

APPENDIX A

FIELD INVESTIGATION

Our subsurface exploration consisted of drilling 10 small diameter borings, four large diameter borings, nine excavator trenches, 22 backhoe trenches, and one air track boring. We performed the field investigation in phases in 2008 and 2010. We have also included three backhoe trenches from a previous report prepared in 2004 by Neblett & Associates. These excavations were performed within the existing roadway prism or adjacent northern areas that are proposed for grading or improvement. The locations of some of the exploratory borings and trenches were surveyed by the project civil engineer with the remainder located in the field using compass and tape. We extended the small diameter borings to a maximum depth of approximately 37½ feet using a CME 75 drill rig equipped with 6-inch diameter hollow stem augers. The large diameter borings were excavated to a maximum depth of 50 feet with a truck-mounted drill rig equipped with a 30-inch diameter bucket-auger. The excavator trenches were extended to a maximum depth of approximately 24 feet using a Komatsu PC 400 excavator equipped with a 36-inch wide bucket. The trackhoe trenches were performed using a John Deere 555 trackhoe equipped with a 24-inch wide bucket and extended to a maximum depth of 13 feet. The air track boring was advanced to a maximum depth of 24 feet using an ECM-370 drill rig equipped with a 4-inch diameter drill bit. The drill bit is advanced with an air percussion hammer and drill rods. As the drilling proceeded, Geocon Incorporated recorded the drill penetration rates in seconds per foot (seconds/foot). The approximate boring and trench locations are shown on the Geologic Map (Figures 2 through 8).

We obtained samples during our subsurface exploration in the borings using a California sampler. The sampler is composed of steel and is driven to obtain ring samples. The California sampler has an inside diameter of 2.5 inches and an outside diameter of 3 inches. Up to 18 rings are placed inside the sampler that is 2.375 inches in diameter and 1 inch in height. We placed the ring samples in moisture-tight containers and transported them to the laboratory for testing. We also obtained bulk samples for laboratory testing.

The small-diameter boring sampler was driven 12 inches into the bottom of the excavation with the use of an automatic hammer. The sampler is connected to A rods and driven into the bottom of the excavation using a 140-pound hammer with a 30-inch drop. Blow counts are recorded for every 6 inches the sampler is driven. The penetration resistances shown on the boring logs are shown in terms of blows per foot. The values indicated on the boring logs are the sum of the last 12 inches of the sampler. The large-diameter boring sampler was driven 12 inches into the bottom of the excavation with the use of a telescoping Kelly bar. The weight of the Kelly bar (4,500 pounds maximum) drives the sampler and varies in weight with depth. The height of drop is usually 18 inches. Blow counts are recorded for every 12 inches the sampler is driven. The penetration

resistance values shown on the boring logs are shown in terms of blows per foot. These values are not to be taken as N-values and adjustments have not been applied.

We estimated elevations shown on the boring and trench logs either from a topographic map or by using a benchmark. In addition, some elevations were obtained from the surveying stakes provided in the field. We visually examined, classified, and logged the soil conditions encountered in the borings and trenches in general conformance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual - Manual Procedure D2844-99). The logs of the exploratory borings and trenches are presented on Figures A-1 through A-48 and included herein. The logs depict the various soil and rock types encountered and indicate the depths at which samples were obtained.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING SB 1			PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>540'</u>	DATE COMPLETED <u>01-19-2010</u>	EQUIPMENT <u>CME 75</u> BY: <u>M. ERTWINE</u>			
MATERIAL DESCRIPTION										
0					3-Inches ASPHALT CONCRETE					
2	SB1-1			SM & CL	UNDOCUMENTED FILL (Qudf) Medium dense to stiff, moist, light brown to dark reddish, interlayered, Silty SAND and Sandy CLAY			31	109.6	9.3
4	SB1-2									
6	SB1-3			CL	Stiff, moist, dark brown to brown, Sandy CLAY; with few gravels			11	110.3	15.9
10	SB1-4				-Gravel in sampler, blow counts likely not accurate			22	105.6	12.3
14	SB1-5								---	14.8
16	SB1-6			CL	ALLUVIUM (Qal) Very stiff, reddish brown, Gravelly CLAY; with angular gravel; blow count not accurate due to gravels; poor recovery			33	108.5	11.2
20	SB1-7			SC/SM	FANGLOMERATE DEPOSITS (Tof) Dense, damp, yellowish brown, mottled, reddish brown, Clayey/Gravelly SAND; moderately weathered			46	106.5	8.3
26	SB1-8			SM/SC	OTAY FORMATION (To) Very dense, moist, grayish brown, Silty/Clayey, fine-grained SANDSTONE; with trace subrounded to angular gravels					
					BORING TERMINATED AT 26.5 FEET No groundwater encountered Backfilled with cement mixed soil, upper 3 ft. concrete seal with black dye					

Figure A-1,
Log of Boring SB 1, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS		... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
		... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING SB 2			PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>533'</u>	DATE COMPLETED <u>01-19-2010</u>	EQUIPMENT <u>CME 75</u> BY: <u>M. ERTWINE</u>			
MATERIAL DESCRIPTION										
0				GC	3 Inch ASPHALT CONCRETE					
2	SB2-1				FANGLOMERATE DEPOSITS (Tof) Very dense, dry, grayish brown, Clayey GRAVEL; -No recovery					
4	SB2-2 SB2-3			ML	OTAY FORMATION (To) Becomes light yellowish brown, fine, Sandy SILTSTONE -No recovery, some gravels in clayey sand matrix			60/10"	---	5.5
					REFUSAL AT 5.5 FEET No groundwater encountered Backfilled with cement-mixed upper 3 ft. concrete seal with black dye					

Figure A-2,
Log of Boring SB 2, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS		... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
		... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

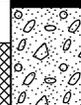
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING SB 3		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>505'</u>	DATE COMPLETED <u>01-19-2010</u>			
					EQUIPMENT <u>CME 75</u> BY: <u>M. ERTWINE</u>				
MATERIAL DESCRIPTION									
0					3-inches ASPHALT				
2	SB3-1			SC/SM	UNDOCUMENTED FILL (Qudf) Medium dense, moist, yellowish brown, Clayey/Gravelly SAND		41	--	5.6
4	SB3-2								
6	SB3-3				-Some subrounded to angular gravels -Gravel layer approximately 1-foot thick		39	111.2	7.8
8									
10	SB3-4				-Gravel layer, no recovery		44		
12									
14									
16	SB3-5			SC	ALLUVIUM (Qal) Medium dense, light brown to pale green, Clayey, fine to coarse grained SAND; with little gravel		38	114.5	14.4
18									
20	SB3-6			SC	OTAY FORMATION (To) Dense, moist, gray, mottled yellowish brown, Clayey, fine to coarse grained SANDSTONE; with some subrounded angular gravels		58	105.0	14.0
					BORING TERMINATED AT 21 FEET No groundwater encountered Backfilled with cement mixed soil, upper 3 ft. concrete seal with black dye				

Figure A-3,
Log of Boring SB 3, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS		... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
		... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING SB 4		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>504'</u>	DATE COMPLETED <u>01-29-2010</u>			
					EQUIPMENT <u>CME 75</u>		BY: <u>M. ERTWINE</u>		
MATERIAL DESCRIPTION									
0				SC	3-inches ASPHALT				
2	SB4-1				UNDOCUMENTED FILL (Qudf) Medium dense, moist, brown mottled grayish brown, Clayey SAND; with fine gravels		18	104.5	10.6
4	SB4-2				-Becomes wet and strong brown		18	110.6	14.4
6	SB4-3								
8	SB4-4								
10	SB4-4				-Becomes moist to dry and brown to dark brown; blow counts not accurate due to gravels in shoe		45	98.4	9.7
12									
14									
16	SB4-5			CL	ALLUVIUM (Qal) Stiff, moist, grayish brown to brown, Sandy CLAY; trace small subrounded gravels		18	107.0	16.3
18									
20									
					BORING TERMINATED AT 21.5 FEET; after 10 minutes of effort by CME 75 No groundwater encountered Backfilled with cement mixed soil, upper 3 ft. concrete seal with black dye				

Figure A-4,
Log of Boring SB 4, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS					
	... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

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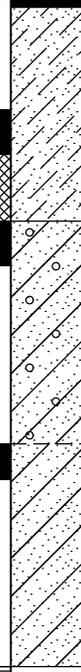
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING SB 5 ELEV. (MSL.) <u>516'</u> DATE COMPLETED <u>01-26-2010</u> EQUIPMENT <u>CME 75</u> BY: <u>M. ERTWINE</u>	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
MATERIAL DESCRIPTION								
0				SC	3-inches ASPHALT CONCRETE			
2	SB5-1				UNDOCUMENTED FILL (Qudf) Medium dense, moist, yellowish brown, Clayey, fine to medium SAND; trace gravels	16	---	5.8
4	SB5-2							
6	SB5-3			GC	ALLUVIUM (Qal) Medium dense, moist, yellowish to grayish brown, Clayey GRAVEL; sand and clay matrix	25	94.1	12.7
8								
10	SB5-4			CL	Stiff, moist, brown, Sandy CLAY; gravel in sample; blow counts not accurate	25	105.9	14.6
12								
14								
					-No recovery due to gravel or rock			
					REFUSAL AT 15 FEET No groundwater encountered Backfilled with cement mixed soil, upper 3 ft. concrete seal with black dye			

Figure A-5,
Log of Boring SB 5, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING SB 6		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	
					ELEV. (MSL.) <u>508'</u>	DATE COMPLETED <u>01-25-2010</u>				
					EQUIPMENT <u>CME 75</u> BY: <u>M. ERTWINE</u>					
MATERIAL DESCRIPTION										
0				CL	3-inches ASPHALT CONCRETE					
2	SB6-1				UNDOCUMENTED FILL (Qudf) Stiff, moist, brown, Sandy CLAY; trace small subrounded gravel		15	115.2	14.2	
4	SB6-2			SC	Medium dense, moist, brown to light brown, Clayey SAND		28	106.8	13.3	
6	SB6-3									
8										
10	SB6-4				Becomes yellowish brown with few small angular gravels		26	110.7	12.8	
12										
14				CL	-Difficult drilling at 14-15 ft.					
16	SB6-5				ALLUVIUM (Qal) Medium dense, damp, light gray, fine, Sandy CLAY with siltstone clasts and gravelly sandstone lenses		50/9"	103.3	10.3	
18										
20	SB6-6				-No recovery		50/2"			
					BORING TERMINATED AT 20.2 FEET No groundwater encountered Backfilled with cement mixed soil, upper 3 ft. concrete seal with black dye					

Figure A-6,
Log of Boring SB 6, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

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DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING SB 7		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>505'</u>	DATE COMPLETED <u>01-25-2010</u>			
					EQUIPMENT <u>CME 75</u> BY: <u>M. ERTWINE</u>				
					MATERIAL DESCRIPTION				
0				SC	3-inches ASPHALT CONCRETE				
2	SB7-1				UNDOCUMENTED FILL (Qudf) Medium dense, dry, yellowish brown, Clayey SAND; with trace angular gravels; erroneous blow counts		23	---	8.9
4	SB7-2								
6	SB7-3		CL		Stiff, moist, reddish brown, Sandy CLAY; some small angular gravels		14	110.0	13.0
10	SB7-4				-Granitic clasts present within fill matrix		15	102.8	15.4
16	SB7-5		SC		Medium dense, moist, yellowish brown with brown stringers within fill matrix, Clayey SAND; few angular gravel		26	99.3	13.1
20	SB7-6		CL		ALLUVIUM (Qal) Firm, moist, dark grayish brown, Sandy CLAY; strong organic odor		16	116.3	11.6
24	SB7-7				-Some gray and brown mottling		19	109.5	17.8
26									
28									

Figure A-7,
Log of Boring SB 7, Page 1 of 2

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

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DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING SB 7		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>505'</u>	DATE COMPLETED <u>01-25-2010</u>			
					EQUIPMENT <u>CME 75</u> BY: <u>M. ERTWINE</u>				
MATERIAL DESCRIPTION									
30	SB7-8				-Trace angular gravels and pebbles		14	105.1	19.9
32	SB7-9				-Excavates to sandy clay				
34					-Seepage at 35 feet				
36	SB7-10 SB7-11				FANGLOMERATE DEPOSITS (Tof) -No recovery with cal sampler, few brecciated metavolcanic rock retrieved from SPT sampler		51		
REFUSAL AT 37.5 FEET Seepage at 35 feet Backfilled with cement mixed concrete, upper 3 ft. concrete seal with black dye									

Figure A-7,
Log of Boring SB 7, Page 2 of 2

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS		... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
		... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

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DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING SB 8			PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>505'</u>	DATE COMPLETED <u>01-25-2010</u>	EQUIPMENT <u>CME 75</u> BY: <u>M. ERTWINE</u>			
MATERIAL DESCRIPTION										
0				SC	3-inches ASPHALT CONCRETE					
2	SB8-1				UNDOCUMENTED FILL (Qudf) Medium dense, moist, yellowish mottled grayish brown, Clayey SAND; trace gravel			21	---	12.0
4	SB8-2				-Few gravel			17	98.4	16.8
6	SB8-3									
8					-Gravel layer, difficult drilling					
10	SB8-4				-Becomes loose and reddish brown with few gravels; poor recovery			16	---	9.2
12										
14										
16	SB8-5			GM/GC	Medium dense, reddish brown, mottled, yellowish brown, Sandy/Clayey GRAVEL; poor recovery due to gravels			29	101.7	14.1
18										
20	SB8-6			CL	Stiff, moist, dark brown, Sandy CLAY; with some gravel			21	104.0	14.1
22										
24	SB8-7							70/7"	109.9	16.2
				SC & ML	OTAY FORMATION (To) Dense to very stiff, moist, light grayish brown, interbedded Clayey SANDSTONE and Sandy SILTSTONE					
					BORING TERMINATED AT 25.7 FEET No groundwater encountered Backfilled with cement mixed soil, upper 3 ft. concrete seal with black dye					

Figure A-8,
Log of Boring SB 8, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS		
	... SAMPLING UNSUCCESSFUL	
	... DISTURBED OR BAG SAMPLE	
		
