KOURY ENGINEERING & TESTING, INC.

GEOTECHNICAL & SEISMIC ENGINEERING,
CONSTRUCTION INSPECTION &
MATERIALS TESTING SERVICES

May 10, 2018, Revised July 22, 2018
Project No. 17-1024

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 Study
Borrow Site No. 3 (Export Fill Dirt Site No. 3)
Cucamonga Avenue and West County Road
City of Chino, CA

Dear Mr. Burroughs:

Presented herein are our preliminary findings and conclusions regarding the suitability of the soils within Borrow Site 3 to be used as engineered fill to balance the grades for the OC Prado site construction located on the southeast corner of Bickmore Avenue and Mountain Avenue, in the City of Chino.

In accordance with the revised Conceptual Grading Plan, the irregular hexagonal-shaped borrow site covers an area of about 44± acres. The site is bounded by the California Institution for Women to the north, Prado Reservoir Park to the west, vacant land to the south and Cucamonga Avenue to the east. On the east side, the site borders Cucamonga Avenue over a distance of about 2230 feet, extending approximately 910 feet south of the intersection with West County Road. The width of the site is about 850 feet in its middle and 1510 feet in its southern portion that extends about 490 feet in the southerly direction.

A Vicinity Map with approximate ground contour elevations is presented in Appendix A as Figure A-1. The site is located entirely on the west side of Cucamonga Avenue, and the nearest street intersection is Cucamonga Avenue with West County Road.

Field Exploration and Laboratory Testing

The field exploration program for Borrow Site 3 was performed in two phases. The first phase of the field exploration was performed within the northern portion of the site and consisted of four test pits, TP-3 through TP-6, excavated on February 23, 2018. The second phase consisted of excavating thirteen test pits; TP-7 though TP-18 plus TP-15A on April 17, 2018. A rubber tire mounted backhoe was used to excavate the test pits ranging in depths from about 14 to 17 feet for the first phase and from 6 to 9 feet for the second phase. Test Pit 1 and 2 were excavated using a hand auger on April 24, 2018 due to the recent re-seeding and on-going irrigation. 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 and hand augering 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. The results of pertinent laboratory tests are presented on the test pit 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 observed during the subsurface investigation consisted predominantly of clay at shallow depths.

Surface Site Conditions

The site has at least three entrances from Cucamonga Avenue to the east; one of these entrances is near the intersection of West County Road with Cucamonga Avenue. No buildings were present onsite at the time of our field exploration; however, there are power lines supported on pile foundations crossing the site about 100 feet north of West County Road. There are also remnants of concrete slabs on grade, which were observed in various locations. Portions of the site appear to have abandoned underground utilities. Other portions of the site support irrigation lines that are being used to water the recent seeding and other grass areas. More than one-half of the site was devoid of vegetation at the time of our field exploration and the remainder of the site contained mostly sparse to dense grass vegetation.

The southern portion of the site contains several water storage ponds that range in depth mostly from about 3 to 7 feet. At the time of our site exploration in April 2018, only the ponds located east of Test Pit 17 and northwest of Test Pit 18 contained water (approximately 1 to 3 feet). The ponds appear to have been created by excavating and mounding the native soils around the excavations. There was localized grass areas and low shrubs near the ponds at the time of our second phase of the field exploration.

The northern portion of the site slopes gently to the southwest while the southern portion generally slopes gently to the south. The existing elevations range between about 545 feet at the south end to 566 feet at the northeast corner of the site (NAVD88).

Soil Conditions

The subsurface soil profile consists generally of artificial fill underlain by alluvial deposits. The fill depth is variable, ranging from less than one foot to about 6 feet at the test pit locations. For the most part, the fill materials are derived from onsite shallow soils and consist generally of lean clay with sand, sandy lean clay, and thin layers of clayey sand and silty sand at or near the surface with localized areas of fat clay. Organic material, including manure, was encountered in Test Pit 15A, which was excavated through a pond berm near the southwest corner of the site.

The alluvium soils consist predominantly of stiff to very stiff, medium to high plastic sandy clay, lean clay with sand, fat clay and sandy silt. Some clayey sand and silty sand layers were encountered below a depth of about 12 feet in some of the deeper test pits.

The soils were generally dry near the surface at the time of the Phase 2 field exploration. Except for organic material, for the soils below a depth of about 1 to 2 feet, the moisture contents of the clay soils are highly variable, ranging from about 9 to 41½ percent with an average on the order of 23 percent. At the time of our field exploration, the silty sand and clayey sand moisture contents ranged from about 3 to 23½ percent with an average of about 12½ percent. Based on the maximum density test 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 within the upper 8 feet of the ground surface (see Table 1 and Appendix C for maximum density test results).

The fines contents of the clay soils range from about 50 to 93 percent with an average of about 69 percent while the fine contents of the sands range from about 14 to 44 percent with an average of about 26½ percent. The average relatively low fines contents of the clay soils are attributed to the presence of concretions (hard matter formed by precipitation of mineral cement between particles) observed in many of the clay samples. The pocket penetrometer tests indicate unconfined compression strength on the order of 1 to 4.5 tsf with an average of about 2.8 tsf.

To aid in the soil classification and to correlate the soil plasticity with the soil expansion, one plasticity index test (Atterberg Limits) was performed on a sample of Test Pit 6 at a depth of 8 to 9 feet. As shown in Table 1, the Liquid limit, Plastic Limit and Plasticity Index for the tested sample are 75, 18 and 57 respectively, which indicate a high plasticity soil at that depth for this test pit.

Table 1 – Maximum Density and Plasticity Index

Test Pit Number	**TP-6 @ 8 to 9 feet**
Maximum Dry Density (pcf)	111.1
Optimum Moisture Content (%)	16.2
Liquid Limit	75
Plastic Limit	18
Plasticity Index	57

The site soil expansion potential ranges from low to very high. Table 2 presents the data for 26 expansion index tests at depths ranging from 1 to 11 feet. These tests indicate expansion index variations from 32 to 208 with an average of about 94. For the 13 tests on samples at depths between 1 and 4½ feet, the expansion index ranges from about 32 to 100 with an average of approximately 65.

Table 2 – Expansion Index Test Results

Test Pit No.	Depth (feet)	Expansion Index	Field Moisture (%)	Fines Percent
*TP-1	2 - 3	64	17.7	76
*TP-1	5 - 6	175	22.4	50
*TP-2	3 - 4	100	21.8	71
*TP-3	1.5 - 2.5	53	17.9	66
*TP-3	4 - 4.5	99	23.7	63
*TP-3	10 - 11	96	25.5	51
*TP-4	3 - 3.5	80	33.8	54
*TP-4	4 - 4.5	56	29.1	60
*TP-5	6 - 7	176	28.4	74
*TP-5	8 - 10	190	31.3	50
*TP-6	1 - 2	32	17.9	56
*TP-6	7 - 8	172	30.6	73
*TP-6	8 - 9	208	30.4	57
TP-7	4 - 4.5	92	18.3	79
TP-7	5.7 - 6.5	101	22.8	68
TP-8	6 - 6.5	60	15.7	83
TP-9	4 - 4.5	62	18.4	65
TP-10	6 - 7	37	25.8	93
TP-11	3.7 - 4.2	32	22.0	50
TP-11	5.5 - 6	50	16.1	50
TP-13	4.75 - 5	100	18.7	53
TP-14	6.7 - 7	40	18.0	82
TP-15	4.2 - 4.7	79	25.0	82
TP-15	5.5 - 6	195	36.2	84
TP-17	4 - 4.5	40	23.4	79
TP-18	4.5 - 5	55	22.8	90

*Northern portion of proposed borrow site

We noted that the light-colored clay samples containing concretions tend to have higher expansion index. The expansion potential can change rapidly with depth as shown by two tests on TP-15 for depths of about 4½ and 5½ feet, where the expansion indices are 79 and 195, respectively.

