

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Boring B-12

Sheet 1 of 2

Date(s) Drilled	04/03/08	Logged By	D. Rector	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	30.5 feet
Drill Rig Type	Unimog Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,290 Feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1808645 E 6603082		

Elevation, feet	Depth, feet	SAMPLES		Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
		Type	Number					
3290	0				ALLUVIUM Medium dense, moist, pale brown, silty fine to medium SAND (SM), with few fine gravels			
		12-5	50/5"					
		12-1	17					
3285	5	12-2	18			1		
3280	10	12-3	53		↓ Becomes very dense with gravel			
					OLDER ALLUVIUM Very dense, moist, pale brown, clayey fine to medium SAND (SC), with trace gravel			
3275	15	12-4	50/5"			3		
3270	20				← ~6" of fine gravels			
					Very dense, moist, pale brown, silty fine to medium SAND (SM), with trace gravel			
3265	25	12-6	50/3"			5		LL(33), PI(7), SA(24)
3260	30							

Report: GEO_10_SNA; File: 27667021.GPJ; 6/5/2008 B-12

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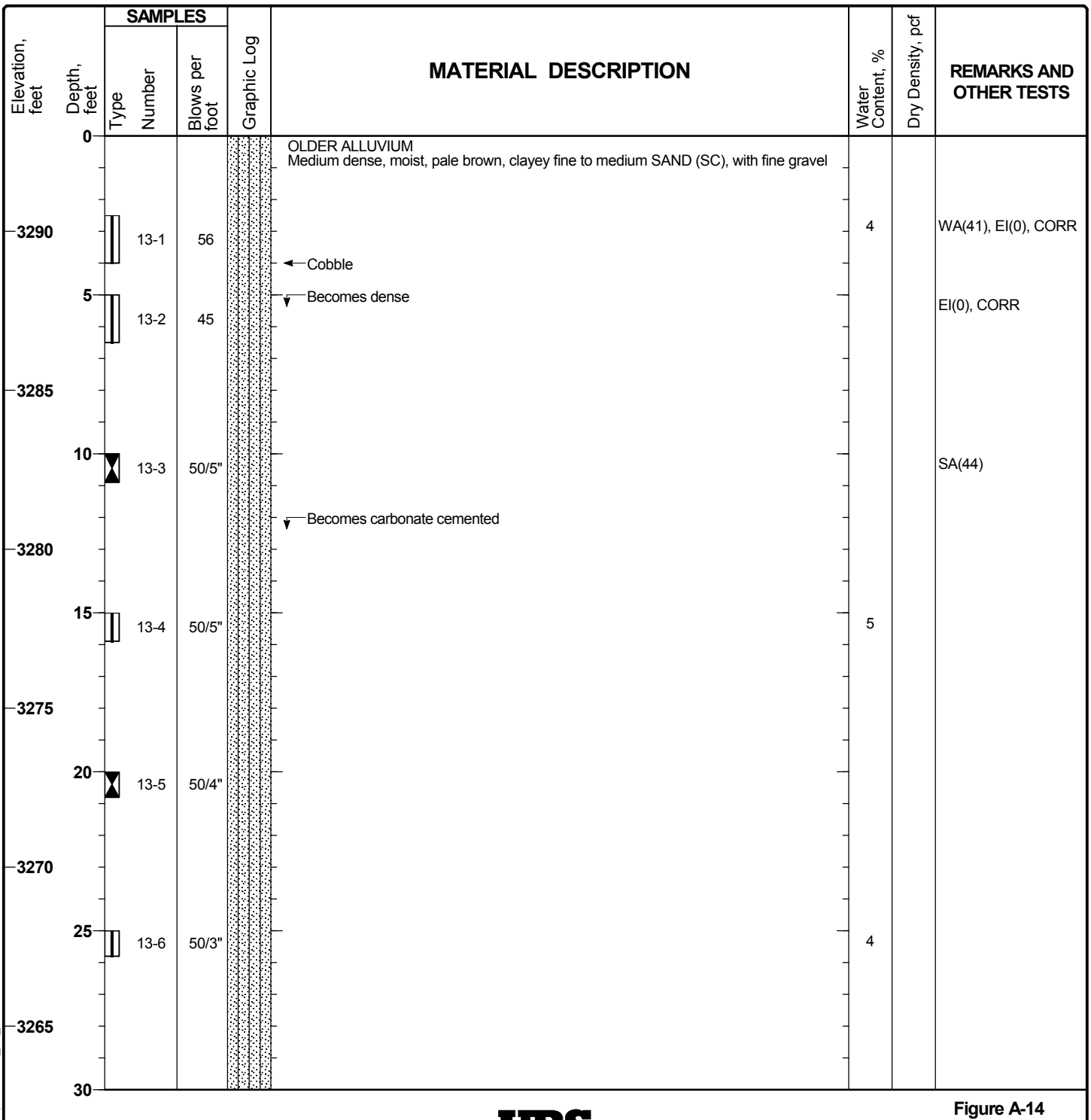
Elevation, feet	Depth, feet	SAMPLES			MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
		Type	Number	Blows per foot				
3260	30	12-7	50/3"		Bottom of boring at 30.5 feet			
3255	35							
3250	40							
3245	45							
3240	50							
3235	55							
3230	60							
3225	65							

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Log of Boring B-13

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Date(s) Drilled	04/03/08	Logged By	D. Rector	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	30.8 feet
Drill Rig Type	Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,293 Feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1808342 E 6602748		



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Log of Boring B-13

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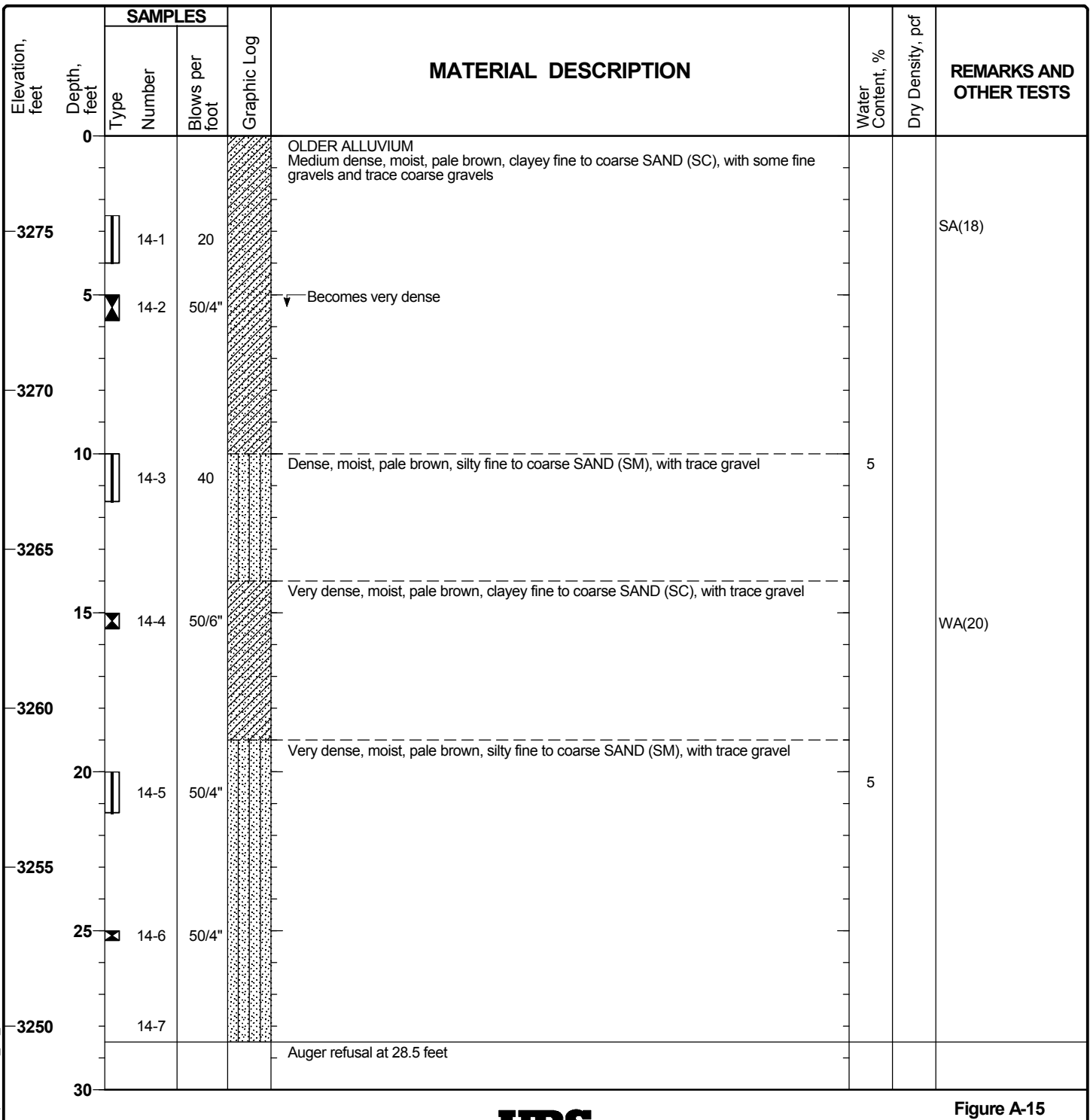
Elevation, feet	Depth, feet	SAMPLES			MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
		Type	Number	Blows per foot				
30		▲	13-7	50/3"				
					Bottom of boring at 30.8 feet			
3260								
35								
3255								
40								
3250								
45								
3245								
50								
3240								
55								
3235								
60								
3230								
65								

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Log of Boring B-14

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Date(s) Drilled	04/03/08	Logged By	D. Rector	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	28.5 feet
Drill Rig Type	Unimog Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,278 Feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1808626 E 6602520		



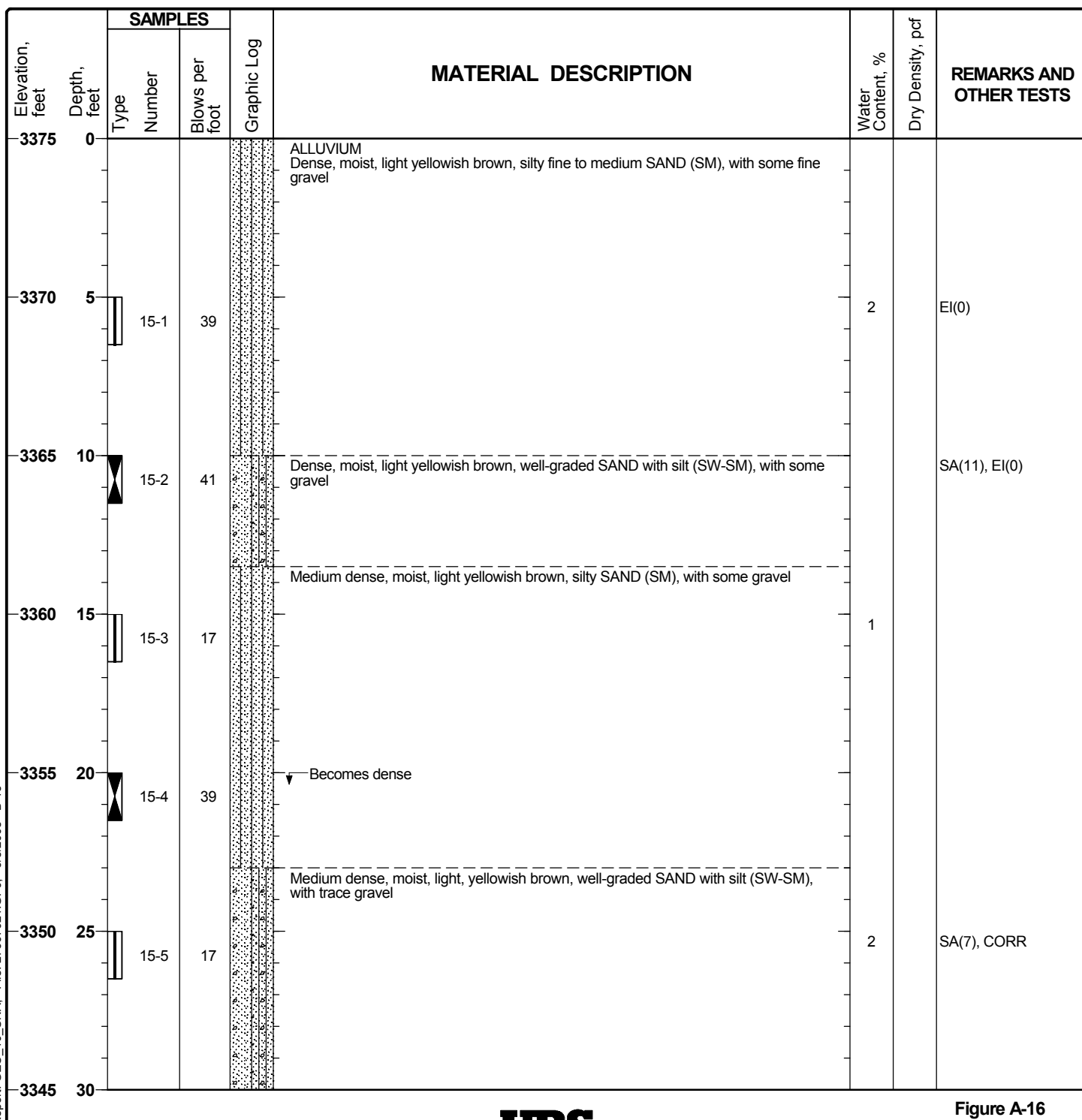
Report: GEO_10_SNA; File: 27667021.GPJ; 6/5/2008 B-14

Project: East County Substation
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Log of Boring B-15

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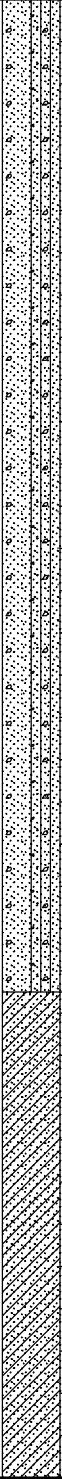
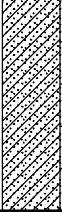
Date(s) Drilled	04/04/08	Logged By	D. Rector	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	81.5 feet
Drill Rig Type	Unimog Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,375 Feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1807493 E 6604121		



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Log of Boring B-15

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Elevation, feet	Depth, feet	SAMPLES			Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
		Type	Number	Blows per foot					
3345	30		15-6	42		↓ Becomes dense			CORR
3340	35		15-7	42		↓ Becomes light brown, coarse to very coarse grained	3		
3335	40		15-8	32		↓ Becomes light yellowish brown, medium to coarse grained			WA(12)
3330	45		15-9	41			4		LL(25), PI(3), WA(14)
3325	50		15-10	57		↓ Becomes very dense			
3320	55		15-11	29		OLDER ALLUVIUM Medium dense, moist, light reddish brown, clayey fine SAND (SC), with gravel	5		SA(17)
3315	60		15-12	65		↓ Becomes very dense			
3310	65								

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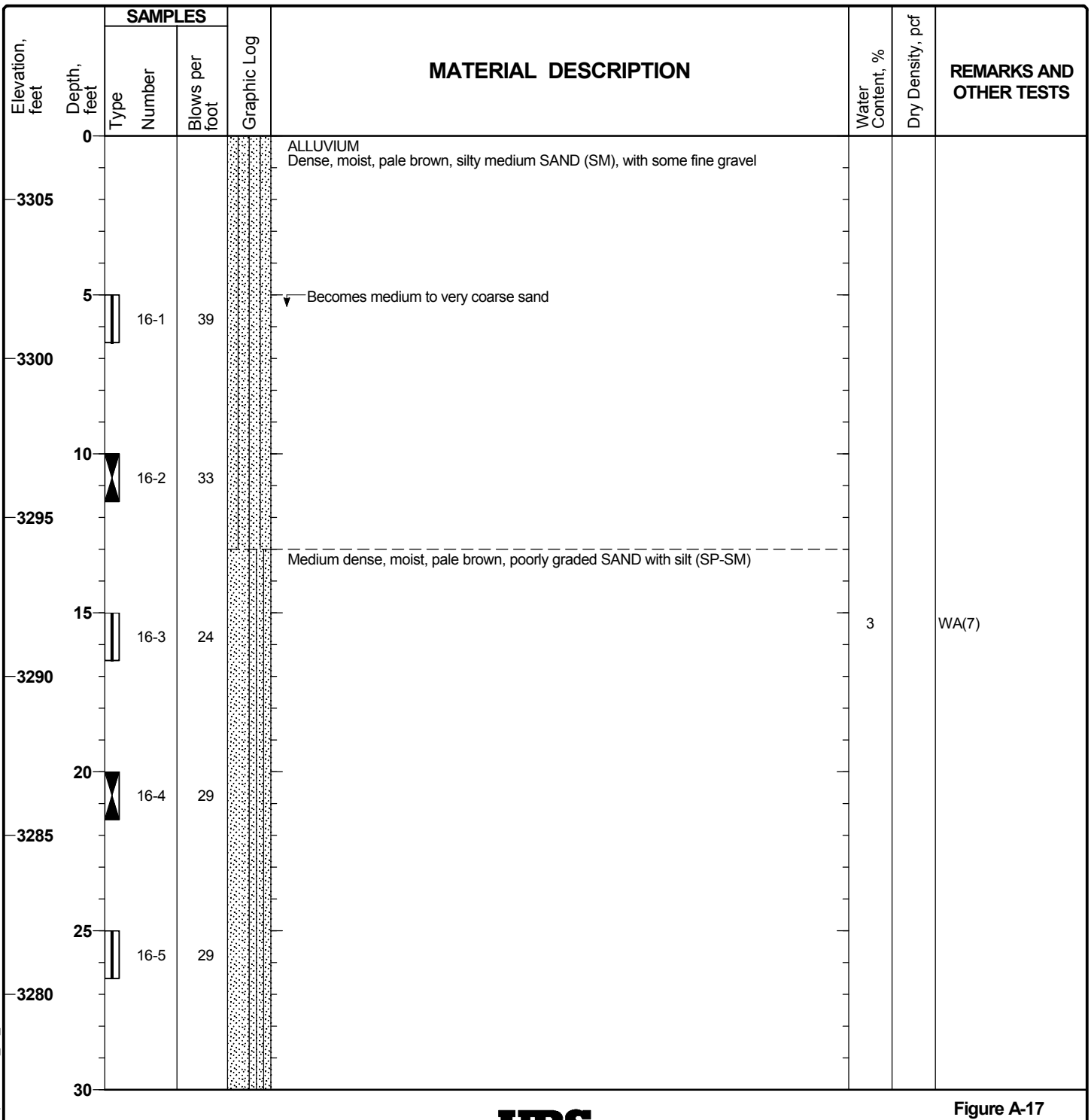
Elevation, feet	Depth, feet	SAMPLES			MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
		Type	Number	Blows per foot				
3310	65		15-13	65	 Increased fines content Very dense, moist, light yellowish brown, silty medium to coarse SAND (SM), with gravel	4		WA(33)
3305	70		15-14	50/6"				
3300	75		15-15	50/6"		1		
3295	80		15-16	50/6"		2		
					Bottom of boring at 81.5 feet			
3290	85							
3285	90							
3280	95							
3275	100							