		... DRIVE SAMPLE (UNDISTURBED)
		... CHUNK SAMPLE
		... WATER TABLE OR SEEPAGE

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DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING SB 9		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>506'</u>	DATE COMPLETED <u>01-26-2010</u>			
					EQUIPMENT <u>CME 75</u> BY: <u>M. ERTWINE</u>				
MATERIAL DESCRIPTION									
0				CL	3-inches ASPHALT CONCRETE				
2	SB9-1				UNDOCUMENTED FILL (Qudf) Firm, moist, reddish brown, Sandy CLAY; trace gravels		22	103.1	13.5
4	SB9-2								
6	SB9-3			SC	Medium dense to stiff, moist, reddish brown, Clayey, fine to medium SAND; with interlayered sandy clay lenses		25	98.9	14.0
10	SB9-4				-Blow counts not accurate due to gravels; some grayish mottling present		42	88.5	12.9
14	SB9-5			GC	Medium dense, moist, reddish brown, with grayish brown mottling, Clayey GRAVEL; poor recovery		39	103.6	14.4
20				SM/SC	-Difficult drilling due to gravels -Seepage encountered at 20 feet; no recovery due to gravels		29		
22					ALLUVIUM (Qal) Dense, moist, dark brown, Gravelly/Clayey, fine to coarse SANDSTONE with gravel and cobble				
24					-Cutting head advanced from 21-24 feet with relative ease				
26	SB9-6				-Poor recovery, brecciated meta volcanic rock obtained from california sampler; blow counts not accurate due to gravels		72	117.0	13.2
					REFUSAL AT 26 FEET Seepage at 20 feet Backfilled with cement mixed soil, upper 3 feet concrete ft. concrete seal with black dye				

Figure A-9,
Log of Boring SB 9, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS		... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
		... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

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DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING SB 10 ELEV. (MSL.) <u>518'</u> DATE COMPLETED <u>01-29-2010</u> EQUIPMENT <u>CME 75</u> BY: <u>M. ERTWINE</u>	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
MATERIAL DESCRIPTION								
0				SC	3-inches ASPHALT CONCRETE			
2	SB10-1 SB10-2				UNDOCUMENTED FILL (Qudf) Medium dense, moist, reddish brown to gray brown, Clayey, fine to coarse SAND; few gravels with interlayered sandy clay lenses	20	117.1	8.8
4								
6	SB10-3			GC	Loose, dry to moist, Clayey GRAVEL; poor recovery	13	99.5	14.6
8								
10	SB10-4 SB10-5				ALLUVIUM (Qal) -Sampling unsuccessful, no recovery -Hard gravel layer; brecciated metavolcanic rock obtained in SPT sampler	50/6" 50/5"		
					REFUSAL AT 11 FEET No groundwater encountered Backfilled with cement mixed cuttings, upper 3 ft. concrete seal with black dye			

Figure A-10,
Log of Boring SB 10, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS		... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
		... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

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DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING LB 10 ELEV. (MSL.) <u>527'</u> DATE COMPLETED <u>01-12-2010</u> EQUIPMENT <u>30" DIAMETER BUCKET RIG</u> BY: <u>T. REIST</u>	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
MATERIAL DESCRIPTION								
0				CL	COLLUVIUM (Qc) Soft to stiff, moist, dark brown, Sandy CLAY with trace gravel			
2				CL	-Gradational contact FANGLOMERATE DEPOSITS (Tof) Very stiff, moist, mottled orange, brown and gray, fine to coarse, Sandy CLAY with 10-25% angular gravel up to 3 inches; no discernible bedding			
4	LB10-1							
6	LB10-2				-Becomes pale green with orange oxidation below 5 feet with random gypsum veins	2	119.5	14.8
8				CL	OTAY FORMATION (To) Very dense, damp, mottled orange brown and gray, Gravelly CLAYSTONE with sand, gravel, cobble and boulders up to 8 inches			
10					-1½ thick, stiff, moist, pale green claystone bed with gravel at 10 feet			
12	LB10-3					4/4"	121.6	8.6
14					-Very difficult drilling			
PRACTICAL REFUSAL AT 15 FEET								

Figure A-11,
Log of Boring LB 10, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING LB 11		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>529'</u>	DATE COMPLETED <u>01-13-2010</u>			
					EQUIPMENT <u>30" DIAMETER BUCKET RIG</u>		BY: <u>T. REIST</u>		
MATERIAL DESCRIPTION									
0				CL	TOPSOIL Stiff, moist, dark brown, fine to coarse, Sandy CLAY with trace gravel				
2				CL/SC	OTAY FORMATION (To) Very hard to very dense, damp, mottled light brown, brown and pale green, Sandy, fine to medium CLAYSTONE/Clayey, fine to medium SANDSTONE; clay and sand content vary with depth				
6	LB11-1						5/10"	111.1	15.7
10	LB11-2						5/8"	116.5	16.2
18				SM	Very dense, damp, light gray, Silty, fine to medium SANDSTONE				
20	LB11-3			CL/SC	-Irregular scoured contact with 6 to 8-inch gravel and cobble bed at contact (10-20°, S35W)		6	123.1	13.7
22					Very hard to very dense, damp, mottled light brown, brown and pale green, Sandy, fine to medium CLAYSTONE/Clayey, fine to medium SANDSTONE; clay and sand content vary with depth				
24				SM	-Gradational contact				
26					Very dense, damp, gray to light brown, Silty, fine to coarse SANDSTONE with 5-10% gravel up to 3 inches				
28									

Figure A-12,
Log of Boring LB 11, Page 1 of 2

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING LB 11		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>529'</u>	DATE COMPLETED <u>01-13-2010</u>			
					EQUIPMENT <u>30" DIAMETER BUCKET RIG</u>		BY: <u>T. REIST</u>		
MATERIAL DESCRIPTION									
30									
32									
34									
36						-Sharp slightly scoured contact with coarse sandstone at base (2-3°, S35W) -1½ foot thick pale green and light brown, sandy claystone/clayey sandstone bed at 35½ feet			
38									
40									
42	LB11-4			CL		-Sharp scoured undulating contact Very hard to hard, pale green, Silty CLAYSTONE, waxy but very competent	8	121.0	14.3
44	LB11-5								
46	LB11-6			SC		-Gradational contact Very dense, damp, orange brown, Clayey, fine to coarse SANDSTONE with 10-30% gravel and cobble up to 10 inches	11/10"	125.7	11.0
48									
50						BORING TERMINATED AT 50 FEET No groundwater encountered			

Figure A-12,
Log of Boring LB 11, Page 2 of 2

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS		
	... SAMPLING UNSUCCESSFUL	
	... DISTURBED OR BAG SAMPLE	
		
		... DRIVE SAMPLE (UNDISTURBED)
		... CHUNK SAMPLE
		... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

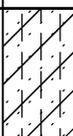
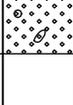
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING LB 14		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>512'</u>	DATE COMPLETED <u>01-14-2010</u>			
					EQUIPMENT <u>30" DIAMETER BUCKET RIG</u> BY: <u>T. REIST</u>				
MATERIAL DESCRIPTION									
0				CL	TOPSOIL Stiff, moist, dark brown, fine to coarse Sandy/Silty CLAY with 5% gravel and cobble up 8 inches				
2				SC	FANGLOMERATE DEPOSITS (Tof) Dense, damp, mottled light brown and orange, Clayey, fine to coarse SANDSTONE with 10-20% gravel, cobble and boulders up to 14 inches; no discernible bedding; difficult drilling				
4					-Heavily scoured and undulating contact (10-30°, S10E)				
6				SM	OTAY FORMATION (To) Dense, damp, light brown, orange and pale green, Silty, fine to medium SANDSTONE				
8				SC/SM	Dense, damp, pale green and orange, Clayey/Silty SANDSTONE				
10				SM/SC	Dense, damp, dark gray, Gravelly/Clayey, fine to coarse SANDSTONE with 20-30% gravel, cobble and boulders up to 14 inches; very slow difficult drilling; rippers used				
12									
14					PRACTICAL REFUSAL IT 14 FEET				

Figure A-13,
Log of Boring LB 14, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING LB 17		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>509'</u>	DATE COMPLETED <u>01-14-2010</u>			
					EQUIPMENT <u>30" DIAMETER BUCKET RIG</u>		BY: <u>T. REIST</u>		
MATERIAL DESCRIPTION									
0				CL	COLLUVIUM (Qc) Stiff, moist, dark brown, Sandy CLAY with 5-10% gravel and cobble up to 6 inches				
2					-Becomes very stiff, pale gray to pale green				
4				CL/SC	OTAY FORMATION (To) Dense, damp, light brown to pale green, fine to coarse, Sandy CLAYSTONE/Clayey, fine to coarse SANDSTONE				
6					-Scoured contact				
8				CL	Dense, damp, pale green and orange, Gravelly/fine to coarse, Sandy CLAYSTONE with 30% gravel, cobble and boulders up to 12 inches				
10				CL	-Heavily scoured contact Hard, moist, pale green, Silty CLAYSTONE with fine to coarse, sandy grit; waxy but very competent				
10	LB17-1				-Gravel in shoe; blow counts not accurate	5/8"	113.2	15.3	
12				SM/SC	Very dense, damp, pale green and orange brown, Gravelly/Clayey, fine to coarse SANDSTONE with 20-40% gravel, cobble and boulders up 14 inches with random pale green discontinuous claystone beds				
14									
16									
18				CL	-Gradational contact Very stiff to hard, pale gray-green, Silty CLAYSTONE with fine to coarse sandy grit and trace gravel; waxy but competent	2	112.6	18.0	
20	LB17-2				-Gravel content increases below 21 feet				
22					-Gradational contact				
22				SM/SC	Very dense, damp, pale green and orange brown, Gravelly/Clayey, fine to coarse SANDSTONE with 20-40% gravel, cobble and boulders up 14 inches with random pale green discontinuous claystone beds				
24									

Figure A-14,
Log of Boring LB 17, Page 1 of 2

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING LB 17 ELEV. (MSL.) <u>509'</u> DATE COMPLETED <u>01-14-2010</u> EQUIPMENT <u>30" DIAMETER BUCKET RIG</u> BY: <u>T. REIST</u>	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
26	LB17-3					5/8"	126.8	9.1
28								
30					-Gravel, cobble and boulder content increases below 30 feet			
					PRACTICAL REFUSAL AT 31 FEET			

Figure A-14,
Log of Boring LB 17, Page 2 of 2

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

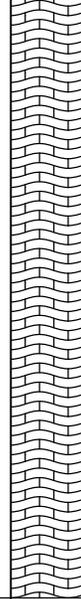
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 4		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>540'</u>	DATE COMPLETED <u>08-18-2008</u>			
					EQUIPMENT <u>PC 400LC-EXCAVATOR W/36" BUCKET</u> BY: <u>J. PAGNILLO</u>				
MATERIAL DESCRIPTION									
0				SC	COLLUVIUM (Qc) Loose, damp, brown to dark brown, Clayey, fine to coarse SAND				
2						-Becomes medium dense			
4					METAVOLCANIC ROCK (KJmv) Highly weathered, grayish brown, moderately weak, METAVOLCANIC ROCK				
6						-Becomes moderately strong			
8						-Becomes strong to very strong and moderately weathered			
10						-Some angular fragments up to 12" in max dimension			
12									
14					REFUSAL AT 14 FEET No groundwater encountered				

Figure A-15,
Log of Trench ET 4, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

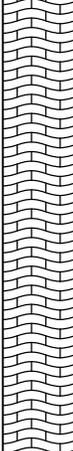
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 5		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>505'</u>	DATE COMPLETED <u>08-18-2008</u>			
					EQUIPMENT <u>PC 400LC-EXCAVATOR W/36" BUCKET</u> BY: <u>J. PAGNILLO</u>				
MATERIAL DESCRIPTION									
0				SC	TOPSOIL Loose, damp, brown, Clayey, fine to coarse SAND				
2					METAVOLCANIC ROCK (KJmv) Highly weathered, grayish brown, weak, METAVOLCANIC ROCK with red oxidation -Becomes moderately weathered and moderately weak -Becomes strong to very strong; angular fragments up to 12" in max dimension				
4									
6									
8									
					REFUSAL AT 9 FEET No groundwater encountered				

Figure A-16,
Log of Trench ET 5, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 6			PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)									
					ELEV. (MSL.) <u>506'</u>	DATE COMPLETED <u>08-18-2008</u>	EQUIPMENT <u>PC 400LC-EXCAVATOR W/36" BUCKET</u> BY: <u>J. PAGNILLO</u>												
MATERIAL DESCRIPTION																			
0	ET6-1			SC	ALLUVIUM (Qal) Medium dense, damp to moist, brown to dark brown, Clayey, fine to coarse SAND with trace sub-angular metavolcanic rock up to 6" in maximum dimension														
2																			
4	ET6-2			CL/CH	OTAY FORMATION (T_o) Stiff, moist, light olive gray, fine to coarse, Sandy CLAYSTONE; waxy lustre, local polished surfaces -Becomes stiff to very stiff														
6																			
8																			
10																			
12																			
14																			
16																			
18																			
TRENCH TERMINATED AT 19 FEET No groundwater encountered																			

Figure A-17,
Log of Trench ET 6, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

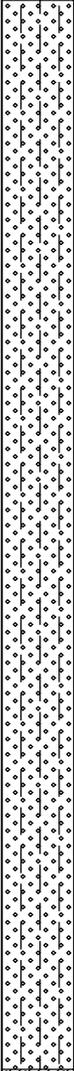
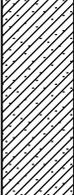
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 7		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>550'</u>	DATE COMPLETED <u>08-18-2008</u>			
					EQUIPMENT <u>PC 400LC-EXCAVATOR W/36" BUCKET</u> BY: <u>J. PAGNILLO</u>				
MATERIAL DESCRIPTION									
0				SC	TOPSOIL Loose to medium dense, damp, Clayey, fine to coarse SAND				
2				SM+GW	FANGLOMERATE DEPOSITS (Tof) Dense, damp, light brown to tan, Silty, fine to coarse SANDSTONE with 20-30% gravel and cobble up to 10 inches				
4									
6									
8									
10									
12									
14									
16					-Gravel percentage decreases (5-10%)				
18				CL-CH	OTAY FORMATION (To) Very stiff, damp, green/brown, Sandy CLAYSTONE				

Figure A-18,
Log of Trench ET 7, Page 1 of 2

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 7			PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>550'</u>	DATE COMPLETED <u>08-18-2008</u>	EQUIPMENT <u>PC 400LC-EXCAVATOR W/36" BUCKET</u> BY: <u>J. PAGNILLO</u>			
20					MATERIAL DESCRIPTION					
22										
24					TRENCH TERMINATED AT 24 FEET No groundwater encountered					

