KOURY
ENGINEERING
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GEOTECHNICAL & SEISMIC ENGINEERING,
CONSTRUCTION INSPECTION &
MATERIALS TESTING SERVICES

March 16, 2018
Project No. 18-0158

Mr. John R. Burroughs, LEED AP, President
Commerce Construction Co., L.P.
13191 Crossroads Parkway North 6th Floor
City of Industry, CA 91746

Subject: Limited Borrow Site Feasibility Study
Alternative Borrow Site 6
SEC of East County Road and Chino Corona Road
City of Chino, California

Dear Mr. Burroughs:

Presented herein are our preliminary findings and conclusions regarding the suitability of the Borrow Site 6 soils to be used as engineered fill to balance the grade for the OC Prado site construction located on the southeast corner of Bickmore Avenue and Mountain Avenue in the City of Chino.

Based on the conceptual grading plan, the proposed rectangular shaped Borrow Site 6 covers an area of about 485,000 square feet or roughly 11 acres. The site is bounded by Chino Corona Road to the north, East County Road to the west, one retention pond to the south and two other retention ponds to the east. A Site Vicinity Map with approximate ground contour elevations is presented in Appendix A as Figure A-1. The site is owned by the County of Orange Flood Control District.

Field Exploration and Laboratory Testing for Feasibility Study

The field exploration program for the feasibility study consisted of excavating twelve test pits. A rubber tire mounted backhoe was used to excavate the 12 test pits ranging in depths from about 15 to 17½ feet. The locations of the test pits are shown on the Field Exploration Map, Figure A-2, presented in Appendix A. Bulk samples were obtained from the test pits for laboratory testing.

Laboratory tests, including moisture content, #200 sieve wash, expansion index, maximum density, pocket penetrometer and plasticity index were performed to aid in the classification of the materials encountered and to evaluate their engineering properties. Sulfates, chlorides, resistivity, and PH tests (corrosivity tests) were also performed on selected samples. The results of pertinent laboratory tests are presented on the boring logs in Appendix B, and/or in Appendix C.

Site Geology

The site is located within the Upper Santa Ana River Valley, which consists of a series of coalescing alluvial fans formed by streams flowing out of the San Gabriel Mountains to the north. The valley lies within the Peninsular Ranges geomorphic province, which is characterized by alluviated basins, elevated erosion surfaces, and northwest-trending mountain ranges bounded by northwest trending faults. The site, which is located within the Chino Basin, is underlain by sediments deposited by the Santa Ana River and its tributaries such as the Chino Creek.

Morton and Miller (2006) show the site to be underlain by very old alluvial-fan deposits (See Figure A-3 in Appendix A). The sediments encountered during the subsurface investigation consisted predominantly of clay.

Surface Site Conditions

At the time of the subsurface investigation, the site was accessible through gated driveways along Chino Corona Road, East County Road, and along unfenced areas adjacent to East County Road. Except for localized areas where concrete was exposed, the ground surface exposed bare soils. There were some concrete slabs remaining at the southwest corner of the site and near the south eastern boundary along with an asphalt paved driveway in the northeastern portion of the site. The site has been cleared of trees, past structures such as buildings, animal shelters, and other above ground ancillary facilities; however, it appears that some foundations may remain below the ground surface.

The site generally slopes to the south between about elevations 563 and 555 feet except for the south end of the site that has a 10-foot high slope dipping toward the existing retention pond. The conceptual plan indicates a proposed 20-feet setback from Chino Corona Road and East County Road followed by slopes at an inclination of 4:1 (H:V). The proposed grades at the toe of the slope will range from about elevation 552 feet at the north end and 544 feet at the south end, which correspond to cuts of about 10 to 12 feet.

Soil Conditions

The subsurface soil profile consists generally of artificial fill underlain by alluvial deposits. For the most part, the fill is generally on the order of one foot thick except for the former area of buildings/structures and underground utilities where 6 feet of fill was encountered in Test Pit 12. The fill derived from onsite shallow soils consists predominantly of lean clay with sand and sandy lean clay.

The alluvium soils consist predominantly of stiff to very stiff medium plastic to high plastic sandy clay and clay with sand. Some discrete layers of silty sand, clayey sand, and poorly graded sand with silt were encountered in Test Pit 3 at depths of 9 to 10 feet, in Test Pit 6 at 15 to 16½ feet, in Test Pit 9 at 11½ to 13 and at 15 to 17½ feet, and in Test Pit 11 at 10½ to 16 feet.

The moisture contents of clay soils are highly variable, ranging from about 12 to 37 percent with an average of about 21 percent while the silty sand and clayey sand moisture contents range from

about 9½ to 12½ percent with an average of about 11 percent. Based on two maximum density tests performed and prior experience with similar soils, many of the clay sample moisture contents are about 8 to 12 percent above optimum for the soils sampled at depths between 4 and 12 feet below the ground surface.

The fine contents range from about 50 to 87 percent with an average of about 64½ percent for clay and from about 15 to 32 percent with an average of about 23½ percent for silt and clayey sand. The average relatively low fine contents of the clay soils are attributed to the presence of concretions (hard matter formed by precipitation of mineral cement between particles), which was observed in many of the clay samples. The pocket penetrometer tests indicate unconfined compression strength on the order of 2 to 4.5 tsf with an average of about 3.8 tsf.

Table 1 – Maximum Density and Plasticity Index

Test Pit Number	TP-6 @ 10 to 11 feet	TP-11 @ 8 to 9 feet
Maximum Dry Density (pcf)	102.6	112.4
Optimum Moisture Content (%)	19.9	15.5
Liquid Limit	54	53
Plastic Limit	29	23
Plasticity Index	25	30

To aid in the soil classification and to correlate the soil plasticity with the soil expansion, two plasticity index tests (Atterberg Limits) were performed on samples of Test Pits 6 and 11 at depths of 8 to 11 feet. As shown in Table 1, the liquid limits exceed 50, which indicate high plasticity for the two samples tested.

The site soil expansion potential ranges from very low to very high. Table 2 presents the data for 15 tests sampled at depths ranging from 1 to 14 feet. These tests indicate expansion index variation from 20 to 180. Within the upper 4 feet, the test data obtained to date indicate expansion indices ranging between 20 and 45 and moisture contents between about 13 and 19 with an average of about 16½ percent. Except for Test Pit 2, at depths of 4 to 5 feet and Test Pit 5 at depths of 6-8 feet that contained abundant concretions, all the expansion index tests performed on samples at depth greater than 4 feet indicated expansion indices greater than 76. Excluding the upper 4 feet of soils and the samples with high concentrations of concretions, the average expansion index is about 132, which is very high.

The moisture contents of the clay below a depth of 4 feet range predominantly between 22 and 37 percent with an average of about 27 percent. On average, this moisture content is about 8 to 12 percent above optimum; however, some samples have moisture contents up to about 15 to 17 percent above optimum.

Table 2 – Expansion Index Test Results

Test Pit	TP-2	TP-3	TP-5	TP-5	TP-6	TP-6	TP-6	TP-6	TP-7	TP-8	TP-9	TP-11	TP-11	TP-11	TP-12
Depth (ft)	**4-5**	**2-3**	**1-2**	**6-8**	**1.5-2**	**5.5-6**	**10-11**	**13-14**	**1-2**	**4.5-5**	**10-11**	**1-2**	**5-6**	**8-9**	**8.5-9.5**
Expansion	57	28	31	49	38	107	108	151	20	76	158	45	132	180	148
Moisture	22.8	19.3	15.7	26.4	13.8	26.4	36.9	34.3	16.9	21.9	30.5	16.4	22.3	24.9	27.0
Fines	73	51	73	66	66	71	69	78	76	71	87	65	70	64	83

There is a rough correlation between in situ natural moisture content at depth and expansion index. For the same amounts of fines, site soils with higher moisture and higher plasticity index tend to have higher expansion index.

Groundwater

No groundwater was encountered in the excavated test pits

Corrosivity

The corrosivity tests performed indicates that the site soils are generally severely corrosive to metal. However, the tests performed did not indicate high corrosivity to concrete. The corrosivity test results are summarized in the following Table 3.

Table 3 - Corrosion Test Results

Boring	Depth (ft)	Minimum Resistivity (ohm-cm)	pH	Soluble Sulfate Content (ppm)	Soluble Chloride Content (ppm)
TP-11	5.0 - 6.0	446	7.5	203	425
TP-12	1.5-2.5	717	7.6	322	170

Conclusions and Recommendations

Based on the data collected from the field to date, it appears feasible to import some material from Borrow Site 6 to use at the OC Prado site. However, it appears that only the upper 4 feet of soils (once well blended) could be suitable for foundation support. Some silty sand and clayey sands were encountered in the southwest corner of the site (mostly in TP-6, TP-9, and TP-11) at depths of about 15 to 17 feet (end of test pits). However, based on the conceptual plan, the proposed basin depth is only 10 to 12 feet and the sands encountered are generally deeper than these depths.

The other soils tested between the depths of 4 feet and the proposed design bottom of the borrow site are generally undesirable from a geotechnical standpoint due to their high moisture content

(average of about 27%), high plasticity and high to very high expansion potential (EI average of 132).

If this borrow site is further considered for import, we recommend that additional test pits be excavated to confirm the preliminary findings, especially within the zone selected for import.