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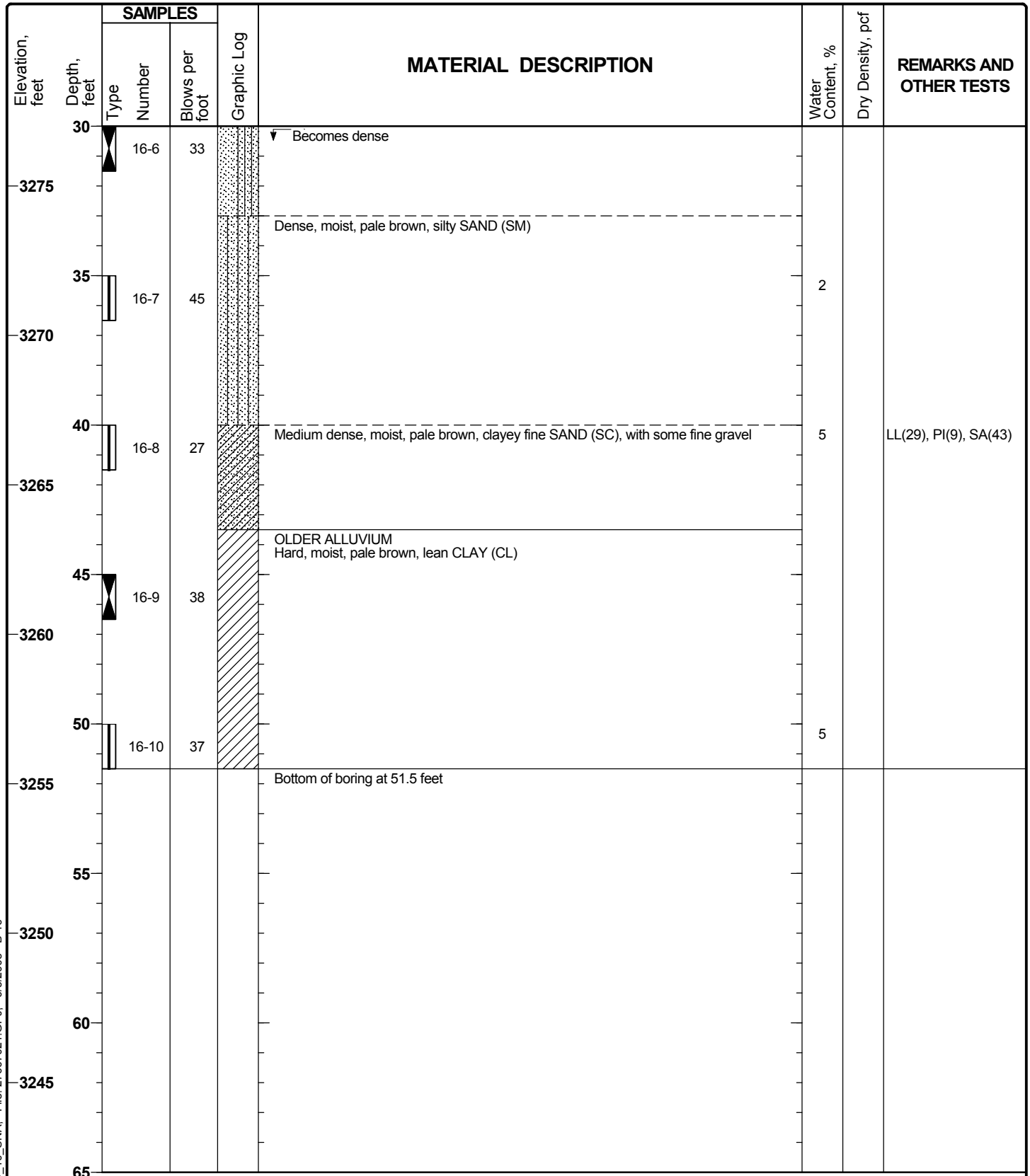
Date(s) Drilled	04/07/08	Logged By	D. Rector	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	51.5 feet
Drill Rig Type	Unimog Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,307 Feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1808728 E 6603414		



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Log of Boring B-16

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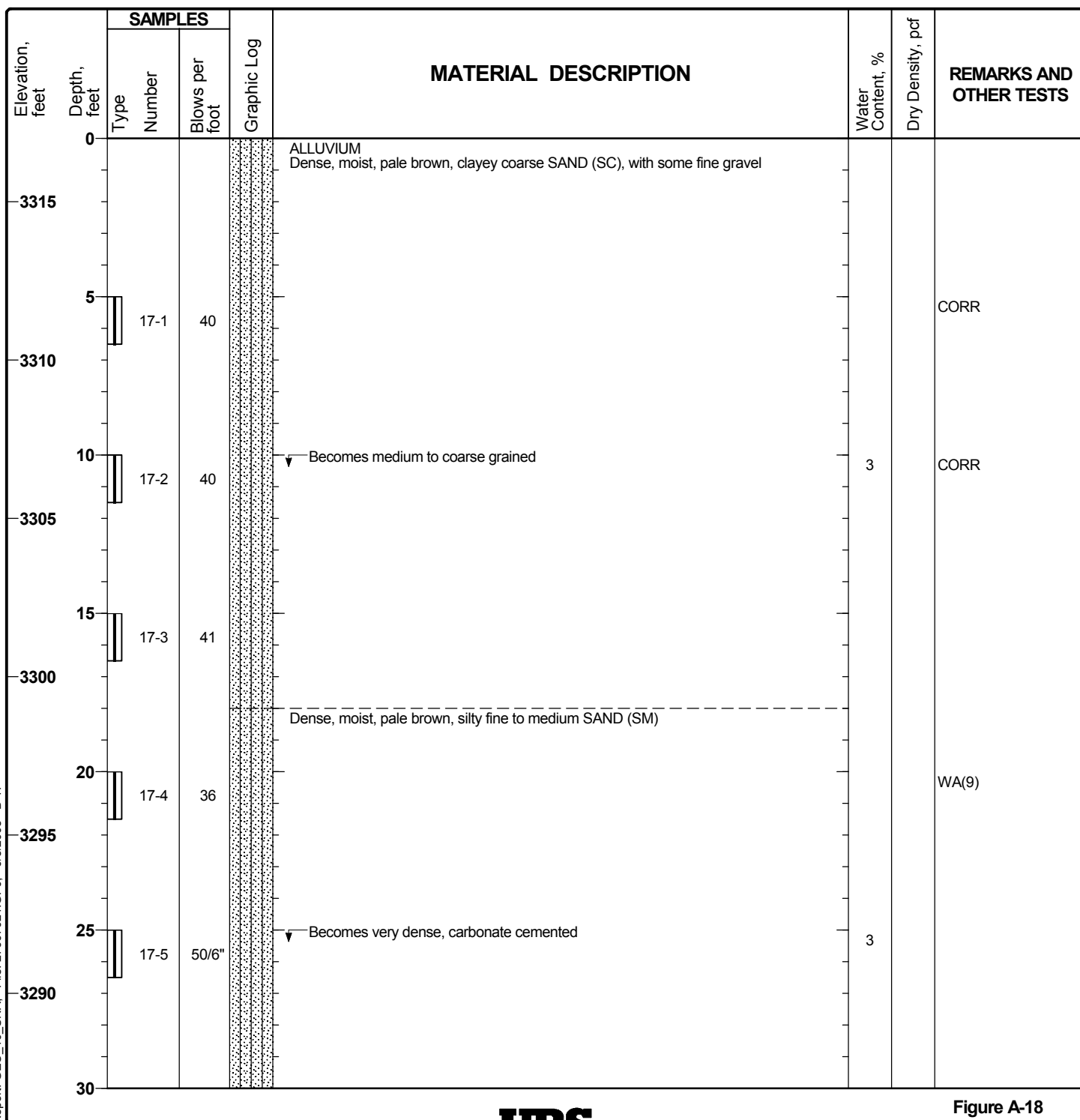


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Date(s) Drilled	04/07/08	Logged By	D. Rector	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	51.5 feet
Drill Rig Type	Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,317 Feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1808488 E 6603494		



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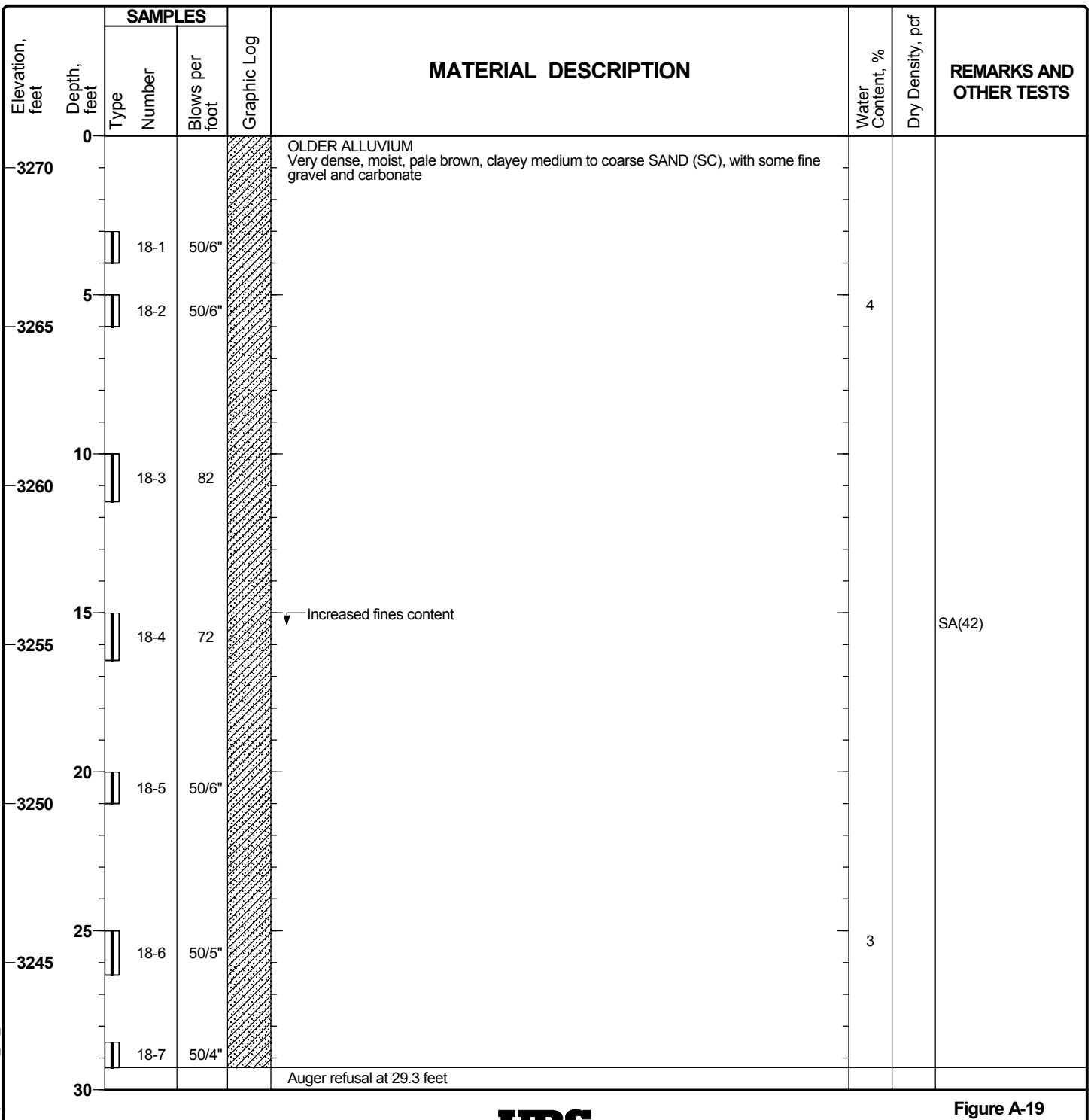
Elevation, feet	SAMPLES			MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
	Type	Number	Blows per foot				
30		17-6	28	↓ No carbonate			
3285							
35		17-7	62		5		LL(27), PI(5), SA(37)
3280							
40		17-8	54	OLDER ALLUVIUM Very dense, moist, pale brown, clayey medium to coarse SAND (SC), with carbonate	3		
3275							
45	⊠	17-9	50/4"				SA(31)
3270							
50		17-10	50/6"				
3265				Bottom of boring at 51.5 feet			
55							
3260							
60							
3255							
65							

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Date(s) Drilled	04/07/08	Logged By	D. Rector	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	29.3 feet
Drill Rig Type	Unimog Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,271 feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1808535 E 6602379		



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Date(s) Drilled	04/08/08	Logged By	D. Rector	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	25.3 feet
Drill Rig Type	Unimog Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,275 feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1808194 E 6602406		

Elevation, feet	Depth, feet	SAMPLES		Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
		Type	Number					
3275	0				OLDER ALLUVIUM Very dense, moist, pale brown, clayey fine to coarse SAND (SC), with some fine gravel and carbonate			
			19-1	50/4"				
3270	5		19-2	50/5"				
3265	10		19-3	50		3		WA(21)
3260	15		19-4	50/6"				
					Hard moist, pale brown, lean CLAY (CL)			
3255	20		19-5	90				
					Very dense, moist, pale brown, clayey fine to coarse SAND (SC), with carbonate			
3250	25		19-6	50/3"				SA(33)
					Bottom of boring at 25.3 feet			
3245	30							

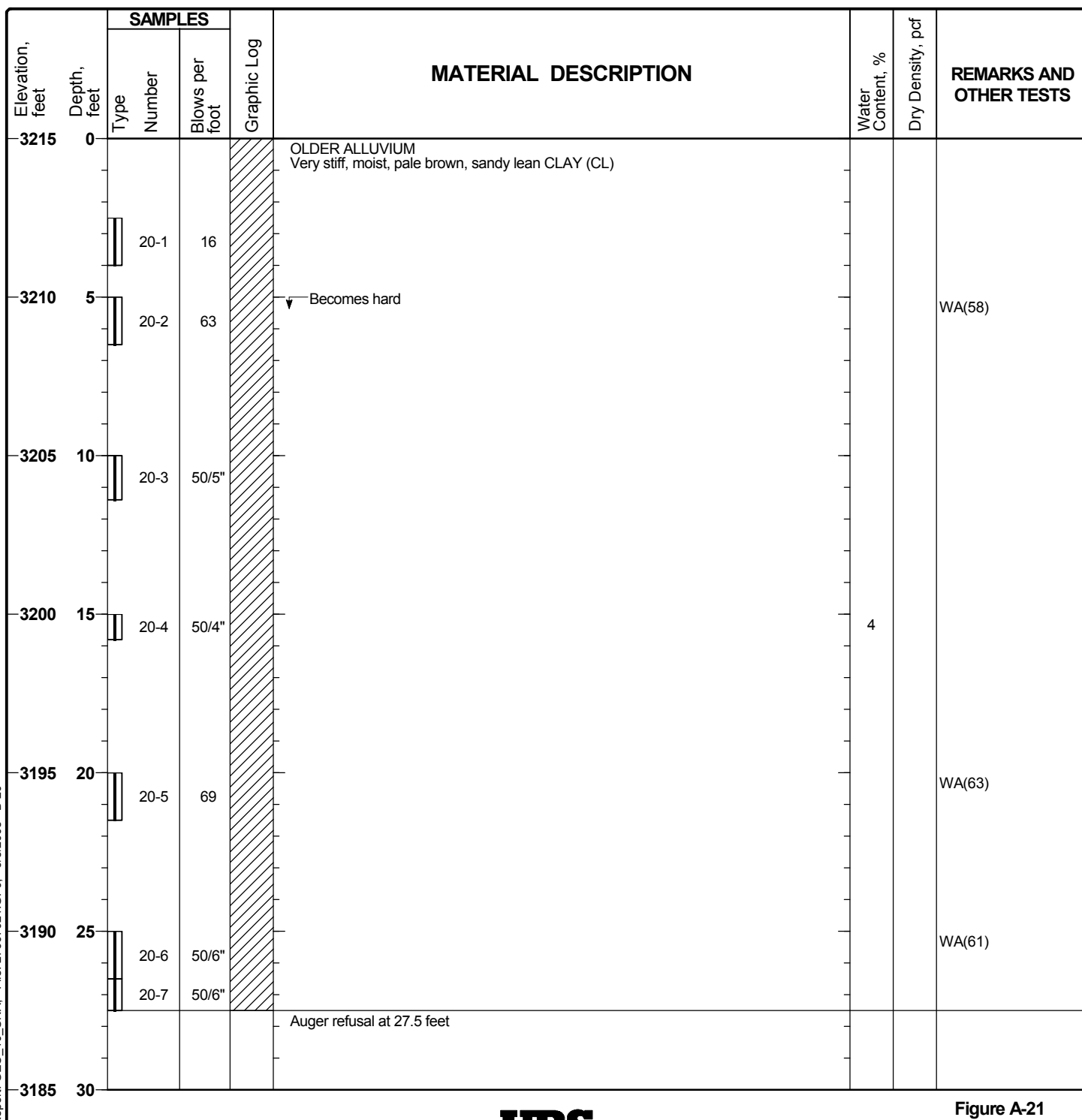
Report: GEO_10_SNA; File: 27667021.GPJ; 6/5/2008 B-19