Figure A-18,
Log of Trench ET 7, Page 2 of 2

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	<input type="checkbox"/> ... SAMPLING UNSUCCESSFUL	<input type="checkbox"/> ... STANDARD PENETRATION TEST	<input type="checkbox"/> ... DRIVE SAMPLE (UNDISTURBED)
	<input checked="" type="checkbox"/> ... DISTURBED OR BAG SAMPLE	<input checked="" type="checkbox"/> ... CHUNK SAMPLE	<input type="checkbox"/> ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 10		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	
					ELEV. (MSL.) <u>504'</u>	DATE COMPLETED <u>08-21-2008</u>				
					EQUIPMENT <u>PC 400LC-EXCAVATOR W/36" BUCKET</u> BY: <u>M. ERTWINE</u>					
MATERIAL DESCRIPTION										
0				CL	ALLUVIUM (Qal) Medium dense, dry, brown, Sandy CLAY; some rootlets					
2						-Becomes dense with some nested gravels and boulders up to 2 feet in maximum dimension				
4				SC	OTAY FORMATION (To) Dense, moist, light grayish to yellowish brown, Clayey, medium- to coarse-grained SANDSTONE with 20% gravel and occasional cobble					
6										
8										
10										
12					-Massive; becomes very dense and cemented					
14					REFUSAL AT 14 FEET No groundwater encountered					

Figure A-19,
Log of Trench ET 10, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

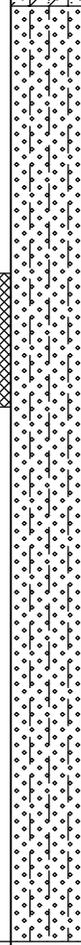
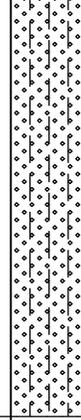
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 15		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>510'</u>	DATE COMPLETED <u>08-22-2008</u>			
					EQUIPMENT <u>PC 400LC-EXCAVATOR W/36" BUCKET</u> BY: <u>M. ERTWINE</u>				
MATERIAL DESCRIPTION									
0				SC-SM	ALLUVIUM (Qal) Medium dense, dry, brown, Clayey to Silty SAND				
2				SM	OTAY FORMATION (To) Dense, moist, olive gray to light reddish brown, Silty to Clayey, fine- to medium-grained SANDSTONE				
6	ET15-1								
8					-Becomes fine- to coarse-grained with 20-30% cobbles and boulders up to 2-foot minus				
10									
12									
14					-Massive				
16					REFUSAL AT 16 FEET No groundwater encountered				

Figure A-20,
Log of Trench ET 15, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS		
	... SAMPLING UNSUCCESSFUL	
	... DISTURBED OR BAG SAMPLE	
		
		... DRIVE SAMPLE (UNDISTURBED)
		
		... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 34			PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>535'</u>	DATE COMPLETED <u>08-20-2008</u>	EQUIPMENT <u>PC 400LC-EXCAVATOR W/36" BUCKET</u> BY: <u>M. ERTWINE</u>			
MATERIAL DESCRIPTION										
0				SM	TOPSOIL Loose, dry, light reddish brown, Silty SAND; trace gravels					
2				SM	FANGLOMERATE DEPOSITS (Tof) Dense, moist, reddish brown, Silty/Gravelly SANDSTONE with 30-40% gravel, cobble and boulders up to 24 inches					
4	ET34-1									
6										
8										
10				SC	OTAY FORMATION (To) Dense, damp, light reddish to yellowish brown, Clayey, fine to coarse SANDSTONE with some gravel and occasional boulder					
12										
14										
16										
					TRENCH TERMINATED AT 16 FEET No groundwater encountered					

Figure A-21,
Log of Trench ET 34, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS					
	... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 37			PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>536'</u>	DATE COMPLETED <u>08-19-2008</u>	EQUIPMENT <u>PC 400LC-EXCAVATOR W/36" BUCKET</u> BY: <u>M. ERTWINE</u>			
MATERIAL DESCRIPTION										
0	ET37-1			SM	TOPSOIL Loose, dry, Silty, fine to medium SAND with abundant gravels and 2' boulders					
2				SM	FANGLOMERATE DEPOSITS (Tof) Very dense, light grayish brown, Silty/Gravelly, medium- to coarse-grained SANDSTONE with 30-40% gravel and cobble					
4										
6										
8										
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered					

Figure A-22,
Log of Trench ET 37, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

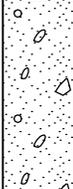
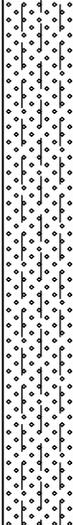
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH ET 48		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>520'</u>	DATE COMPLETED <u>08-20-2008</u>			
					EQUIPMENT <u>PC 400LC-EXCAVATOR W/36" BUCKET</u> BY: <u>M. ERTWINE</u>				
MATERIAL DESCRIPTION									
0				SM	TOPSOIL Loose, dry, dark brown, Gravelly, fine to coarse SAND				
2									
4				SM	FANGLOMERATE DEPOSITS (Tof) Dense, dry, reddish brown, Gravelly/Silty SANDSTONE with gravel, cobble and boulders up to 14 inches -Becomes grayish brown				
6									
8									
10									
					REFUSAL AT 11 FEET No groundwater encountered				

Figure A-23,
Log of Trench ET 48, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

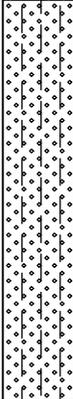
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 1		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>546'</u>	DATE COMPLETED <u>01-29-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u>		BY: <u>T. REIST</u>		
MATERIAL DESCRIPTION									
0				CL	COLLUVIUM (Qc) Medium dense, moist, reddish brown to mottled gray, pale green and brown, fine to coarse, Sandy CLAY (weathered)				
2				SM/SC	OTAY FORMATION (To) Very dense, damp, pale green and light brown, Silty/Clayey, fine to coarse SANDSTONE with trace gravel				
4									
6									
TRENCH TERMINATED AT 7 FEET									

Figure A-24,
Log of Trench T 1, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

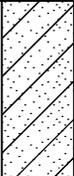
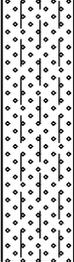
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 2		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>560'</u>	DATE COMPLETED <u>01-29-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u>		BY: <u>T. REIST</u>		
MATERIAL DESCRIPTION									
0				CL	TOPSOIL Stiff, moist to wet, dark brown, fine to coarse, Sandy CLAY with trace gravel and cobble up to 8 inches				
2				SM/SC	FANGLOMERATE DEPOSITS (Tof) Dense, damp to moist, mottled light brown and pale green, Silty/Clayey, fine to coarse SANDSTONE with 20% gravel and cobble up to 9 inches; claystone and sandstone rip-up clasts up to 5 inches				
4					TRENCH TERMINATED AT 5 FEET				

Figure A-25,
Log of Trench T 2, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 16		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>496'</u>	DATE COMPLETED <u>02-01-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u>		BY: <u>T. REIST</u>		
MATERIAL DESCRIPTION									
0			▽	CL	ALLUVIUM (Qal) Soft, wet, dark brown, fine to coarse Sandy CLAY with 10% gravel, cobble and boulders up to 14 inches				
2							-Heavy seepage with minor caving		
4									
6									
8				SM/SC	OTAY FORMATION (To) Dense, moist, light brown and orange, Silty/Clayey, fine to coarse SANDSTONE				
TRENCH TERMINATED AT 8.5 FEET									

Figure A-26,
Log of Trench T 16, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS					
	... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 18		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>540'</u>	DATE COMPLETED <u>02-01-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u> BY: <u>T. REIST</u>				
MATERIAL DESCRIPTION									
0				CL	ALLUVIUM (Qal) Stiff, very moist, dark brown to reddish brown, Sandy CLAY with gravel and cobble up to 8 inches				
2						-Gravel, cobble and boulders at contact			
4				SM	OTAY FORMATION (To) Very dense, damp, light brown, Silty, fine to coarse SANDSTONE with 10-20% gravel				
6						TRENCH TERMINATED AT 6 FEET			

Figure A-27,
Log of Trench T 18, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 20		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	
					ELEV. (MSL.) <u>488'</u>	DATE COMPLETED <u>02-01-2010</u>				
					EQUIPMENT <u>JD 555 TRACKHOE</u>		BY: <u>T. REIST</u>			
MATERIAL DESCRIPTION										
0				SC	ALLUVIUM (Qal) Loose, wet, dark brown to brown, Clayey, fine to coarse SAND with 10-30% gravel, cobble and boulders up to 20 inches; minor to moderate caving					
2										
4						-Heavy seepage at 4 feet				
6						-36-inch boulder present at 5 feet				
8										
10					SC	OTAY FORMATION (To) Dense, moist, mottled pale green, orange and brown, Clayey, fine to coarse SANDSTONE with gravel and cobble; difficult to see below 10 feet due to caving and heavy seepage; sidewall collapsed soon after formation was exposed				
					TRENCH TERMINATED AT 10 FEET DUE TO CAVING					

Figure A-28,
Log of Trench T 20, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS		... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
		... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 22		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>534'</u>	DATE COMPLETED <u>02-01-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u> BY: <u>T. REIST</u>				
MATERIAL DESCRIPTION									
0				SC	TOPSOIL Medium dense, moist, reddish brown, Clayey, fine to medium SAND with 10% gravel and cobble up to 5 inches				
2				SM	FANGLOMERATE DEPOSITS (Tof) Very dense, damp, reddish brown, Gravelly, fine to coarse SANDSTONE with gravel and cobble up to 14 inches REFUSAL AT 2.5 FEET				

Figure A-29,
Log of Trench T 22, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 23		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>558'</u>	DATE COMPLETED <u>02-01-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u>		BY: <u>T. REIST</u>		
MATERIAL DESCRIPTION									
0				SC	COLLUVIUM (Qc) Medium dense, moist, reddish brown, Clayey, fine to medium SAND with gravel and cobble up to 8 inches				
2									
4				SM/SC	FANGLOMERATE DEPOSITS (Tof) Very dense, damp, transitions from reddish brown to mottled light brown and pale green, Gravelly/Clayey, fine to coarse SANDSTONE with 30-40% gravel, cobble and boulders up to 14 inches				
6									
PRACTICAL REFUSAL AT 6 FEET									

Figure A-30,
Log of Trench T 23, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 26		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>510'</u>	DATE COMPLETED <u>02-01-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u>		BY: <u>T. REIST</u>		
MATERIAL DESCRIPTION									
0				CL	ALLUVIUM (Qal) Soft, wet, dark brown to brown, Sandy CLAY with 10% gravel and cobble up to 6 inches -Estimated 5-foot diameter boulder in sidewall at 3 feet; moderate seepage with minor/moderate caving below 3 feet				
2									
4									
6				SC	Medium dense, moist, mottled light brown and pale green, Clayey, fine to medium SAND with minor pinholes				
8									
10				SM/SC	OTAY FORMATION (To) Very dense, damp, reddish brown with pale green mottling, Silty/Clayey, fine to coarse SANDSTONE TRENCH TERMINATED AT 10 FEET DUE TO CAVING OF SIDEWALL				

Figure A-31,
Log of Trench T 26, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

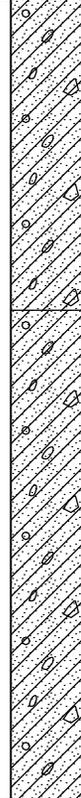
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 28		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>561'</u>	DATE COMPLETED <u>02-02-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u>		BY: <u>T. REIST</u>		
MATERIAL DESCRIPTION									
0				CL	COLLUVIUM (Qc) Stiff, moist to wet, dark brown, Sandy CLAY with 10% gravel, cobble and boulders up to 14 inches				
2				CL	FANGLOMERATE DEPOSITS (Tof) Very stiff, damp, white to pale green, fine to coarse, Sandy CLAY with 10-15% gravel and cobble size rock fragments up to 8 inches (appears to be reworked saprolite with abundant caliche)				
4									
6									
8					-Gravel and cobble size fragment increase below 8 feet				
TRENCH TERMINATED AT 9 FEET									

Figure A-32,
Log of Trench T 28, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 29 ELEV. (MSL.) _____ DATE COMPLETED <u>02-02-2010</u> EQUIPMENT <u>JD 555 TRACKHOE</u> BY: <u>T. REIST</u>	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	MATERIAL DESCRIPTION TOPSOIL Loose, damp to moist, reddish brown, Clayey, fine to coarse SAND with 10% gravel, cobble and boulders up to 16 inches; possible metavolcanic rock contact REFUSAL ON ROCK AT 1 FOOT			

Figure A-33,
Log of Trench T 29, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS <input type="checkbox"/> ... SAMPLING UNSUCCESSFUL <input checked="" type="checkbox"/> ... DISTURBED OR BAG SAMPLE	<input type="checkbox"/> ... STANDARD PENETRATION TEST <input checked="" type="checkbox"/> ... CHUNK SAMPLE	<input checked="" type="checkbox"/> ... DRIVE SAMPLE (UNDISTURBED) <input checked="" type="checkbox"/> ... WATER TABLE OR SEEPAGE
--	--	--

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 30		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>522'</u>	DATE COMPLETED <u>02-02-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u>		BY: <u>T. REIST</u>		
MATERIAL DESCRIPTION									
0				SC	ALLUVIUM (Qal) Loose, moist to wet, dark brown, very Clayey, fine to coarse SAND with 20-30% gravel, cobble and boulders up to 16 inches				
2									
4									
6									
8				SM/SC	OTAY FORMATION (To) Dense, damp, light brown to brown, Clayey/Silty, fine to medium SANDSTONE; weathered in upper few feet				
10									
TRENCH TERMINATED AT 10 FEET									

Figure A-34,
Log of Trench T 30, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 38		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	
					ELEV. (MSL.) <u>480'</u>	DATE COMPLETED <u>02-03-2010</u>				
					EQUIPMENT <u>JD 555 TRACKHOE</u>		BY: <u>T. REIST</u>			
MATERIAL DESCRIPTION										
0				CL	ALLUVIUM (Qal) Soft, wet, dark brown, Sandy CLAY with trace cobble					
2						-Slight seepage at contact				
4			▽	SC	OTAY FORMATION (To)(Weathered) Loose to medium dense, moist, light brown, very Clayey, fine to coarse SAND with trace gravel and cobble					
6										
8										
10										
12					SC/SM	OTAY FORMATION (To) Dense, damp to moist, white and orange brown, Clayey/Silty, fine to coarse SANDSTONE with trace gravel and cobble up to 8 inches				
TRENCH TERMINATED AT 13 FEET										

Figure A-36,
Log of Trench T 38, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

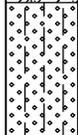
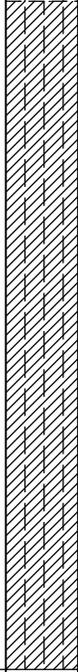
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 44		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>540'</u>	DATE COMPLETED <u>02-03-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u> BY: <u>T. REIST</u>				
MATERIAL DESCRIPTION									
0				CL	TOPSOIL Stiff, moist, dark brown, Sandy CLAY; several boulders 2 to 5 feet in diameter				
2				SM/SC	OTAY FORMATION (To) Dense, damp, mottled light brown to orange, Silty/Clayey, fine to coarse SANDSTONE with gravel and cobble up to 10 inches				
4				CL	Hard, moist, pale green, Silty CLAYSTONE; waxy and weathered -Becomes mottled brown and pale green with conchoidal fracturing and much more competent				
6									
8									
10									
					TRENCH TERMINATED AT 11 FEET				