CLOSURE

The findings and recommendations presented in this report were based on the results of our field and laboratory investigations, combined with professional engineering experience and judgment. The report was prepared in accordance with generally accepted engineering principles and practice. We make no other warranty, either expressed or implied. Subsurface variations between and beyond the test pits should be anticipated. Samples obtained during this investigation will be retained in our laboratory for a period of 45 days from the date of this report and will be disposed after this period.

Should you have any questions concerning this submittal, or the recommendations contained herewith, please do not hesitate to call our office.

Respectfully submitted,

KOURY ENGINEERING & TESTING, INC

Jacques B. Roy, PE, GE
Principal Engineer

Distribution: 1. Addressee (a pdf copy via e-mail)
2.File (B)

APPENDICES

Appendix A: Maps and Plans

Vicinity Map – Figure A-1
Field Exploration Map – Figure A-2
Geology Map – Figure A-3

Appendix B: Field Exploratory Test Pits

Test Pits 1 through 12

Appendix C: Laboratory Test Results

REFERENCES

1. California Division of Mines and Geological Survey, 1998, Seismic Hazard Zone Report 045 for the Prado Dam 7.5 Minute Quadrangle, California.

2. California Division of Mines and Geological Survey, 2003, Earthquake Fault Zones, Prado Dam Quadrangle, May 1, 2003.

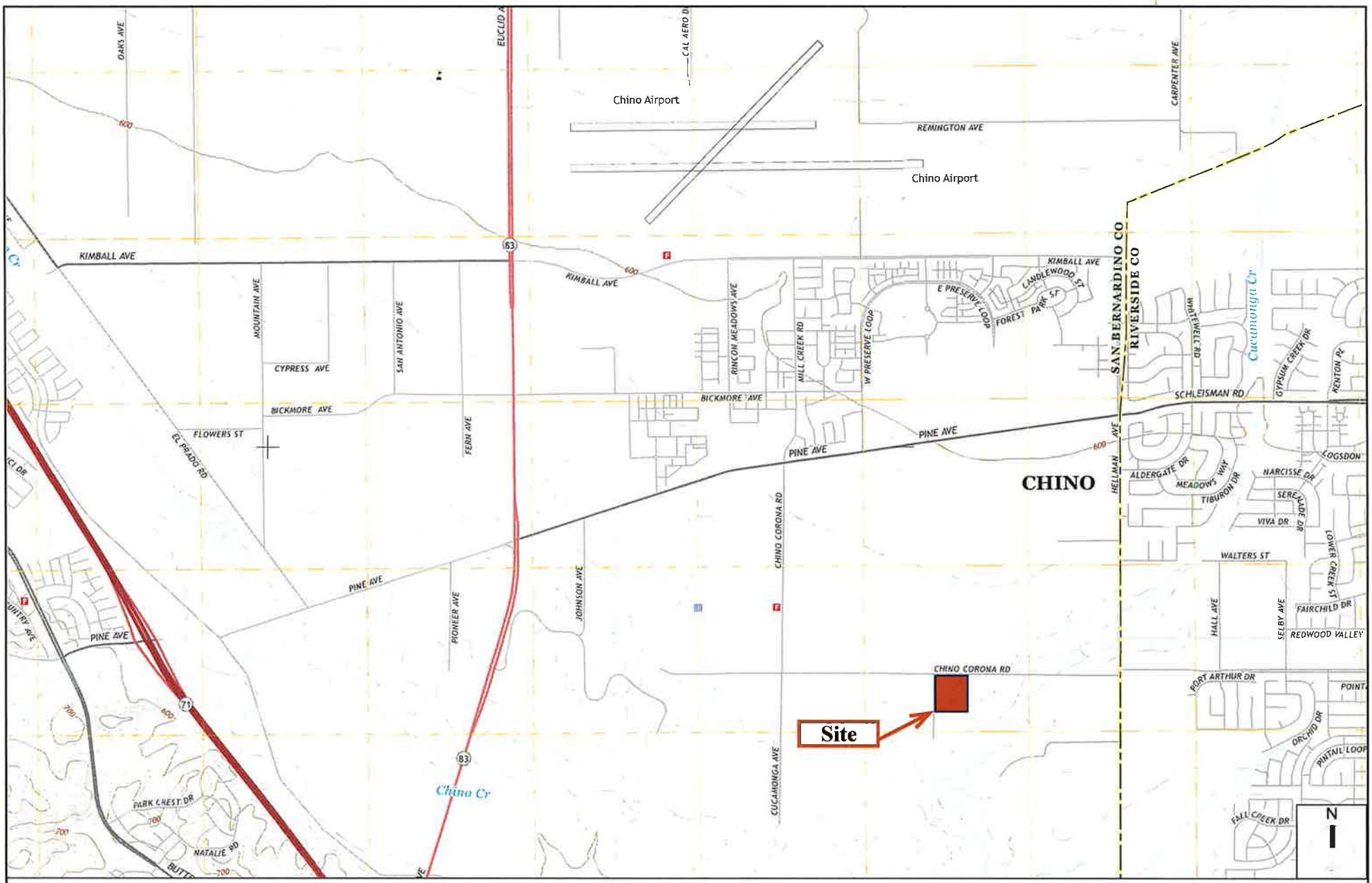
3. City of Chino General Plan, Safety Element, 2010, Final Report.

4. US Army Corps of Engineers, Geotechnical Investigations, Engineering Manual EM 1110-1-1804, dated 8/26/86.

5. US Army Corps of Engineers, Laboratory Soils Testing, Engineering Manual EM 1110-2-1906, dated 8/26/86.

APPENDIX A

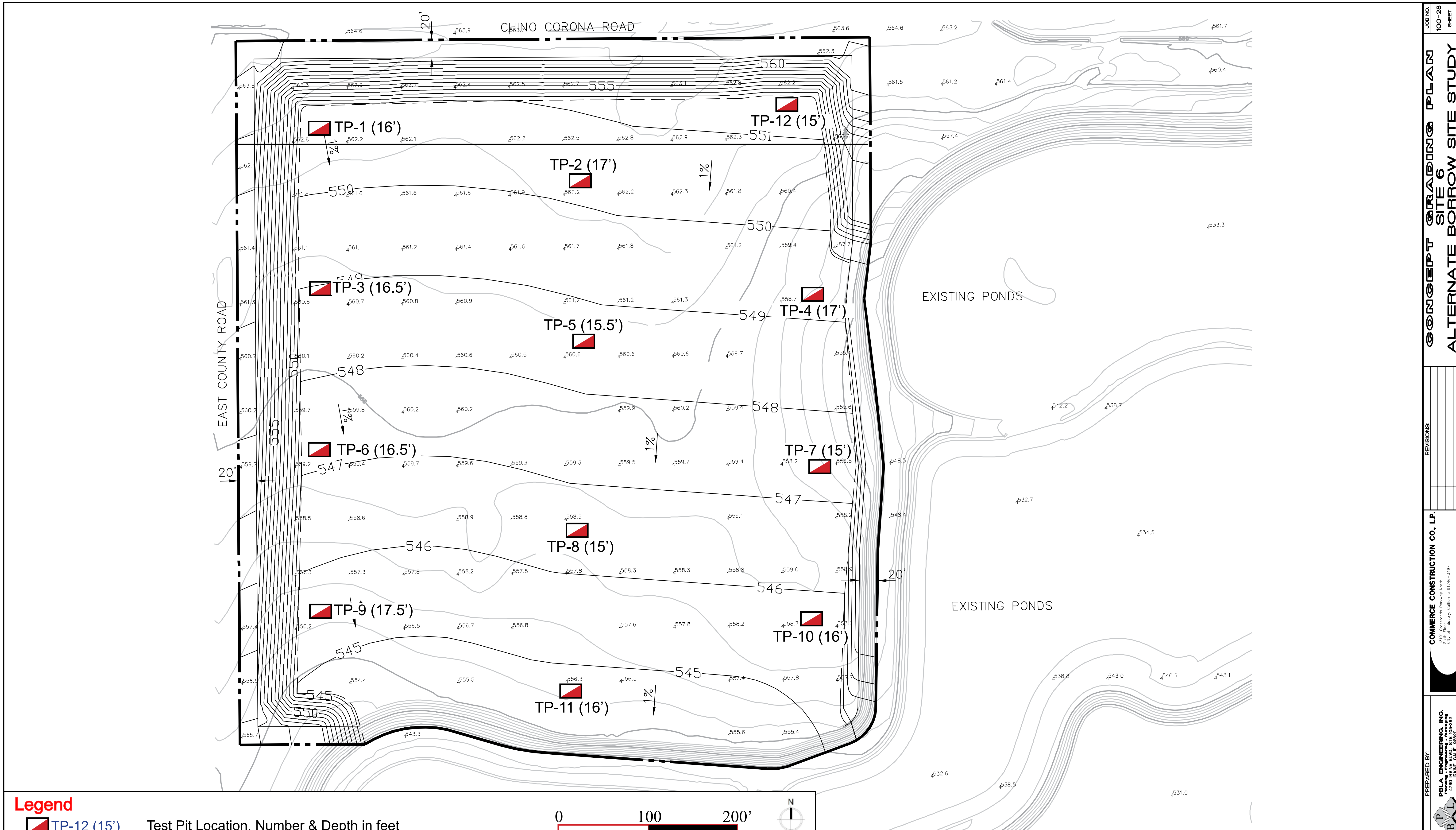
Maps and Plans



Reference: USGS Topographic Map, Prado Dam & Corona North Quadrangles, California, 7.5 Minute Series 2015 - Contour Interval 20 feet, NAVD of 1988