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Date(s) Drilled	04/08/08	Logged By	D. Rector	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	27.5 feet
Drill Rig Type	Unimog Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,215 feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1808030 E 6601482		



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Date(s) Drilled	04/08/08	Logged By	D. Rector	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	19.8 feet
Drill Rig Type	Unimog Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,215 feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location			

Elevation, feet	Depth, feet	SAMPLES		Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
		Type	Number					
3215	0				OLDER ALLUVIUM Hard, moist, pale brown, lean CLAY (CL), with carbonate and fine sand			
			21-1	50/6"				
3210	5		21-2	50				WA(85)
3205	10		21-3	70		6		
3200	15		21-4	50/5"				
			21-5	50/4"		6		
3195	20				Auger refusal at 19.8 feet			
3190	25							
3185	30							

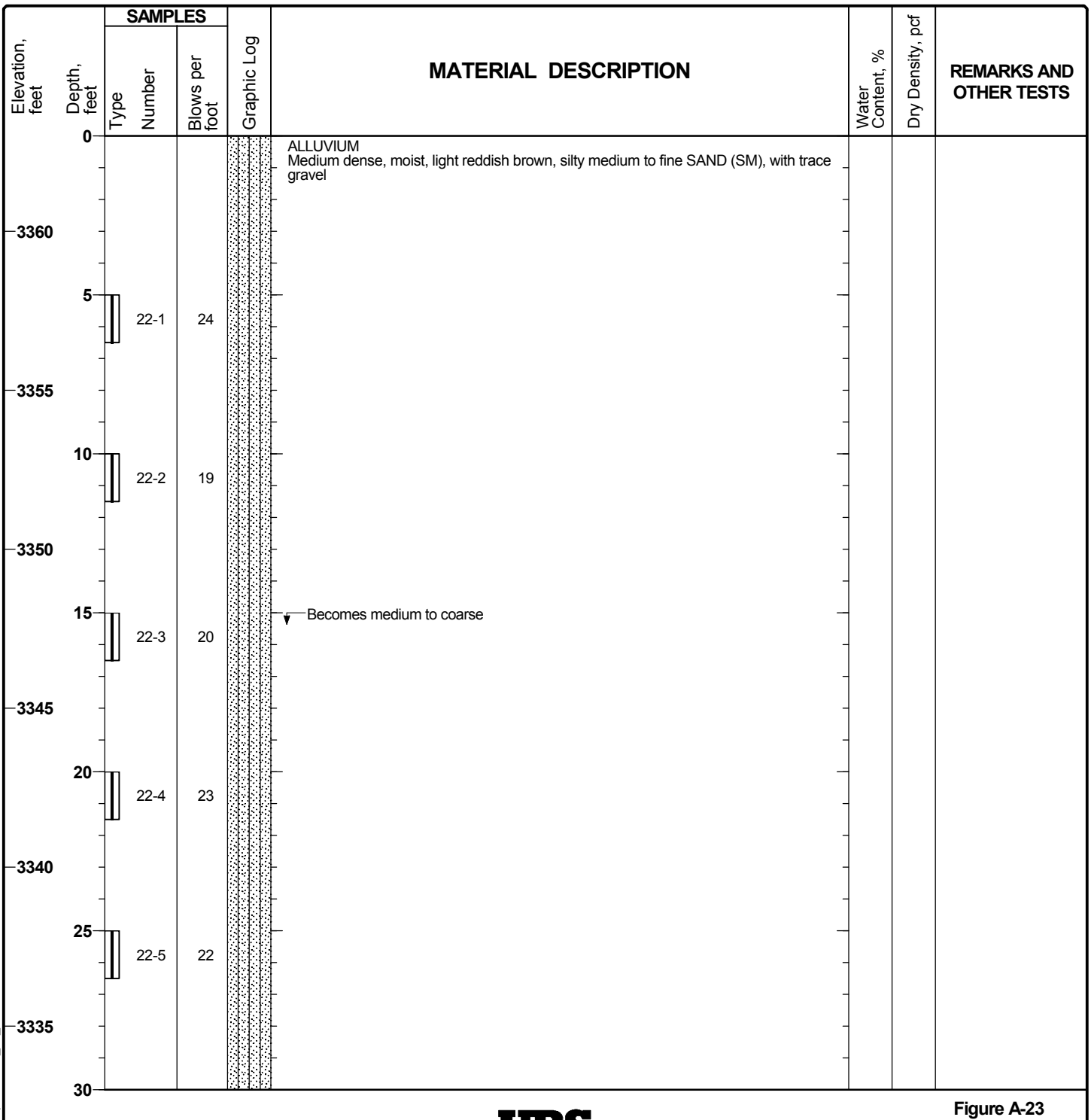
Report: GEO_10_SNA; File: 27667021.GPJ; 6/5/2008 B-21

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Log of Boring B-22

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Date(s) Drilled	04/09/08	Logged By	A. Podwiltz	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	86.4 feet
Drill Rig Type	Unimog Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,363 feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1807573 E 6603888		

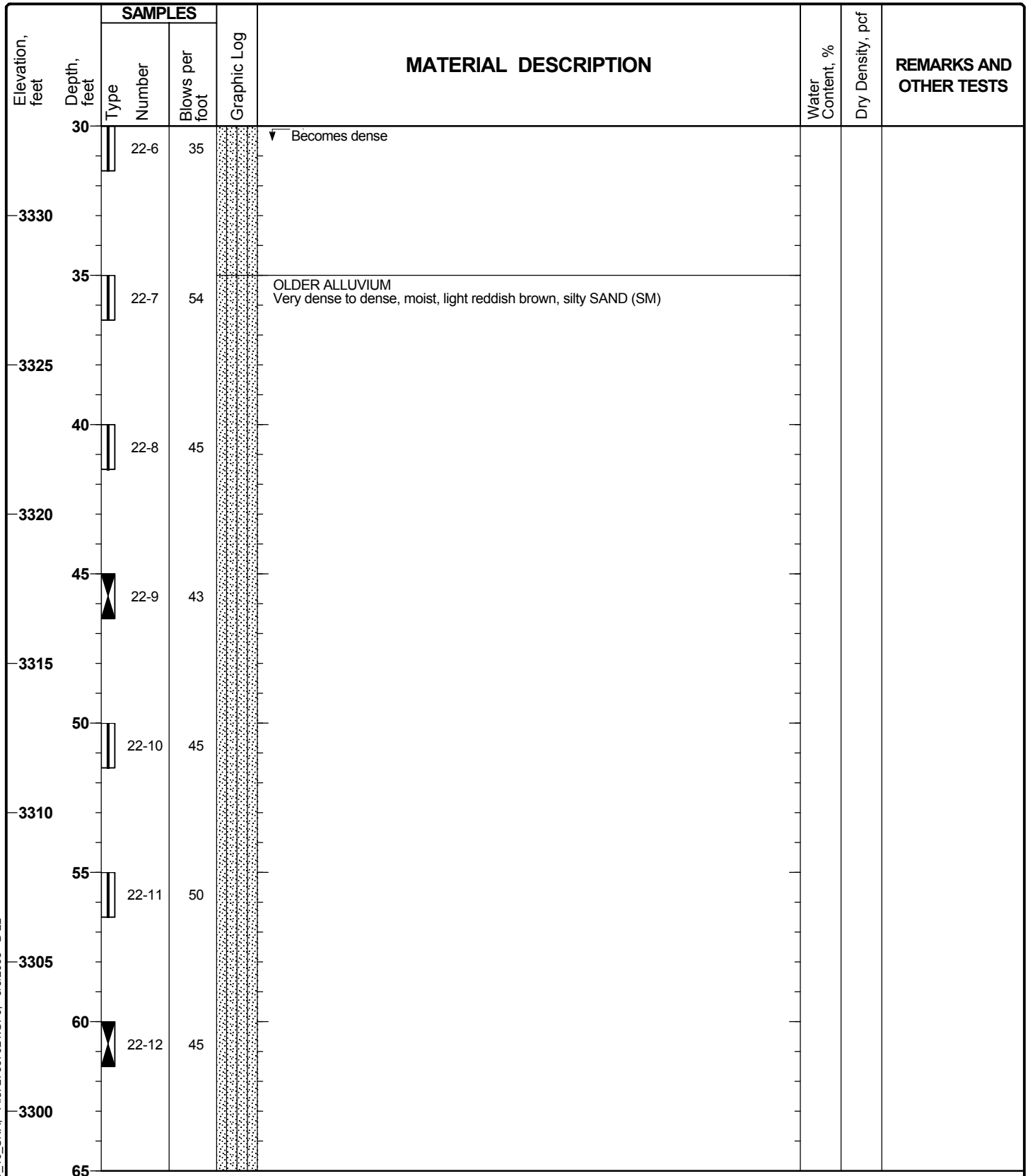


Report: GEO_10_SNA; File: 27667021.GPJ; 6/5/2008 B-22

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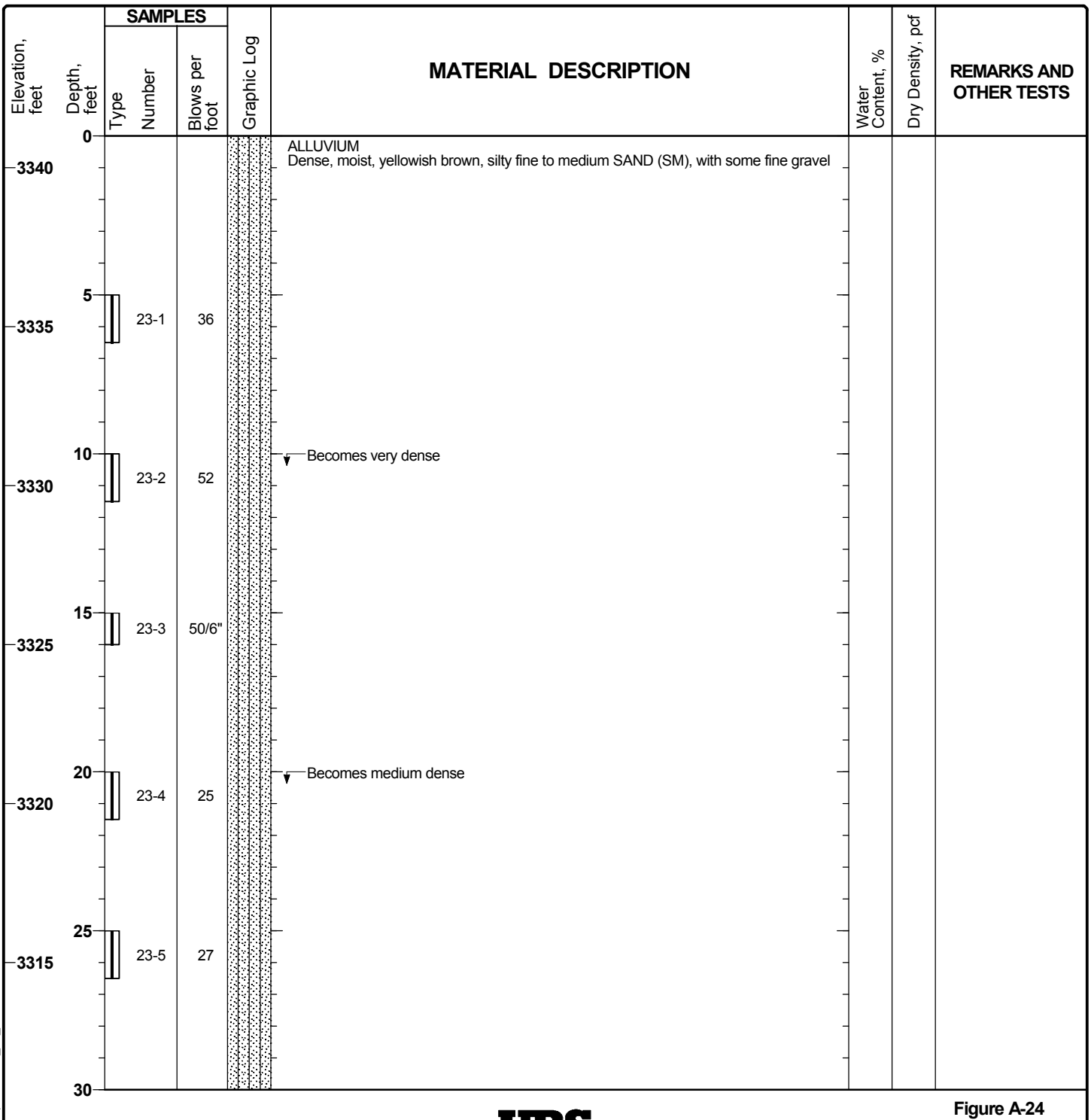
Elevation, feet	SAMPLES			MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
	Type	Number	Blows per foot				
65		22-13	28	↓ Becomes medium dense			
3295							
70		22-14	50/6"	↓ Becomes very dense			
3290							
75		22-15	50/6"				
3285							
80		22-16	50/6"				
3280							
85		22-17	50/5"				
				Very dense, moist, light gray, silty fine SAND (SM) Bottom of boring at 86.4 feet			
3275							
90							
3270							
95							
3265							
100							

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Date(s) Drilled	04/09/08	Logged By	A. Podwiltz	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	80.3 feet
Drill Rig Type	Unimog Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,341 feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1807760 E 6603489		



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Log of Boring B-23

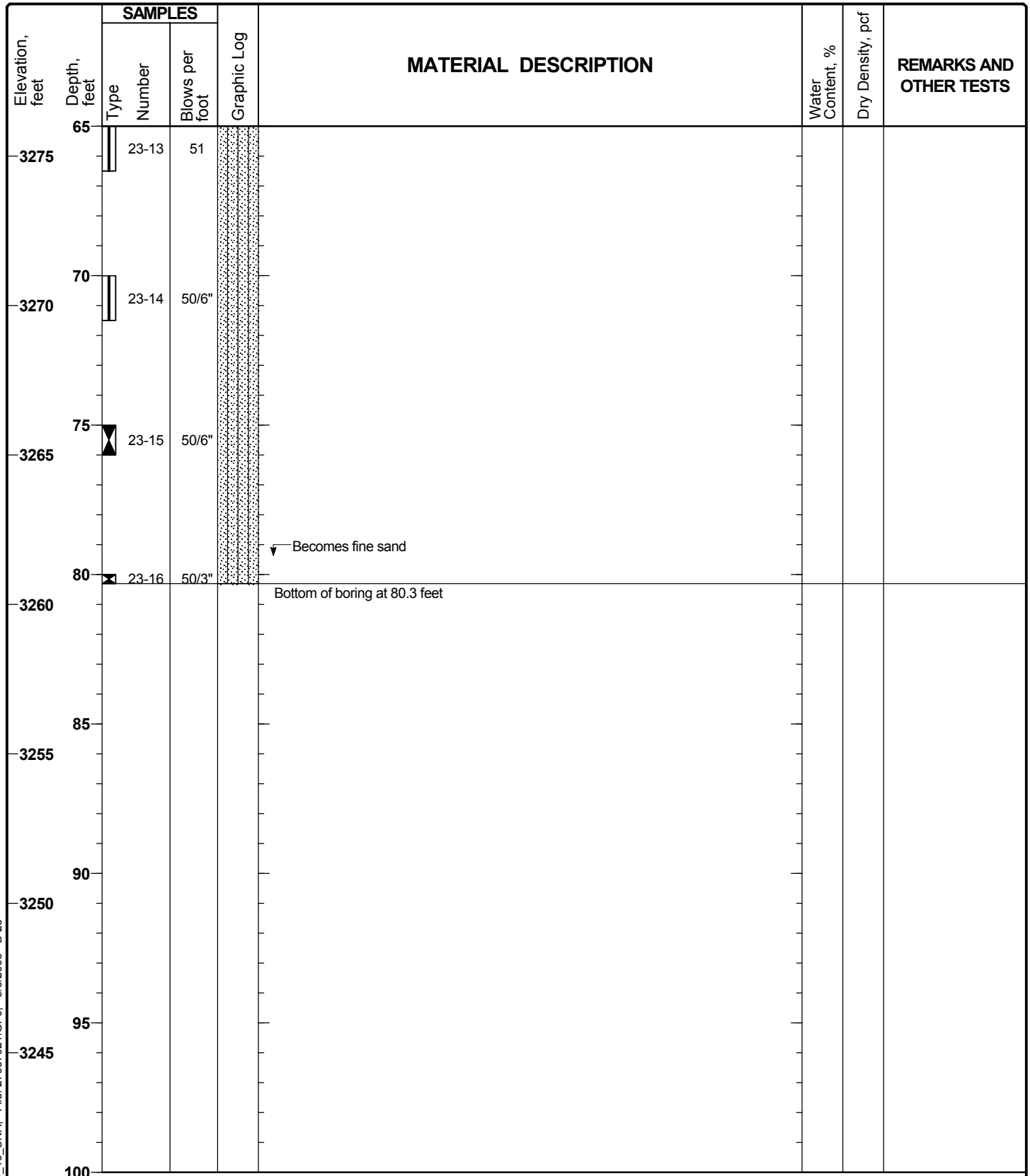
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Elevation, feet	Depth, feet	SAMPLES		Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
		Type	Number					
30								
3310			23-6	35	↓ Becomes dense			
35								
3305			23-7	49				
40								
3300			23-8	31				
45								
3295			23-9	50/6"	OLDER ALLUVIUM Very dense, moist, light reddish brown, silty medium to fine SAND (SM), with trace gravel and carbonate			
50								
3290			23-10	50/4"				
55								
3285			23-11	50				
60								
3280			23-12	50/6"				
65								