Figure A-38,
Log of Trench T 44, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

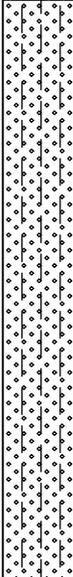
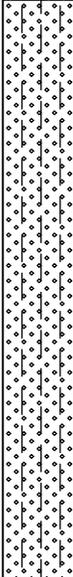
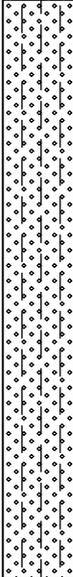
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 46		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>567'</u>	DATE COMPLETED <u>02-03-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u> BY: <u>T. REIST</u>				
MATERIAL DESCRIPTION									
0				CL	TOPSOIL Stiff, moist, dark brown, Sandy CLAY with some gravel				
2									
4				SM	OTAY FORMATION (To) Dense to very dense, light brown, Silty/Gravelly, fine to coarse SANDSTONE with 15-25% gravel				
6									
8					-Cobble size fragments present below 8 feet				
TRENCH TERMINATED AT 9 FEET									

Figure A-40,
Log of Trench T 46, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

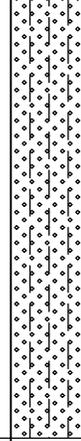
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 47		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>526'</u>	DATE COMPLETED <u>02-03-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u>		BY: <u>T. REIST</u>		
MATERIAL DESCRIPTION									
0				CL	ALLUVIUM ((Qal)) Soft, wet, dark brown, Sandy CLAY				
2						-Moderate seepage at contact			
4				SM	OTAY FORMATION (To) Dense, damp, light brown, Silty, fine to coarse SANDSTONE with 10-20% gravel and cobble up to 10 inches				
6						-Random 16-inch boulders present below 6 feet			
8					TRENCH TERMINATED AT 8 FEET				

Figure A-41,
Log of Trench T 47, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 49		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>496'</u>	DATE COMPLETED <u>02-03-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u> BY: <u>T. REIST</u>				
MATERIAL DESCRIPTION									
0				SM	ALLUVIUM (Qal) Loose, wet, dark brown, Silty, fine to coarse SAND -Heavy seepage at 3 feet with moderate caving below				
2									
4									
6				SM	OTAY FORMATION (To) Very dense, damp, light brown, Silty/Gravelly, fine to medium SANDSTONE with 20-30% gravel, cobble and boulders up to 14 inches TRENCH TERMINATED AT 7 FEET DUE TO CAVING				

Figure A-42,
Log of Trench T 49, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 54		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>515'</u>	DATE COMPLETED <u>02-03-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u>		BY: <u>T. REIST</u>		
MATERIAL DESCRIPTION									
0				SC	ALLUVIUM (Qal) Loose, wet, dark brown, very Clayey, fine to coarse SAND				
2									
4				SM	OTAY FORMATION (To) Dense to very dense, damp, light brown, Silty/Gravelly, fine to coarse SANDSTONE with 15-25% gravel and trace cobble				
						TRENCH TERMINATED AT 5.5 FEET			

Figure A-43,
Log of Trench T 54, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 55		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>504'</u>	DATE COMPLETED <u>02-03-2010</u>			
					EQUIPMENT <u>JD 555 TRACKHOE</u>		BY: <u>T. REIST</u>		
MATERIAL DESCRIPTION									
0			▽	SC/SM	ALLUVIUM (Qal) Loose, wet, dark brown, Clayey/Silty, fine to coarse SAND with 10-20% gravel and cobble up to 8 inches; moderate caving below 3 feet				
2									
4						-Moderate seepage at 3 feet			
6						-Boulders up to 30 inches present at contact			
8				SC/SM	OTAY FORMATION (To) Dense, damp, light brown and orange, Silty/Clayey, fine to coarse SANDSTONE with 10-20% gravel, cobble and boulders up to 14 inches				
					TRENCH TERMINATED AT 8 FEET DUE TO CAVING				

Figure A-44,
Log of Trench T 55, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 56		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	
					ELEV. (MSL.) <u>520'</u>	DATE COMPLETED <u>02-03-2010</u>				
					EQUIPMENT <u>JD 555 TRACKHOE</u>		BY: <u>T. REIST</u>			
MATERIAL DESCRIPTION										
0				SC	OTAY FORMATION (T_o) Dense, moist, light brown, Clayey, fine to coarse SANDSTONE					
2										
4										
6										
8										
10										
					LOGGED ROAD HIGH CUT SLOPE *Picked through approx. 2 to 3 feet of colluvium to expose formational material					

Figure A-45,
Log of Trench T 56, Page 1 of 1

G1012-52-01A (OTAY LAKES RD. WIDENING).GPJ

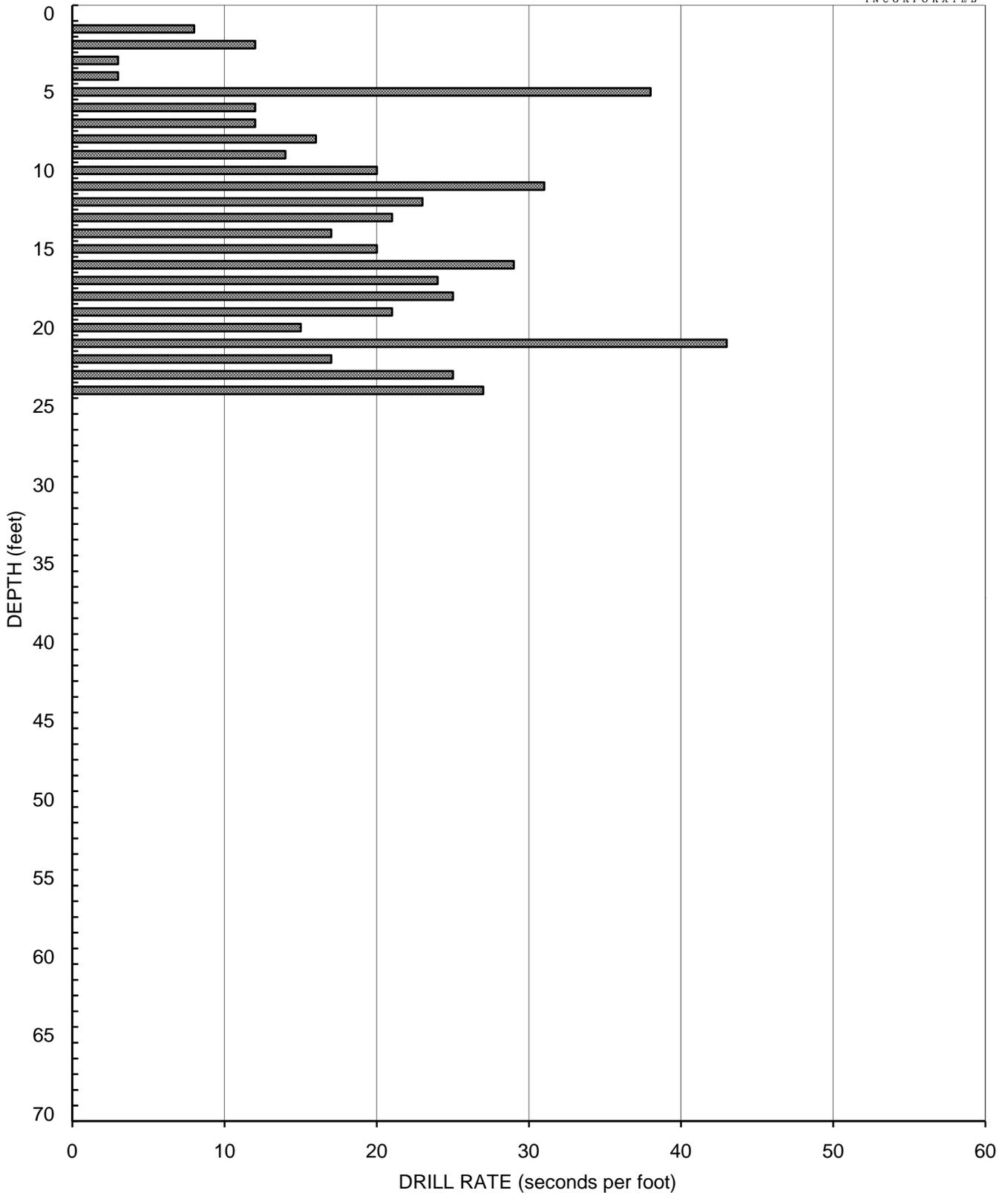
SAMPLE SYMBOLS					
	... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



GEOCON
INCORPORATED

AIR TRACK BORING AT-21
Elevation - 537 Feet (MSL)



NT - 1

Date Excavated: 6-19-01

Logged by: JSC

<u>Depth</u>	<u>Description</u>
0.0' - 3.0'	Alluvium (Qal): silty sand with gravel, cobbles, and boulders, brown, slightly moist, moderately dense, rooted, clayey, porous, difficult to excavate, sharp lower contact.
3.0' - 6.5'	Unnamed Fanglomerate Deposits (Tfg): gravel and cobble conglomerate with clayey sand matrix, mottled orangish brown and grayish brown, slightly moist, moderately dense, locally decomposed clay (bentonite) within matrix, difficult to excavate.
<u>Total Depth 6.5'; no groundwater, no caving.</u>	

NT - 2

Date Excavated: 6-19-01

Logged by: JSC

<u>Depth</u>	<u>Description</u>
0.0' - 4.5'	Colluvium (Qcol): silty sand, brown, slightly moist, moderately dense, fine to coarse grained, porous, rooted, some gravel and cobbles, some boulders at 3 feet, sharp lower contact.
4.5' - 7.5'	Unnamed Fanglomerate Deposits (Tfg): gravel-cobble conglomerate with coarse sand and clay matrix (bentonitic), mottled orangish brown, pale greenish brown and yellowish brown, slightly moist, massive, cobble amount increases with depth, few boulders.
<u>Total Depth 7.5'; no groundwater, no caving.</u>	

NT - 3

Date Excavated: 6-19-2001

Logged by: JSC

<u>Depth</u>	<u>Description</u>
0.0' - 3.5'	<u>Alluvium (Qal)</u> : silty sand, brown, slightly moist, moderately dense, fine to coarse grained, boulders and cobbles, porous, sharp lower contact. BULK SAMPLE at 1.0' to 2.0'.
3.5' - 7.5'	<u>Unnamed Fanglomerate Deposits (Tfg)</u> : sandy claystone (bentonitic), pale yellowish to greenish gray, moist, soft to moderately hard, massive, weathered. BULK SAMPLE at 6'.
<u>Total Depth 7.5'; no groundwater, no caving.</u>	

NT - 4

Date Excavated: 6-19-2001

Logged by: JSC

<u>Depth</u>	<u>Description</u>
0.0' - 2.0'	<u>Colluvium (Qcol)</u> : gravelly sand, brown, fine- to coarse-grained, moist, moderately dense, weakly bedded, heavily rooted in upper 1-2 feet.
2.0' - 6.0'	<u>Unnamed Fanglomerate Deposits (Tfg)</u> : gravel and cobble conglomerate with clayey coarse sand matrix, mottled brown and pale brown, moist, moderately hard, massive.
<u>Total Depth 6.0'; no groundwater, no caving.</u>	

NT - 5

Date Excavated: 6-19-2001

Logged by: JSC

<u>Depth</u>	<u>Description</u>
0.0' - 5.0'	<u>Alluvium (Qcol)</u> : clayey sand and silty sand; dark brown; fine to medium grained; slightly moist; moderately dense; some gravel; weak angular blocky structure; sharp lower contact.
5.0' - 7.5'	<u>Unnamed Fanglomerate Deposits (Tfg)</u> : gravel and cobble conglomerate with clayey coarse sand matrix, mottled brown and pale brown, moist, moderately hard, massive.
<u>Total Depth 7.5'; no groundwater, no caving.</u>	

APPENDIX B

LABORATORY TESTING

We performed laboratory tests in accordance with current, generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were analyzed for in-situ dry density and moisture content, maximum dry density and optimum moisture content, expansion potential, shear strength, consolidation, water-soluble sulfate content, chloride ion content, potential of hydrogen (pH) and resistivity, and resistance value (R-Value). The results of the laboratory tests are presented on Tables B-I through B-VII and Figures B-1 through B-8. The in-place dry density and moisture content of the samples tested are presented on the boring logs in Appendix A.

**TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND
OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557**

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
ET6-1	Dark brown, Clayey SAND	128.9	8.6
ET6-2	Light olive brown, Silty CLAY	117.7	14.2

**TABLE B-II
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080**

Sample No.	Dry Density (pcf)	Moisture Content (%)		Peak [Ultimate] Cohesion (psf)	Peak [Ultimate] Angle of Shear Resistance (degrees)
		Initial	After Test		
SB4-4	97.1	9.5	23.4	40[0]	43[42]
SB4-5	104.8	14.6	23.2	450[450]	25[25]
SB7-4	103.3	15.1	23.9	580[550]	23[23]
SB7-6	116.1	12.0	14.5	460[430]	35[36]
SB7-8	105.4	19.2	21.4	800[780]	22[22]
SB9-3	97.1	13.3	25.5	0[0]	45[45]
LB10-3	121.6	8.6	14.5	640[740]	45[43]
LB11-1	111.1	15.7	21.6	875[1000]	32[27]
LB17-1	113.2	15.3	20.5	500[725]	31[19]
LB17-2	112.6	18.0	23.4	300[375]	30[20]
ET6-1*	115.5	8.9	20.5	190 [140]	32 [32]
ET6-2*	107.1	12.8	22.9	380 [295]	17 [16]

*Sample remolded to a dry density of approximately 90 percent of the laboratory maximum dry density near optimum moisture content.

**TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829**

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Expansion Classification
	Before Test	After Test			
ET6-2	12.5	29.5	98.5	63	Medium
ET37-1	10.9	25.3	105.2	66	Medium

**TABLE B-IV
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417**

Sample No.	Water-Soluble Sulfate (%)	Water-Soluble Sulfate (ppm)	Sulfate Exposure*
ET6-2	0.050	500	Not Applicable (S0)
B15-5	0.008	80	Not Applicable (S0)
ET37-1	0.172	1,720	Moderate (S1)

*Reference: 2007 California Building Code.