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

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-5	5 – 6	566	7.7	235	490

Groundwater

Groundwater seepage was encountered in Test Pit 18 which was excavated within the slope of a pond containing water. The wet soil level in the test pit was at about the pond water level. Groundwater seepage was encountered at a depth of about 13½ feet in Test Pit 3. No seepage was encountered in the other test pits excavated to a maximum depth of 17 feet. Borings should be drilled if the groundwater level needs to be determined.

Conclusions and Recommendations

Based on the data collected from the field to date, it appears feasible to import material from Borrow Site 3 to use at the OC Prado site. However, it appears that on average only the upper 4 to 4½ feet of soils (once well blended and once clearing, grubbing and stripping of the topsoil is complete) could be suitable for foundation. It should be noted that for the southernmost portion of the site, the construction of the ponds has resulted in some of the expansive clay soils to be mixed with the less expansive soils and with some organics. Therefore, some material at shallow depth in the southernmost portion of the site may not be suitable for export to be used as engineered fill. Therefore, observation and testing during export of the material to the OC Prado site is advisable. All organic material, construction debris, and other unsuitable materials should be removed prior to export to the OC Prado site.

During the second phase of field exploration, we noted that the upper one to two feet of soils had low moisture contents due to drying weather conditions. Dry clay soils are undesirable from a geotechnical performance standpoint and require time to absorb moisture. Therefore, the surface conditions should be checked prior to export, and where the moisture contents are not above optimum, we recommend that the soils be pre-moisture conditioned in the borrow site prior to export. For the areas under active irrigation, the irrigation system should be stopped at least 3 to 4 weeks prior to soil export.

We anticipate that an excavation plan will be prepared by the project civil engineer. Appropriate setback should be set from existing foundations, slopes and property lines.

LIMITATIONS

Our work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Koury's profession practicing in the same locality, under similar conditions and at the date the services are provided.

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. Koury should be notified if subsurface conditions are encountered, which differ from those described in this report. 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 Roy

Jacques B. Roy, PE, GE
Principal Engineer

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

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, Soil 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.