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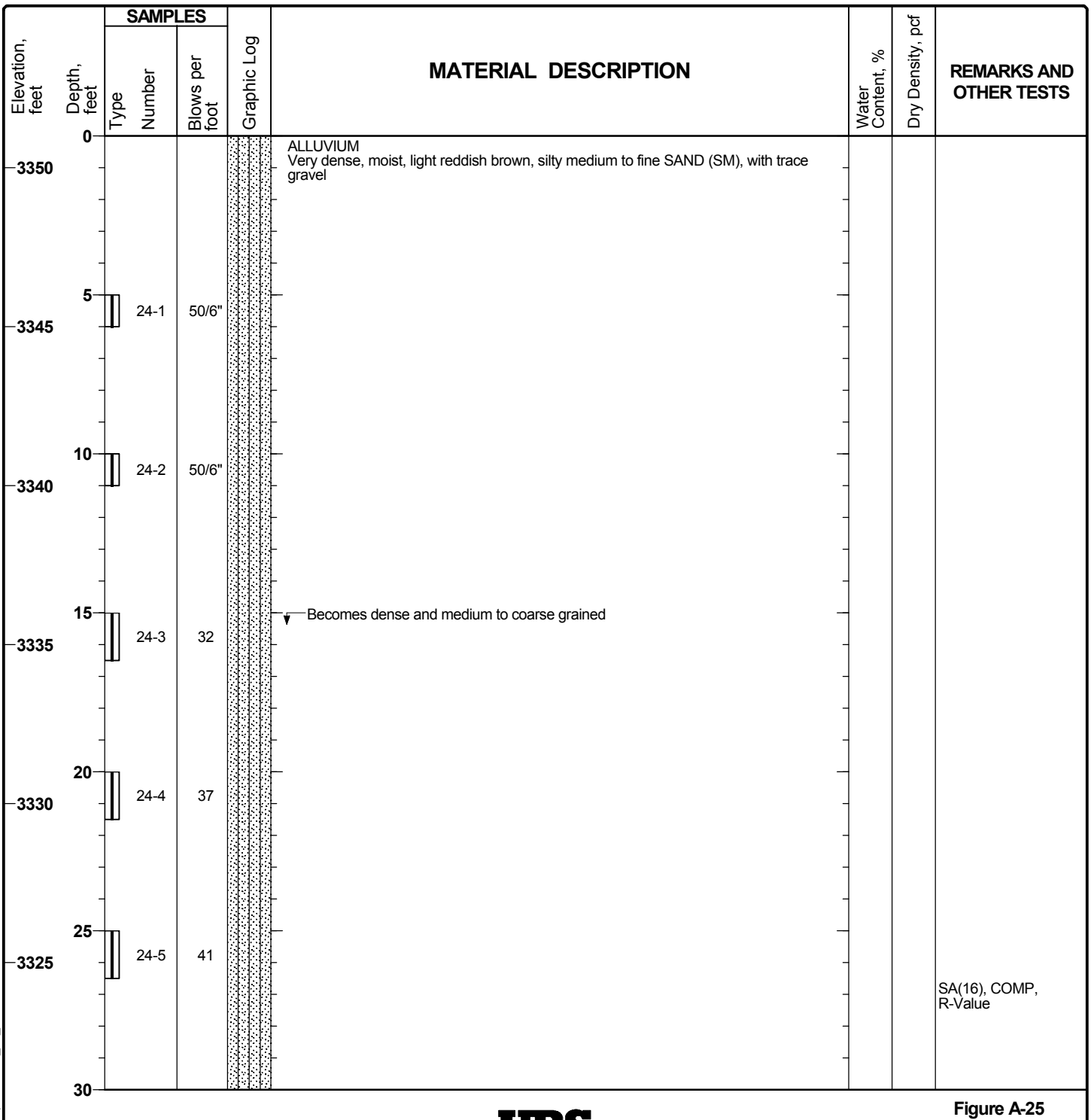


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Date(s) Drilled	04/10/08	Logged By	A. Podwiltz	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	66.5 feet
Drill Rig Type	Unimog Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,351 feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1807843 E 6603762		



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Elevation, feet	Depth, feet	SAMPLES		Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
		Type	Number					
3320	30		24-6	39				
3315	35		24-7	50	OLDER ALLUVIUM Very dense, light yellowish brown, fine to medium SAND (SM) with carbonate			
3310	40		24-8	68				
3305	45		24-9	43	↓ Becomes dense, yellowish brown, with gravel			
3300	50		24-10	50/6"	↓ Becomes very dense			
3295	55		24-11	55	↓ Becomes medium to fine grained			
3290	60		24-12	65				
	65							

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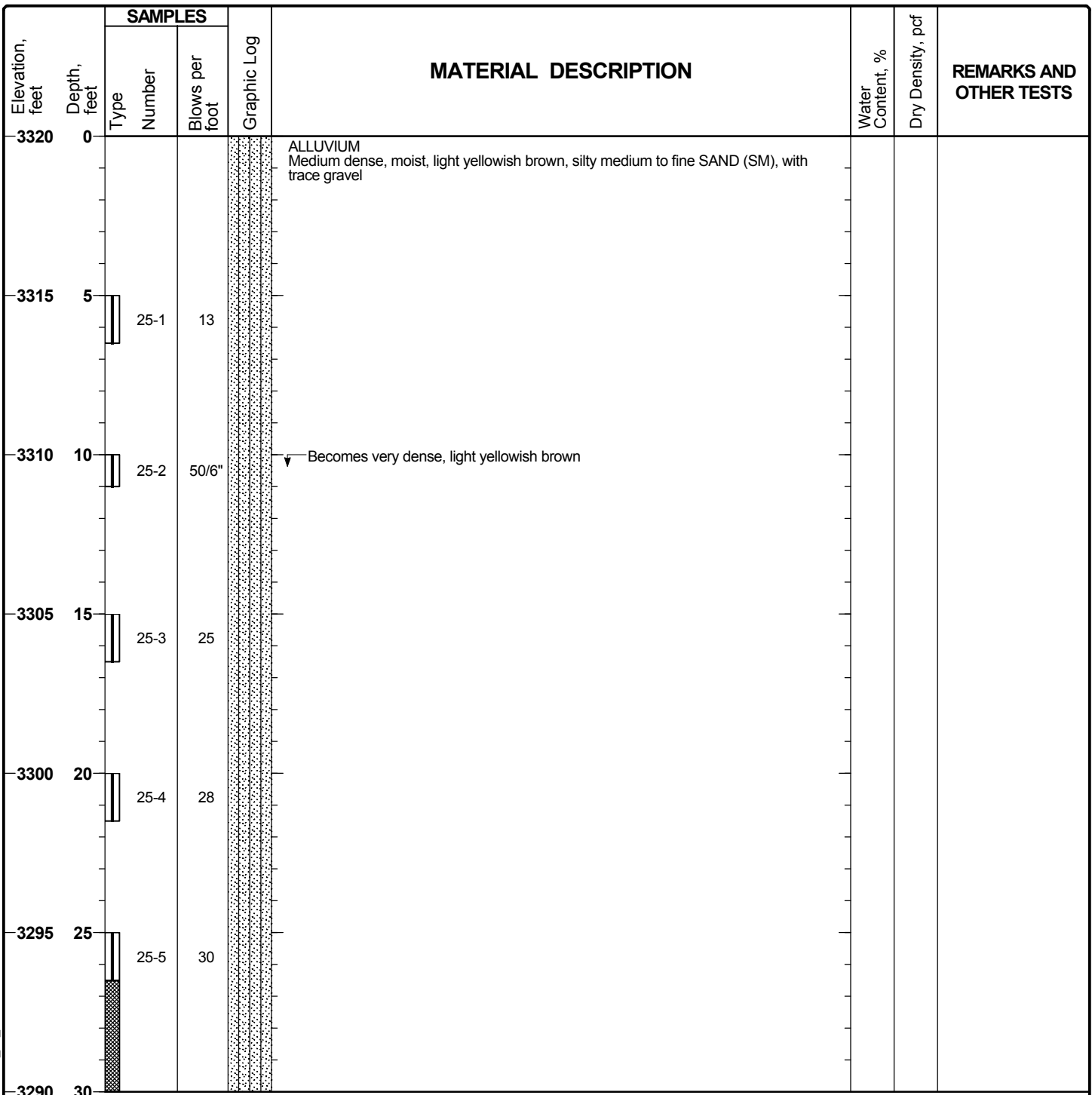
Elevation, feet	Depth, feet	SAMPLES		Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
		Type	Number					
3285	65		24-13	50/6"				
					Bottom of boring at 66.5 feet			
3280	70							
3275	75							
3270	80							
3265	85							
3260	90							
3255	95							
	100							

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Log of Boring B-25

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Date(s) Drilled	04/10/08	Logged By	A. Podwiltz	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	50.5 feet
Drill Rig Type	Unimog Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,320 feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1808798 E 6603729		



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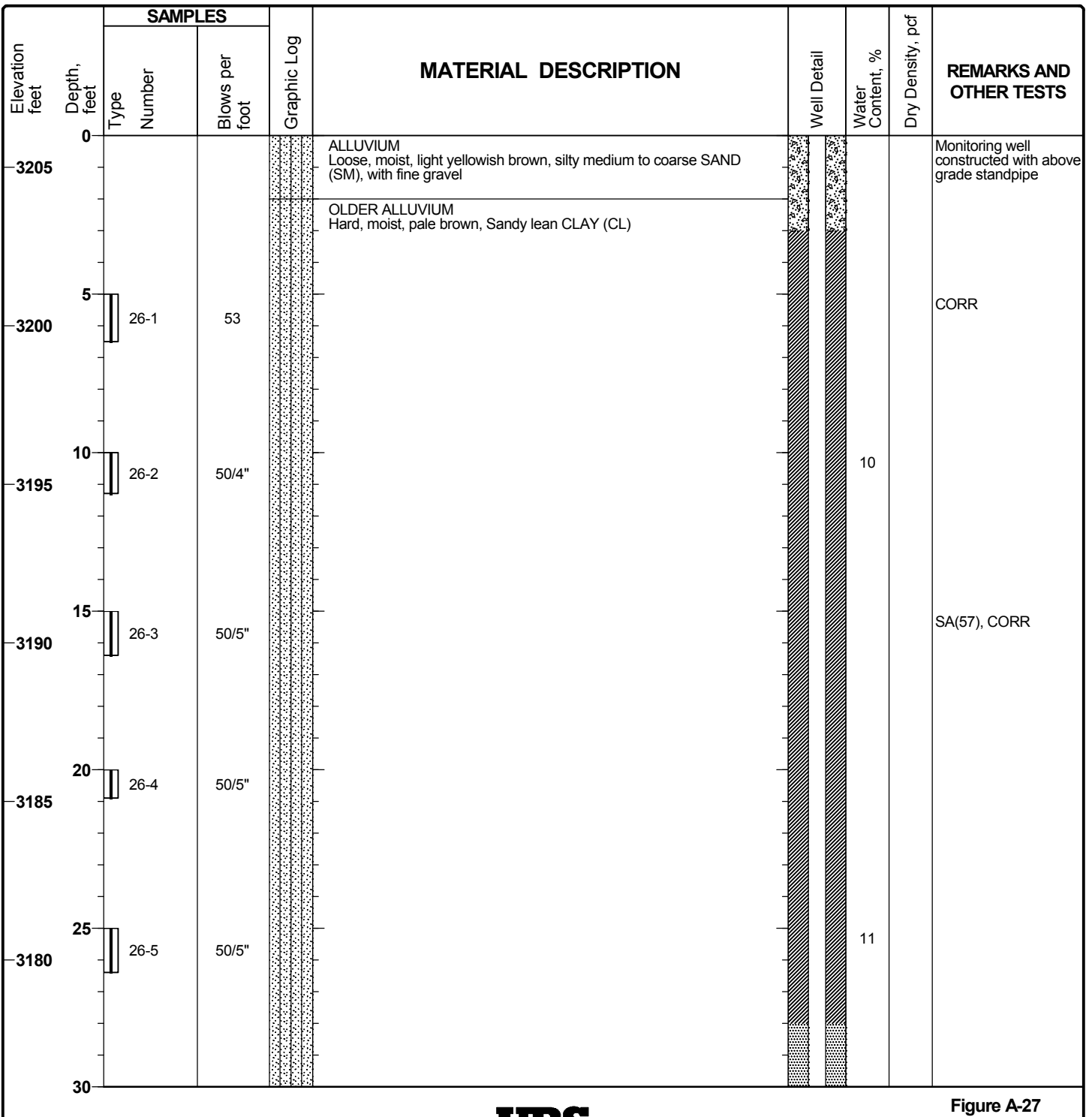
Elevation, feet	Depth, feet	SAMPLES		Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
		Type	Number					
3290	30		25-6	52	↓ Becomes very dense			
3285	35		25-7	74	OLDER ALLUVIUM Very dense, moist, light brown, clayey SAND (SC), with trace gravel			
3280	40		25-8	58				
3275	45		25-9	77				
3270	50		25-10	50/6"	Bottom of boring at 50.5 feet			
3265	55							
3260	60							
3255	65							

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Date(s) Drilled	04/11/08	Logged By	A. Podwiltz	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger Unimog Marl M5 All Terrain	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	50.4 feet
Drilling Contractor	Pacific Drilling	Hammer Data	140 lbs/30" drop	Surface Elevation	3,206 feet
Groundwater Level	Not encountered	Sampling Method(s)	ModCal/SPT	Coordinates	N 1,808,112.4 E 6,601,391.1
Borehole Completion	Soil cuttings/bentonite chips				

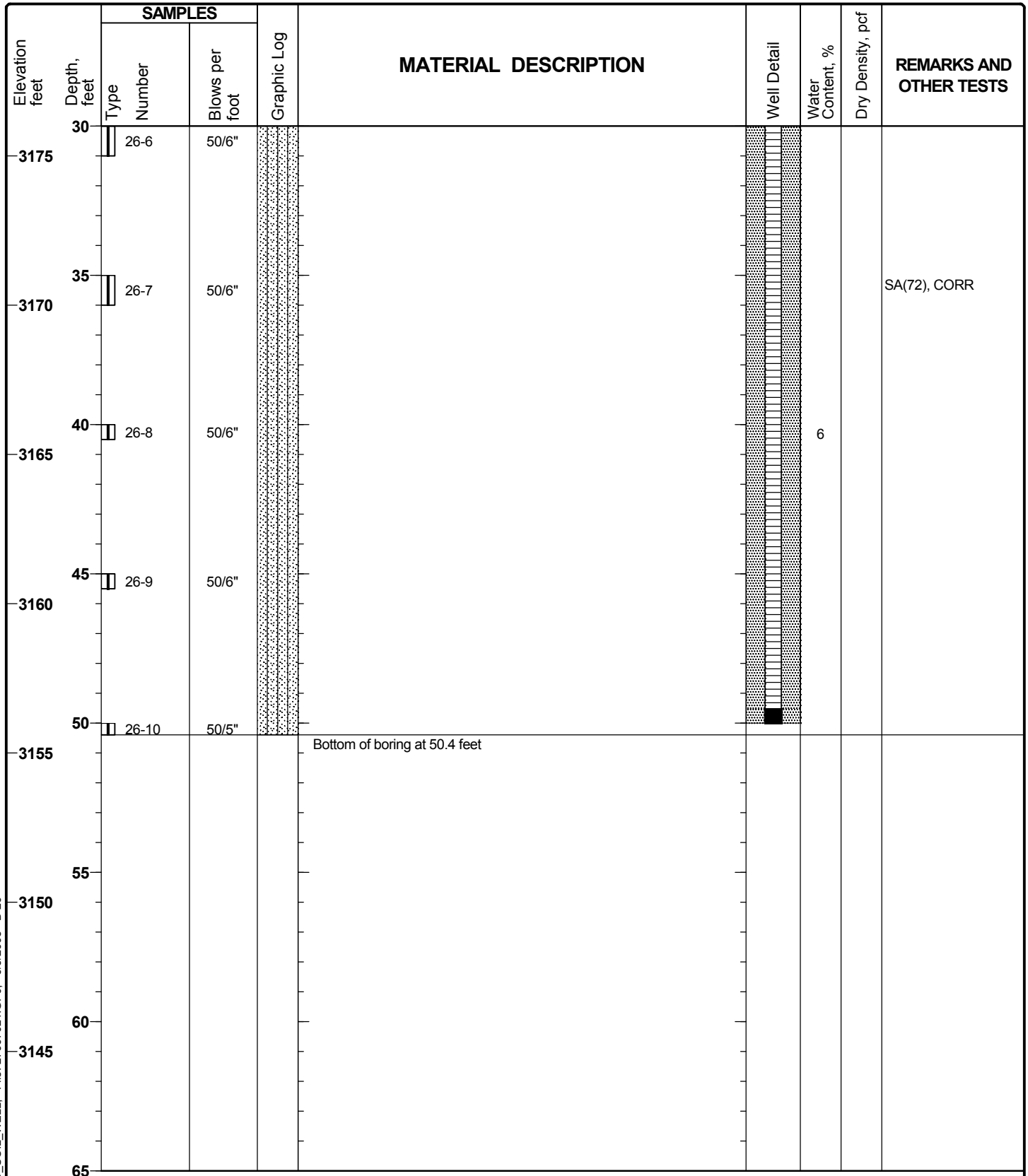


Report: GEO_SOIL_WELL; File: 27667021.GPJ; 6/5/2008 B-26

Project: East County Substation
 Project Location: Jacumba, California
 Project Number: 27667021.00030