0 1/2 1 Mile

KOURY ENGINEERING & TESTING, INC.	Project Name: **Alternative Borrow Site Chino Corona Road & East County Road**	Project No.: **18-0158** Date: **March 2018**	Drawing Title: **Vicinity Map**	Figure: **A-1**

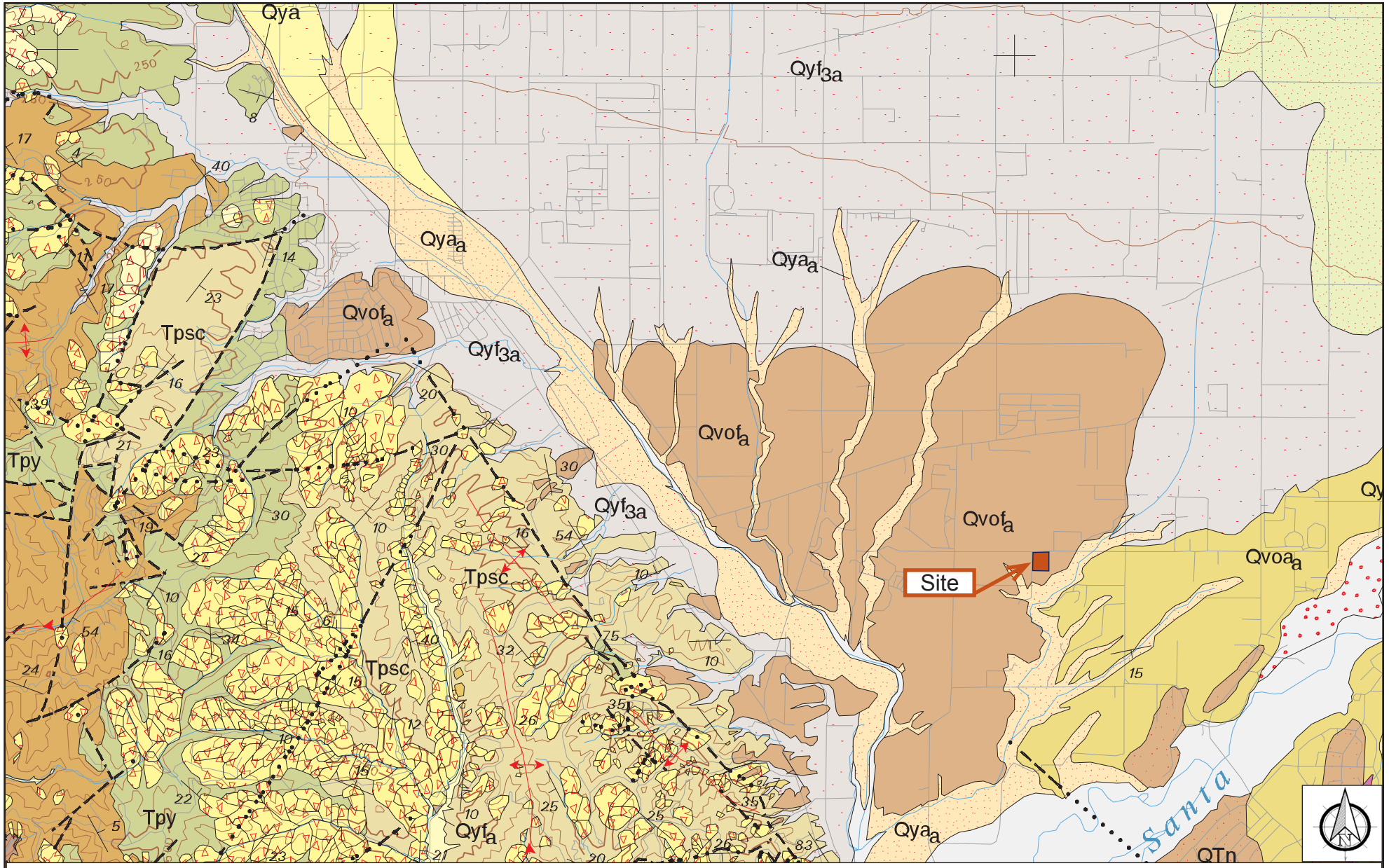


Legend

TP-12 (15') Test Pit Location, Number & Depth in feet

KOURY ENGINEERING & TESTING, INC.

Project Name:	Project No.: 18-0158	Drawing Title:	Figure:
Alternative Borrow Site Chino Corona Road & East County Road	Date: March 2018	Test Pit Exploration Map	A-2



LEGEND

Qvof — Very old alluvial-fan deposits

Qya — Young alluvial-valley deposits

0 1 2 Mile

Reference: Geologic Map of the San Bernardino & Santa Ana 30´x60´ Quadrangle California-Version 1.0 Compiled by Douglas M. Morton and Fred K. Miller, 2006

KOURY ENGINEERING & TESTING, INC.

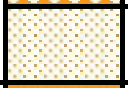
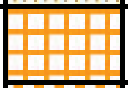
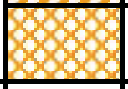
Project Name:	Project No.:	Drawing Title:	Figure:
Alternative Borrow Site Chino Corona Road & East County Road	18-0158 Date: March 2018	Geology Map	A-3

APPENDIX B

Field Exploratory Test Pits

KEY TO LOGS

SOILS CLASSIFICATION

MAJOR DIVISIONS			GRAPHIC LOG	USCS SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN 50% OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS LESS THAN 5% 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 MORE THAN 12% FINES		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS 50% OR MORE OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS LESS THAN 5% FINES		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES MORE THAN 12% FINES		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS 50% OR MORE OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS 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 IS 50 OR MORE			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR GRAVELLY ELASTIC SILTS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

GRAIN SIZES

SILT AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		
SIEVE SIZES	#200	#40	#10	#4	3/4"	3"	12"

KEY TO LOGS (continued)

SPT/CD BLOW COUNTS VS. CONSISTENCY/DENSITY					
FINE-GRAINED SOILS (SILTS, CLAYS, etc.)			**GRANULAR SOILS (SANDS, GRAVELS, etc.)**		
CONSISTENCY	***BLOWS/FOOT**		**RELATIVE DENSITY**	***BLOWS/FOOT**	
	SPT	**CD**		**SPT**	**CD**
SOFT	0-4	0-4	VERY LOOSE	0-4	0-8
FIRM	5-8	5-9	LOOSE	5-10	9-18
STIFF	9-15	10-18	MEDIUM DENSE	11-30	19-54
VERY STIFF	16-30	19-39	DENSE	31-50	55-90
HARD	over 30	over 39	VERY DENSE	over 50	over 90

* CONVERSION BETWEEN CALIFORNIA DRIVE SAMPLERS (CD) AND STANDARD PENETRATION TEST (SPT) BLOW COUNT HAS BEEN CALCULATED USING "FOUNDATION ENGINEERING HAND BOOK" BY H.Y. FANG. (**VALUES ARE FOR 140 Lbs HAMMER WEIGHT ONLY**)

DESCRIPTIVE ADJECTIVE VS. PERCENTAGE	
DESCRIPTIVE ADJECTIVE	**PERCENTAGE REQUIREMENT**
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

*THE FOLLOWING "DESCRIPTIVE TERMINOLOGY/ RANGES OF MOISTURE CONTENTS" HAVE BEEN USED FOR MOISTURE CLASSIFICATION IN THE LOGS.

APPROXIMATE MOISTURE CONTENT DEFINITION	
DEFINITION	**DESCRIPTION**
DRY	Dry to the touch; no observable moisture
SLIGHTLY MOIST	Some moisture but still a dry appearance
MOIST	Damp, but no visible water
VERY MOIST	Enough moisture to wet the hands
WET	Almost saturated; visible free water

Boring Log

KOURY ENGINEERING & TESTING, INC.

Project No. : 18-0158
Project Name : Borrow Site 4

Test Pit No. : 1

Sheet : 1 of : 1

Drilling Method : Backhoe
Sampling Method : Bulk
Hammer Weight : **Drop Height :**
Location : See Figure A-2

Ground Elevation:
Drilling Co. : Gilstrap
Date Drilled : 2-22-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0				**Fill: Lean CLAY with SAND;** moist, brown	
1	12.2						CL	**ALLUVIUM:** **Lean CLAY with SAND;** stiff, moist, brown	#200 Wash Fines = 82%
2	3.6			5			CL/CH	**Sandy Lean to Fat CLAY;** stiff, some concretions, moist to very moist, light yellowish brown	#200 Wash Fines = 72%
3	17.1							Aubundant concretions, very pale brown with white	#200 Wash Fines = 50%
4	17.4			10					#200 Wash Fines = 50%
5	23.0						CH	**Fat CLAY with SAND;** minor concretions, stiff, moist to very moist, brown with white	#200 Wash Fines = 80% PP = 3.0 tsf
6	16.1			15			CL/CH	**Lean to Fat CLAY;** stiff, concretions, moist, light yellowish brown	Fines = 65% PP = 2.5-3 tsf
7	19.9								Fines = 66%
								End of test pit @ 16' No groundwater encountered	
				20					
				25					
				30					
				35					
				40					

Bulk ☒ CD ■ SPT ☒

Boring Log

KOURY ENGINEERING & TESTING, INC.