**TABLE B-V
SUMMARY OF LABORATORY CHLORIDE ION CONTENT TEST RESULTS
AASHTO TEST NO. T 291**

Sample No.	Chloride Ion Content (%)	Chloride Ion Content (ppm)
ET17-1*	0.188	1,882

*Sample obtained from adjacent Otay Ranch Resort Village Investigation.

**TABLE B-VI
SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (PH) AND RESISTIVITY TEST RESULTS
CALIFORNIA TEST METHOD 643**

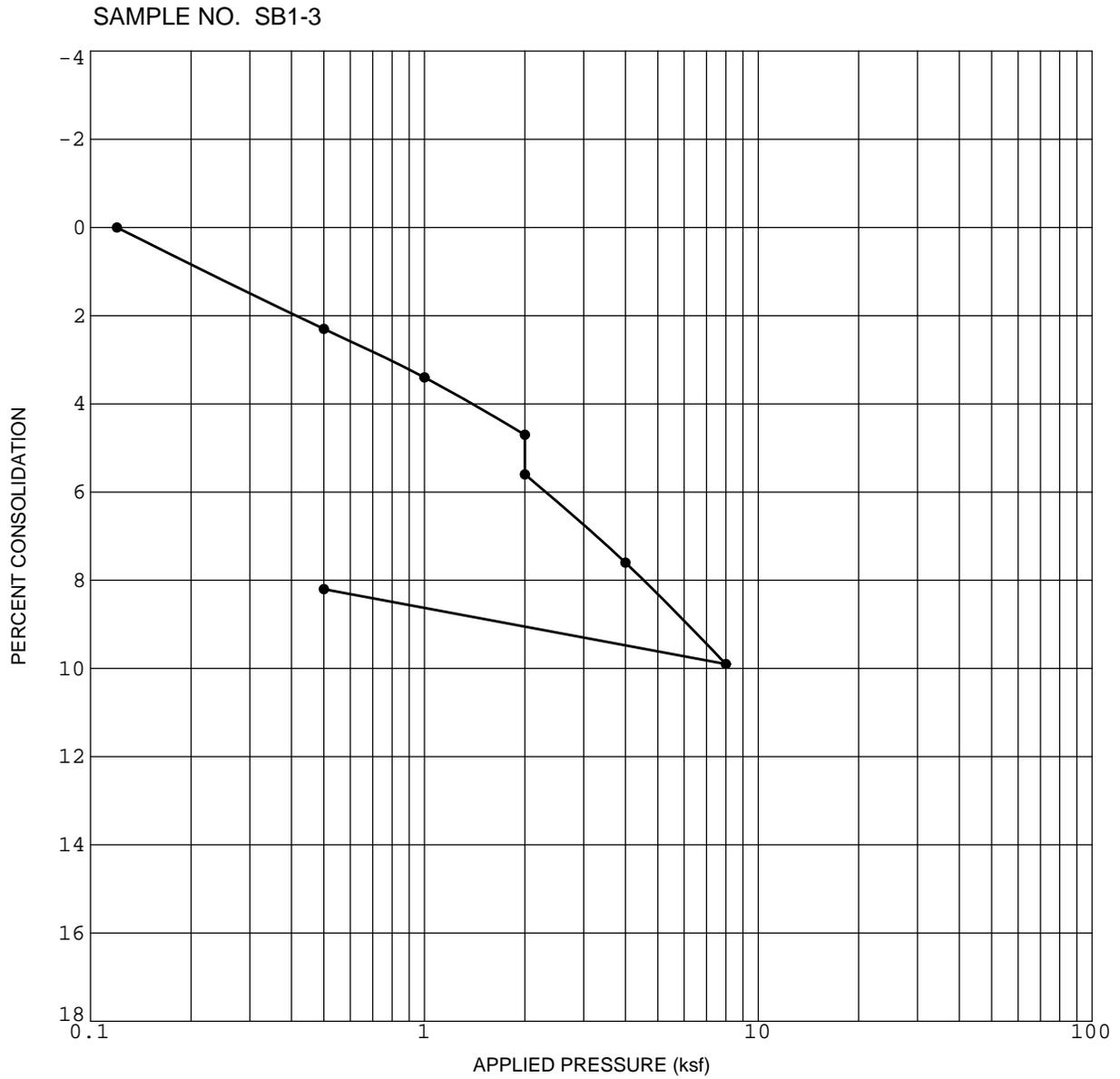
Sample No.	pH	Minimum Resistivity (ohm-centimeters)
ET17-1*	7.8	180

*Sample obtained from adjacent Otay Ranch Resort Village Investigation.

**TABLE B-VII
SUMMARY OF LABORATORY RESISTANCE VALUE (R-VALUE) TEST RESULTS
ASTM D 2844**

Sample No.	R-Value
ET28-1*	23

*Sample obtained from adjacent Otay Ranch Resort Village Investigation.

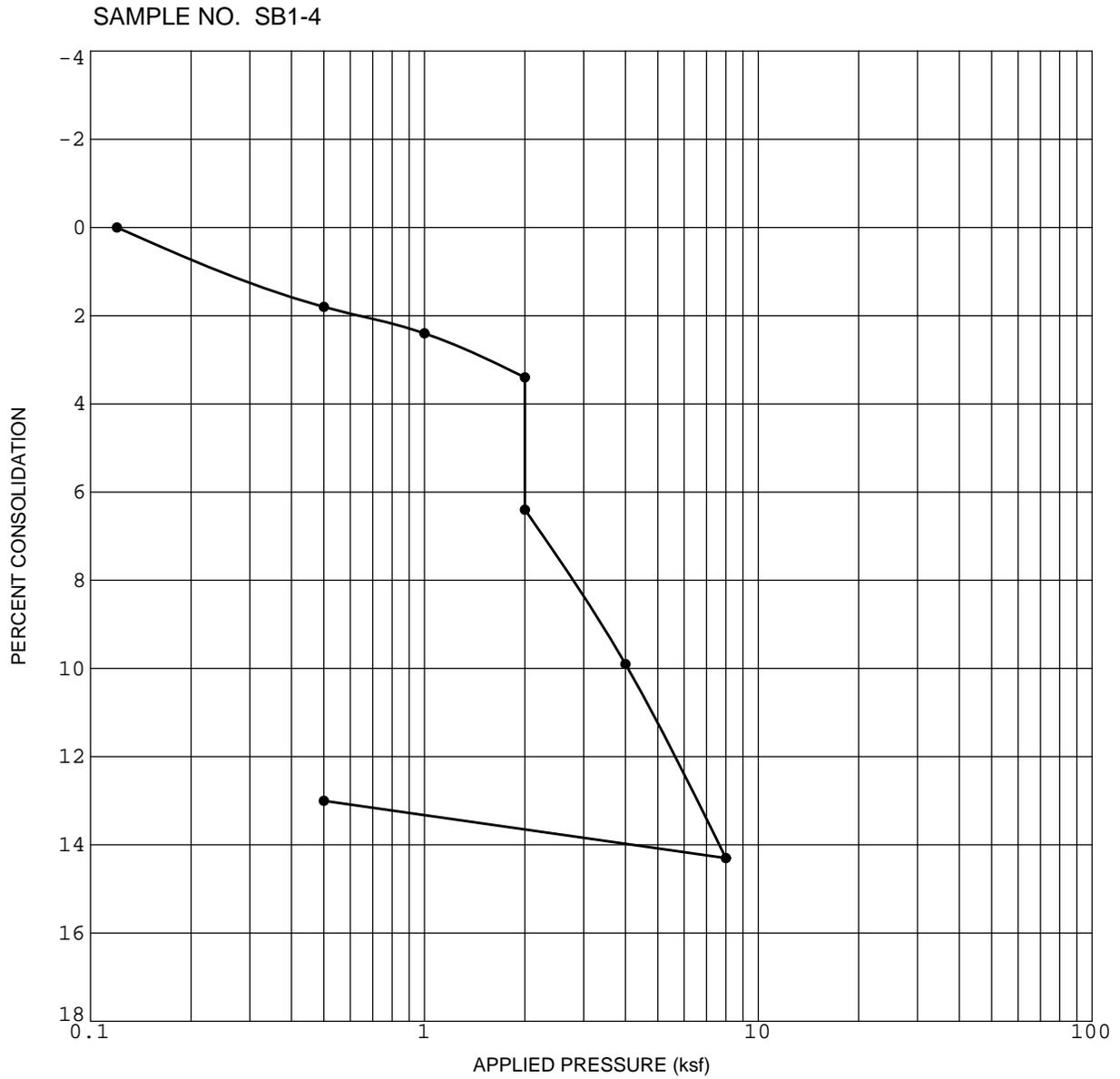


Initial Dry Density (pcf)	110.3
Initial Water Content (%)	15.9

Initial Saturation (%)	84.1
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

OTAY RANCH RESORT VILLAGE
 OTAY LAKES ROAD WIDENING AND REALIGNMENT
 SAN DIEGO COUNTY, CALIFORNIA

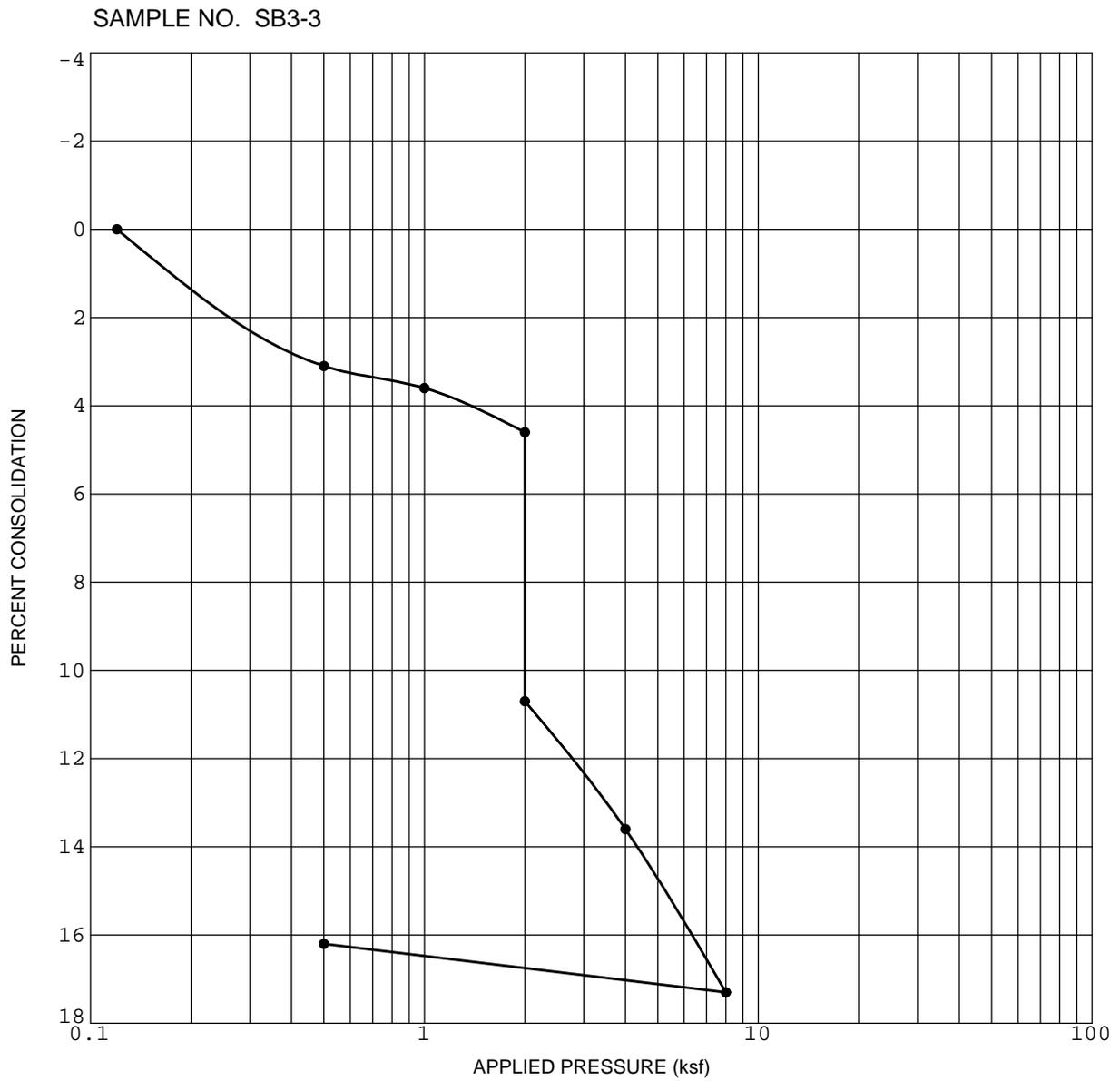


Initial Dry Density (pcf)	105.6
Initial Water Content (%)	12.3

Initial Saturation (%)	57.3
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