Log of Boring B-26

Sheet 2 of 2

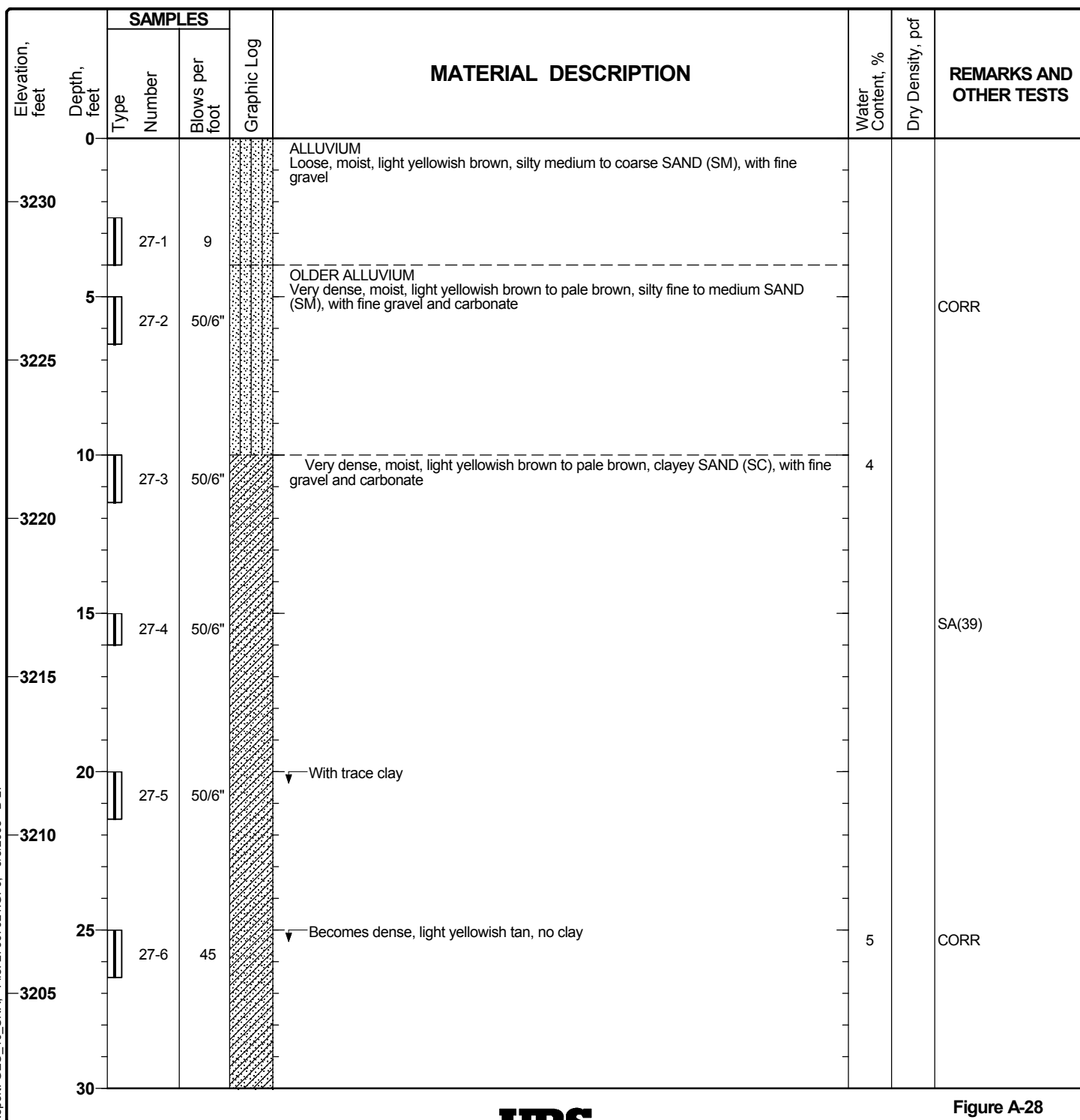


Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Boring B-27

Sheet 1 of 2

Date(s) Drilled	04/10/08	Logged By	A. Podwiltz	Checked By	P. Balasubramanyam
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	6 inch finger bit	Total Depth of Borehole	31.5 feet
Drill Rig Type	Unimog Marl M5 All Terrain	Drilling Contractor	Pacific Drilling	Approximate Surface Elevation	3,232 feet
Water Level Depth (Feet)	Not encountered	Sampling Method(s)	ModCal/SPT	Hammer Data	140 lbs/30" drop
Borehole Backfill	Soil cuttings/bentonite chips	Location	N 1807910 E 6601741		



Project: East County Substation
 Project Location: Jacumba, California
 Project Number: 27667021.00030

Log of Boring B-27

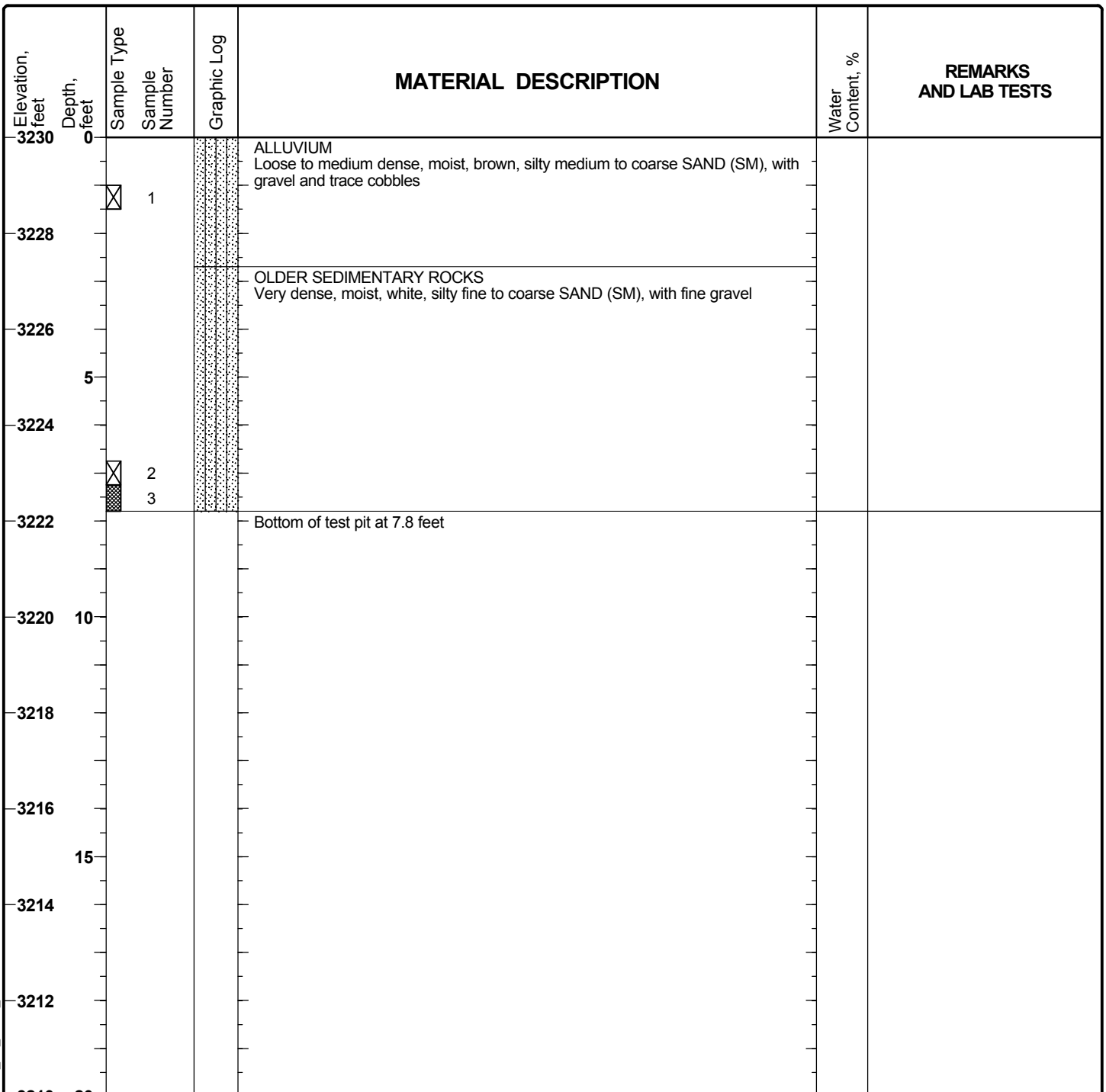
Sheet 2 of 2

Elevation, feet	Depth, feet	SAMPLES		Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Density, pcf	REMARKS AND OTHER TESTS
		Type	Number					
30			27-7	76				
3200					Bottom of boring at 31.5 feet			
35								
3195								
40								
3190								
45								
3185								
50								
3180								
55								
3175								
60								
3170								
65								

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP- 1

Date(s) Excavated	04/15/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	7.8 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,230 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag/Bucket)
Location	N 1809594 E 6601605				



Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP- 2

Date(s) Excavated	04/15/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	6 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,235 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag/Bucket)
Location	N 1809158 E 6601628				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3234	0	1		ALLUVIUM Loose to medium dense, moist, brown, silty medium to coarse SAND (SM), with gravel, trace cobbles, and carbonate beds		
3232		2				SA(25), R-Value
3230	5					
3228				Bottom of test pit at 6.0 feet		
3226						
3224	10					
3222						
3220	15					
3218						
3216						
20						

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP- 3

Date(s) Excavated	04/15/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	8 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,245 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag/Bucket)
Location	N 1808728 E 6602078				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3244	0	1		ALLUVIUM Loose to medium dense, moist, reddish brown, silty coarse to medium SAND (SM), with trace gravel		
3242		2 3		Loose to medium dense, moist, reddish brown with white dots (carbonate), silty coarse to medium to SAND (SM), with carbonate and trace clay		SA(13), R-Value
3240	5	4		OLDER ALLUVIUM Dense to very dense, moist, light brown, silty fine SAND (SM), with trace gravel and carbonate		
3238						
3236				Bottom of test pit at 8.0 feet		
3234	10					
3232						
3230	15					
3228						
3226						
20						

Project: East County Substation
 Project Location: Jacumba, California
 Project Number: 27667021.00030

Log of Test Pit TP- 4

Date(s) Excavated	04/15/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	6 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,228 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag)
Location	N 1808566 E 6601785				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3228	0			OLDER SEDIMENTARY ROCKS Very dense, moist, light brownish white, silty fine to coarse SAND (SM), with gravel and carbonate		
3226						
3224		1				
	5	2				
3222				Bottom of test pit at 6.0 feet		
3220						
3218	10					
3216						
3214						
3212	15					
3210						
3208	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP- 5

Date(s) Excavated	04/15/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	7 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,230 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag)
Location	N 1808300 E 6601760				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3230	0			ALLUVIUM Loose to medium dense, moist, brown, silty medium to coarse SAND (SM), with gravel and organics		
		1				
3228				Loose to medium dense, moist, light brown, silty medium SAND (SM), with trace gravel, some organics, and carbonate		
		2				
3226						
	5					
3224		3		OLDER ALLUVIUM Dense to very dense, moist, light brown to white, silty medium to fine SAND (SM), with trace coarse sand, fine gravel, and carbonate		
				Bottom of test pit at 7.0 feet		
3222						
3220	10					
3218						
3216						
	15					
3214						
3212						
3210	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP- 6

Date(s) Excavated	04/15/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	5.2 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,251 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag/Bucket)
Location	N 1807923 E 6602217				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3250	0	1		ALLUVIUM Loose to medium dense, moist, reddish brown, silty medium to coarse SAND (SM), with organics and trace gravel		
3248				OLDER ALLUVIUM Dense to very dense, moist, light brown to white, silty fine to coarse SAND (SM), with gravel, trace fine cobbles, and carbonate		
3246	5	2 3				SA(29), R-Value
				Bottom of test pit at 5.2 feet		
3244						
3242						
3240	10					
3238						
3236	15					
3234						
3232						
20	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP- 7

Date(s) Excavated	04/15/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	7 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,285 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag)
Location	N 1807872 E 6602486				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3284	0			ALLUVIUM Loose to medium dense, moist, reddish brown, silty medium to coarse SAND (SM), with gravel and trace cobbles		
3282		1				
3280	5			OLDER ALLUVIUM Dense to very dense, moist, light brown, silty fine to coarse SAND (SM), with gravel and carbonate		
3278		2				
				Bottom of test pit at 7.0 feet		
3276						
3274	10					
3272						
3270	15					
3268						
3266						
20	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP- 8

Date(s) Excavated	04/15/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	4.5 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,247 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag)
Location	N 1808223 E 6602022				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3246	0	1		ALLUVIUM Loose to medium dense, moist, light brown, silty fine to medium SAND (SM)		
3244		2		OLDER ALLUVIUM Dense to very dense, moist, light brown to white, silty medium to fine SAND (SM), with coarse sand, fine gravel, and carbonate		
3242	5			Bottom of test pit at 4.5 feet		
3240						
3238						
3236	10					
3234						
3232	15					
3230						
3228						
20	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP- 9

Date(s) Excavated	04/15/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	6.7 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,244 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag/Bucket)
Location	N 1808557 E 6602106				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3244	0			ALLUVIUM Loose to medium dense, moist, reddish brown, silty medium to coarse SAND (SM), with trace gravel and zone of poorly graded coarse SAND		
3242		1				
3240						
	5					
3238		2		OLDER ALLUVIUM Dense to very dense, moist, light brown, silty medium to coarse SAND (SM), with fine gravel, more cementation		SA(36)
		3				COMP, R-Value
				Bottom of test pit at 6.7 feet		
3236						
3234	10					
3232						
3230						
	15					
3228						
3226						
3224	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP-10

Date(s) Excavated	04/16/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	4 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,210 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag)
Location	N 1808582 E 6601293				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3210	0			OLDER ALLUVIUM Dense to very dense, moist, light brownish white, silty medium to fine SAND (SM), with trace coarse SAND, organics, carbonate, and trace clay		
		1				
3208				OLDER SEDIMENTARY ROCKS Very dense, moist, light brownish white, silty fine to coarse SAND (SM), with trace gravel and carbonate		
		2				
3206				Bottom of test pit at 4.0 feet		
	5					
3204						
3202						
3200	10					
3198						
3196						
	15					
3194						
3192						
3190	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP-11

Date(s) Excavated	04/16/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	6 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,215 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag)
Location	N 1808372 E 6601370				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3214	0	1		ALLUVIUM Loose to medium dense, moist, reddish brown, silty medium to coarse SAND (SM), with fine gravel		
3212		2		OLDER ALLUVIUM Dense to very dense, moist, light brownish white, silty medium to fine SAND (SM), with trace gravel and clay		
3210	5	3		↓ Increase in carbonate		
		4		Bottom of test pit at 6.0 feet		
3208						
3206						
3204	10					
3202						
3200	15					
3198						
3196						
20	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP-12