Project No. 18-0158 **Project Name :** Borrow Site 4

Test Pit No. : 2

Sheet : 1 **of :** 1

Drilling Method : Backhoe

Sampling Method : Bulk

Ground Elevation:

Hammer Weight : **Drop Height :**

Drilling Co. : Gilstrap

Location : See Figure A-2

Date Drilled : 2-22-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0			CL	**Fill: Sandy Lean CLAY;** moist, brown	
								ALLUVIUM: **Sandy Lean CLAY;** stiff**,** moist, brown	
1	22.8			5			CL/CH	**Sandy Lean to Fat CLAY;** concretions, moist to very moist, very pale brown	#200 Wash Fines = 73% EI = 57
2	24.9			10					#200 Wash Fines = 70%
3	18.7			15				Yellowish brown	#200 Wash Fines = 61% PP = 2.0 tsf
4	17.5								#200 Wash Fines = 59%
				20				End of test pit @ 17' No groundwater encountered	
				25					
				30					
				35					
				40					

Bulk ☒ CD ■ SPT ☒

Boring Log

KOURY ENGINEERING & TESTING, INC.

Project No. 18-0158 **Project Name :** Borrow Site 4

Test Pit No. : 3

Sheet : 1 **of :** 1

Drilling Method : Backhoe

Sampling Method : Bulk

Ground Elevation:

Hammer Weight : **Drop Height :**

Drilling Co. : Gilstrap

Location : See Figure A-2

Date Drilled : 2-22-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0				**Fill: Sandy Lean CLAY;** moist, brown	
1	14.5						CL	**ALLUVIUM:**	#200 Wash
2	19.3							**Sandy Lean CLAY; trace of concretions, very** stiff, moist, pale brown	Fines = 55% EI = 28 Fines = 51% PP = 4-4.5 tsf
				5			CL/CH	**Sandy Lean to Fat CLAY; very** stiff, abundant concretions, moist, very pale brown with white	
3	17.8								#200 Wash Fines = 55% PP = 4.5 tsf
									#200 Wash Fines = 61%
4	10.2						SC	**Clayey SAND;** trace to little gravel, moist, yellowish brown	Fines = 32%
5	16.2			10			CL/CH	**Sandy Lean to Fat CLAY;** concretions, moist, dark yellowish brown	Fines = 51% PP = 3.5 tsf
6	32.7								Fines = 50% PP = 2-4 tsf
				15			CH	**Sandy Fat CLAY;** stiff, very moist, yellowish brown with dark brown	
7	34.1								#200 Wash Fines = 51% PP = 2.5 - 3 tsf
								End of test pit @ 16' 6" No groundwater encountered	
				20					
				25					
				30					
				35					
				40					

Bulk ☒ CD ■ SPT ☒

Boring Log

KOURY ENGINEERING & TESTING, INC.

Project No. 18-0158 **Project Name :** Borrow Site 4

Test Pit No. : 4

Sheet : 1 **of :** 1

Drilling Method : Backhoe

Sampling Method : Bulk

Ground Elevation:

Hammer Weight : **Drop Height :**

Drilling Co. : Gilstrap

Location : See Figure A-2

Date Drilled : 2-22-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0				**Fill: Sandy Lean CLAY;** stiff brown.	
1	13.8						CL	**ALLUVIUM:** **Sandy Lean CLAY;** very stiff, moist, brown	#200 Wash Fines = 61% PP= 4 - 4.5 tsf
2	19.5			5			CL/CH	**Sandy Lean to Fat CLAY;** abundant concretions, moist, very pale brown	#200 Wash Fines = 51%
3	19.4							abundant concretions	#200 Wash Fines = 55%
4	23.9			10				yellowish brown	#200 Wash Fines = 55%
5	17.6							brown and strong brown	#200 Wash Fines = 58% PP=3.5-4.5 tsf
6	22.4			15				**Lean to Fat CLAY with SAND;** stiff to very stiff, moist to very moist, olive	#200 Wash Fines = 76% PP= 3.5 tsf
				20				End of test pit @ 17' No groundwater encountered	
				25					
				30					
				35					
				40					

▽ Bulk ☒ CD ■ SPT ☒

Boring Log

KOURY ENGINEERING & TESTING, INC.

Project No. 18-0158 **Project Name :** Borrow Site 4

Test Pit No. : 5

Sheet : 1 **of :** 1

Drilling Method : Backhoe

Sampling Method : Bulk

Ground Elevation:

Hammer Weight : **Drop Height :**

Drilling Co. : Gilstrap

Location : See Figure A-2

Date Drilled : 2-22-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0				**Fill: Sandy Lean CLAY;** stiff, moist	
1	15.7						CL	**ALLUVIUM:** **Sandy Lean CLAY;** concretions, very stiff, moist, brown	Fines = 73% EI = 31 PP= 3 - 4.5 tsf
				5			CL/CH	**Sandy Lean to Fat CLAY;** stiff, abundant concretions, stiff to very stiff, moist to very moist, pale brown	
2	26.4								#200 Wash Fines = 66% EI = 49 PP= 2.5- 3.5 tsf
3	30.9			10			CH	**Fat CLAY with SAND;** concretions, stiff, moist to very moist, dark yellowish brown.	#200 Wash Fines = 84%
4	27.6						CL/CH	**Sandy Lean to Fat CLAY;** stiff to very stiff, moist to very moist, brown	#200 Wash Fines = 51% PP= 3- 4.5 tsf
5	17.8			15				dark yellowish brown with white inclusions	#200 Wash Fines =66% PP= 4.5 tsf
								End of test pit @ 15' 6" No groundwater encountered	
				20					
				25					
				30					
				35					
				40					

▽ Bulk ⊠ CD ■ SPT ⊠

Boring Log

KOURY ENGINEERING & TESTING, INC.

Project No. 18-0158 **Project Name :** Borrow Site 4

Test Pit No. : 6

Sheet : 1 **of :** 1

Drilling Method : Backhoe

Sampling Method : Bulk

Hammer Weight : **Drop Height :**

Location : See Figure A-2

Ground Elevation:

Drilling Co. : Gilstrap

Date Drilled : 2-22-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0				**Fill: Sandy Lean CLAY;** stiff, dark brown	
1	13.8				☒		CL	**ALLUVIUM:** **Sandy Lean CLAY;** stiff, moist, dark brown	#200 Wash Fines = 65% EI = 38
2	17.7			5	☒		CL/CH	**Sandy Lean to Fat CLAY;** stiff, concretions, moist, brownish yellow	#200 Wash Fines = 50%
3	26.4				☒			light olive brown with white, moist to very moist	#200 Wash Fines = 71% EI= 107
4	20.8				☒				#200 Wash Fines = 51%
5	25.3				☒			brown, layers of dark yellowish brown silty sand	#200 Wash Fines = 54%
6	36.9			10	☒		CH	**Sandy Fat CLAY;** very stiff, very moist, yellowish brown LL= 54 PL= 29 Max Density = 102.6 pcf Opt Moisture = 19.9%	#200 Wash Fines = 69% EI= 108 PP= 3.5 - 4.5 tsf
7	34.3				☒			**Fat CLAY with SAND;** very stiff, moist to very moist, light yellowish brown	#200 Wash Fines = 78% EI= 151 PP= 4.5 tsf
8	10.5			15	☒		SM	**Silty SAND;** fine to coarse, trace to little gravel, moist, light olive brown	#200 Wash Fines = 19%
9					☒				
				20				End of test pit @ 16' 6" No groundwater encountered	
				25					
				30					
				35					
				40					

Bulk ☒ CD ■ SPT ☒

Boring Log

KOURY ENGINEERING & TESTING, INC.

Project No. 18-0158 **Project Name :** Borrow Site 4

Test Pit No. : 7

Sheet : 1 **of :** 1

Drilling Method : Backhoe

Sampling Method : Bulk

Ground Elevation:

Hammer Weight : **Drop Height :**

Drilling Co. : Gilstrap

Location : See Figure A-2

Date Drilled : 2-22-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0				**Fill: Sandy Lean CLAY;** stiff, dark brown.	
1	16.9						**CL**	**ALLUVIUM:** **Lean CLAY with SAND;** concretions, stiff, moist, brown	Fines = 76% EI= 20
2	19.2			5			**CL/CH**	**Sandy Lean to Fat CLAY;** abundant concretions, stiff, moist, pale brown with white	#200 Wash Fines = 50%
3				10				yellowish brown	PP= 3- 3.5 tsf
4	16.2						**CL**	Sandy Lean CLAY; stiff to very stiff, moist, strong brown with light yellowish brown and black	Fines = 60% PP= 3 - 3.5 tsf
5 6	17.2 20.2						**CL/CH**	**Sandy Lean to Fat CLAY;** very stiff to hard, moist, mottled brown to light olive brown	Fines = 63% PP= 4- 4.5 tsf Fines = 69%
				15				End of test pit @ 15' No groundwater encountered	
				20					
				25					
				30					
				35					
				40					

Bulk ☒ CD ■ SPT ☒

Boring Log

KOURY ENGINEERING & TESTING, INC.