OTAY RANCH RESORT VILLAGE
 OTAY LAKES ROAD WIDENING AND REALIGNMENT
 SAN DIEGO COUNTY, CALIFORNIA

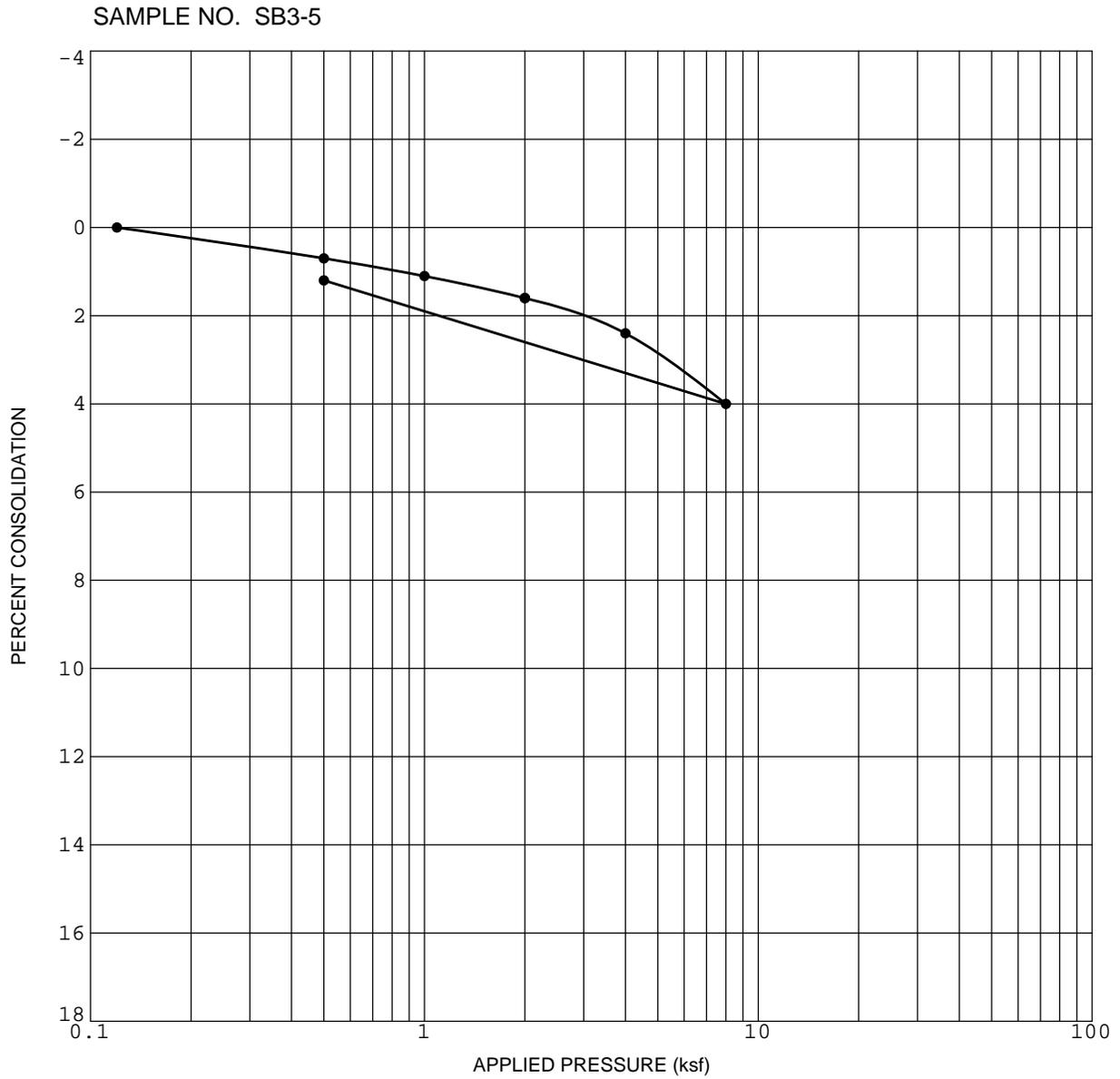


Initial Dry Density (pcf)	111.2
Initial Water Content (%)	7.8

Initial Saturation (%)	42.3
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

OTAY RANCH RESORT VILLAGE
 OTAY LAKES ROAD WIDENING AND REALIGNMENT
 SAN DIEGO COUNTY, CALIFORNIA

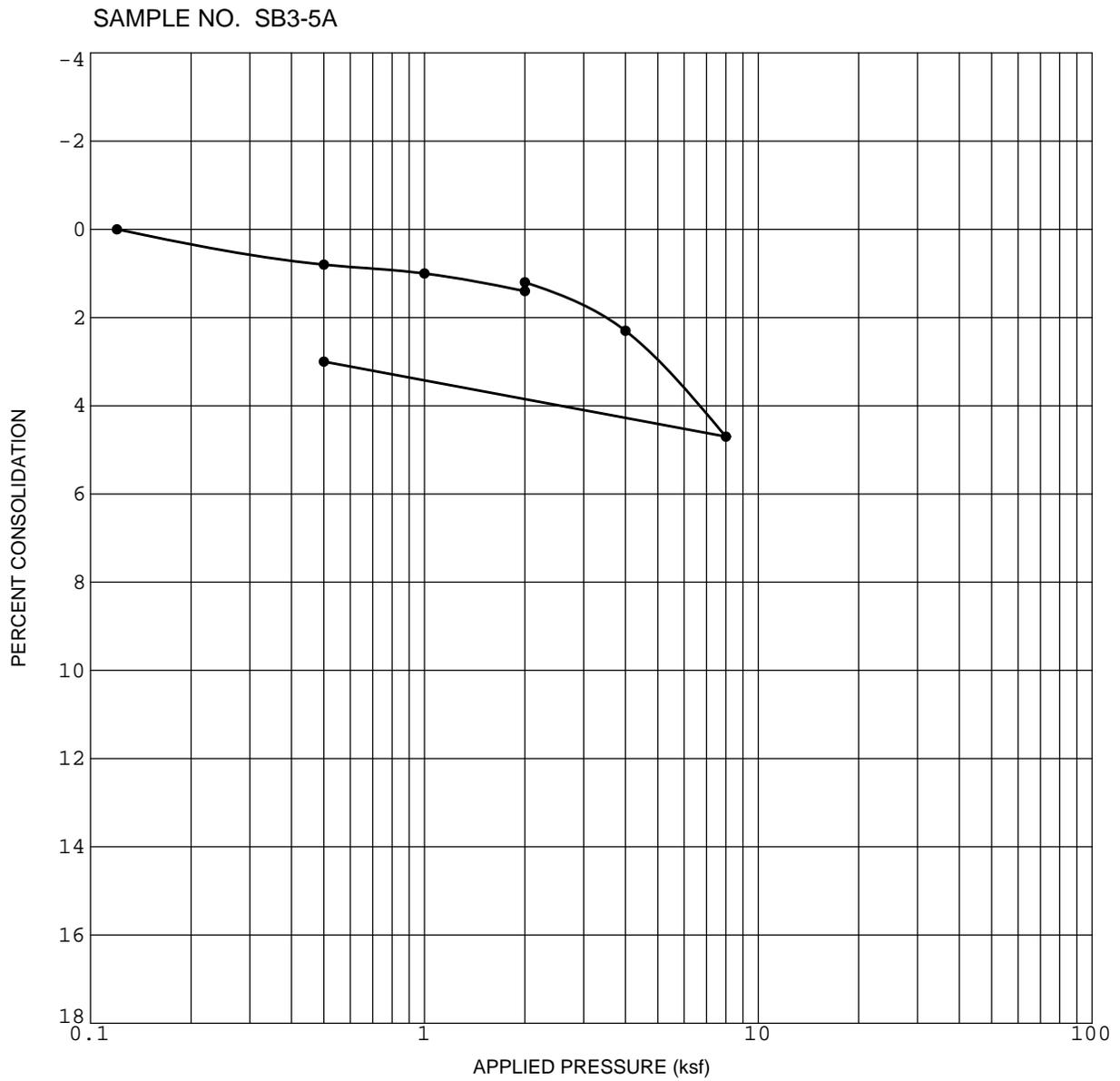


Initial Dry Density (pcf)	114.5
Initial Water Content (%)	14.4

Initial Saturation (%)	85.1
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

OTAY RANCH RESORT VILLAGE
 OTAY LAKES ROAD WIDENING AND REALIGNMENT
 SAN DIEGO COUNTY, CALIFORNIA

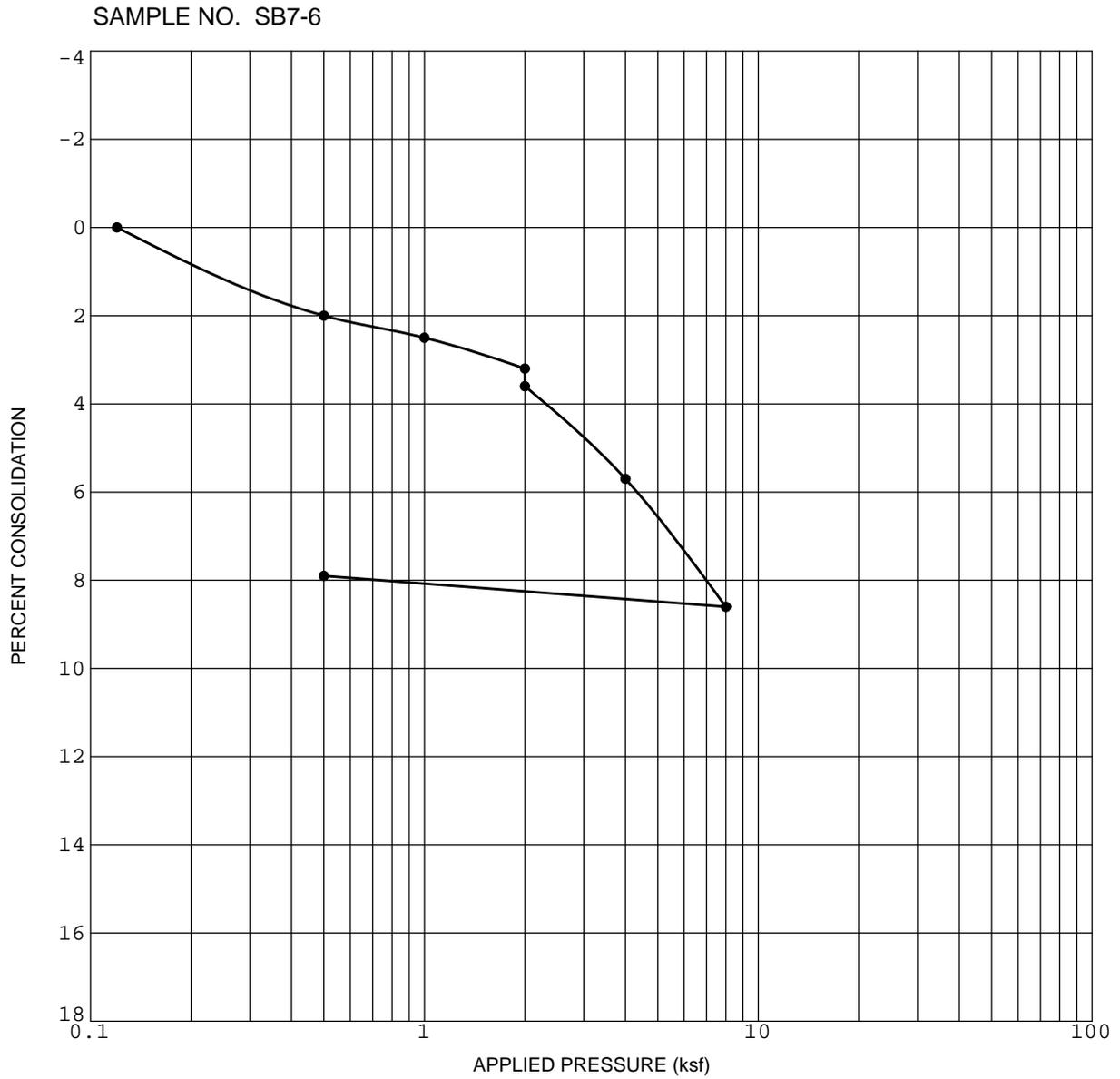


Initial Dry Density (pcf)	109.6
Initial Water Content (%)	14.4

Initial Saturation (%)	74.4
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

OTAY RANCH RESORT VILLAGE
 OTAY LAKES ROAD WIDENING AND REALIGNMENT
 SAN DIEGO COUNTY, CALIFORNIA

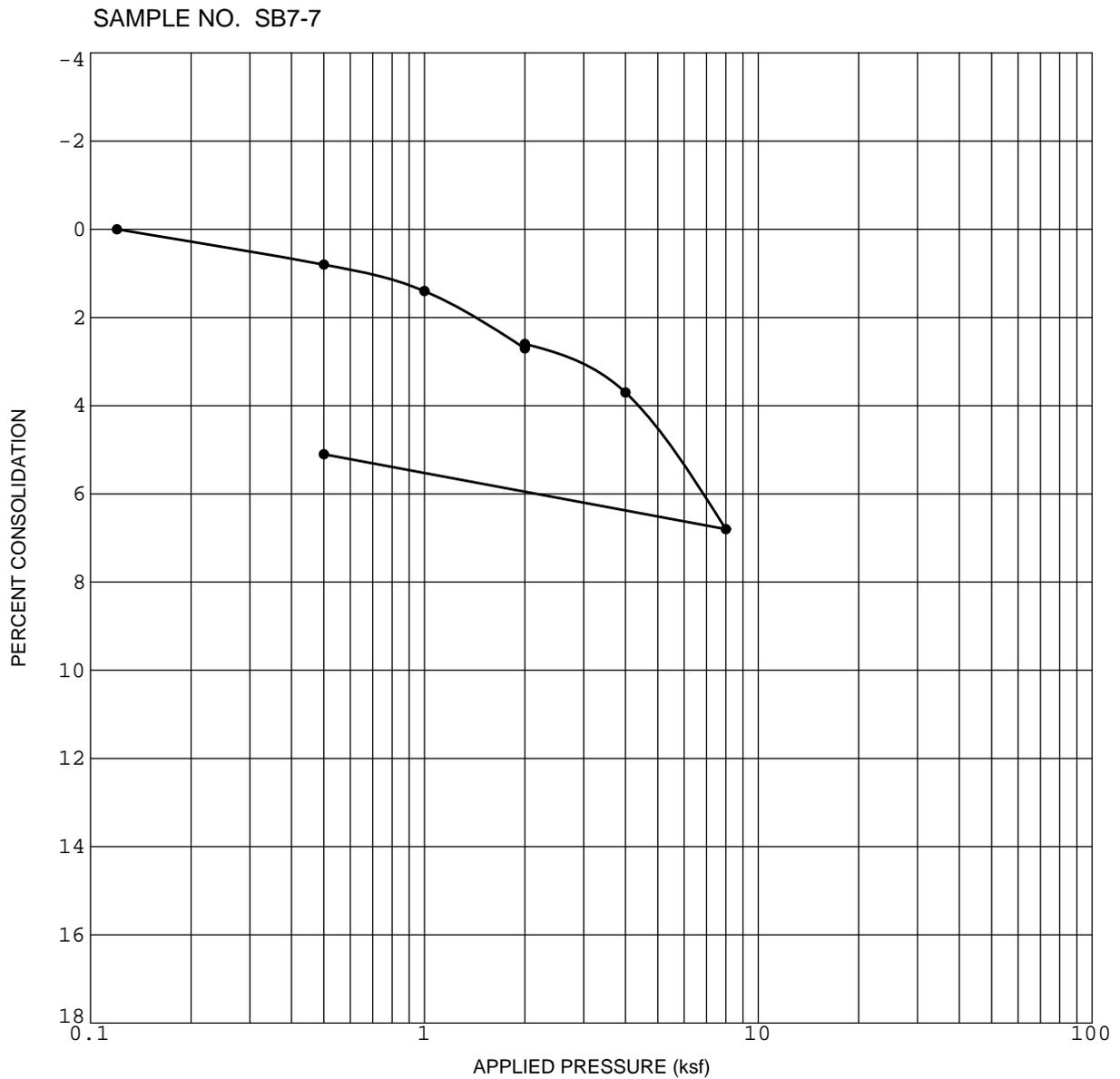


Initial Dry Density (pcf)	115.6
Initial Water Content (%)	11.2

Initial Saturation (%)	68.3
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