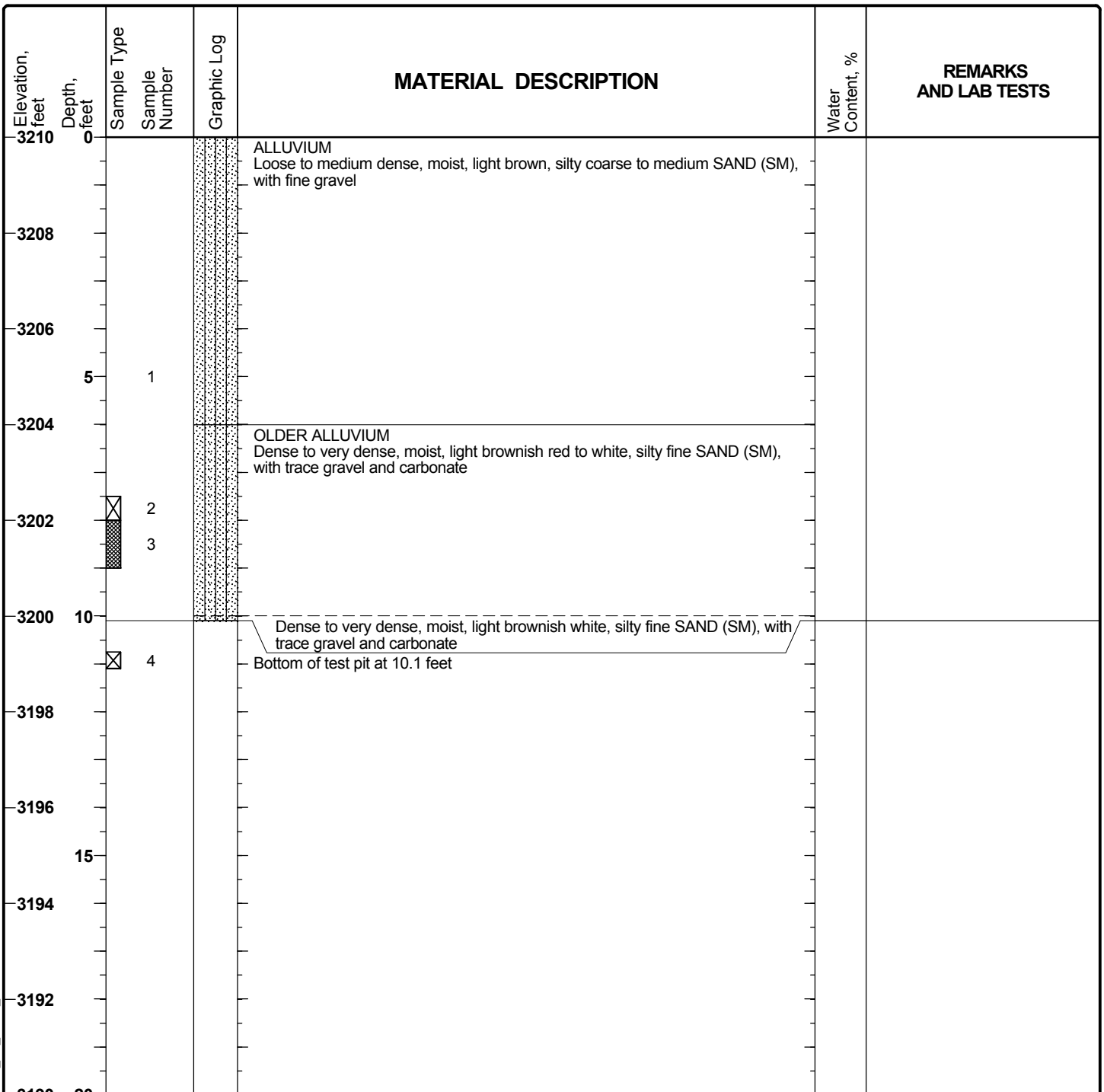
Date(s) Excavated	04/16/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	7 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,231 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag)
Location	N 1808076 E 6601483				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3230	0	1		ALLUVIUM Loose to medium dense, moist, light brown, silty medium to fine SAND (SM), with trace gravel and organics		
3228		2		OLDER ALLUVIUM Dense to very dense, moist, light brown, silty medium to coarse SAND (SM), with trace gravel and carbonate		
3226	5			OLDER SEDIMENTARY ROCKS Very dense, moist, light brownish white, silty fine to coarse SAND (SM), with trace gravel and some carbonate		
3224		3		Bottom of test pit at 7.0 feet		
3222						
3220	10					
3218						
3216	15					
3214						
3212						
20	20					

Project: East County Substation
 Project Location: Jacumba, California
 Project Number: 27667021.00030

Log of Test Pit TP-13

Date(s) Excavated	04/16/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	10.1 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,210 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag/Bucket)
Location	N 1807946 E 6601213				



Project: East County Substation
 Project Location: Jacumba, California
 Project Number: 27667021.00030

Log of Test Pit TP-14

Date(s) Excavated	04/16/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	5.2 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,226 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag)
Location	N 1807825 E 6601655				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3226	0	1		ALLUVIUM Loose to medium dense, moist, reddish brown, silty fine to medium GRAVEL (GM), with sand and trace cobbles		
3224		2		OLDER ALLUVIUM Dense to very dense, moist, brown, silty medium to fine SAND (SM), with trace gravel		
3222	5	3		Bottom of test pit at 5.2 feet		
3220						
3218						
3216	10					
3214						
3212	15					
3210						
3208						
3206	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP-15

Date(s) Excavated	04/16/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	9.8 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,242 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag)
Location	N 1807532 E 6601807				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3242	0			ALLUVIUM Loose to medium dense, moist, brown, silty medium to coarse SAND (SM), with fine gravel		
		1				
3240				↓ Becomes light brown		
		2				
3238						
	5					
3236						
3234						
		3				
3232	10			Bottom of test pit at 9.8 feet		
3230						
3228						
	15					
3226						
3224						
3222	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP-16

Date(s) Excavated	04/16/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	6.5 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,258 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag)
Location	N 1807579 E 6602155				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3258	0			ALLUVIUM Loose to medium dense, moist, brown, silty medium to coarse SAND (SM), with gravel		
3256		1				
		2				
3254						
	5					
3252		3		OLDER ALLUVIUM Dense to very dense, moist, brown, silty medium to coarse SAND (SM), with gravel and carbonate		
				Bottom of test pit at 6.5 feet		
3250						
3248	10					
3246						
3244						
	15					
3242						
3240						
3238	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP-17

Date(s) Excavated	04/17/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	5.9 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,287 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag)
Location	N 1808657 E 6602767				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3286	0	1		ALLUVIUM Loose to medium dense, moist, brown, silty medium to coarse SAND (SM) With trace carbonate		
3284		2		OLDER SEDIMENTARY ROCKS Very dense, moist, light brownish white, silty medium to coarse SAND (SM), with carbonate		
3282	5	3				
		4				
3280				Bottom of test pit at 5.9 feet		
3278						
3276	10					
3274						
3272	15					
3270						
3268						
20						

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP-18

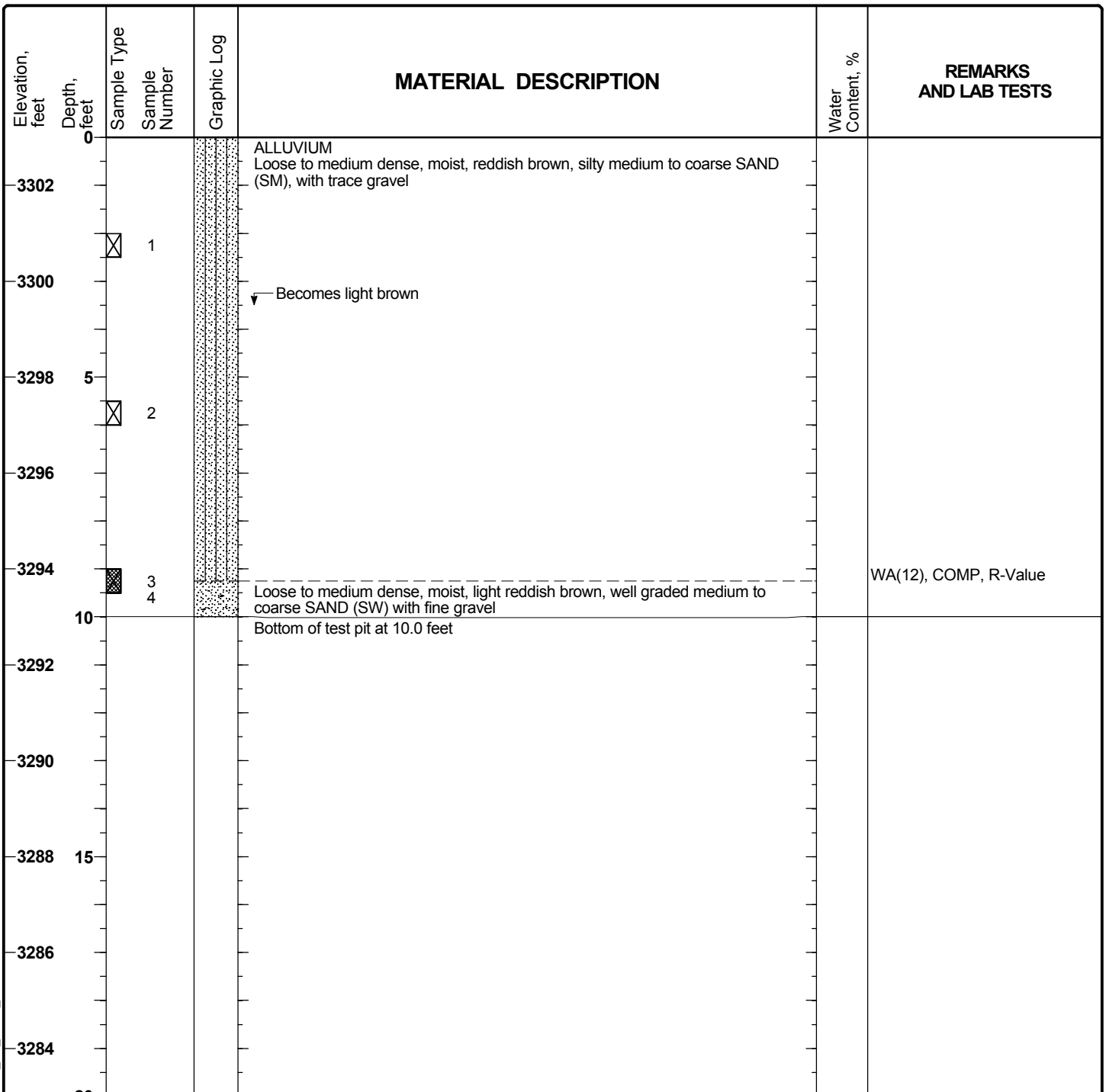
Date(s) Excavated	04/17/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	4.8 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,293 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag)
Location	N 1808720 E 6603132				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3292	0	1		OLDER SEDIMENTARY ROCKS Very dense, moist, light brown, silty medium to fine SAND (SM), with trace gravel		
3290		2				
3288	5			Bottom of test pit at 4.8 feet		
3286						
3284						
3282	10					
3280						
3278	15					
3276						
3274						
20	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP-19

Date(s) Excavated	04/17/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	10 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,303 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag/Bucket)
Location	N 1808203 E 6603000				



Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP-20

Date(s) Excavated	04/17/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	7 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,284 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag)
Location	N 1808075 E 6602451				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3284	0	☒ 1		ALLUVIUM Loose to medium dense, moist, brown, silty medium to fine SAND (SM), with trace gravel		
		☒ 2		Loose to medium dense, moist, light reddish brown, well graded medium to coarse SAND (SW)		
3282				OLDER ALLUVIUM Dense to very dense, moist, light yellowish brown, silty medium to fine SAND (SM), with carbonate		
3280		☒ 3				
	5					
3278						
				Bottom of test pit at 7.0 feet		
3276						
3274	10					
3272						
3270						
	15					
3268						
3266						
3264	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP-21

Date(s) Excavated	04/17/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	13 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,328 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag/Bucket)
Location	N 1807661 E 6603095				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3328	0			ALLUVIUM Loose to medium dense, moist, brown, silty medium SAND (SM)		
		1		↙ With trace gravel		
3326		2				
3324		3				
3322	5	4				
3320		5		↙ Becomes light brown		
3318	10	6				
3316						
3314	15			Bottom of test pit at 13.0 feet		
3312						
3310						
3308	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP-22

Date(s) Excavated	04/17/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	6.5 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,316 feet
Water Observations	Not encountered	Sampling Method(s)	Bulk (Bag/Bucket)		
Location	N 1807986 E 6603028				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3316	0			ALLUVIUM Loose to medium dense, moist, reddish brown, silty medium SAND (SM)		
		1				
3314						
		2				
3312						
	5	3				
3310						
				Bottom of test pit at 6.5 feet		
3308						
3306	10					
3304						
3302						
	15					
3300						
3298						
3296	20					

Project: East County Substation
Project Location: Jacumba, California
Project Number: 27667021.00030

Log of Test Pit TP-23

Date(s) Excavated	04/17/08	Logged By	A. Podawiltz	Checked by	D. Rector
Length of Excavation	7 feet	Width of Excavation	2 feet	Depth of Excavation	10 feet
Excavation Equipment	Komatsu WB140	Excavation Contractor	SDCC	Approximate Surface Elevation	3,340 feet
Water Observations	Not encountered			Sampling Method(s)	Bulk (Bag/Bucket)
Location	N 1808472 E 6603898				

Elevation, feet	Depth, feet	Sample Type Sample Number	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND LAB TESTS
3340	0			ALLUVIUM Loose to medium dense, moist, light brown, silty medium to coarse SAND (SM), with trace gravel		
		1				
3338		2				
				Loose to medium dense, moist, light brown, well graded coarse SAND (SW), with some coarse gravel		
3336		3				
	5	4		↓ Becomes loose		
3334						
3332						
		5				
3330	10			Bottom of test pit at 10.0 feet		
3328						
3326						
	15					
3324						
3322						
3320	20					

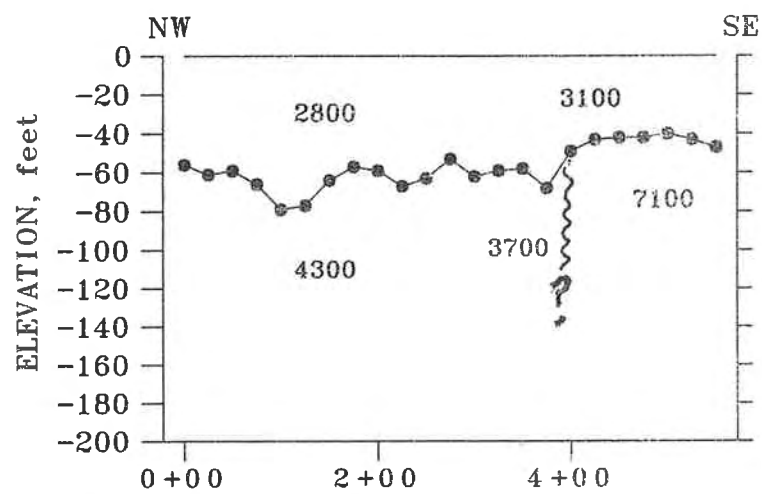
Geophysical measurements were obtained along six seismic refraction profiles (designated RS08-1 through RS08-6) during the week ending March 24, 2008, as shown on Figure 2. The seismic refraction traverses were completed by Mr. Ronald Mees, a URS California Registered geophysicist. Profiles RS08-1 and RS08-3 were run across potential bedrock irregularities. Profile RS08-6 was run near the deepest cut at the southeast corner of the original location of the west substation pad. The remaining three profiles were run near the deepest cuts on the eastern side of the original location of the east substation pad. Profile RS08-2 is 1650 feet long and the remaining profiles are 550 feet long.

The seismic refraction technique is based on the measurement of the time required for a shockwave to travel from a sourcepoint (shotpoint) to one or more co-linear sensors (geophones). Measurements were obtained using a Geometrics S24 seismograph with 24 geophones. The source consisted of multiple sledgehammer blows to a groundplate or rock. Geophones were spaced at 25 foot intervals. Shotpoints were nominally placed at the center of each line segment, at each end, and typically offset 200 feet to 500 feet beyond each end. The primary constraint on data quality was wind noise and electrical noise.

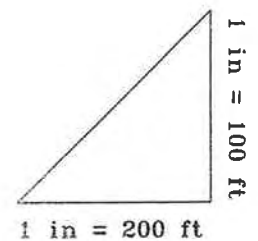
The seismic travel times were plotted on time-distance graphs and interpreted using time-term methods (the generalized reciprocal method with the XY parameter set to zero). The resulting models represent the rock and soils depths and velocities which would account for the measured travel times. The models are non-unique but appear to be the most reasonable solutions based on the known geology. Basic assumptions inherent in this geophysical method include the expectation that velocity increases downward, that layers are relatively continuous and thick enough to be individually resolved, and that significant velocity differences are present between the layers of interest. The generally accepted value for depth accuracy is 20%.

Figures B-1 through B-6 show the interpreted velocity profiles. Figures B-7 through B-22 show the data plots and interpretative process. Four seismic layers are generally evident. The surface layer typically consists of 3 feet to 15 feet of loose surficial soils with an estimated average velocity of 1,100 feet per second (fps). This first layer is not shown on the profiles, as it is poorly controlled and primarily used for internal data consistency. The second seismic layer consists of the upper younger alluvial soils, typically 30 feet to 70 feet thick, with a velocity range of 2,100 fps to 3,200 fps. The third seismic layer consists of older alluvium with a velocity range of 3,300 fps to 4,400 fps. The fourth seismic layer is bedrock, with a velocity range of 5,000 fps to 7,100 fps, which is over 100 feet deep under the proposed pad elevations, but was found to be as shallow as 40 feet under some areas outside the excavation areas.

The velocities of the two alluvial soils layers are so close, that they appear to grade into one another in some instances, both vertically and horizontally. This condition suggests that the alluvium consists of discontinuous lenses of differing materials. This condition also means that the basic seismic interpretation assumptions are being violated to some degree, and that individual calculated depths between the two alluvial units should be viewed with caution. An additional effect is that the two layers may not show up individually when directly underlain by shallow bedrock, due to one layer masking the other. These potential concerns do not, however, change the overall trends shown for the bedrock, nor the conclusion that shallow bedrock is not present along the seismic profiles obtained in the excavation areas.