APPENDICES

Appendix A: Maps and Plans

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

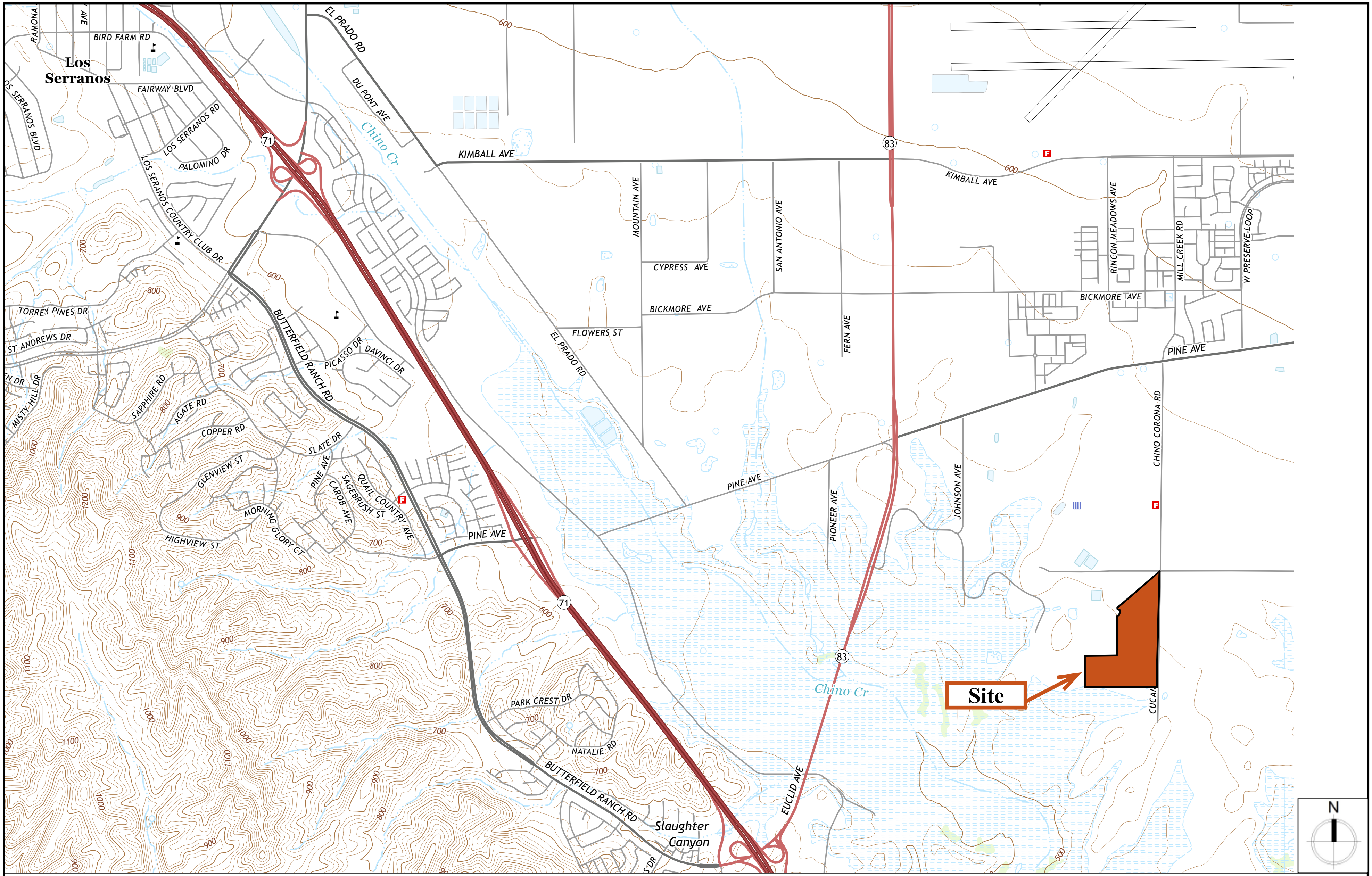
Appendix B: Field Exploratory Test Pits

Test Pits 1 through 18

Appendix C: Laboratory Test Results

APPENDIX A

Maps and Plans



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

0 1/2 1 Mile

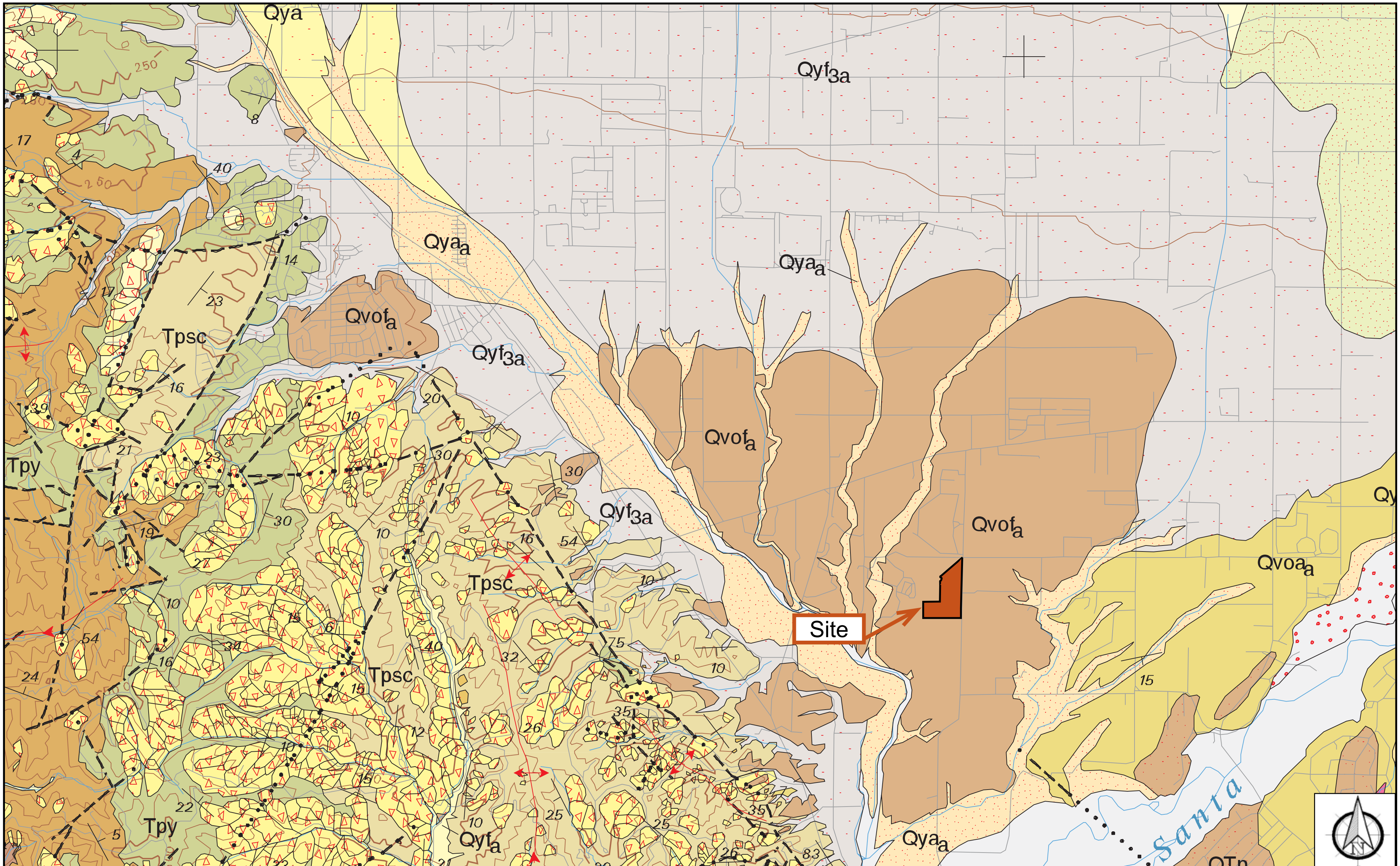
KOURY ENGINEERING & TESTING, INC.	Project Name: Alternative Borrow Site # 2 South of California Institution for Women	Project No.: 17-1024 Date: June 2018	Drawing Title: Vicinity Map	Figure: A-1

Legend

0 250 500'

TP-1 to TP-18 Field Exploration Points

KOURY ENGINEERING & TESTING, INC.	Project Name: Alternative Borrow Site # 3	Project No.: 17-1024 Date: June 2018	Drawing Title: Field Exploration Points	Figure: A-2



LEGEND

Qvof	Very old alluvial-fan 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: Alternative Borrow Site # 2 South of California Institution for Women	Project No.: 17-1024 Date: June 2018	Drawing Title: Geology Map	Figure: 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		
	#200	#40	#10	#4	3/4"	3"	12"

SIEVE SIZES

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

Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 1
Sheet : 1 **Of :** 1

Drilling Method : Hand Auger
Sampling Method : Bulk
Hammer Weight :
Drop Height :
Location : See Figure A-2
Ground Elevation:
Drilling Co. : Koury
Date Drilled : 4-24-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Soil Type (USCS)	Description	Additional Tests
1	18.7			0	CL	**FILL: Lean CLAY with SAND;** trace of gravel, very stiff, moist, dark brown	Fines = 79%
2	17.6						Fines = 75% PP = 2.5-3 tsf
3	17.7				CL/CH	**ALLUVIUM:** **Lean to Fat CLAY with SAND;** trace of gravel, very stiff, moist, brown with light brown inclusions	Fines = 76% PP = 3.5 tsf EI = 64
4	19.5						Fines = 82%
5	22.4			5	CH	**Sandy Fat CLAY;** trace of gravel, concretions, stiff to very stiff, moist, light brown to pale brown	Fines = 82% PP = 2.5 tsf
6	22.4						Fines = 50% EI = 175
7	21.0						Fines = 53%
8	26.2						Fines = 51%

End of test pit @ 8'
No groundwater encountered

Depth scale (ft): 0, 5, 10, 15, 20, 25, 30, 35, 40

Bulk ☒ CD ■ SPT ☒

Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 2
Sheet : 1 **Of :** 1

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

Ground Elevation:
Drilling Co. : Koury
Date Drilled : 4-24-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	8.2			0			SC	**FILL: Clayey SAND**; fine-coarse, trace gravel, moist, dk brown	Fines = 27%
2	17.2						CL	**ALLUVIUM: Lean CLAY with SAND**; very stiff, concretions	Fines = 76% PP = 3.0 tsf
3	20.5								
4	21.8						CL/CH	**Lean to Fat CLAY;** very stiff, concretions, moist, light brown	Fines = 84% PP = 3.5 tsf
5	22.3						CH	**Sandy Fat CLAY;** stiff to very stiff, concretions, moist, light yellowish brown EI = 100	Fines = 71% PP = 3.0 tsf Fines = 51%
6	27.5			5			CH	**Fat CLAY with SAND**; concretions, stiff, moist, light yellowish brown to pale brown	Fines = 76%
7	24.5								Fines = 88%
8	25.8								Fines = 88%
				10				End of test pit @ 8' No groundwater encountered	
				15					
				20					
				25					
				30					
				35					
				40					

Bulk ☒ CD ■ SPT ☒

Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 3
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 : 2-23-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Soil Type (USCS)	Description	Additional Tests
1	14.4			0	CL	**FILL: Sandy Lean CLAY**; very stiff, brown	Fines = 65% PP = >4.5 tsf
2	17.9				CL	**ALLUVIUM:** **Sandy Lean CLAY**; hard, slightly moist, brown to dark brown and light grayish brown	#200 Wash Fines = 66% EI = 53
3	23.7				CL/CH		Fines = 63% EI = 99
4	21.9			5	CL/CH	**Sandy Lean to Fat CLAY;** very stiff, moist, pale brown	Fines = 53% PP = 4-4.5 tsf
5	25.6				CL/CH	Light olive brown with white specks	Fines = 69% PP = 2.5-2.8 tsf
6	25.5			10	CL/CH	Very moist	#200 Wash Fines = 51% PP = 2.5 tsf EI = 96
7	31.6				CL/CH	Thin layers of sitly sand	#200 Wash Fines = 51%
8	41.4				CL/CH		Fines = 52%
				15		End of test pit @ 14' Groundwater sepage observed @ 13' 6"	
				20			
				25			
				30			
				35			
				40			

Bulk ☒ CD ■ SPT ☒

Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 4
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 : 2-23-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Soil Type (USCS)	Description	Additional Tests
				0	CL/CH	**FILL:**	
1	16.2					**Sandy Lean CLAY;** stiff, moist to very moist, dark brown	#200 Wash Fines = 62%
2	33.8					**ALLUVIUM:**	Fines = 54% EI = 80
3	29.1			5		**Sandy LEAN to Fat CLAY;** concretions, firm, moist to very moist, dark yellowish brown Abundant concretions	#200 Wash Fines = 60% EI = 56
4	18.7						#200 Wash Fines = 50%
5	15.6				SC	**Clayey SAND;** trace of gravel, moist, dark yelllowish brown	Fines = 30%
6	26.4			10	CL	**Sandy Lean CLAY;** stiff, moist, yellowish brown	Fines = 51%
7	23.6				SC	**Clayey SAND;** fine, moist, yellowish brown	#200 Wash Fines = 28%
8	22.7			15	CL	**Sandy Lean CLAY;** layers of clayey sand, stiff, moist, yellowish brown	#200 Wash Fines = 51%
9	23.1				SM	**Silty SAND;** fine to medium, very moist, light olive brown	#200 Wash Fines = 17%
						End of test pit @ 17' No groundwater encountered	
				20			
				25			
				30			
				35			
				40			