OTAY RANCH RESORT VILLAGE
 OTAY LAKES ROAD WIDENING AND REALIGNMENT
 SAN DIEGO COUNTY, CALIFORNIA

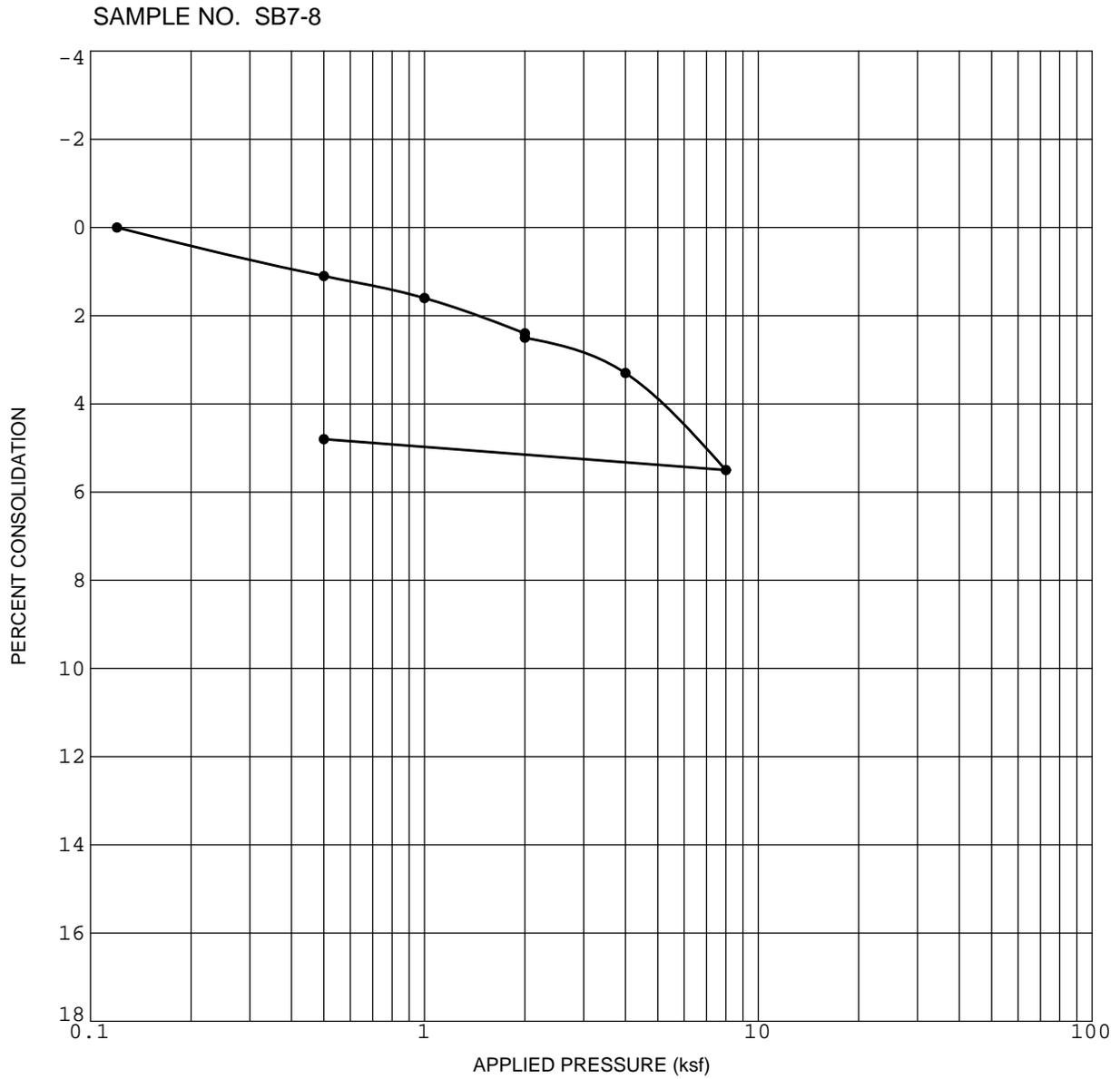


Initial Dry Density (pcf)	109.5
Initial Water Content (%)	17.8

Initial Saturation (%)	91.7
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

OTAY RANCH RESORT VILLAGE
 OTAY LAKES ROAD WIDENING AND REALIGNMENT
 SAN DIEGO COUNTY, CALIFORNIA



Initial Dry Density (pcf)	111.3
Initial Water Content (%)	17.1

Initial Saturation (%)	92.7
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

OTAY RANCH RESORT VILLAGE
 OTAY LAKES ROAD WIDENING AND REALIGNMENT
 SAN DIEGO COUNTY, CALIFORNIA

APPENDIX C

SLOPE STABILITY ANALYSIS

We performed preliminary slope stability analyses using a two-dimensional computer software *GeoStudio2004* developed by Geo-Slope International Ltd. The critical modes of potential slip surfaces including rotational-mode and block-mode were analyzed based on Spencer's method. The soil parameters used, case conditions, and the calculated factors of safety are presented herein. Output of the computer results, including the soil stratigraphy, potential failure surfaces, and calculated Factors of Safety, are included in this appendix.

We estimated the shear strength characteristics of the existing geologic units based on laboratory direct shear tests on samples obtained during our field investigation in accordance with ASTM D 3080 (see Appendix B), and based on empirical data obtained from the referenced geotechnical literature. The soil parameters used for the stability analyses are presented in Table C-I.

**TABLE C-I
SUMMARY OF SOIL PROPERTIES USED FOR SLOPE STABILITY ANALYSES**

Geologic Unit/Material	Density (pcf)	Cohesion (psf)	Friction Angle (degrees)
Compacted Fill (Qcf)	125	250	30
Alluvium (Qal)	120	300	16
Fanglomerate Deposits (Tof)	130	200	31
Otay Formation (To - Claystone)	130	300	22
Otay Formation (To – Sandstone)	130	700	34
Otay Formation (To – Clayey Sandstone)	130	700	34
Metavolcanic Rock (KJmv)	130	1,000	35

We selected Cross Sections B1-B1', C-C', and G-G' to perform the slope stability analyses. Table C-II provides a summary of cases analyzed and calculated Factors of Safety. A minimum Factor of Safety of 1.5 under static conditions is currently required by the City of Chula Vista and the County of San Diego for slope stability. Figures C-1 through C-4 presents the results of the computer slope stability analyses. As discussed herein, we encountered sheared claystone bedding within several of the exploratory borings and trenches within the Otay Formation (To). Although the claystone generally possess relatively adequate shear strengths, the sheared portions of the bedding may be prone to slope instability if exposed in cut slopes and may require the construction of stability fills.

**TABLE C-II
SUMMARY OF SLOPE STABILITY ANALYSES**

Cross Section	Condition of Slope Stability Analyses	Calculated Factor of Safety	Figure Number
B1-B1'	Minimum Rotational-Mode Factor of Safety – Cut and Fill Slope at inclination of 2:1 in Fanglomerate Deposits and Otay Formation	1.52	C-1
C1-C1'	Minimum Rotational-Mode Factor of Safety – Cut Slope at inclination of 2:1 in Fanglomerate Deposits and Otay Formation	1.65	C-2
G-G'	Minimum Rotational-Mode Factor of Safety Cut Slope at inclination of 2:1	1.66	C-3
G-G'	Minimum Block-Mode Factor of Safety Cut Slope at inclination of 2:1	1.61	C-4

We calculated the surficial slope stability analysis for a 2:1 (horizontal to vertical) fill slope. The calculated factor of safety is greater than the required minimum factor of safety of 1.5. Plants with variable root depth should be planted as soon as possible once the fill slopes have been constructed. Surficial slope stability calculations are presented on Figure C-5.

Otay Ranch Resort Village - Otay Lakes Road

Project No. G1012-52-01A

Cross Section B1-B1'

Name: B1_basin_cir.gsz

Date: 9/3/2014 Time: 10:17:43 AM

Description: Qcf C: 250 psf Phi: 30deg. Wt: 125pcf

Description: Tof C: 200 psf Phi: 31deg. Wt: 130pcf

Description: To-Claystone C: 300 psf Phi: 22deg. Wt: 130pcf

Description: Kjmv C: 1000 psf Phi: 35deg. Wt: 130pcf

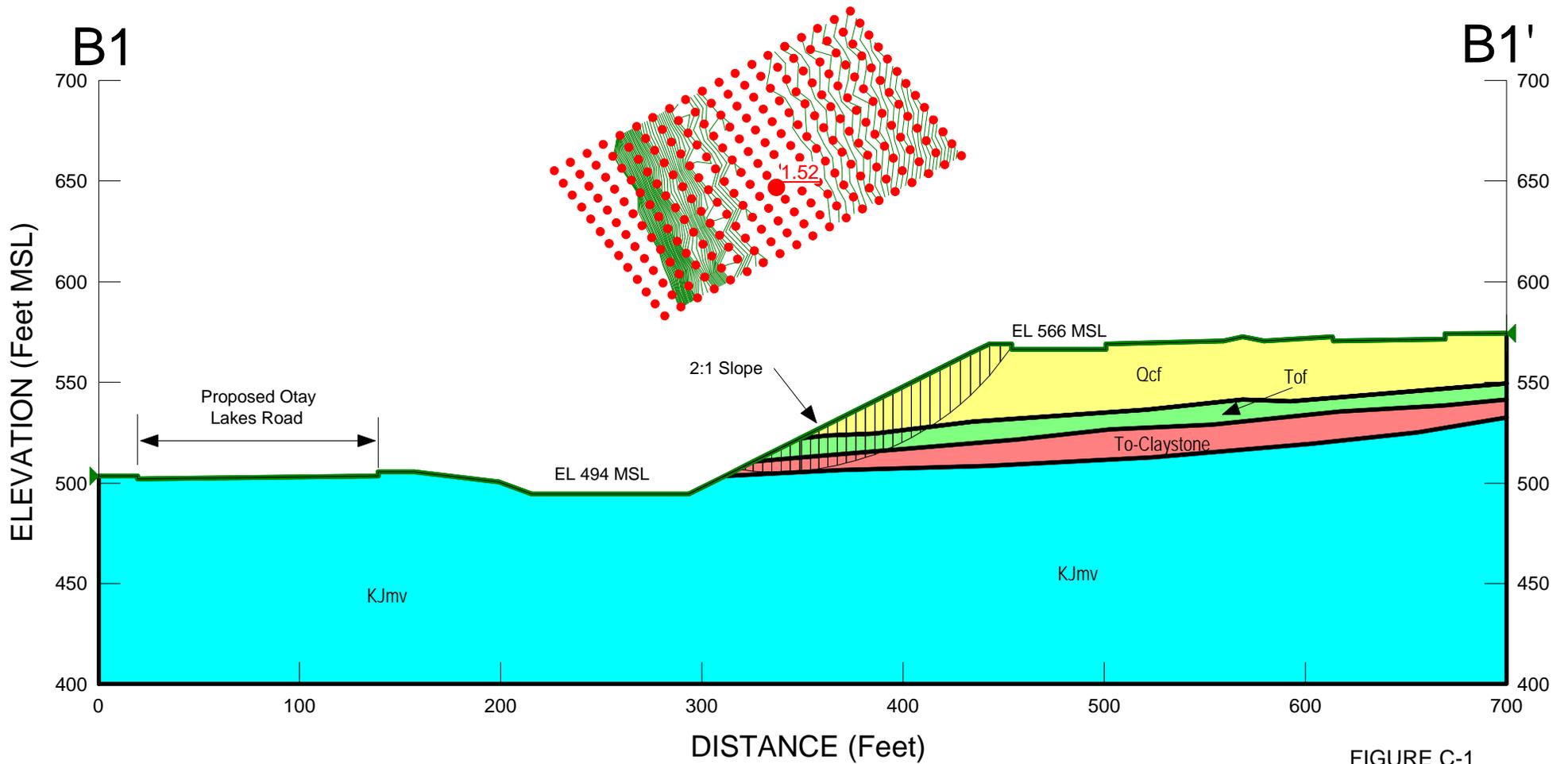


FIGURE C-1

Otay Ranch Resort Village - Otay Lakes Road

Project No. G1012-52-01A

Cross Section C1-C1'

Name: C1_basin1_cir.gsz

Date: 9/3/2014 Time: 10:22:11 AM

Description: Qcf C: 250 psf Phi: 30deg. Wt: 125pcf

Description: ToF C: 200 psf Phi: 31deg. Wt: 130pcf

Description: To-Claystone C: 300 psf Phi: 22deg. Wt: 130pcf

Description: To-Sandstone C: 700 psf Phi: 34deg. Wt: 130pcf

Description: To-Sandstone (SC) C: 700 psf Phi: 30deg. Wt: 130pcf

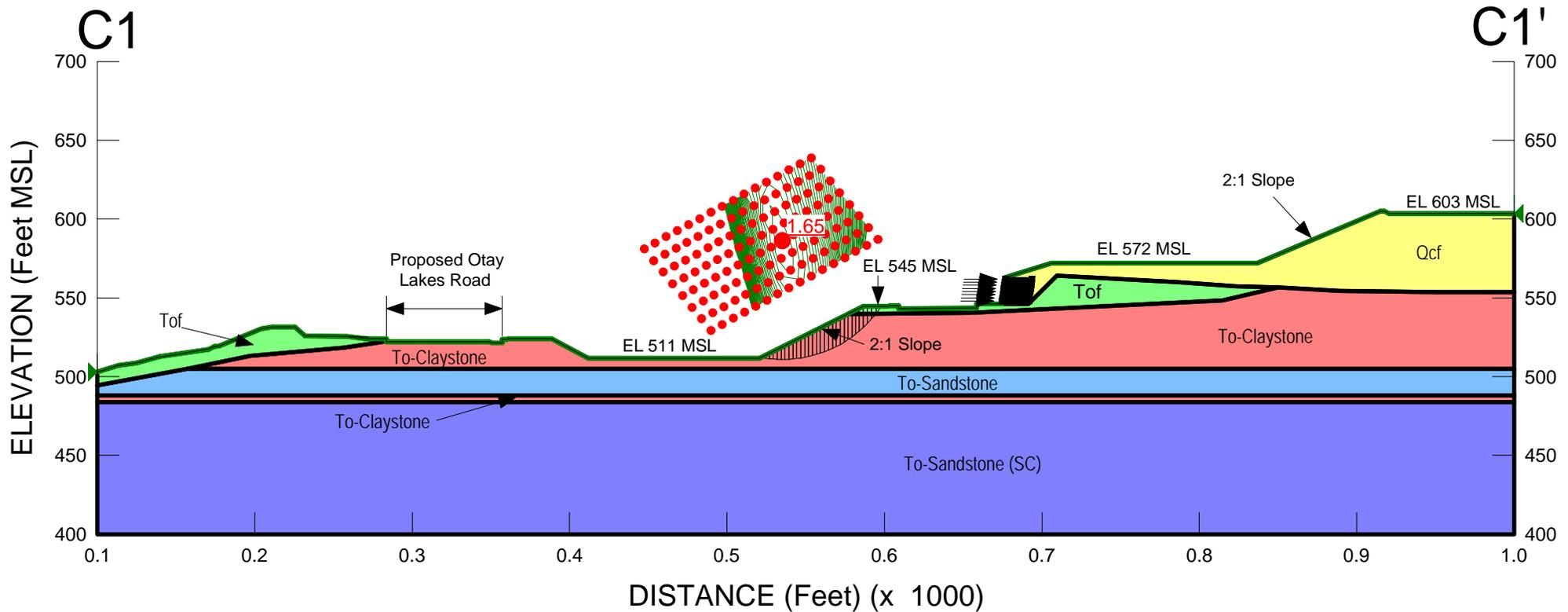


FIGURE C-2

Otay Ranch Resort Village - Otay Lakes Road

Project No. G1012-52-01A

Cross Section G-G'