Project No. 18-0158 **Project Name :** Borrow Site 4

Test Pit No. : 8

Sheet : 1 **of :** 1

Drilling Method : Backhoe

Sampling Method : Bulk

Hammer Weight : **Drop Height :**

Location : See Figure A-2

Ground Elevation:

Drilling Co. : Gilstrap

Date Drilled : 2-22-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0				**Fill: Lean CLAY with SAND;** stiff, brown	
1	16.4				⊠		CL	**ALLUVIUM:** **Lean CLAY with SAND;** trace of gravel, very stiff, moist, brown	#200 Wash Fines = 82%
2	16.0			5	⊠		CL/CH	**Sandy Lean to Fat CLAY;** concretions, moist, pale brown	#200 Wash Fines = 50% EI = 76
3	21.9				⊠			pale brown with white	Fines = 71%
4	22.2			10	⊠		CH	**Sandy Fat CLAY;** stiff, moist to very moist, light olive brown with white and brown	#200 Wash Fines = 55% PP = 2.5 tsf
5	17.7				⊠		CL/CH	**Sandy Lean to Fat CLAY;** concretions, very stiff, moist, light yellowish brown with white concretions	Fines = 51% PP = 4.5 tsf
				15				End of test pit @ 15' No groundwater encountered	
				20					
				25					
				30					
				35					
				40					

Bulk ⊠ CD ■ SPT ⊠

Boring Log

KOURY ENGINEERING & TESTING, INC.

Project No. 18-0158 **Project Name :** Borrow Site 4

Test Pit No. : 9

Sheet : 1 **of :** 1

Drilling Method : Backhoe

Sampling Method : Bulk

Hammer Weight : **Drop Height :**

Location : See Figure A-2

Ground Elevation:

Drilling Co. : Gilstrap

Date Drilled : 2-22-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0				**Fill: Sandy Lean CLAY;** stiff, brown	
1	14.2				⊠		CL	**ALLUVIUM:** **Lean CLAY with SAND;** concretions, stiff to very stiff, moist, brown	#200 Wash Fines = 76%
2	17.8			5	⊠		CH	**Fat CLAY with SAND;** concretions, very stiff, moist to very moist, very pale brown with yellowish brown and white	#200 Wash Fines = 75% PP = 4 tsf
3	31.4				⊠				#200 Wash Fines = 79%
4	30.5			10	⊠			**Fat CLAY;** very stiff, moist to very moist, light yellowish brown	#200 Wash Fines = 87% PP = 3.5-4 tsf FI = 158
5	9.5				⊠		SM	**Silty SAND;** fine to coarse,trace to little gravel, light yellowish brown	Fines = 15%
6	28.5				⊠		CH	**Fat CLAY with SAND;** thin layers of silty sand, stiff, moist to very moist, light yellowish brown	Fines = 67%
7	12.5			15	⊠		SM	**Silty SAND;** fine to coarse, trace of gravel, moist, light yellowish brown	Fines = 22%
8					⊠		SP-SM	**Poorly Graded SAND with SILT;** fine to coarse, concretions	
								End of test pit @ 17' 6" No groundwater encountered	
				20					
				25					
				30					
				35					
				40					

Bulk ⊠ CD ■ SPT ⊠

Boring Log

KOURY ENGINEERING & TESTING, INC.

Project No. 18-0158 **Project Name :** Borrow Site 4

Test Pit No. : 10

Sheet : 1 **of :** 1

Drilling Method : Backhoe

Sampling Method : Bulk

Ground Elevation:

Hammer Weight : **Drop Height :**

Drilling Co. : Gilstrap

Location : See Figure A-2

Date Drilled : 2-22-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0				**Fill: Lean Clay with SAND**	
1	14.5				⊠		CL	**ALLUVIUM:** **Lean Clay with SAND;** very stiff, moist, brown	#200 Wash Fines = 82% PP = 4-4.25 tsf
2	19.2			5	⊠		CL/CH	**Sandy Lean to Fat CLAY;** concretions, very stiff, moist, light yellowish brown	#200 Wash Fines = 70%
3	20.7			10	⊠			abundant concretions, very pale brown	#200 Wash Fines = 50% PP = 4.5 tsf
4	27.1				⊠		CH	**Sandy Fat CLAY;** concretions, very stiff, light olive brown with white	#200 Wash Fines = 51% PP = 4.5 tsf
5	17.2			15	⊠		CL/CH	**Sandy Lean to Fat CLAY;** very stiff to hard, moist, yellowish brown	#200 Wash Fines = 51% PP = 4.5 tsf
				20				End of test pit @ 16' No groundwater encountered	
				25					
				30					
				35					
				40					

Bulk ⊠ CD ■ SPT ⊠

Boring Log

KOURY ENGINEERING & TESTING, INC.

Project No. 18-0158 **Project Name :** Borrow Site 4

Test Pit No. : 11

Sheet : 1 **of :** 1

Drilling Method : Backhoe

Sampling Method : Bulk

Ground Elevation:

Hammer Weight : **Drop Height :**

Drilling Co. : Gilstrap

Location : See Figure A-2

Date Drilled : 2-22-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0				**Fill: Sandy Lean CLAY;** stiff, brown	
1	16.4				⊠		CL	**ALLUVIUM:** **Sandy Lean CLAY;** stiff, moist, brown	#200 Wash Fines = 65% EI = 45
2	22.3			5	⊠		CH	**Sandy Fat CLAY;** trace of concretions, moist to very moist, brown with white	#200 Wash Fines = 70% EI = 132 Corrosivity
3	24.9				⊠			very stiff, light yellowish brown Max Density 112.4 pcf Optimum 15.5%	#200 Wash Fines = 64% PP = 3.5-4.5 tsf EI = 180 LL=53 PL =23
4	11.9			10	⊠		SC	**Clayey SAND;** trace of gravel and cobbles, concretions, yellowish brown	#200 Wash Fines = 28%
5	12.1				⊠			light olive yellow	#200 Wash Fines = 30%
6	10.8			15	⊠			fine to medium, trace of gravel, light yellowish brown	Fines = 17%
								End of test pit @ 16' No groundwater encountered	
				20					
				25					
				30					
				35					
				40					

Bulk ⊠ CD ■ SPT ⊠

Boring Log

KOURY ENGINEERING & TESTING, INC.

Project No. 18-0158 **Project Name :** Borrow Site 4

Test Pit No. : 12

Sheet : 1 **of :** 1

Drilling Method : Backhoe

Sampling Method : Bulk

Ground Elevation:

Hammer Weight : **Drop Height :**

Drilling Co. : Gilstrap

Location : See Figure A-2

Date Drilled : 2-22-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	13.7			0			CL	**Fill:** **Lean CLAY with SAND;** stiff to very stiff, moist, brown	#200 Wash Fines = 80% PP = 3.5-4.5 tsf Corrosivitv
2	18.8			5			CL/CH	**ALLUVIUM:** **Sandy Lean to Fat CLAY;** abundant concretions, moist, very pale brown	#200 Wash Fines = 64%
3	27.0						CH	**Fat CLAY with SAND;** stiff, moist to very moist, pale brown	#200 Wash Fines = 83% EI=148
4	30.3			10			CL/CH	**Sandy Lean to Fat CLAY;** stiff, moist to very moist, yellowish brown	Fines = 50% LL= 54 PL= 29 Fines = 68% PP = 4-4.5 tsf #200 Wash Fines = 59%
5	23.6								
6	22.7								
7	14.7						CL	**Sandy Lean CLAY;** very stiff, moist, yellowish brown	Fines = 58%
				15				End of test pit @ 15' No groundwater encountered	
				20					
				25					
				30					
				35					
				40					

Bulk ☒ CD ■ SPT ☒

APPENDIX C

Laboratory Test Results

MAXIMUM DENSITY TEST REPORT

Curve No.: 4835 Series

Project No.: 18-0158 **Date:** 3/5/18

Project: Borrow Site #4

Client:

Location: TP-6 @ 10' - 11'

Sample Number: 4835 Series

Remarks: Less than 5% Material retained on the #4 Sieve.