Bulk ☒ CD ■ SPT ☒

Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3
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 : 2-23-18

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:**	
1	13.2						CL	**Sandy Lean CLAY;** stiff to very stiff, slightly moist, yellowish brown	#200 Wash Fines = 73% PP = 4.5 tsf
2	25.6			5			CL/CH	**Lean to Fat CLAY;** very stiff, moist, concretions, olive brown	Fines = 77% PP=3.5-4.5 tsf
3	28.4							**ALLUVIUM:**	#200 Wash Fines = 74% EI = 176
4	31.3			10			CH	**Sandy Fat CLAY**; very moist, light olive brown	#200 Wash Fines = 50% EI = 190
5	5.4								Fines = 23%
6	14.7						SC	**Clayey SAND;** fine to medium, trace of gravel, moist to very moist, yellowish brown	Fines = 19%
7	16.3			15				Coarser, more gravel	Fines = 27%
8	16.6								Fines = 14%
				20				End of test pit @ 17' No groundwater encountered	
				25					
				30					
				35					
				40					

Bulk CD SPT

Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

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 : 2-23-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Soil Type (USCS)	Description	Additional Tests
				0		**FILL: Sandy Lean Clay;** stiff, brown	
1	17.9				CL	**ALLUVIUM:** **Sandy Lean CLAY;** trace of gravel, stiff, brown with light brown inclusions	#200 Wash Fines = 56% EI = 32
2	18.0			5	CL/CH	**Lean to Fat CLAY with SAND;** trace of gravel, concretions, stiff, moist, pale brown	#200 Wash Fines = 77%
3	30.6				CH	**Sandy Fat CLAY;** stiff, very moist, light olive brown	Fines = 73% PP = 1.5 tsf EI = 172
4	30.4			10			Fines = 57% PP = 1.5 tsf EI = 208
5	12.4				SC	**Clayey SAND;** fine to medium, pockets of silty sand, trace of gravel, concretions, moist olive yellow	#200 Wash Fines = 25%
6	15.2			15	SM	**Silty SAND;** fine, trace of gravel, moist, mottled yellowish brown and gray	#200 Wash Fines = 19%
7	18.8						#200 Wash Fines = 14%
				20		End of test pit @ 16' 6" No groundwater encountered	
				25			
				30			
				35			
				40			

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Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 7
Sheet : 1 **Of :** 1

Drilling Method : Backhoe
Sampling Method : Bulk
Hammer Weight : **Drop Height :**
Location : See Figure A-2
Ground Elevation:
Drilling Co. : Bastedo Backhoe
Date Drilled : 4-17-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	8.4			0			SC	**FILL: Clayey SAND;** moist, brown	Fines = 26%
2	23.5						CL	**ALLUVIUM:** **Lean CLAY with SAND;** moist to very moist, stiff to very stiff, brown to dark brown	Fines = 79%
3	18.3								EI = 92 Fines = 79%
				5					
4	22.8						CH	**Sandy Fat CLAY;** moist, stiff, abundant concretions, yellowish brown	EI = 101 Fines = 68%
5	24.1								Fines = 51%
6	22.2								Fines = 67%
				10				End of test pit @ 8' 6" No groundwater encountered	
				15					
				20					
				25					
				30					
				35					
				40					

Bulk CD SPT

Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

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. : Bastedo Backhoe
Date Drilled : 4-17-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Soil Type (USCS)	Description	Additional Tests
1	15.8			0		**FILL: Sandy Lean CLAY;** stiff, moist, trace of gravel, dark brown	#200 Wash Fines = 65%
2	17.9				CL	**ALLUVIUM:** **Lean CLAY with SAND;** firm to stiff, moist to very moist, dark brown and black	#200 Wash Fines = 81%
3	18.3						PP = 1.0 tsf Fines = 79%
4	25.5			5			PP = 1.5 tsf Fines = 83%
5	21.8						PP = 1.0 tsf Fines = 83%
6	15.7						EI = 60 Fines = 62%
7	28.6						PP = 1.75 tsf Fines = 62%
				10		End of test pit @ 8' 6" No groundwater encountered	
				15			
				20			
				25			
				30			
				35			
				40			

Bulk CD SPT

Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

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. : Bastedo Backhoe
Date Drilled : 4-17-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	4.8			0	Bulk		SM	**FILL:** **Silty SAND;** fine to coarse, trace of gravel, moist, dark yellowish brown	Fines = 20%
2	5.4				Bulk				Fines = 19%
3	17.5				Bulk		CL	**ALLUVIUM: Lean CLAY with SAND;** stiff to very stiff, moist, very dark brown	Fines = 77%
4	18.4				Bulk		CL/CH	**Sandy Lean to Fat CLAY;** stiff, moist to very moist, minor concretions, dark grayish brown	Fines = 65% EI = 62
5	21.8			5	Bulk		CH	**Sandy Fat CLAY;** stiff to very stiff, moist, concretions, pale brown with reddish gray and white	Fines = 50% PP = 4.5 tsf
6	34.7				Bulk				Fines = 70%
7	31.3				Bulk				#200 Wash Fines = 50%
				10				End of test pit @ 9' No groundwater encountered	
				15					
				20					
				25					
				30					
				35					
				40					

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Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 10
Sheet : 1 **Of :** 1

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

Ground Elevation:
Drilling Co. : Bastedo Backhoe
Date Drilled : 4-17-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	8.0			0	Bulk		SC	**FILL: Clayey SAND;** hard, lumps of sandy clay, trace of gravel, slightly moist, brown	#200 Wash Fines = 30%
2	16.1				Bulk		CL	**ALLUVIUM:** **Sandy Lean CLAY;** stiff, moist, trace of gravel and wood, very dark brown	Fines = 69% PP = 2.5 tsf
3	16.8				Bulk				Fines = 72% PP = 3.5 tsf
4	27.6			5	Bulk			**Lean CLAY;** trace of concretions, stiff, moist, dark gray and dark browninsh gray	Fines = 93%
5	25.8				Bulk				Fines = 93% EI = 37 PP = 1.5 tsf
7	22.6				Bulk			stiff to very stiff, gray with white specs	Fines = 90% PP = 2.5-3 tsf
								End of test pit @ 8' No groundwater encountered	
				10					
				15					
				20					
				25					
				30					
				35					
				40					

Bulk ☒ CD ■ SPT ☒

Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 11
Sheet : 1 **Of :** 1

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

Ground Elevation:
Drilling Co. : Bastedo Backhoe
Date Drilled : 4-17-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1 2	5.6 8.3			0			CL/CH	**FILL: Sandy Lean to Fat CLAY;** hard, trace of gravel, dry, yellowish brown	#200 Wash Fines = 66% PP = 2.5 tsf
							SC	**ALLUVIUM: Clayey SAND;** organics, wood inclusions, very light, dry, gray	#200 Wash Fines = 27%
3 4	22.0 23.0			5			CL	**Sandy Lean CLAY;** concretions, moist to very moist, mottled brown, yellowish brown	Fines = 50% EI = 32 Fines = 68%
5 6 7	21.0 16.1 22.5						CH	**Sandy Fat CLAY;** concretions, stiff, moist, light brown to brown	Fines = 52% PP = 4.5 tsf Fines = 50% EI = 50 Fines = 66%
8	13.9						SC	**Clayey SAND;** concretions, moist, yellow	Fines = 38%
				10				End of test pit @ 8' 6" No groundwater encountered	
				15					
				20					
				25					
				30					
				35					
				40					

