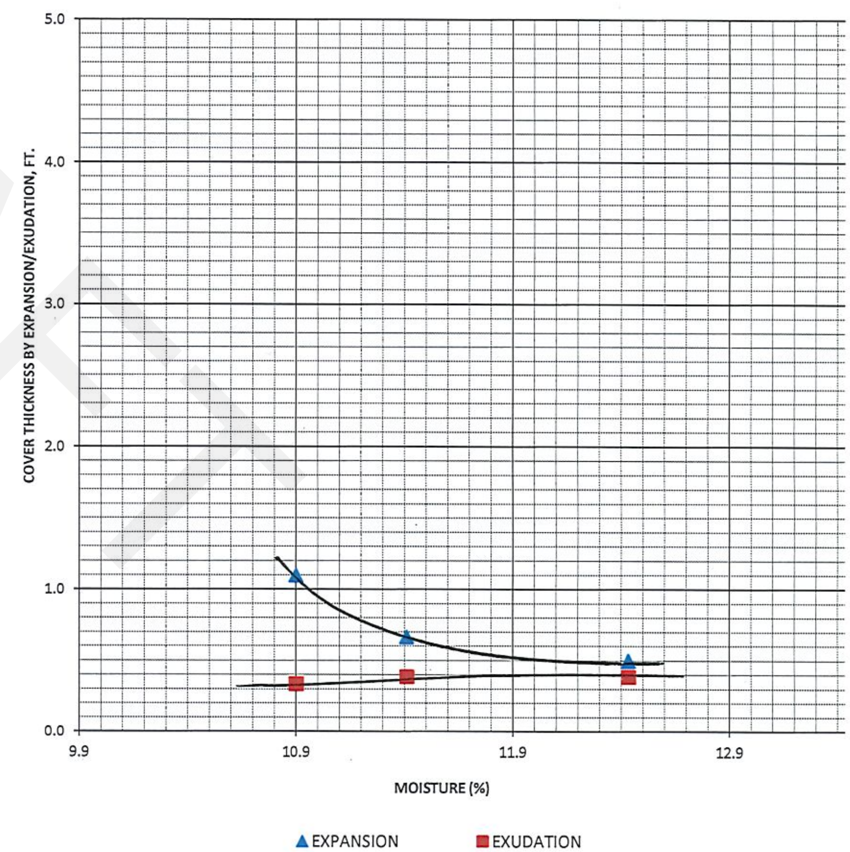


PLATE C13

R - VALUE DATA SHEET

LaBelle Marvin

PROJECT No.	44522
DATE:	1/9/2019
BORING NO.	DYB-05 Bulk @ 0'-5'
	Pico Rivera Bikeway
	P.N. DYAL 18-025 / 2018-027

SAMPLE DESCRIPTION: Brown Silty Sand

R-VALUE TESTING DATA | CA TEST 301			
	SPECIMEN ID		
	a	b	c
Mold ID Number	7	8	9
Water added, grams	67	60	53
Initial Test Water, %	11.5	10.8	10.1
Compact Gage Pressure,psi	350	350	350
Exudation Pressure, psi	145	306	527
Height Sample, Inches	2.57	2.57	2.57
Gross Weight Mold, grams	3068	3053	2891
Tare Weight Mold, grams	1955	1950	1775
Sample Wet Weight, grams	1113	1103	1116
Expansion, Inches x 10exp-4	12	14	18
Stability 2,000 lbs (160psi)	15 / 30	14 / 27	12 / 23
Turns Displacement	5.58	5.41	5.36
R-Value Uncorrected	66	69	74
R-Value Corrected	68	70	75
Dry Density, pcf	117.7	117.4	119.5

DESIGN CALCULATION DATA

Traffic Index Assumed:	4.0	4.0	4.0
G.E. by Stability	0.33	0.31	0.26
G. E. by Expansion	0.40	0.47	0.60

Equilibrium R-Value	**64** by EXPANSION	Examined & Checked: 1 /9/ 19
REMARKS:	Gf = 1.25 0.0% Retained on the 3/4" Sieve. Partial Free Drainage.	REGISTERED PROFESSIONAL ENGINEER STEVEN R. MARVIN C 30659 CIVIL STATE OF CALIFORNIA Steven R. Marvin, RCE 30659