MATERIAL DESCRIPTION

Description: Light Yellowish Brown to Pale Olive Silty Fat Clay

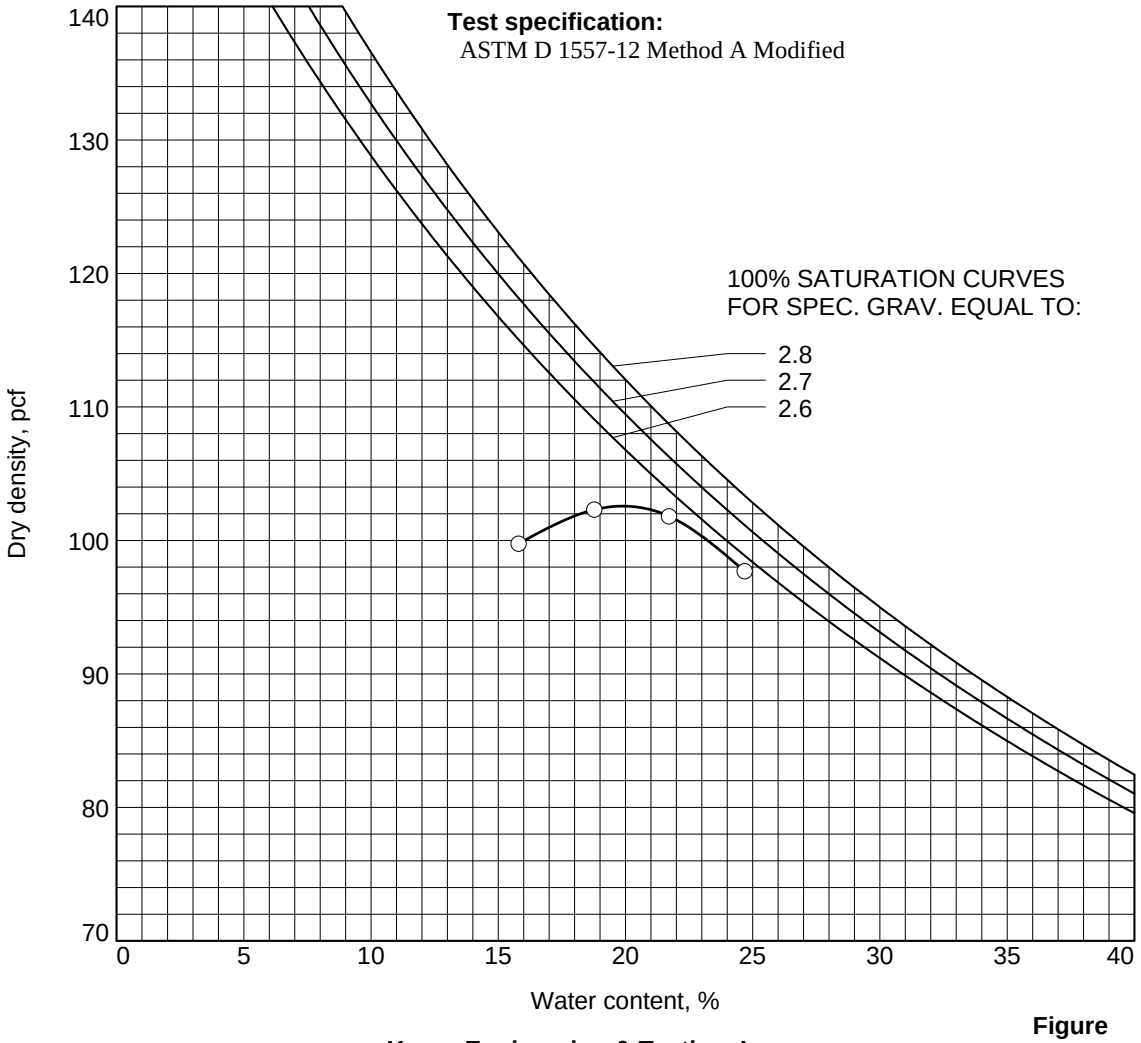
Classifications - **USCS:** CH **AASHTO:**

Nat. Moist. = **Sp.G. =**

Liquid Limit = 54 **Plasticity Index =** 25

% < No.200 =

TEST RESULTS
Maximum dry density = 102.6 pcf
Optimum moisture = 19.9 %



Figure

Koury Engineering & Testing, Inc.

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: Mathew F. Perry **Checked By:** _____

MAXIMUM DENSITY TEST REPORT

Curve No.: 4835 Series

Project No.: 18-0158 **Date:** 3/1/18

Project: Borrow Site #4

Client:

Location: TP-11 @ 8' - 9'

Sample Number: 4835 Series

Remarks: Less than 5% Material retained on the #4 Sieve.

MATERIAL DESCRIPTION

Description: Light Yellowish Brown to Light Olive Brown Fat Clay with Sand

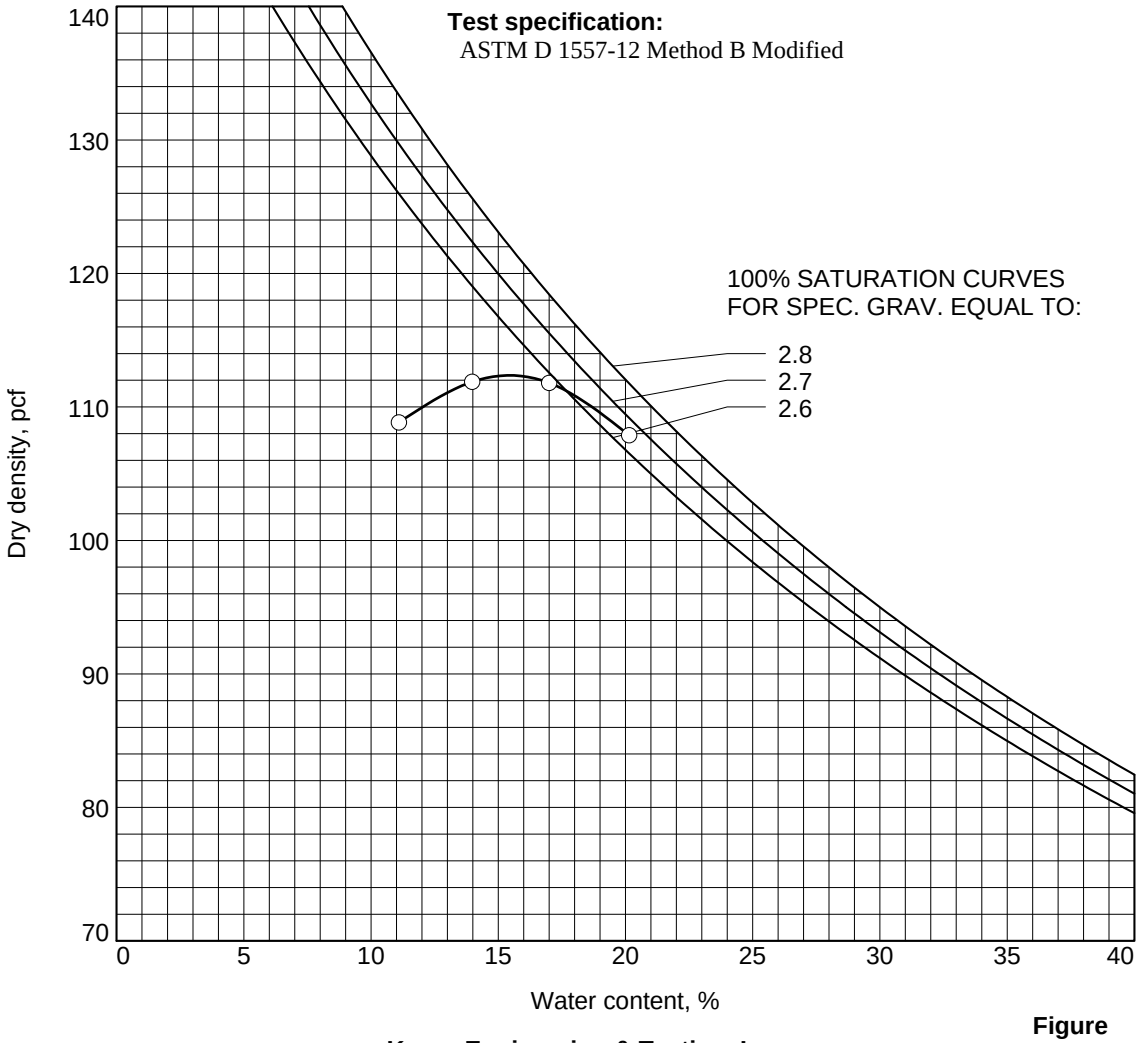
Classifications - **USCS:** CH **AASHTO:**