Bulk CD SPT

Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 12
Sheet : 1 **Of :** 1

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

Ground Elevation:
Drilling Co. : Bastedo Backhoe
Date Drilled : 4-17-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	7.0			0	Bulk		SC	**FILL:** **Clayey SAND;** trace of gravel, dry, brown	#200 Wash Fines = 34%
2	14.9				Bulk		CL	**ALLUVIUM:** **Sandy Lean CLAY;** trace of gravel, stiff to very stiff, moist to slightly moist, mottled brown, yellowish brown to dark brown	Fines = 74%
3	10.9				Bulk				Fines = 61% PP = 4.5 tsf
				5			CH	**Sandy Fat CLAY**; stiff to very stiff, moist, yellowish brown with some brown	
								End of test pit @ 8' 0" No groundwater encountered	
				10					
				15					
				20					
				25					
				30					
				35					
				40					

Bulk ☒ CD ■ SPT ☒

Test Pit Log

KOURY
ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 13
Sheet : 1 **Of :** 1

Drilling Method : Backhoe
Sampling Method : Bulk
Hammer Weight :
Drop Height :
Location : See Figure A-2
Ground Elevation:
Drilling Co. : Bastedo Backhoe
Date Drilled : 4-17-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	14.7			0	⊠	▨	SC	**FILL: Clayey SAND;** moist, dark yellowish brown	#200 Wash Fines = 39%
2	24.6					▨	CL	**ALLUVIUM:** **Sandy Lean CLAY;** minor concretions, stiff, moist, brown to black	Fines = 68%
3	20.5				⊠				#200 Wash Fines = 71% PP = 3.2 tsf
4	17.8				⊠				Fines = 86% PP = 2.5 tsf
5	18.7			5	⊠	▨	CH	**Sandy Fat CLAY**; stiff, concretions, moist, white specs, yellowish brown and grayish brown	Fines = 53% PP = 1.5 tsf EI = 100
6	28.7				⊠				Fines = 74% PP = 2-2.5 tsf
7	30.8				⊠			pale brown	Fines = 71%
								End of test pit @ 8' 0" No groundwater encountered	
				10					
				15					
				20					
				25					
				30					
				35					
				40					

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Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 14
Sheet : 1 **Of :** 1

Drilling Method : Backhoe
Sampling Method : Bulk
Hammer Weight :
Drop Height :
Location : See Figure A-2
Ground Elevation:
Drilling Co. : Bastedo Backhoe
Date Drilled : 4-17-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	3.0			0	⊠		SC	**FILL:** **Clayey SAND;** trace of gravel, dry, yellowish brown	#200 Wash Fines = 26%
								ALLUVIUM:	
2	29.6				⊠		CL	**Sandy Lean CLAY;** stiff, moist to very moist, brown to black	Fines = 86% PP = 1.5 tsf
3	29.0			5	⊠				Fines = 84%
4	18.0				⊠			become brownish gray	PP = 2.5 tsf Fines = 82% EI = 40
5	20.8				⊠				PP = 2.5 tsf Fines = 81%
				10				End of test pit @ 8' 0" No groundwater encountered	
				15					
				20					
				25					
				30					
				35					
				40					

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Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 15
Sheet : 1 **Of :** 1

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

Ground Elevation:
Drilling Co. : Bastedo Backhoe
Date Drilled : 4-17-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0				**ALLUVIUM:**	
1	9.3						CL	**Lean CLAY with SAND;** very stiff, slightly moist, mottled yellowish brown	#200 Wash Fines = 83%
2	13.6						CL	**Sandy Lean CLAY;** very stiff, slightly moist, grayish brown with white	Fines = 73%
3	25.0			5			CL	**Lean CLAY with SAND;** stiff to very stiff, moist, minor concretions, light yellowish brown	#200 Wash Fines = 82% EI = 79
4	36.2						CH	**Fat CLAY with SAND;** stiff to very stiff, moist to very moist, yellowish brown	Fines = 84% EI = 195
5	17.8						SC	**Clayey SAND;** fine, very moist, gray	Fines = 36%
				10				End of test pit @ 8' 5" No groundwater encountered	
				15					
				20					
				25					
				30					
				35					
				40					

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Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 15A
Sheet : 1 **Of :** 1

Drilling Method : Backhoe
Sampling Method : Bulk
Hammer Weight :
Drop Height :
Location : See Figure A-2
Ground Elevation:
Drilling Co. : Bastedo Backhoe
Date Drilled : 4-17-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
				0				Test pit excavated on top of pond berm	
1	12.9				⊠		CL	**FILL: Sandy Lean CLAY;** stiff, moist, yellowish brown	#200 Wash Fines = 62%
2	44.0				⊠		CL/OL	**Sandy Lean CLAY with Organic Material;** soft, moist, dark brown with reddish brown	Fines = 55%
3	36.6			5	⊠				#200 Wash Fines = 63% PP = 1.5 tsf
4	8.7				⊠		CL	**ALLUVIUM: Lean CLAY with SAND;** trace of gravel, stiff, moist, yellowish brown	#200 Wash Fines = 80%
								End of test pit @ 7' 6" No groundwater encountered	
				10					
				15					
				20					
				25					
				30					
				35					
				40					

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Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 16
Sheet : 1 **Of :** 1

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

Ground Elevation:
Drilling Co. : Bastedo Backhoe
Date Drilled : 4-17-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	9.2			0	Bulk		CL	**ALLUVIUM: Lean CLAY with SAND;** hard, slightly moist, brown to dark brown	#200 Wash Fines = 79%
2	11.9				Bulk		CL	**Sandy Lean CLAY;** stiff, dry, mottled, brown with white	Fines = 66%
3	24.6				Bulk		CL		Fines = 65%
4	32.5			5	Bulk		CH	**Sandy Fat CLAY;** stiff, concretions, moist to very moist, light olive brown	Fines = 65%
5	25.0				SPT		CH		Fines = 68% PP = 2.5 tsf
				10				End of test pit @ 8' No groundwater encountered	
				15					
				20					
				25					
				30					
				35					
				40					

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Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024	**Test Pit No. :** 17
Project Name : Borrow Site 3	**Sheet :** 1 **Of :** 1
Drilling Method : Backhoe	
Sampling Method : Bulk	**Ground Elevation:**
Hammer Weight : **Drop Height :**	**Drilling Co. :** Bastedo Backhoe
Location : See Figure A-2	**Date Drilled :** 4-17-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	4.1			0	Bulk		SC	**FILL: Clayey SAND;** trace of gravel, slightly moist, yellowish brown	#200 Wash Fines = 44%
2	19.1				Bulk		CL	**ALLUVIUM:** **Lean CLAY with SAND; stiff, moist, light brown**	Fines = 84% PP = 2.75 tsf
3	23.4			5	Bulk				#200 Wash Fines = 79% EI = 40
4	26.6				Bulk		CH	**Fat CLAY with SAND;** soft to stiff, concretions, pale brown	#200 Wash Fines = 76%
				10				End of test pit @ 8' No groundwater encountered	
				15					
				20					
				25					
				30					
				35					
				40					

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Test Pit Log

KOURY ENGINEERING & TESTING, INC.