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R-VALUE GRAPHICAL PRESENTATION

PROJECT NO. 44522

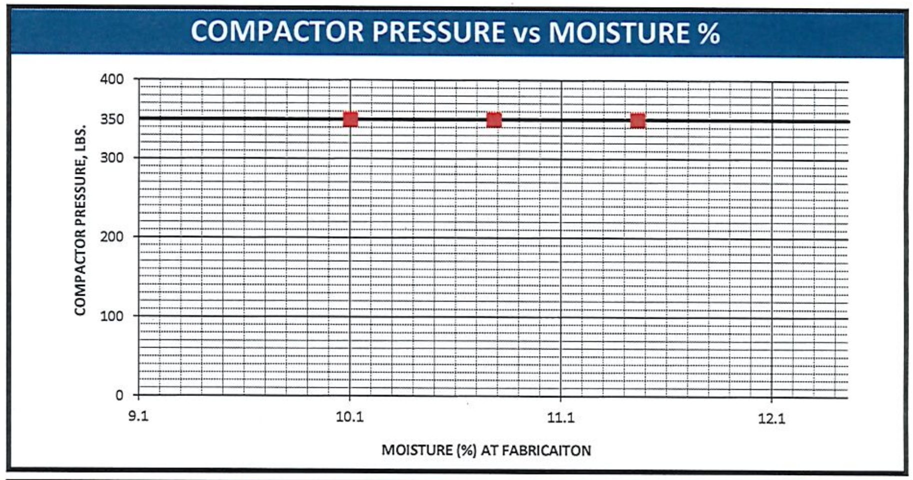
DATE: 1 /9/ 19

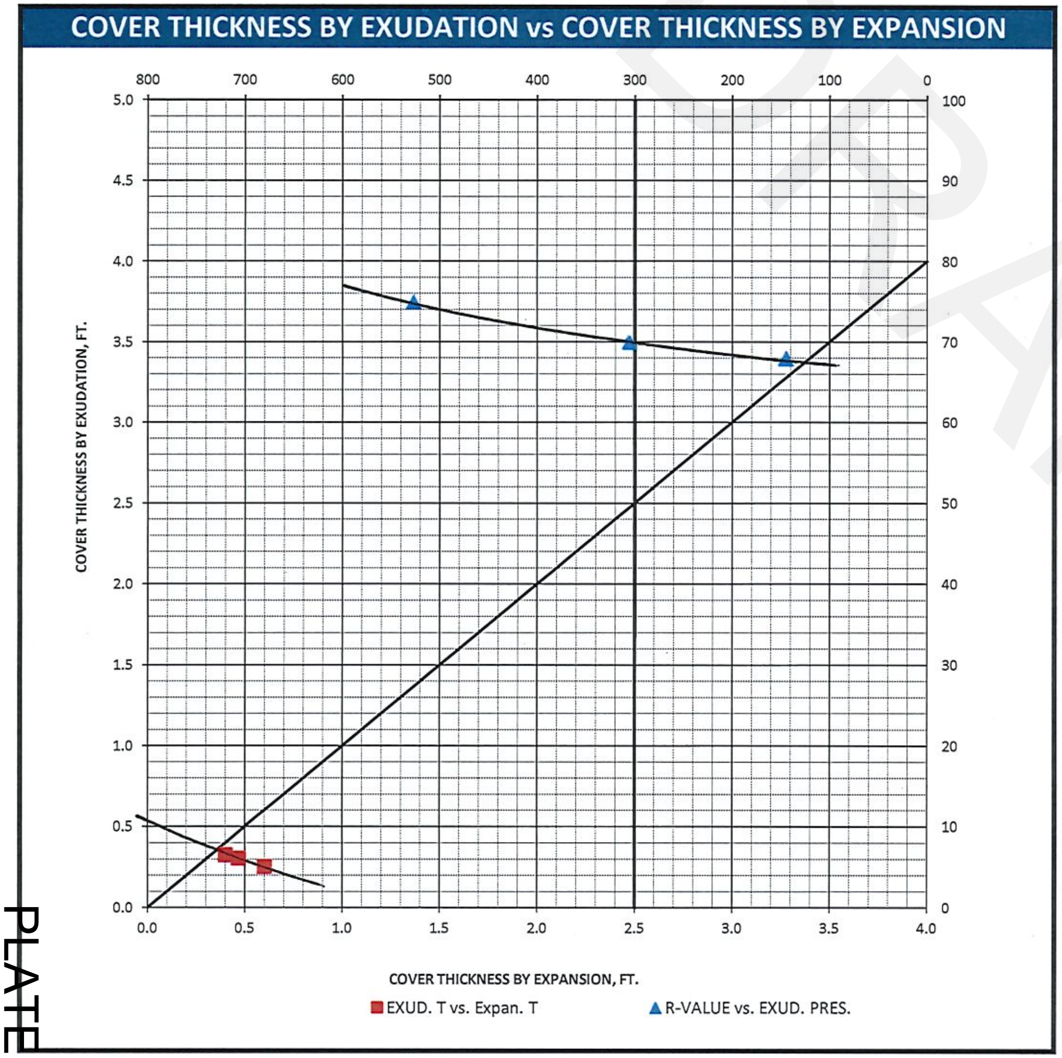
REMARKS:

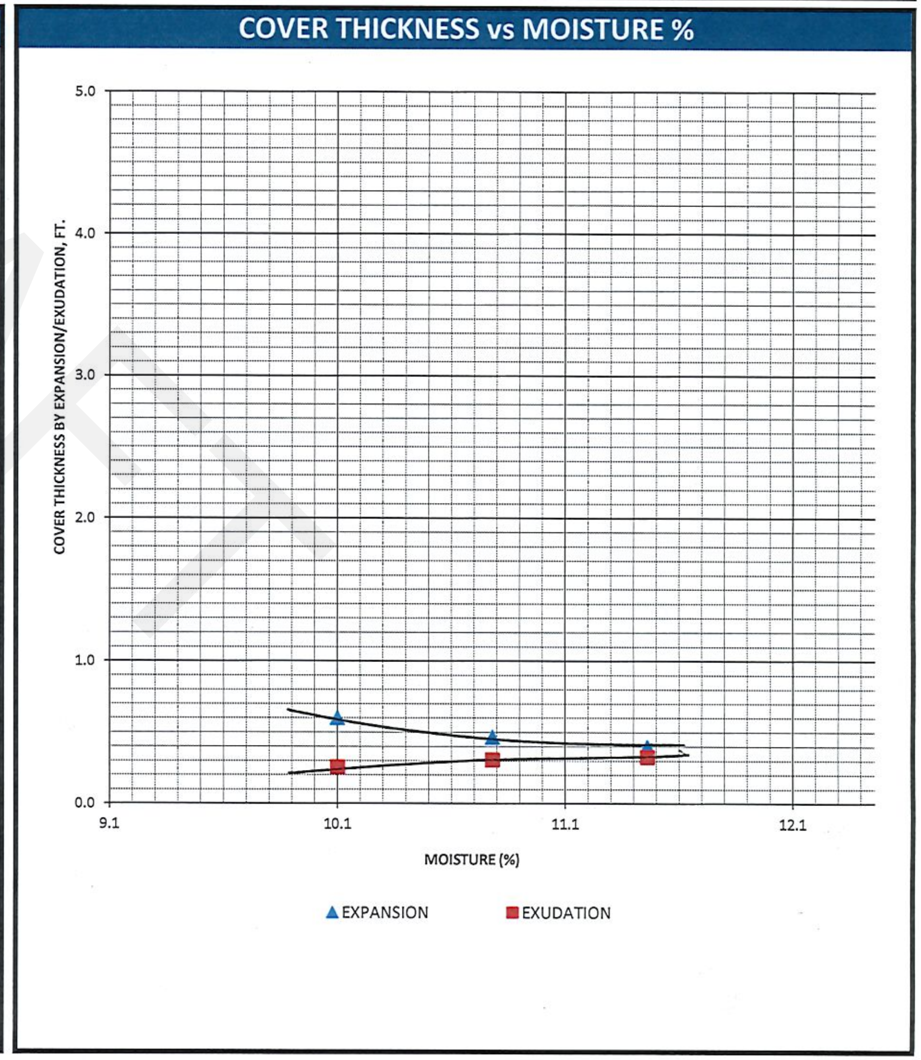
BORING NO. DYB-05 Bulk @ 0'-5'