Nat. Moist. = **Sp.G. =**

Liquid Limit = 53 **Plasticity Index =** 30

% < No.200 =

TEST RESULTS
Maximum dry density = 112.4 pcf
Optimum moisture = 15.5 %



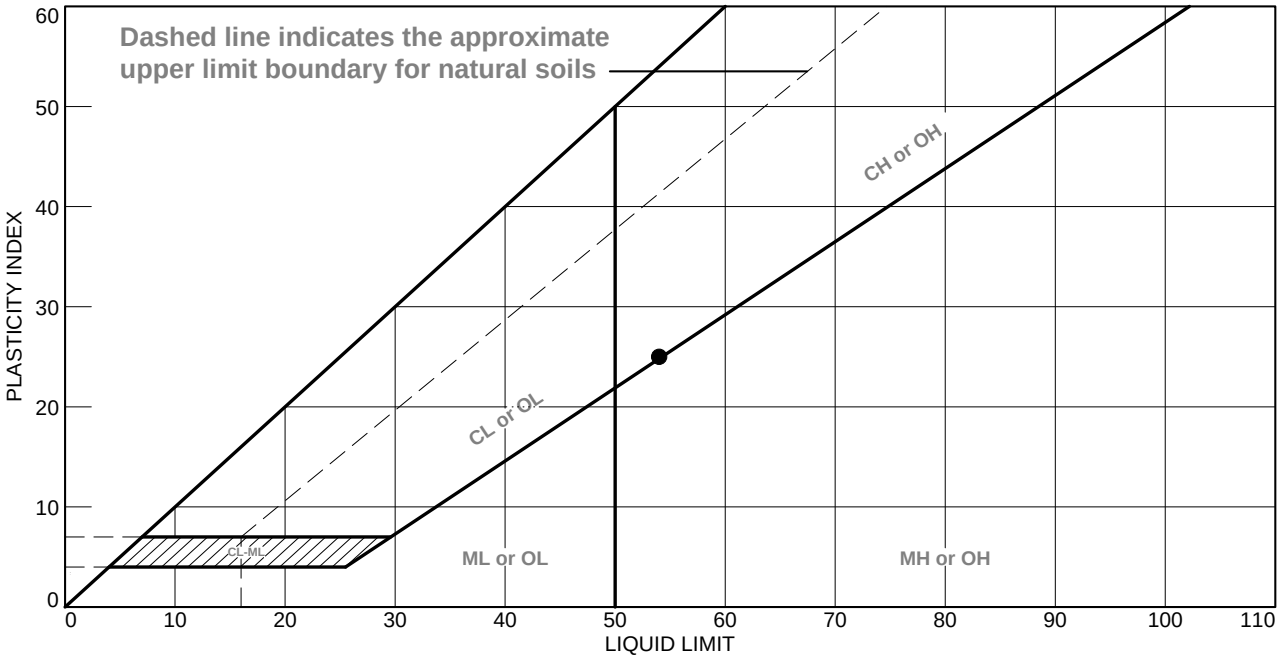
Figure

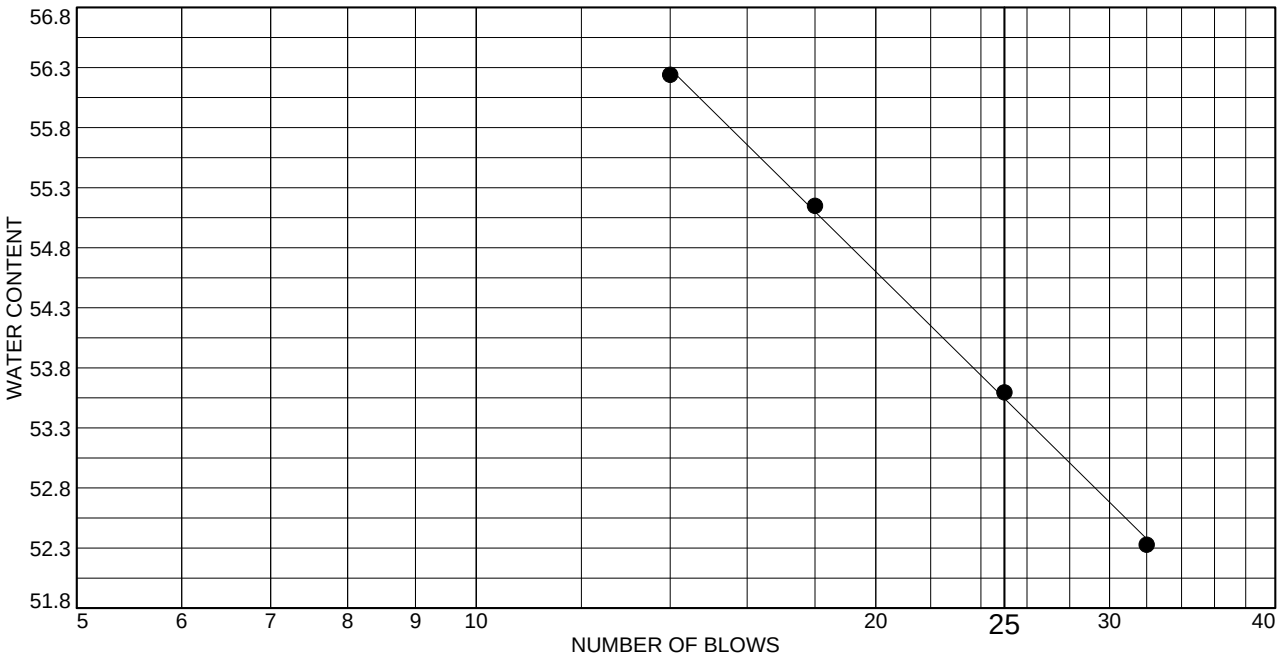
Koury Engineering & Testing, Inc.

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: Mathew F. Perry **Checked By:** _____

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light Yellowish Brown to Pale Olive Silty Fat Clay	54	29	25			CH

Project No. 18-0158 **Client:**

Project: Borrow Site #4

Location: TP-6 @ 10' - 11'
Sample Number: 4835 Series

Koury Engineering & Testing, Inc.

Chino, CA

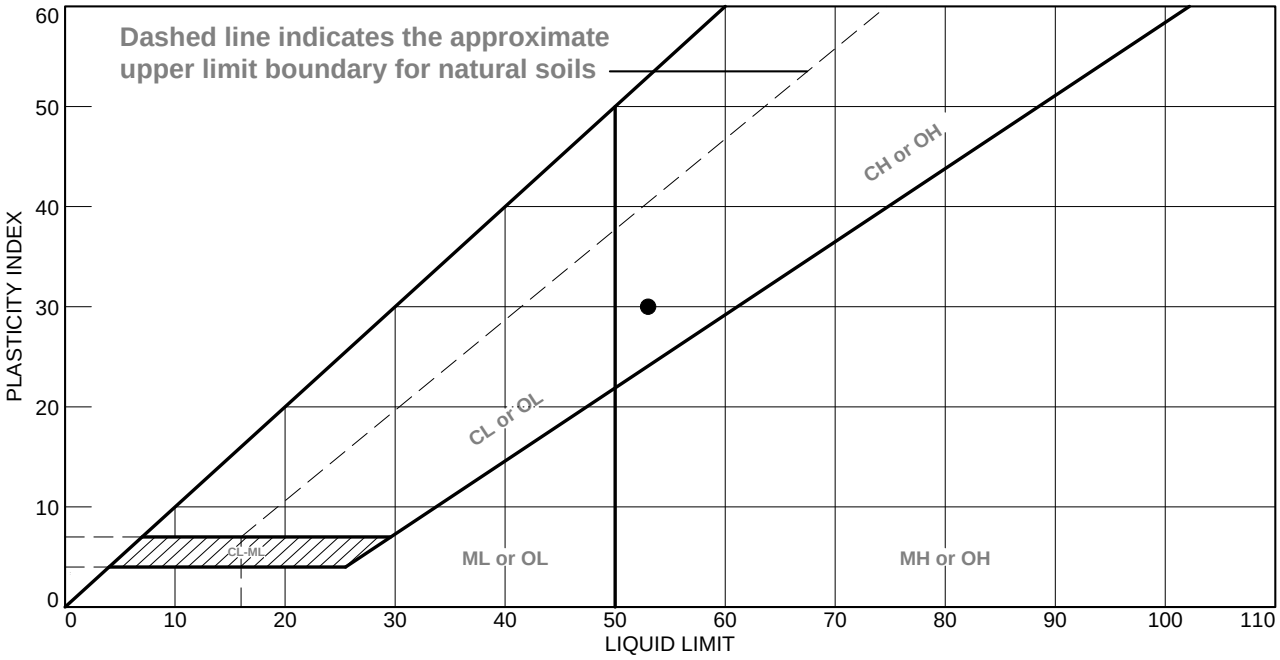
Remarks:
● Lab #4835 Series.

Figure

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: Mathew F. Perry **Checked By:** _____

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light Yellowish Brown to Light Olive Brown Fat Clay with Sand	53	23	30			CH

Project No. 18-0158 **Client:**

Project: Borrow Site #4

Location: TP-11 @ 8' - 9'
Sample Number: 4835 Series

Koury Engineering & Testing, Inc.

Chino, CA

Remarks:
● Lab #4835 Series.

Figure

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: Mathew F. Perry **Checked By:** _____

EXPANSION INDEX TEST RESULTS

ASTM D 4829

Client Name: Koury Geotechnical Services, Inc.
Project Name: Borrow Site 4
Project No.: 18-0158

AP Job No.: 18-0309
Date: 03/09/18

Boring No.	Sample No.	Depth (ft)	Soil Description	Molded Dry Density (pcf)	Molded Moisture Content (%)	Init. Degree Saturation (%)	Measured Expansion Index	Corrected Expansion Index
TP-2	-	4-5	Silty Clay	84.8	19.0	52.0	36	57
TP-5	-	6-8	Silty Clay	92.4	14.7	48.1	30	49
TP-6	-	5.5-6.5	Clay	94.8	13.6	47.4	110	107
TP-6	-	13-14	Clay	90.3	15.3	47.8	153	151
TP-9	-	10-11	Clay	96.7	13.8	50.3	158	158
TP-11	-	5-6	Clay	96.7	13.7	49.7	133	132

ASTM EXPANSION CLASSIFICATION

Expansion Index	Classification
0-20	V. Low
21-50	Low
51-90	Medium
91-130	High
>130	V. High