Project No. 17-1024
Project Name : Borrow Site 3

Test Pit No. : 18
Sheet : 1 **Of :** 1

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

Ground Elevation:
Drilling Co. : Bastedo Backhoe
Date Drilled : 4-17-18

Sample No.	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per 6"	Depth (ft)	Sample Location	Graphic Log	Soil Type (USCS)	Description	Additional Tests
1	28.0			0	Bulk		CL	**FILL: Sandy Lean CLAY; stiff, moist, very dark brown**	Fines = 72%
2	26.2				Bulk				PP= 2.5-3.5 tsf Fines = 73%
3	18.0				Bulk				Fines = 60
4	21.7				Bulk			**ALLUVIUM:** **Sandy Lean CLAY;** very stiff, moist, dark gray	Fines = 64%
5	22.8			5	Bulk			**Lean CLAY with SAND;** very stiff, moist, dark gray	Fines = 90% EI = 55
								End of test pit @ 6' Wet soils encountered at 6'	

Depth scale (ft): 0, 5, 10, 15, 20, 25, 30, 35, 40

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APPENDIX C

Laboratory Test Results

EXPANSION INDEX TESTS

DENSITY AND MOISTURE CONTENT DATA - EI TEST

Location/ Elevation	TP7 @ 4' - 4.5'		TP7 @ 5.75' - 6.5'		TP9 @ 4' - 4.5'	
USCS Symbol	CH / CL		CH / CL		CH / CL	
Normal Load (psf)	144		144		144	
SAMPLE CONDITION	Initial	Final	Initial	Final	Initial	Final
Wt Specimen & Ring (gr)	761.380		703.070		742.100	
Wt. of ring (gr)	367.47		364.16		366.64	
Wt. Specimen (gr)	393.910		338.910		375.460	
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	0.9993	N/A	1.0020	N/A
Height change (final)(in)	N/A	0.0926	N/A	0.1006	N/A	0.0623
Adjusted Spec.height(in)	1.00	0.9094	1.00	0.8987	1.00	0.9397
" " (cm)	2.545	2.310	2.538	2.283	2.545	2.387
Specimen Volume (cm^3)	207.371		206.812		207.371	
Moist Density (pcf)	118.59		102.31		113.03	
MOISTURE CONTENT						
Wt. moist soil+tare(gr)	126.54	126.54	130.33	130.33	125.87	125.87
Wt. dry soil+tare(gr)	115.59	115.59	113.23	113.23	113.23	113.23
Wt. of tare(gr)	19.64	19.64	19.71	19.71	19.74	19.74
Wt. dry soil (gr)	95.95	95.95	93.52	93.52	93.49	93.49
Wt. of water (gr)	10.95	10.95	17.10	17.10	12.64	12.64
M/C (%)	11.41	11.41	18.28	18.28	13.52	13.52
DRY DENSITY (pcf)	106.4		86.5		99.6	
% Saturation* (48%-52%)	52.8		52.0		52.7	
*Assumes Gs =	2.7		2.7		2.7	
EXPANSION INDEX =	92		101		62	
Potential Expansion *(per ASTM 4829-08)*	High		High		Medium	

KOURY ENGINEERING & TESTING, INC.	Project Name: Borrow Site #2	Project No.: 17-1021 Date: 4/25/18	Run by: MFP QA:	Lab: 18-0023 Series

EXPANSION INDEX TESTS

DENSITY AND MOISTURE CONTENT DATA - EI TEST

Location/ Elevation	TP8 @ 6' - 6.5'		TP10 @ 6' - 7'		TP14 @ 6.5' - 7'	
USCS Symbol	CL		CL		CL	
Normal Load (psf)	144		144		144	
SAMPLE CONDITION	Initial	Final	Initial	Final	Initial	Final
Wt Specimen & Ring (gr)	752.450		718.350		762.070	
Wt. of ring (gr)	367.45		364.18		366.65	
Wt. Specimen (gr)	385.000		354.170		395.420	
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	0.9993	N/A	1.0020	N/A
Height change (final)(in)	N/A	0.0606	N/A	0.0369	N/A	0.0404
Adjusted Spec.height(in)	1.00	0.9414	1.00	0.9624	1.00	0.9616
" " (cm)	2.545	2.391	2.538	2.444	2.545	2.442
Specimen Volume (cm^3)	207.371		206.812		207.371	
Moist Density (pcf)	115.91		106.91		119.04	
MOISTURE CONTENT						
Wt. moist soil+tare(gr)	132.38	132.38	136.31	136.31	148.38	148.38
Wt. dry soil+tare(gr)	119.95	119.95	122.87	122.87	135.41	135.41
Wt. of tare(gr)	19.71	19.71	31.57	31.57	17.30	17.30
Wt. dry soil (gr)	100.24	100.24	91.30	91.30	118.11	118.11
Wt. of water (gr)	12.43	12.43	13.44	13.44	12.97	12.97
M/C (%)	12.40	12.40	14.72	14.72	10.98	10.98
DRY DENSITY (pcf)	103.1		93.2		107.3	
% Saturation* (48%-52%)	52.8		49.1		51.9	
*Assumes Gs =	2.7		2.7		2.7	
EXPANSION INDEX =	60		37		40	
Potential Expansion *(per ASTM 4829-08)*	Medium		Low		Low	

KOURY ENGINEERING & TESTING, INC.	Project Name: Borrow Site #2	Project No.: 17-1021 Date: 4/27/18	Run by: MFP QA:	Lab: 18-0023 Series

EXPANSION INDEX TESTS

DENSITY AND MOISTURE CONTENT DATA - EI TEST

Location/ Elevation	TP11 @ 3.7' - 4.3'		TP11 @ 5.5' - 6.0'	
USCS Symbol	CL		CL / CH	
Normal Load (psf)	144		144	
SAMPLE CONDITION	**Initial**	**Final**	**Initial**	**Final**
Wt Specimen & Ring (gr)	716.340		743.890	
Wt. of ring (gr)	367.47		364.17	
Wt. Specimen (gr)	348.870		379.720	
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	0.9993	N/A
Height change (final)(in)	N/A	0.0321	N/A	0.0502
Adjusted Spec.height(in)	1.00	0.9699	1.00	0.9491
" " (cm)	2.545	2.464	2.538	2.411
Specimen Volume (cm^3)	207.371		206.812	
Moist Density (pcf)	105.03		114.63	
MOISTURE CONTENT				
Wt. moist soil+tare(gr)	142.42	142.42	133.92	133.92
Wt. dry soil+tare(gr)	125.20	125.20	120.63	120.63
Wt. of tare(gr)	19.62	19.62	17.33	17.33
Wt. dry soil (gr)	105.58	105.58	103.30	103.30
Wt. of water (gr)	17.22	17.22	13.29	13.29
M/C (%)	16.31	16.31	12.87	12.87
DRY DENSITY (pcf)	90.3		101.6	
% Saturation* (48%-52%)	50.8		52.7	
*Assumes Gs =	2.7		2.7	
EXPANSION INDEX =	32		50	
Potential Expansion *(per ASTM 4829-08)*	Low		Medium	

KOURY ENGINEERING & TESTING, INC.	**Project Name:** Borrow Site #2	**Project No.: 17-1021** **Date: 4/23/18**	**Run by: MFP** **QA:**	**Lab:** **18-0023 Series**

EXPANSION INDEX TESTS

DENSITY AND MOISTURE CONTENT DATA - EI TEST

Location/ Elevation	TP13 @ 4.75' - 5'	
USCS Symbol	CH / CL	
Normal Load (psf)	144	
SAMPLE CONDITION	**Initial**	**Final**
Wt Specimen & Ring (gr)	749.650	
Wt. of ring (gr)	366.71	
Wt. Specimen (gr)	382.940	
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	0.0998
Adjusted Spec.height(in)	1.00	0.9022
" " (cm)	2.545	2.292
Specimen Volume (cm^3)	207.371	
Moist Density (pcf)	115.29	
MOISTURE CONTENT		
Wt. moist soil+tare(gr)	171.93	171.93
Wt. dry soil+tare(gr)	154.80	154.80
Wt. of tare(gr)	19.71	19.71
Wt. dry soil (gr)	135.09	135.09
Wt. of water (gr)	17.13	17.13
M/C (%)	12.68	12.68
DRY DENSITY (pcf)	102.3	
% Saturation* (48%-52%)	52.9	