Pico Rivera Bikeway

P.N. DYAL 18-025 / 2018-027







R - VALUE DATA SHEET

LaBelle Marvin

PROJECT No. 44522
DATE: 1/9/2019

BORING NO. DYB-04 Bulk @ 0'-5'
Pico Rivera Bikeway
P.N. DYAL 18-025 / 2018-027

SAMPLE DESCRIPTION: Brown Silty Fine Sand

R-VALUE TESTING DATA | CA TEST 301

	SPECIMEN ID		
	a	b	c
Mold ID Number	1	2	4
Water added, grams	50	61	40
Initial Test Water, %	14.0	15.2	12.9
Compact Gage Pressure,psi	350	260	350
Exudation Pressure, psi	458	244	759
Height Sample, Inches	2.48	2.53	2.48
Gross Weight Mold, grams	2982	2988	2976
Tare Weight Mold, grams	1946	1956	1959
Sample Wet Weight, grams	1036	1032	1017
Expansion, Inches x 10exp-4	41	35	59
Stability 2,000 lbs (160psi)	18 / 36	19 / 39	17 / 35
Turns Displacement	5.48	5.92	5.43
R-Value Uncorrected	61	57	62
R-Value Corrected	61	57	62
Dry Density, pcf	111.0	107.3	110.0

DESIGN CALCULATION DATA

Traffic Index Assumed:	4.0	4.0	4.0
G.E. by Stability	0.40	0.44	0.39
G. E. by Expansion	1.37	1.17	1.97

Equilibrium R-Value	**42** by EXPANSION	Examined & Checked: 1 /9/ 19
REMARKS:	Gf = 1.25 2.7% Retained on the 3/4" Sieve.	REGISTERED PROFESSIONAL ENGINEER STEVEN R. MARVIN C 30659 CIVIL STATE OF CALIFORNIA Steven R. Marvin, RCE 30659

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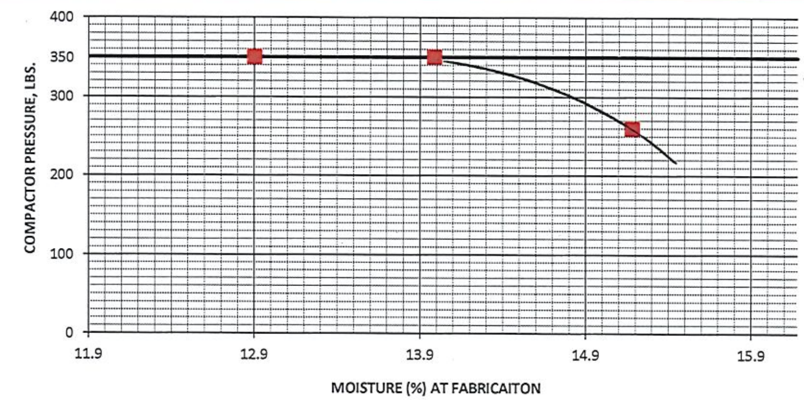
R-VALUE GRAPHICAL PRESENTATION