P-wave velocities in feet per second



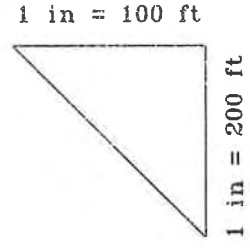
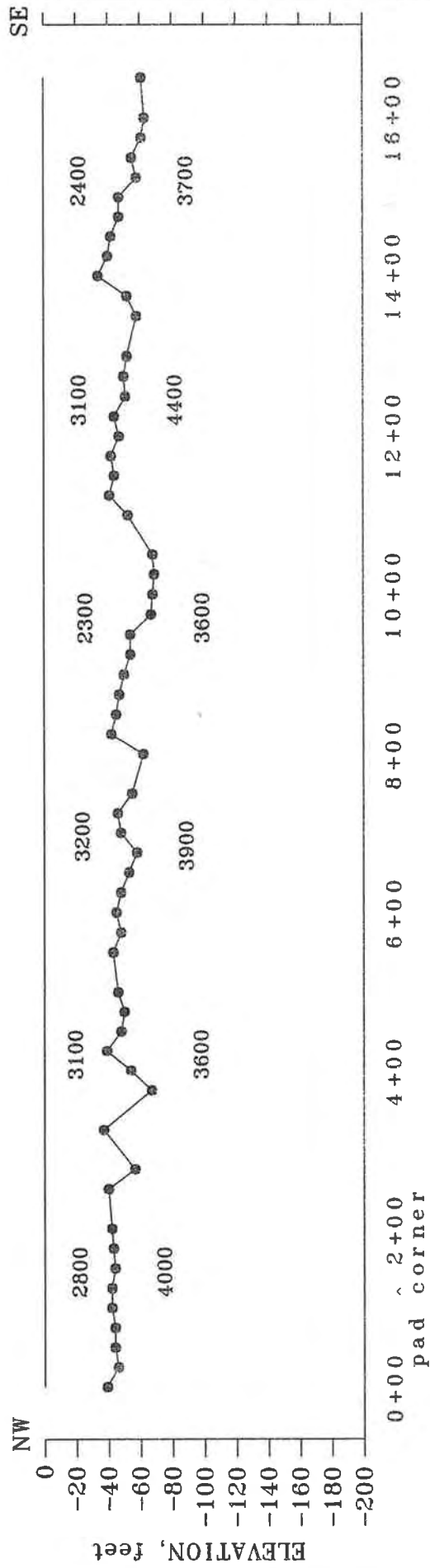
RS08-1

Project No.: 27667021

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Fig. B-1



P-wave velocities in feet per second

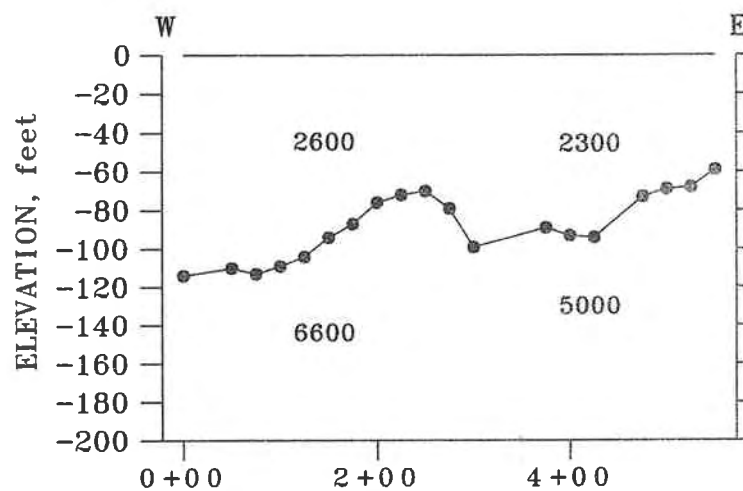
RS08-2

Project No.: 27667021

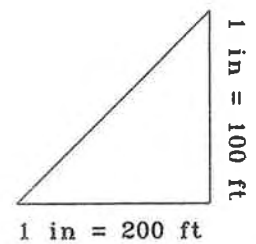
Date: 3-24-08

Project: East County Substation

Fig. B-2



P-wave velocities in feet per second



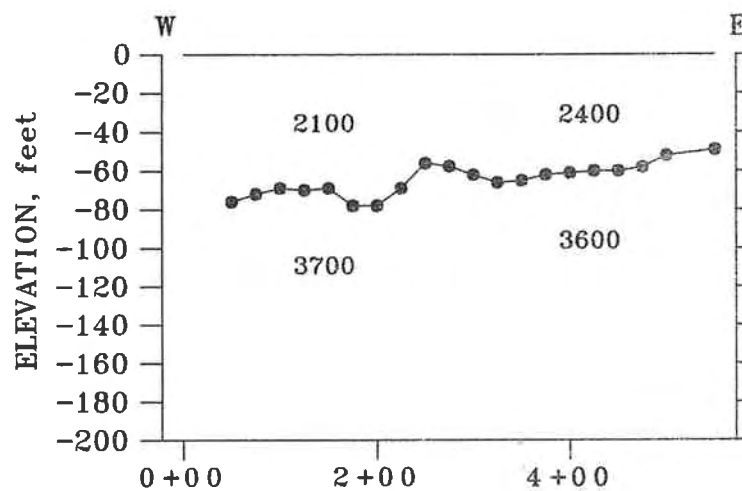
RS08-3

Project No.: 27667021

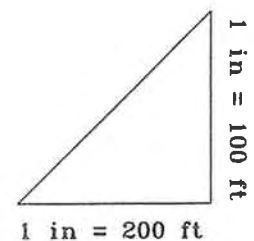
Date: 3-24-08

Project: East County Substation

Fig. B-3



P-wave velocities in feet per second



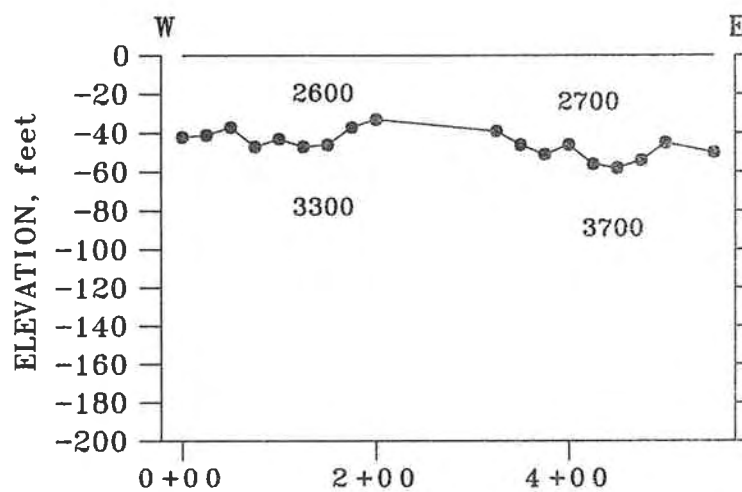
RS08-4

Project No.: 27667021

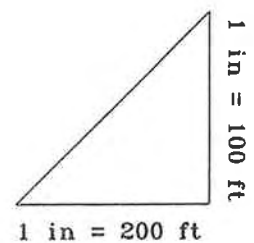
Date: 3-24-08

Project: East County Substation

Fig. B-4



P-wave velocities in feet per second



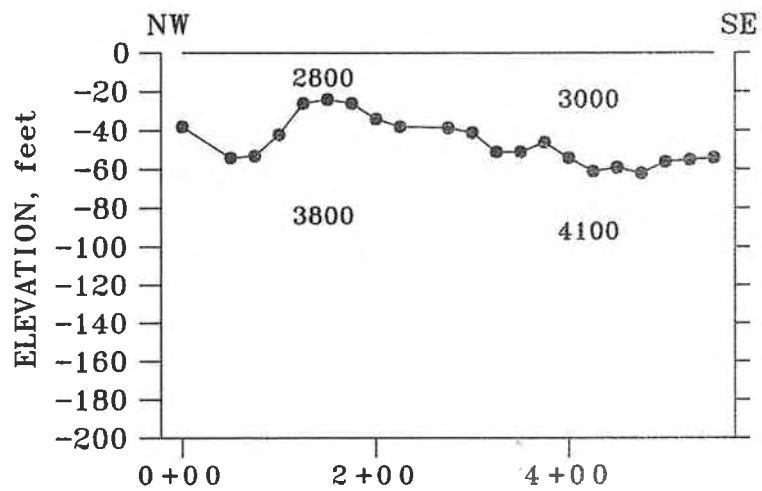
RS08-5

Project No.: 27667021

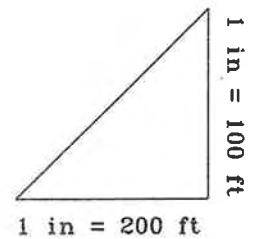
Date: 3-24-08

Project: East County Substation

Fig. B-5



P-wave velocities in feet per second



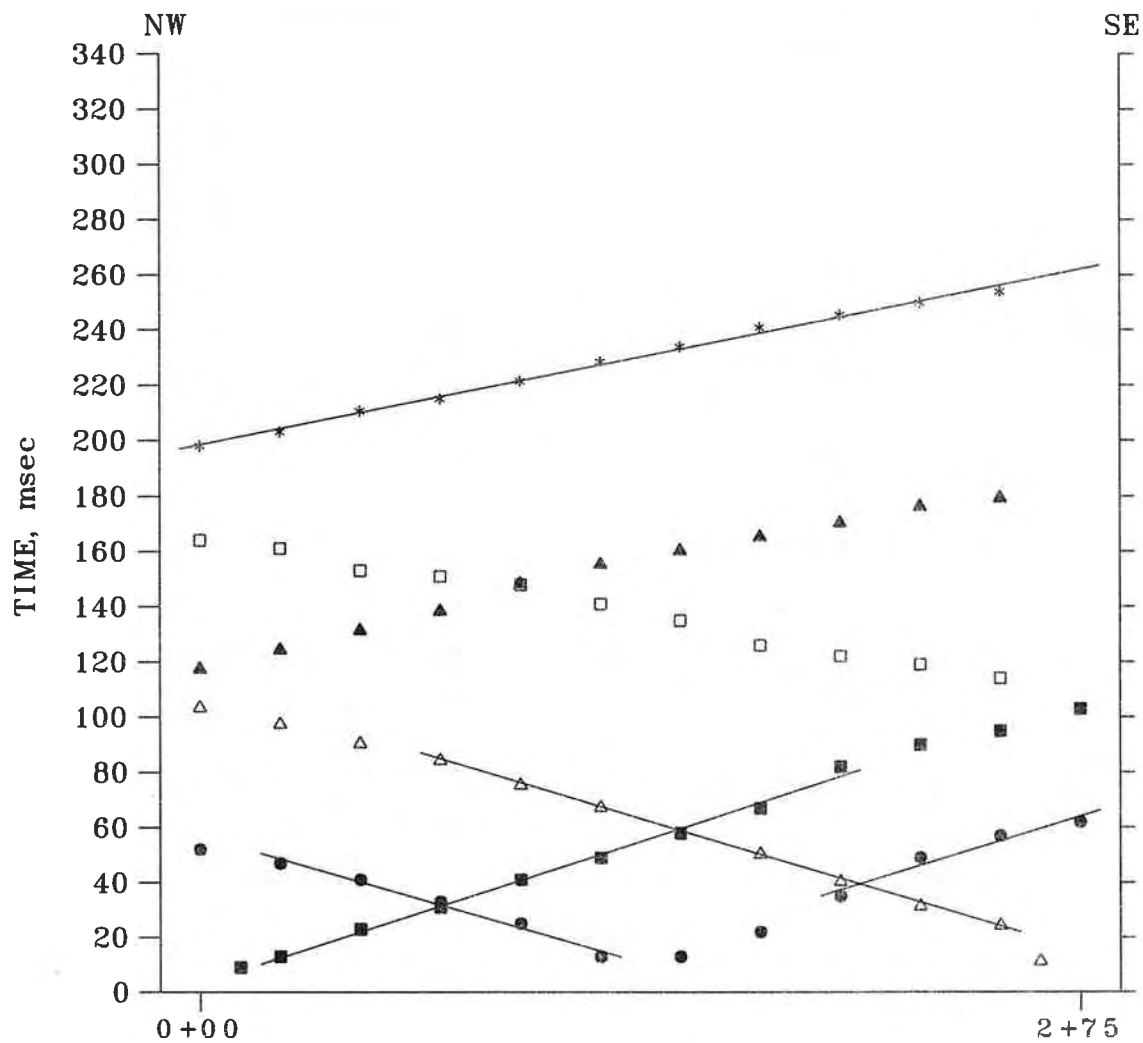
RS08-6

Project No.: 27667021

Date: 3-24-08

Project: East County Substation

Fig. B-6



Geophone spacing = 25 ft													
Arrival Time, msec	▲	118	125	132	139	149	156	161	166	171	177	180	
	■	9	13	23	31	41	49	58	67	82	90	95	103
	●	52	47	41	33	25	13	13	22	35	49	57	62
	△	104	98	91	85	76	68		51	41	32	25	12
	□	164	161	153	151	148	141	135	126	122	119	114	
$t_{ab}= 104$ msec; XY = 0													
	$t_a=$	33	40	47	54	64	71	76	81	86	92	95	103
	$t_b=$	104	101	93	91	88	81	75	66	62	59	54	
*	$\frac{1}{2}\Delta t=$	$-35\frac{1}{2}$	$-30\frac{1}{2}$	-23	$-18\frac{1}{2}$	-12	-5	$0\frac{1}{2}$	$7\frac{1}{2}$	12	$16\frac{1}{2}$	$20\frac{1}{2}$	
	$t_g=$	$16\frac{1}{2}$	$18\frac{1}{2}$	18	$20\frac{1}{2}$	24	24	$23\frac{1}{2}$	$21\frac{1}{2}$	22	$23\frac{1}{2}$	$22\frac{1}{2}$	
	$t_c=$	2	3	3	4	4	5	8	8	8	8	8	8
	$z_0=$	2	3	3	4	4	5	8	8	8	8	8	ft
	$z_1=$	56	61	59	66	79	77	64	57	59	67	63	ft
	$v_0=$						1000						fps
	$v_1=$		2650			2980		2810		2880			fps
	$v_2=$						4310						fps

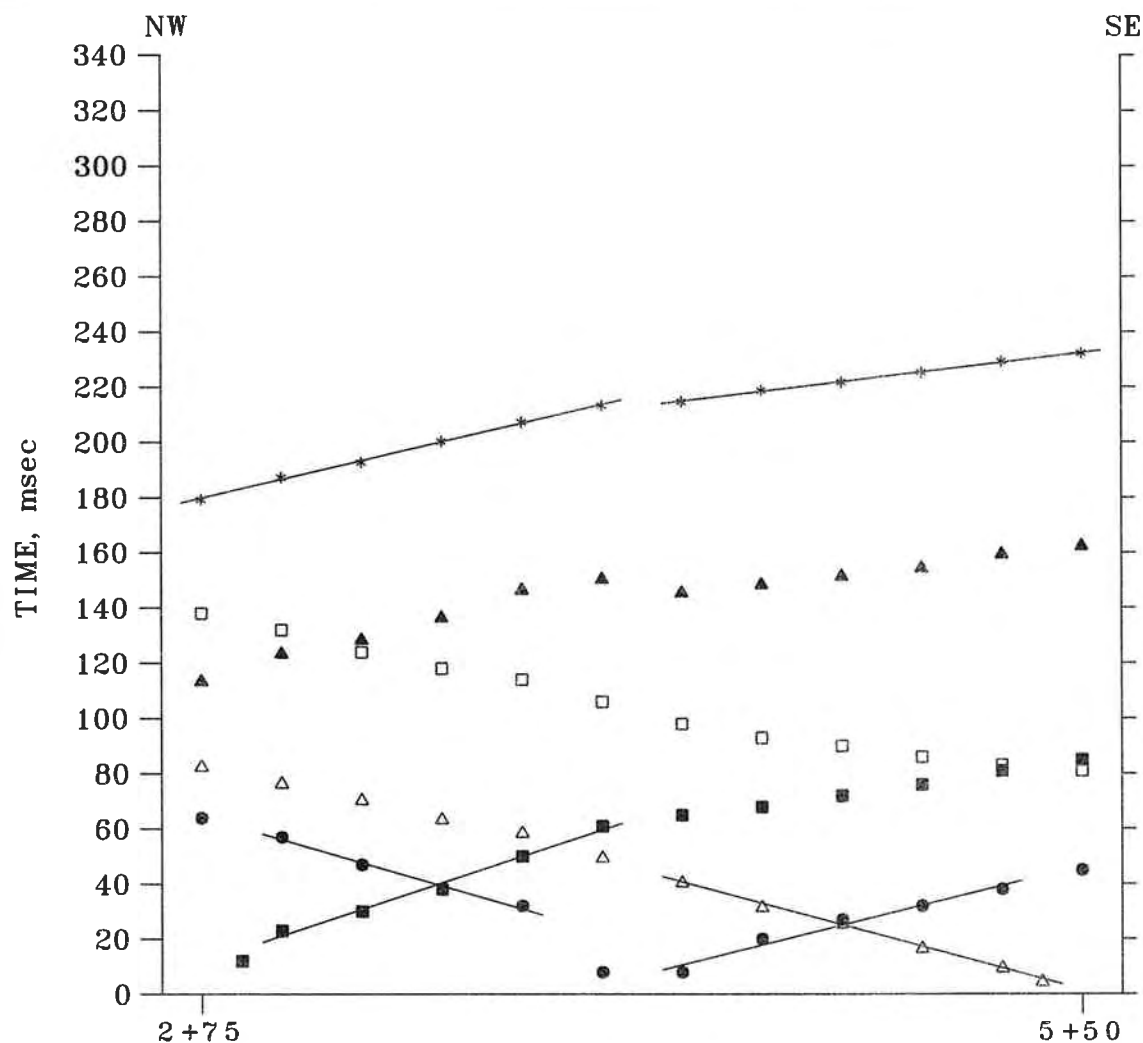
RS08-1

Project No.: 27667021

Date: 3-24-08

Project: East County Substation

Fig. B-7



Geophone spacing = 25 ft													
Arrival Time, msec	▲	114	124	129	137	147	151	146	149	152	155	160	163
	■	12	23	30	38	50	61	65	68	72	76	81	85
	●	64	57	47	38	32	8	8	20	27	32	38	45
	△	83	77	71	64	59	50	41	32	26	17	10	5
	□	138	132	124	118	114	106	98	93	90	86	83	81
$t_{ab}= 84 \text{ msec}; \quad XY = 0$													
*	$t_a=$	35	45	50	58	68	72	67	70	73	76	81	85
	$t_b=$	83	77	71	64	60	52	44	39	36	32	29	27
	$\frac{1}{2}\Delta t=$	-24	-16	-10 $\frac{1}{2}$	-3	4	10	11 $\frac{1}{2}$	15 $\frac{1}{2}$	18 $\frac{1}{2}$	22	26	29
	$t_g=$	17	19	18 $\frac{1}{2}$	19	22	20	13 $\frac{1}{2}$	12 $\frac{1}{2}$	12 $\frac{1}{2}$	12	13	14
	$t_c=$	6	6	6	7	8	9	3	2	2	2	2	1
$z_0=$	6	6	6	7	8	9	3	2	2	2	2	2	1 ft
$z_1=$	53	62	59	58	68	49	43	42	42	40	43	47	ft
$v_0=$	1000												fps
$v_1=$	2600			2980			3470			3190			fps
$v_2=$				3680			7140						fps