*Assumes Gs = 2.7

EXPANSION INDEX = 100

Potential Expansion *(per ASTM 4829-08)* High

KOURY ENGINEERING & TESTING, INC.	**Project Name:** Borrow Site #2	**Project No.: 17-1024** **Date: 5/1/18**	**Run by: MFP** **QA:**	**Lab:** **18-0023 Series**

EXPANSION INDEX TESTS

DENSITY AND MOISTURE CONTENT DATA - EI TEST

Location/ Elevation	TP-15 @ 4.2' - 4.7'	
USCS Symbol	CL	
Normal Load (psf)	144	
SAMPLE CONDITION	**Initial**	**Final**
Wt Specimen & Ring (gr)	679.610	
Wt. of ring (gr)	366.65	
Wt. Specimen (gr)	312.960	
Specimen diameter (in)	4.010	
Specimen radius (cm)	5.09	
Area of Specimen (cm^2)	81.479	
Init. Spec. height (in)	1.0015	N/A
Height change (final)(in)	N/A	0.0788
Adjusted Spec.height(in)	1.00	0.9227
" " (cm)	2.544	2.344
Specimen Volume (cm^3)	207.268	
Moist Density (pcf)	94.26	
MOISTURE CONTENT		
Wt. moist soil+tare(gr)	128.75	128.75
Wt. dry soil+tare(gr)	110.26	110.26
Wt. of tare(gr)	19.72	19.72
Wt. dry soil (gr)	90.54	90.54
Wt. of water (gr)	18.49	18.49
M/C (%)	20.42	20.42
DRY DENSITY (pcf)	78.3	
% Saturation* (48%-52%)	47.8	

*Assumes Gs = 2.7

EXPANSION INDEX = 79

Potential Expansion *(per ASTM 4829-08)* Medium

KOURY ENGINEERING & TESTING, INC.	**Project Name:** Borrow Site #2	**Project No.: 17-1024** **Date: 5/11/18**	**Run by: MFP** **QA:**	**Lab:** 18-0023 Series

EXPANSION INDEX TESTS

DENSITY AND MOISTURE CONTENT DATA - EI TEST

Location/ Elevation	TP15 @ 5.5' - 6'	
USCS Symbol	CH	
Normal Load (psf)	144	
SAMPLE CONDITION	**Initial**	**Final**
Wt Specimen & Ring (gr)	682.770	
Wt. of ring (gr)	364.17	
Wt. Specimen (gr)	318.600	
Specimen diameter (in)	4.010	
Specimen radius (cm)	5.09	
Area of Specimen (cm^2)	81.479	
Init. Spec. height (in)	0.9995	N/A
Height change (final)(in)	N/A	0.1946
Adjusted Spec.height(in)	1.00	0.8049
" " (cm)	2.539	2.044
Specimen Volume (cm^3)	206.854	
Moist Density (pcf)	96.16	
MOISTURE CONTENT		
Wt. moist soil+tare(gr)	136.78	136.78
Wt. dry soil+tare(gr)	117.52	117.52
Wt. of tare(gr)	31.57	31.57
Wt. dry soil (gr)	85.95	85.95
Wt. of water (gr)	19.26	19.26
M/C (%)	22.41	22.41
DRY DENSITY (pcf)	78.6	
% Saturation* (48%-52%)	52.8	

*Assumes Gs = 2.7

EXPANSION INDEX = 195

Potential Expansion *(per ASTM 4829-08)* Very High

KOURY ENGINEERING & TESTING, INC.	**Project Name:** Borrow Site #2	**Project No.: 17-1024**	**Run by: MFP**	**Lab:** 18-0023 Series
		Date: 5/1/18	**QA:**	