LaBelle Marvin

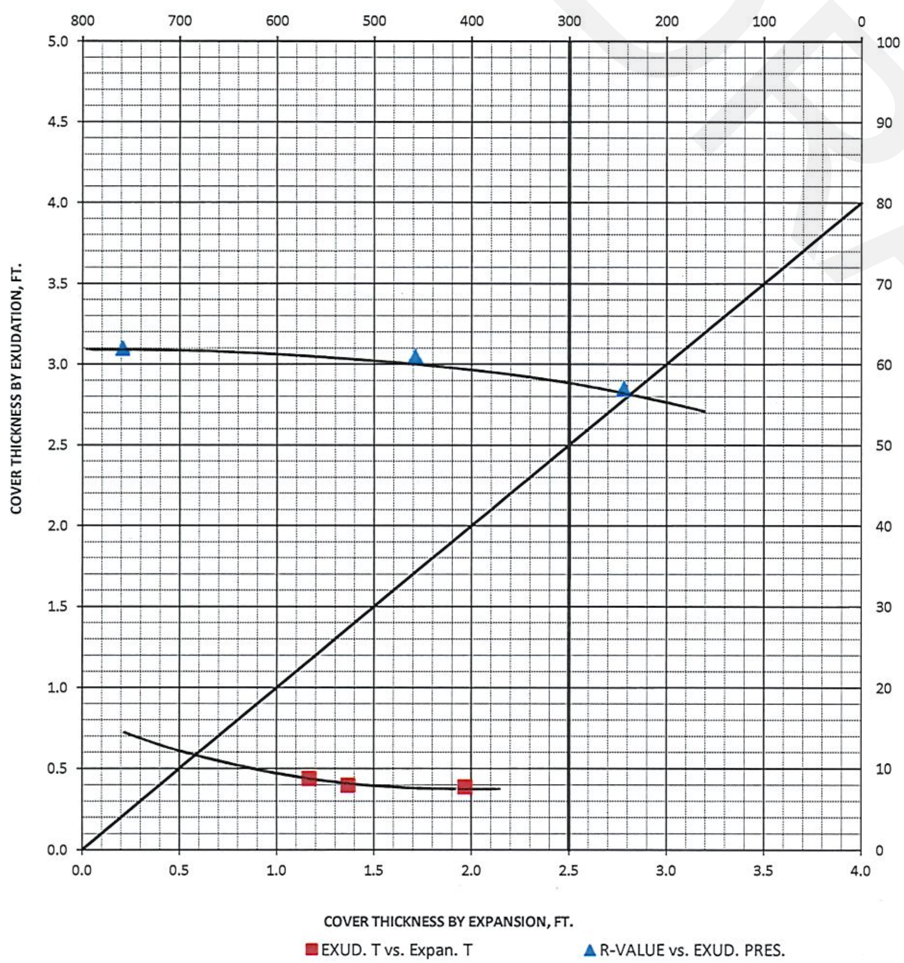
PROJECT NO.	44522
DATE:	1 /9/ 19
BORING NO.	DYB-04 Bulk @ 0'-5'
	Pico Rivera Bikeway
	P.N. DYAL 18-025 / 2018-027

REMARKS:

COMPACTOR PRESSURE vs MOISTURE %



COVER THICKNESS BY EXUDATION vs COVER THICKNESS BY EXPANSION



COVER THICKNESS vs MOISTURE %

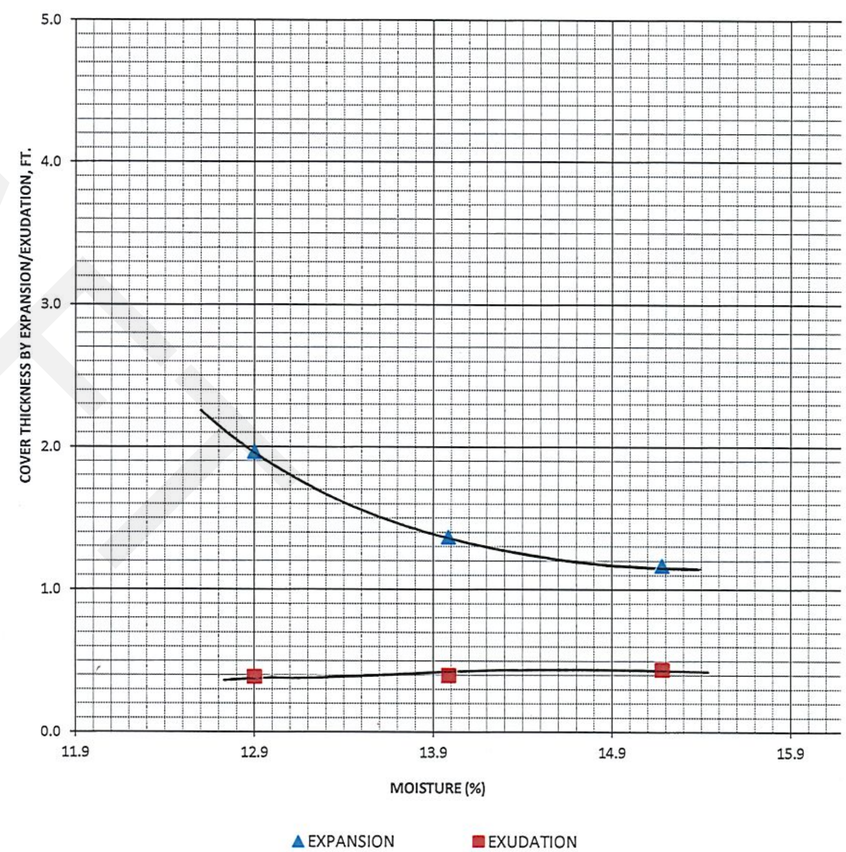


PLATE C17

R - VALUE DATA SHEET

LaBelle Marvin

PROJECT No. 44582

DATE: 2/1/2019

BORING NO. DYB-06A

Pico Rivera Bikeway

P.N. DYAL-18-025-2

SAMPLE DESCRIPTION: Brown Sand

R-VALUE TESTING DATA | CA TEST 301			
	SPECIMEN ID		
	a	b	c
Mold ID Number	1	2	3
Water added, grams	40	47	35
Initial Test Water, %	9.0	9.7	8.5
Compact Gage Pressure,psi	350	350	350
Exudation Pressure, psi	305	115	793
Height Sample, Inches	2.51	2.51	2.48
Gross Weight Mold, grams	3093	3093	3077
Tare Weight Mold, grams	1959	1954	1947
Sample Wet Weight, grams	1134	1139	1130
Expansion, Inches x 10exp-4	7	4	8
Stability 2,000 lbs (160psi)	16 / 27	23 / 40	13 / 22
Turns Displacement	4.08	4.44	4.24
R-Value Uncorrected	75	63	79
R-Value Corrected	75	63	79
Dry Density, pcf	125.6	125.4	127.2

DRAFT

DESIGN CALCULATION DATA

Traffic Index Assumed:	4.0	4.0	4.0
G.E. by Stability	0.26	0.38	0.22
G. E. by Expansion	0.23	0.13	0.27

Equilibrium R-Value	**75** by EXUDATION	Examined & Checked: 2 /1/ 19
REMARKS:	Gf = 1.25 2.0% Retained on the 3/4" Sieve.	REGISTERED PROFESSIONAL ENGINEER STEVEN R. MARVIN C 30659 CIVIL STATE OF CALIFORNIA Steven R. Marvin, RCE 30659

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R-VALUE GRAPHICAL PRESENTATION

LaBelle Marvin

PROJECT NO. 44582

DATE: 2 /1/ 19

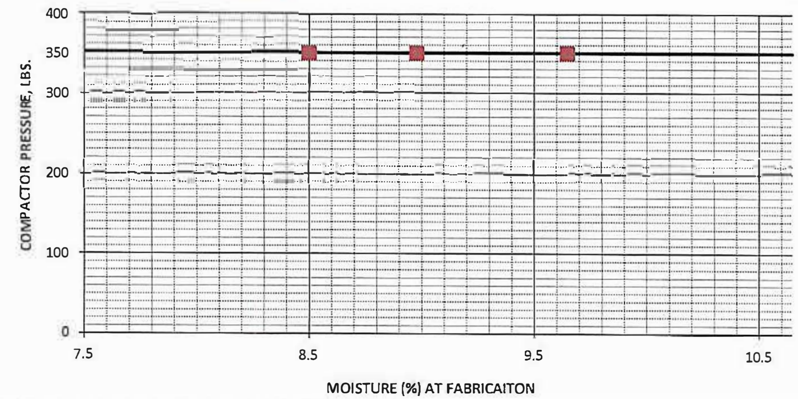
REMARKS:

BORING NO. DYB-06A

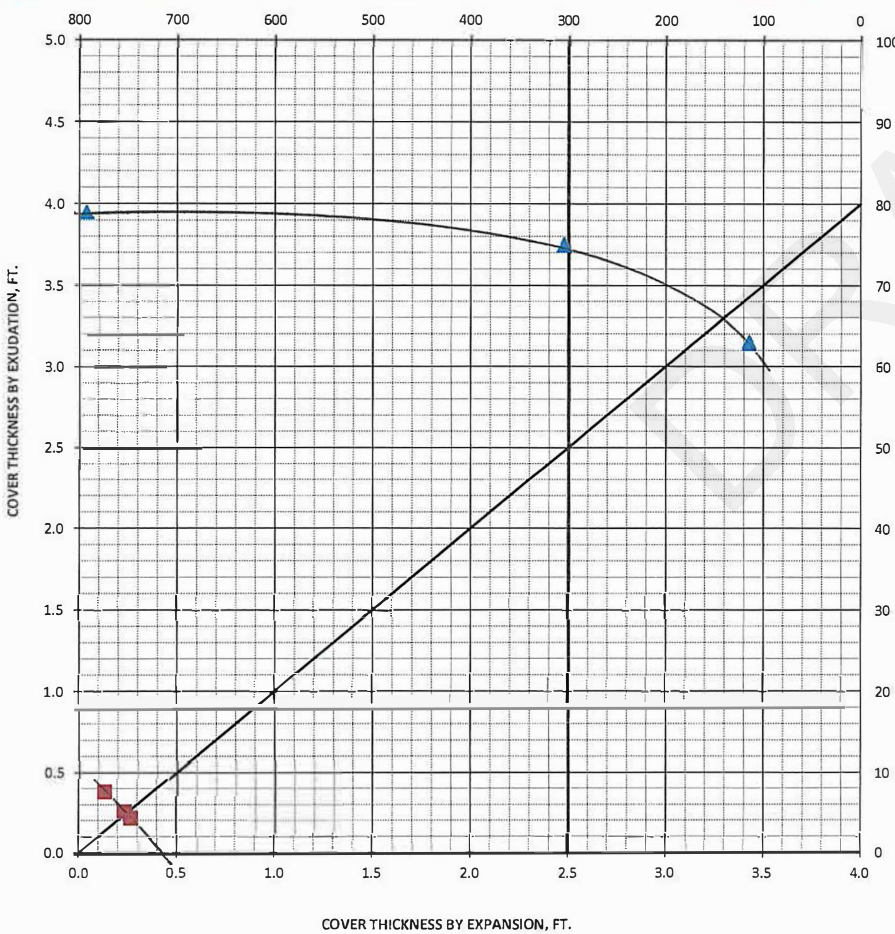
Pico Rivera Bikeway

P.N. DYAL-18-025-2

COMPACTOR PRESSURE vs MOISTURE %



COVER THICKNESS BY EXUDATION vs COVER THICKNESS BY EXPANSION



COVER THICKNESS vs MOISTURE %

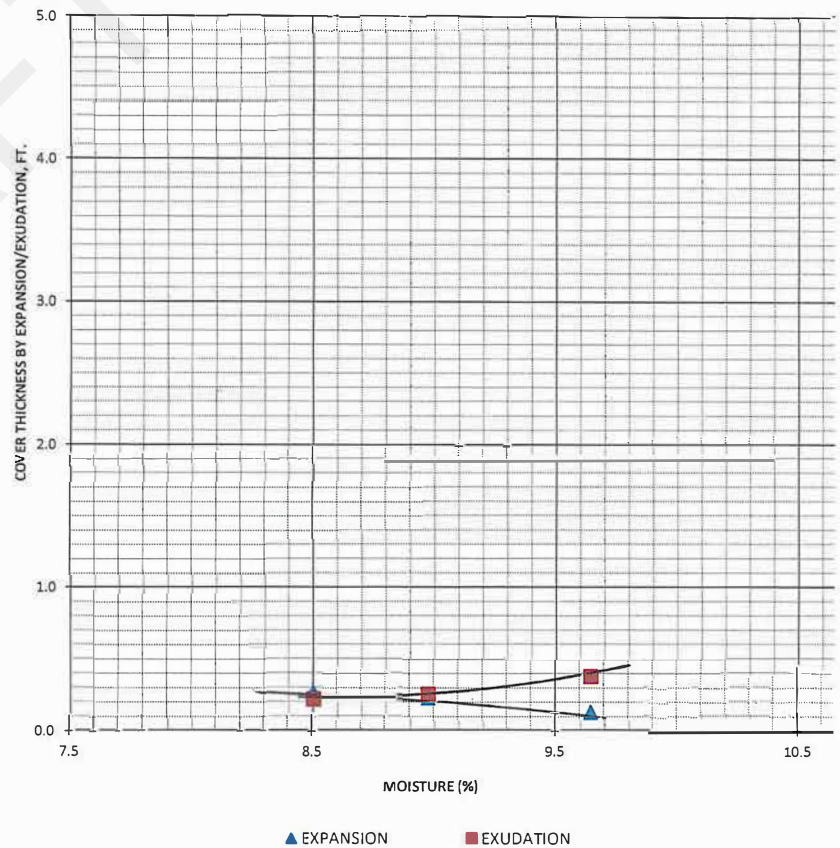


PLATE C19

Soil Analysis Lab Results

Client: HAI
Job Name: Pico Rivera Bikeway
Client Job Number: DYAL-18-025
Project X Job Number: S190104A
January 7, 2019

	Method	ASTM G187		ASTM D516		ASTM D512B		ASTM G51
Bore# / Description	**Depth**	**Resistivity**		**Sulfates**		**Chlorides**		**pH**
		As Rec'd	**Minimum**					
	(ft)	**(Ohm-cm)**	**(Ohm-cm)**	**(mg/kg)**	**(wt%)**	**(mg/kg)**	**(wt%)**	
DYB-01 Bulk	0.0-5.0	32,830	13,400	30	0.0030	30	0.0030	8.69
DYB-03 Bulk	0.0-5.0	22,780	7,370	21	0.0021	21	0.0021	8.66
DYB-05 Bulk	0.0-5.0	45,560	12,060	18	0.0018	24	0.0024	8.89

Unk = Unknown
NT = Not Tested
ND = 0 = Not Detected
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
Chemical Analysis performed on 1:3 Soil-To-Water extract

Please call if you have any questions.

Prepared by,

Ernesto Padilla, BSME
Field Engineer

Respectfully Submitted,

Eddie Hernandez, M.Sc., P.E.
Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