Name: G-1_cir.gsz

Date: 11/4/2014 Time: 2:54:33 PM

Description: Qcf C: 0psf Phi: 30deg. Wt: 125pcf

Description: Qal C: 0psf Phi: 16deg. Wt: 120pcf

Description: Ql C: 0psf Phi: 31deg. Wt: 130pcf

Description: ToF C: 0psf Phi: 31deg. Wt: 130pcf

Description: To-Claystone C: 0psf Phi: 22deg. Wt: 130pcf

Description: To-Sandstone C: 0psf Phi: 34deg. Wt: 130pcf

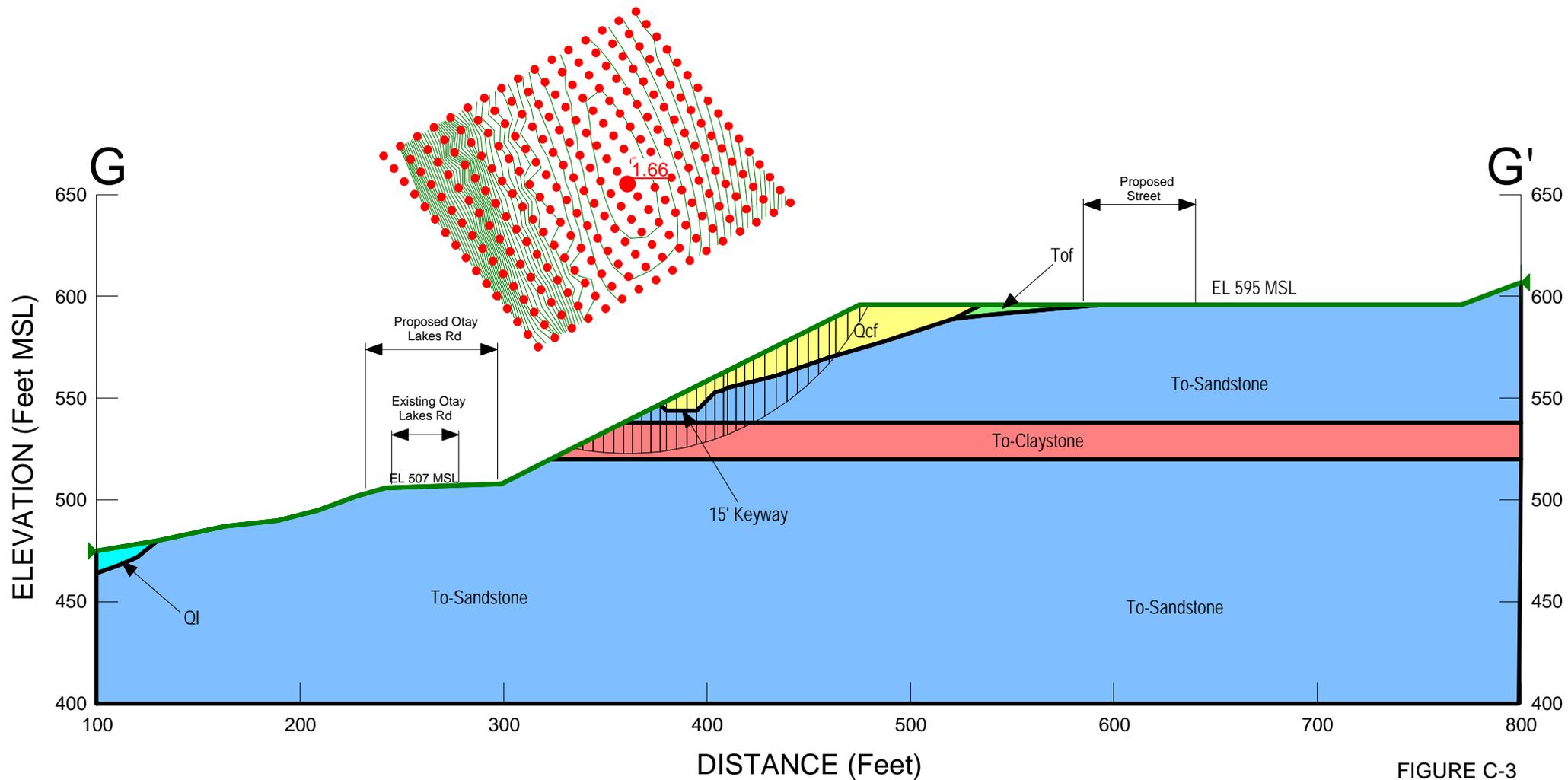


FIGURE C-3

Otay Ranch Resort Village - Otay Lakes Road

Project No. G1012-52-01A

Cross Section G-G'

Name: G-2_blk.gsz

Date: 11/4/2014 Time: 2:56:00 PM

Description: Qcf C: 0psf Phi: 30deg. Wt: 125pcf

Description: Qal C: 0psf Phi: 16deg. Wt: 120pcf

Description: Ql C: 0psf Phi: 31deg. Wt: 130pcf

Description: ToF C: 0psf Phi: 31deg. Wt: 130pcf

Description: To-Claystone C: 0psf Phi: 22deg. Wt: 130pcf

Description: To-Sandstone C: 0psf Phi: 34deg. Wt: 130pcf

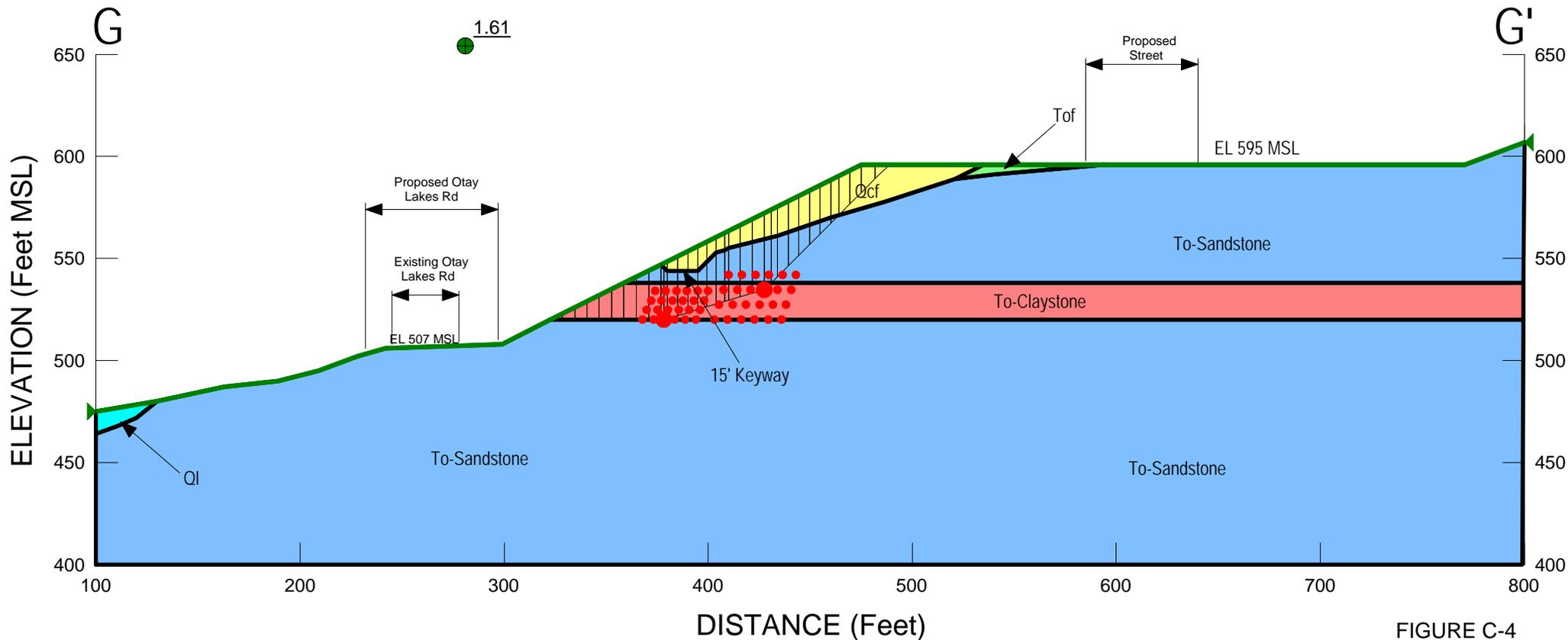


FIGURE C-4

ASSUMED CONDITIONS :

SLOPE HEIGHT	$H =$	Infinite
DEPTH OF SATURATION	$Z =$	3 feet
SLOPE INCLINATION	$2 : 1$	(Horizontal : Vertical)
SLOPE ANGLE	$i =$	26.8 degrees
UNIT WEIGHT OF WATER	$\gamma_w =$	62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	$\gamma_t =$	130 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	$\phi =$	28 degrees
APPARENT COHESION	$C =$	250 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w) Z \cos^2 i \tan \phi}{\gamma_t Z \sin i \cos i} = 2.2$$

REFERENCES :

- 1.....Haefell, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62
- 2.....Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL FILL SLOPE STABILITY ANALYSIS

GEOCON
INCORPORATED



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OTAY RANCH RESORT VILLAGE
OTAY LAKES ROAD WIDENING AND REALIGNMENT
SAN DIEGO COUNTY, CALIFORNIA

LR / AML

DSK/E0000

DATE

PROJECT NO. G1012 - 52 - 01A

FIG. C-5

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

**OTAY RANCH RESORT VILLAGE
OTAY LAKES ROAD
WIDENING AND REALIGNMENT
SAN DIEGO COUNTY, CALIFORNIA**

PROJECT NO. G1012-52-01A

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

- 1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon Incorporated. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.
- 1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.
- 1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, adverse weather, result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

- 2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.
- 2.2 **Contractor** shall refer to the Contractor performing the site grading work.
- 2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

- 2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.
- 2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.
- 2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.
- 2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

- 3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.
- 3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than $\frac{3}{4}$ inch in size.
- 3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.
- 3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than $\frac{3}{4}$ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

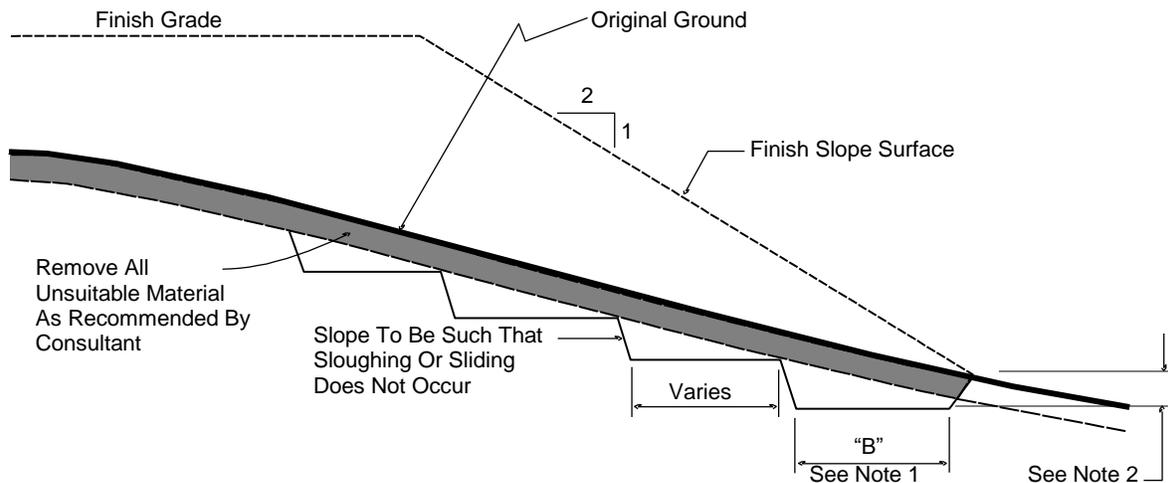
- 3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.
- 3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.
- 3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.
- 3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.
- 3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

- 4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

- 4.2 Any asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.
- 4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.
- 4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

- DETAIL NOTES:
- (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.
 - (2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

- 4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

- 5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.
- 5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

- 6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:
- 6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.
- 6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557-09.
- 6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.
- 6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

- 6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557-09. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.
- 6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.
- 6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.
- 6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.
- 6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:
- 6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.
- 6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

- 6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.
 - 6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.
 - 6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.
 - 6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.
- 6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:
- 6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.
 - 6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the

required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

- 6.3.3 Plate bearing tests, in accordance with ASTM D 1196-09, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.
- 6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of “passes” have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.
- 6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.
- 6.3.6 To reduce the potential for “piping” of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.
- 6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. OBSERVATION AND TESTING

- 7.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.
- 7.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.
- 7.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.
- 7.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.
- 7.5 The Consultant should observe the placement of subdrains, to verify that the drainage devices have been placed and constructed in substantial conformance with project specifications.
- 7.6 Testing procedures shall conform to the following Standards as appropriate:

7.6.1 Soil and Soil-Rock Fills:

- 7.6.1.1 Field Density Test, ASTM D 1556-07, *Density of Soil In-Place By the Sand-Cone Method.*
- 7.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938-08A, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*
- 7.6.1.3 Laboratory Compaction Test, ASTM D 1557-09, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop.*
- 7.6.1.4. Expansion Index Test, ASTM D 4829-08A, *Expansion Index Test.*

7.6.2 Rock Fills

- 7.6.2.1 Field Plate Bearing Test, ASTM D 1196-09 (Reapproved 1997) *Standard Method for Nonreparative Static Plate Load Tests of Soils and Flexible Pavement Components, For Use in Evaluation and Design of Airport and Highway Pavements.*

8. PROTECTION OF WORK

- 8.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.
- 8.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

9. CERTIFICATIONS AND FINAL REPORTS

- 9.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.
- 9.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.