EXPANSION INDEX TESTS

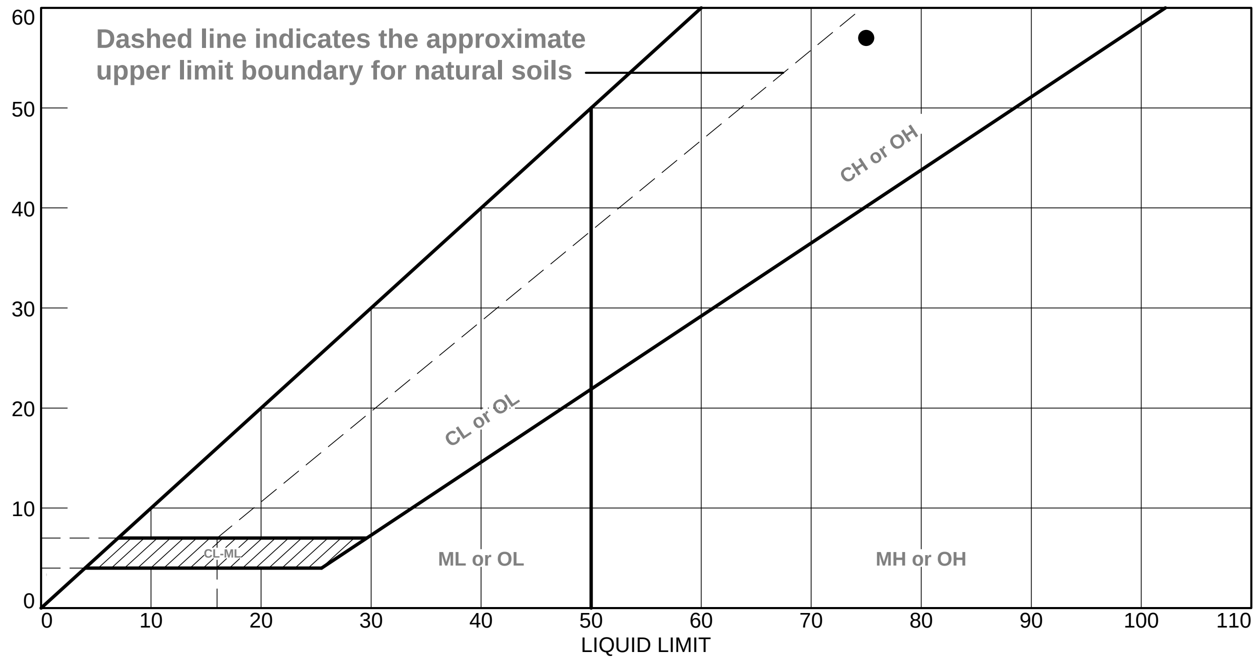
DENSITY AND MOISTURE CONTENT DATA - EI TEST

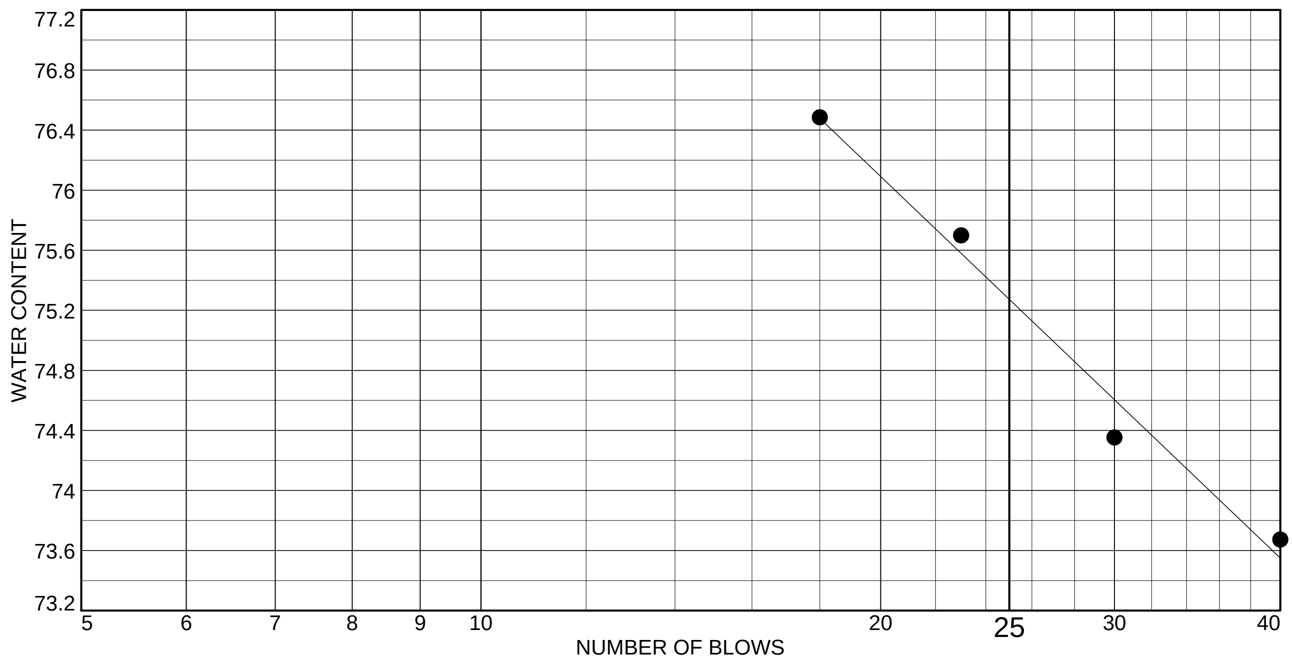
Location/ Elevation	TP17 @ 4' - 4.5'	
USCS Symbol	CL	
Normal Load (psf)	144	
SAMPLE CONDITION	Initial	Final
Wt Specimen & Ring (gr)	714.050	
Wt. of ring (gr)	366.68	
Wt. Specimen (gr)	347.370	
Specimen diameter (in)	4.010	
Specimen radius (cm)	5.09	
Area of Specimen (cm^2)	81.479	
Init. Spec. height (in)	1.0020	N/A
Height change (final)(in)	N/A	0.0399
Adjusted Spec.height(in)	1.00	0.9621
" " (cm)	2.545	2.444
Specimen Volume (cm^3)	207.371	
Moist Density (pcf)	104.58	
MOISTURE CONTENT		
Wt. moist soil+tare(gr)	155.07	155.07
Wt. dry soil+tare(gr)	135.10	135.10
Wt. of tare(gr)	19.73	19.73
Wt. dry soil (gr)	115.37	115.37
Wt. of water (gr)	19.97	19.97
M/C (%)	17.31	17.31
DRY DENSITY (pcf)	89.1	
% Saturation* (48%-52%)	52.5	

*Assumes Gs =	2.7
EXPANSION INDEX =	40
Potential Expansion *(per ASTM 4829-08)*	Low

KOURY ENGINEERING & TESTING, INC.	**Project Name:** Borrow Site #2	**Project No.: 17-1021**	**Run by: MFP**	**Lab:** 18-0023 Series
		Date: 4/26/18	**QA:**	

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light Pale Olive to Light Yellowish Brown Clay	75	18	57			CH

Project No. 17-1024 **Client:**

Project: Borrow Site #2

Location: TP-6 @ 8' - 9'
Sample Number: 4838 Series

Koury Engineering & Testing, Inc.

Chino, CA

Remarks:
● Lab #4838 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: Suzy Amaya **Checked By:** ____________

MAXIMUM DENSITY TEST REPORT

Curve No.: 4838 Series

Project No.: 17-1024 **Date:** 3/10/18

Project: Borrow Site #2

Client:

Location: TP-6 @ 8' - 9'

Sample Number: 4838 Series

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

MATERIAL DESCRIPTION

Description: Light Pale Olive to Light Yellowish Brown Clay

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

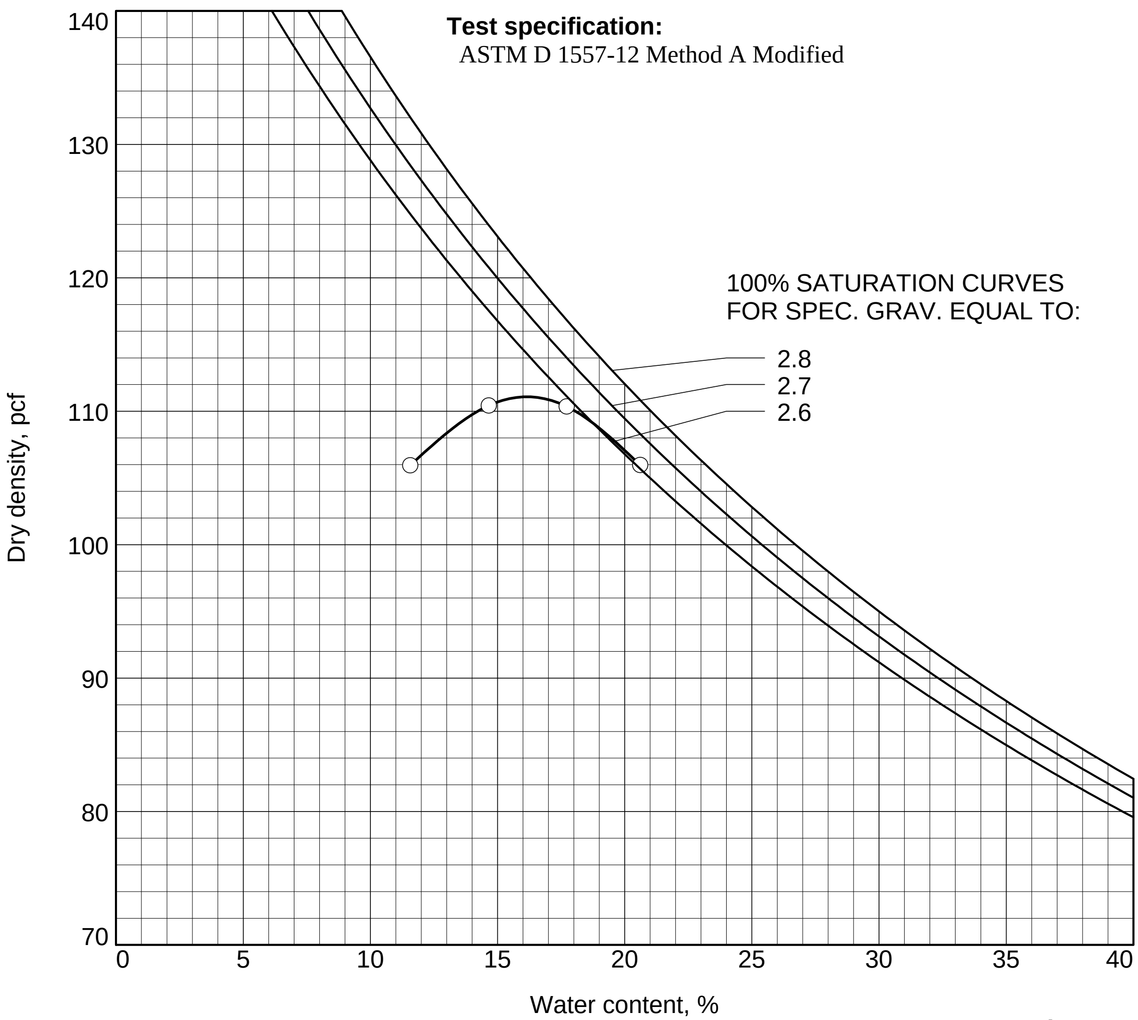
Nat. Moist. = **Sp.G. =**

Liquid Limit = **Plasticity Index =**

% < No.200 =

TEST RESULTS
Maximum dry density = 111.1 pcf
Optimum moisture = 16.2 %

Test specification:
ASTM D 1557-12 Method A Modified



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.

Figure

Koury Engineering & Testing, Inc.

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

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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