California No. M37102
ehernandez@projectxcorrosion.com

PLATE
C20

Soil Analysis Lab Results

Client: HAI
Job Name: Pico Rivera Bikeway
Client Job Number: DYAL-18-025-2
Project X Job Number: S190201B
February 6, 2019

	Method	ASTM G187		ASTM D516		ASTM D512B		ASTM G51
Bore# / Description	**Depth**	**Resistivity**		**Sulfates**		**Chlorides**		**pH**
		As Rec'd	**Minimum**					
	(ft)	**(Ohm-cm)**	**(Ohm-cm)**	**(mg/kg)**	**(wt%)**	**(mg/kg)**	**(wt%)**	
DYB-06A Bulk	0.0-5.0	9,380	2,546	60	0.0060	18	0.0018	7.97

Unk = Unknown
NT = Not Tested
ND = 0 = Not Detected
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
Chemical Analysis performed on 1:3 Soil-To-Water extract

Please call if you have any questions.

Prepared by,

Nathan Jacob
Lab Technician

Respectfully Submitted,

Eddie Hernandez, M.Sc., P.E.
Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
California No. M37102
ehernandez@projectxcorrosion.com

REGISTERED PROFESSIONAL ENGINEER
EDUARDO HERNANDEZ
No. M37102
MECHANICAL
STATE OF CALIFORNIA

PLATE
C21

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QUALITY CONTROL REVIEWER

Saroj Weeraratne, PhD, PE, GE
Associate Engineer

BH/SN:sjd/dr