EXPANSION INDEX TESTS

DENSITY AND MOISTURE CONTENT DATA - EI TEST

Location/ Elevation	TP-3 @ 2' - 3'		TP-8 @ 4.5' - 5'	
USCS Symbol	CL		CL	
Normal Load (psf)	144		144	
SAMPLE CONDITION	Initial	Final	Initial	Final
Wt Specimen & Ring (gr)	715.950		726.030	
Wt. of ring (gr)	366.67		364.16	
Wt. Specimen (gr)	349.280		361.870	
Specimen diameter (in)	4.010		4.010	
Specimen radius (cm)	5.09		5.09	
Area of Specimen (cm^2)	81.479		81.479	
Init. Spec. height (in)	1.0020	N/A	1.0005	N/A
Height change (final)(in)	N/A	0.0279	N/A	0.0759
Adjusted Spec.height(in)	1.00	0.9741	1.00	0.9246
" " (cm)	2.545	2.474	2.541	2.348
Specimen Volume (cm^3)	207.371		207.061	
Moist Density (pcf)	105.15		109.11	
MOISTURE CONTENT				
Wt. moist soil+tare(gr)	131.71	131.71	126.26	126.26
Wt. dry soil+tare(gr)	116.99	116.99	113.10	113.10
Wt. of tare(gr)	17.32	17.32	19.59	19.59
Wt. dry soil (gr)	99.67	99.67	93.51	93.51
Wt. of water (gr)	14.72	14.72	13.16	13.16
M/C (%)	14.77	14.77	14.07	14.07
DRY DENSITY (pcf)	91.6		95.6	
% Saturation* (48%-52%)	47.5		49.8	
*Assumes Gs =	2.7		2.7	
EXPANSION INDEX =	28		76	
Potential Expansion *(per ASTM 4829-08)*	Low		Medium	

KOURY ENGINEERING & TESTING, INC.	Project Name: Borrow Site #4	Project No.: 18-0158 Date: 3/15/18	Run by: MFP QA:
			Lab: 4835 Series

EXPANSION INDEX TESTS

DENSITY AND MOISTURE CONTENT DATA - EI TEST

Location/ Elevation	TP-5 @ 1' - 2'		TP-6 @ 1.5' - 2.5'		TP-7 @ 1' - 2'	
USCS Symbol	CL		CL		CL	
Normal Load (psf)	144		144		144	
SAMPLE CONDITION	Initial	Final	Initial	Final	Initial	Final
Wt Specimen & Ring (gr)	758.510		762.780		748.810	
Wt. of ring (gr)	367.50		364.17		366.67	
Wt. Specimen (gr)	391.010		398.610		382.140	
Specimen diameter (in)	4.010		4.010		4.010	
Specimen radius (cm)	5.09		5.09		5.09	
Area of Specimen (cm^2)	81.479		81.479		81.479	
Init. Spec. height (in)	1.0020	N/A	1.0000	N/A	1.0015	N/A
Height change (final)(in)	N/A	0.0310	N/A	0.0376	N/A	0.0200
Adjusted Spec.height(in)	1.00	0.9710	1.00	0.9624	1.00	0.9815
" " (cm)	2.545	2.466	2.540	2.444	2.544	2.493
Specimen Volume (cm^3)	207.371		206.957		207.268	
Moist Density (pcf)	117.72		120.24		115.10	
MOISTURE CONTENT						
Wt. moist soil+tare(gr)	148.18	148.18	151.86	151.86	144.12	144.12
Wt. dry soil+tare(gr)	135.32	135.32	139.40	139.40	132.94	132.94
Wt. of tare(gr)	19.67	19.67	19.61	19.61	31.58	31.58
Wt. dry soil (gr)	115.65	115.65	119.79	119.79	101.36	101.36
Wt. of water (gr)	12.86	12.86	12.46	12.46	11.18	11.18
M/C (%)	11.12	11.12	10.40	10.40	11.03	11.03
DRY DENSITY (pcf)	105.9		108.9		103.7	
% Saturation* (48%-52%)	50.8		51.3		47.6	
*Assumes Gs =	2.7		2.7		2.7	
EXPANSION INDEX =	31		38		20	
Potential Expansion *(per ASTM 4829-08)*	Low		Low		Very Low	

KOURY ENGINEERING & TESTING, INC.

Project Name:	Project No.: 18-0158	Run by: MFP	Lab:
Borrow Site #4	Date: 3/14/18	QA:	4835 Series

EXPANSION INDEX TESTS

DENSITY AND MOISTURE CONTENT DATA - EI TEST

Location/ Elevation	TP-11 @ 1' - 2'	
USCS Symbol	CL	
Normal Load (psf)	144	
SAMPLE CONDITION	Initial	Final
Wt Specimen & Ring (gr)	751.570	
Wt. of ring (gr)	366.66	
Wt. Specimen (gr)	384.910	
Specimen diameter (in)	4.010	
Specimen radius (cm)	5.09	
Area of Specimen (cm^2)	81.479	
Init. Spec. height (in)	1.0020	N/A
Height change (final)(in)	N/A	0.0446
Adjusted Spec.height(in)	1.00	0.9574
" " (cm)	2.545	2.432
Specimen Volume (cm^3)	207.371	
Moist Density (pcf)	115.88	
MOISTURE CONTENT		
Wt. moist soil+tare(gr)	159.09	159.09
Wt. dry soil+tare(gr)	145.93	145.93
Wt. of tare(gr)	31.57	31.57
Wt. dry soil (gr)	114.36	114.36
Wt. of water (gr)	13.16	13.16
M/C (%)	11.51	11.51
DRY DENSITY (pcf)	103.9	
% Saturation* (48%-52%)	50.0	

*Assumes Gs =	2.7
EXPANSION INDEX =	45
Potential Expansion *(per ASTM 4829-08)*	Low

KOURY ENGINEERING & TESTING, INC.	Project Name: Borrow Site #4	Project No.: 18-0158 Date: 3/16/18	Run by: MFP QA:	Lab: 4835 Series

EXPANSION INDEX TESTS

DENSITY AND MOISTURE CONTENT DATA - EI TEST

Location/ Elevation	TP-11 @ 8' - 9'		TP-6 @ 10' - 11'	
USCS Symbol	CH		CH	
Normal Load (psf)	144		144	
SAMPLE CONDITION	Initial	Final	Initial	Final
Wt Specimen & Ring (gr)	716.690		706.920	
Wt. of ring (gr)	366.67		367.49	
Wt. Specimen (gr)	350.020		339.430	
Specimen diameter (in)	4.010		4.010	
Specimen radius (cm)	5.09		5.09	
Area of Specimen (cm^2)	81.479		81.479	
Init. Spec. height (in)	1.0015	N/A	1.0010	N/A
Height change (final)(in)	N/A	0.1802	N/A	0.1080
Adjusted Spec.height(in)	1.00	0.8213	1.00	0.8930
" " (cm)	2.544	2.086	2.543	2.268
Specimen Volume (cm^3)	207.268		207.164	
Moist Density (pcf)	105.43		102.29	
MOISTURE CONTENT				
Wt. moist soil+tare(gr)	196.18	196.18	145.08	145.08
Wt. dry soil+tare(gr)	174.98	174.98	125.60	125.60
Wt. of tare(gr)	31.57	31.57	19.61	19.61
Wt. dry soil (gr)	143.41	143.41	105.99	105.99
Wt. of water (gr)	21.20	21.20	19.48	19.48
M/C (%)	14.78	14.78	18.38	18.38
DRY DENSITY (pcf)	91.8		86.4	
% Saturation* (48%-52%)	47.8		52.2	
*Assumes Gs =	2.7		2.7	
EXPANSION INDEX =	180		108	
Potential Expansion *(per ASTM 4829-08)*	Very High		High	

KOURY ENGINEERING & TESTING, INC.

Project Name:	Project No.: 18-0158	Run by: MFP	Lab:
Borrow Site #4	Date: 2/28/18	QA:	4835 Series

EXPANSION INDEX TESTS

DENSITY AND MOISTURE CONTENT DATA - EI TEST

Location/ Elevation	TP12 @ 8.5' - 9.5'	
USCS Symbol	CH	
Normal Load (psf)	144	
SAMPLE CONDITION	Initial	Final
Wt Specimen & Ring (gr)	684.810	
Wt. of ring (gr)	357.47	
Wt. Specimen (gr)	327.340	
Specimen diameter (in)	4.010	
Specimen radius (cm)	5.09	
Area of Specimen (cm^2)	81.479	
Init. Spec. height (in)	1.0010	N/A
Height change (final)(in)	N/A	0.1483
Adjusted Spec.height(in)	1.00	0.8527
" " (cm)	2.543	2.166
Specimen Volume (cm^3)	207.164	
Moist Density (pcf)	98.65	
MOISTURE CONTENT		
Wt. moist soil+tare(gr)	122.69	122.69
Wt. dry soil+tare(gr)	105.21	105.21
Wt. of tare(gr)	19.60	19.60
Wt. dry soil (gr)	85.61	85.61
Wt. of water (gr)	17.48	17.48
M/C (%)	20.42	20.42
DRY DENSITY (pcf)	81.9	
% Saturation* (48%-52%)	52.1	

*Assumes Gs =	2.7
EXPANSION INDEX =	148
Potential Expansion *(per ASTM 4829-08)*	Very High

KOURY ENGINEERING & TESTING, INC.	Project Name: Borrow Site #4	Project No.: 18-0158 Date: 3/6/18	Run by: MFP QA:	Lab: 4835 Series

We are a key member of the construction team while safeguarding the public. We improve operational logistics and provide superior quality control through the continuing development of our engineering staff and technical expertise, utilization of classroom training and field supervisors, thus defining the industry standard.

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