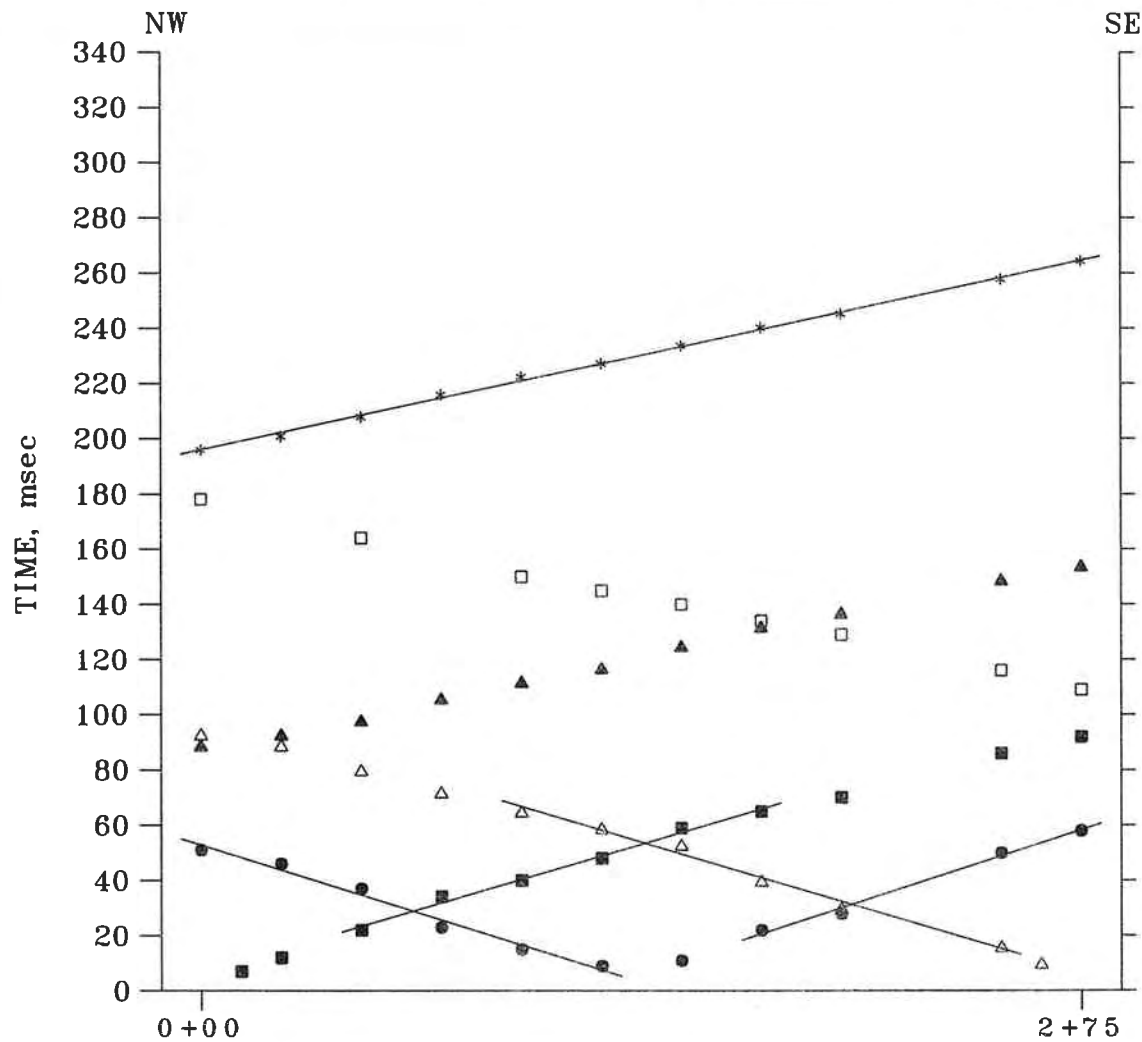
RS08-1

Project No.: 27667021

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Project: East County Substation

Fig. B-8



Geophone spacing = 25 ft																
Arrival Time, msec	▲	89	93	98	106	112	117	125	132	137		149	154			
	■	7	12	22	34	40	48	59	65	70		86	92			
	●	51	46	37	23	15	9	11	22	28		50	58			
	△	93	89	80	72	65	59	53	40	30		16	10			
	□	178		164		150	145	140	134	129		116	109			
$t_{ab}= 92 \text{ msec}; \quad XY = 0$																
*	$t_a=$	24	30	35	43	49	54	62	69	74		86	92			
	$t_b=$	93	89	80	72	65	60	55	49	44		31	24			
	$\frac{1}{2}\Delta t=$	$-34\frac{1}{2}$	$-29\frac{1}{2}$	$-22\frac{1}{2}$	$-14\frac{1}{2}$	-8	-3	$3\frac{1}{2}$	10	15		$27\frac{1}{2}$	34			
	$t_g=$	$12\frac{1}{2}$	$13\frac{1}{2}$	$11\frac{1}{2}$	$11\frac{1}{2}$	11	11	$12\frac{1}{2}$	13	13		$12\frac{1}{2}$	12			
	$t_c=$	3	2	1	1	1	1	3	3	3	3	3	3			
	$z_0=$	3	2	1	1	1	1	3	3	3		3	3 ft			
	$z_1=$	39	46	44	44	42	42	44	43	42		40	35 ft			
	$v_0=$						1000						fps			
	$v_1=$		2940			2760		2660		2910			fps			
	$v_2=$						4010						fps			

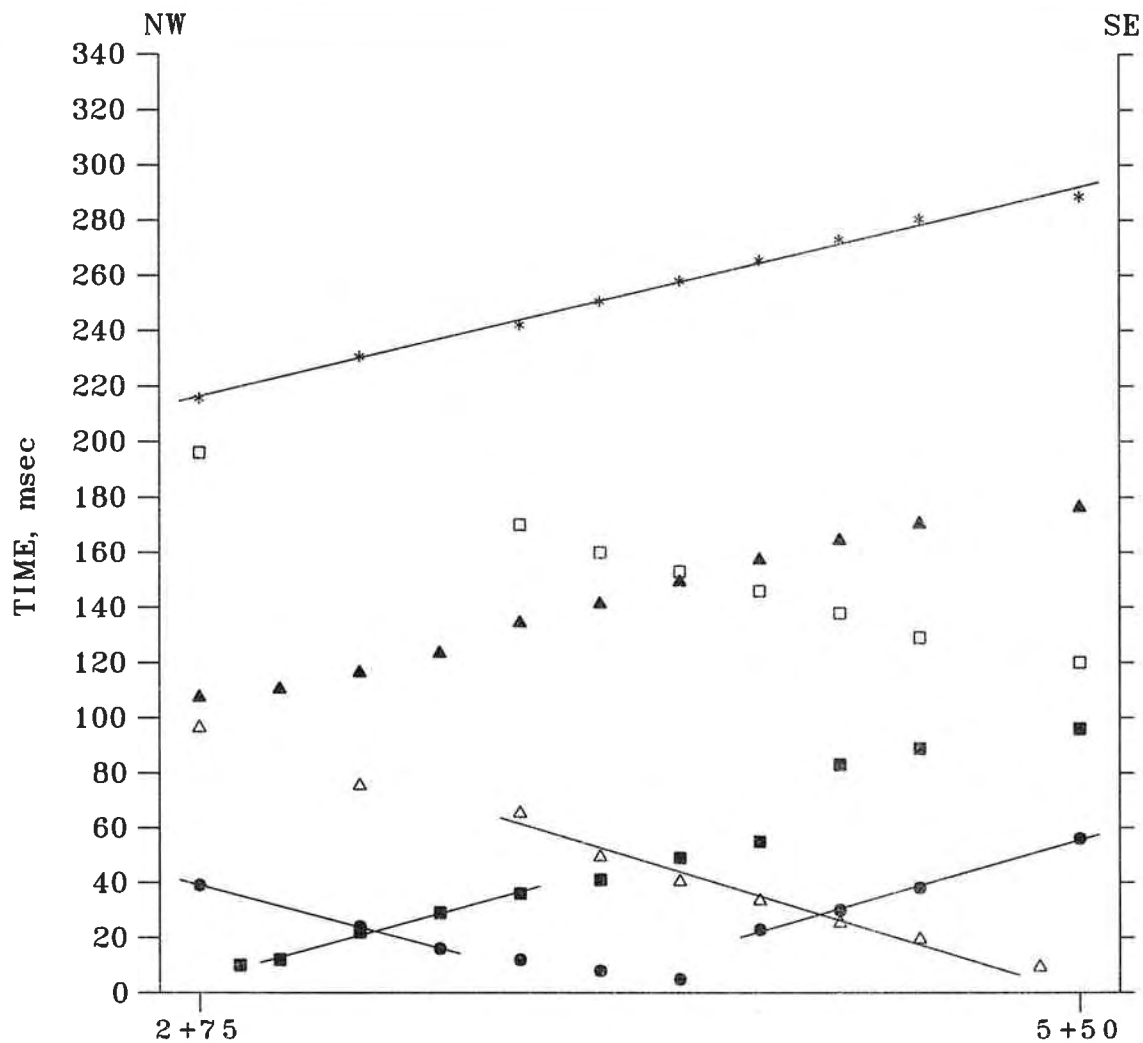
RS08-2

Project No.: 27667021

Date: 3-24-08

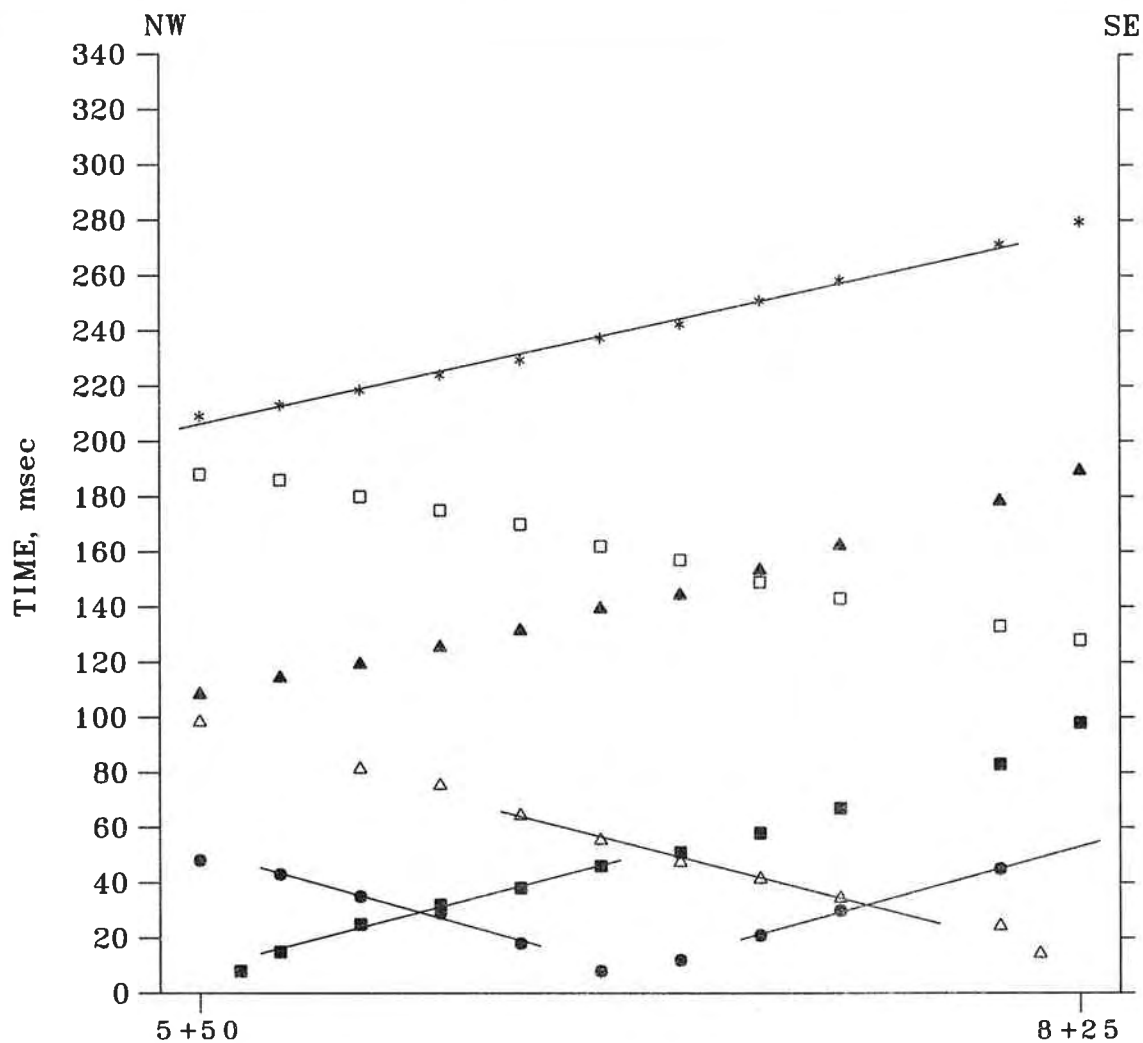
Project: East County Substation

Fig. B-9



Geophone spacing = 25 ft													
Arrival Time, msec	▲	108	111	117	124	135	142	150	158	165	171	177	
	■	10	12	22	29	36	41	49	55	83	89	96	
	●	39		24	16	12	8	5	23	30	38	56	
	△	97		76		66	50	41	34	26	20	10	
	□	196				170	160	153	146	138	129	120	
$t_{ab}= 97 \text{ msec}; \quad XY = 0$													
	$t_a=$	26	29	35	42	53	60	68	76	83	89	96	
	$t_b=$	97		76		71	61	54	47	39	30	21	
*	$\frac{1}{2}\Delta t=$	$-35\frac{1}{2}$		$-20\frac{1}{2}$		-9	$-0\frac{1}{2}$	7	$14\frac{1}{2}$	22	$29\frac{1}{2}$	$37\frac{1}{2}$	
	$t_g=$	13		7		$13\frac{1}{2}$	12	$12\frac{1}{2}$	13	$12\frac{1}{2}$	11	10	
	$t_c=$	3	2	2	1	1	0	5	4	3	2	1	0
	$z_0=$	3		2		1	0	5	4	3	2	0	ft
	$z_1=$	78		37		67	54	39	48	50	46	54	ft
	$v_0=$						1000						fps
	$v_1=$		3160			3270		3010			2830		fps
	$v_2=$						3630						fps

RS08-2



Geophone spacing = 25 ft																
Arrival Time, msec	▲	109	115	120	126	132	140	145	154	163		179	190			
	■	8	15	25	32	38	46	51	58	67		83	98			
	●	48	43	35	29	18	8	12	21	30		45				
	△	99		82	76	65	56	48	42	35		25	15			
	□	188	186	180	175	170	162	157	149	143		133	128			
$t_{ab} = 98 \text{ msec}; \quad XY = 0$																
	$t_a =$	17	23	28	34	40	48	53	62	71		87	98			
	$t_b =$	99	97	91	86	81	73	68	60	54		44	39			
*	$\frac{1}{2}\Delta t =$	-41	-37	$-31\frac{1}{2}$	-26	$-20\frac{1}{2}$	$-12\frac{1}{2}$	$-7\frac{1}{2}$	1	$8\frac{1}{2}$		$21\frac{1}{2}$	$29\frac{1}{2}$			
	$t_g =$	9	11	$10\frac{1}{2}$	11	$11\frac{1}{2}$	$11\frac{1}{2}$	$11\frac{1}{2}$	12	$13\frac{1}{2}$		$16\frac{1}{2}$	$19\frac{1}{2}$			
	$t_c =$	4	3	3	3	3	3	5	5	5	6	6	6			
	$z_0 =$	4	3	3	3	3	3	5	5	5		6	ft			
	$z_1 =$	32	48	45	48	53	58	48	46	55		62	ft			
	$v_0 =$						1000						fps			
	$v_1 =$		3330			3090		3150			3380		fps			
	$v_2 =$						3920						fps			

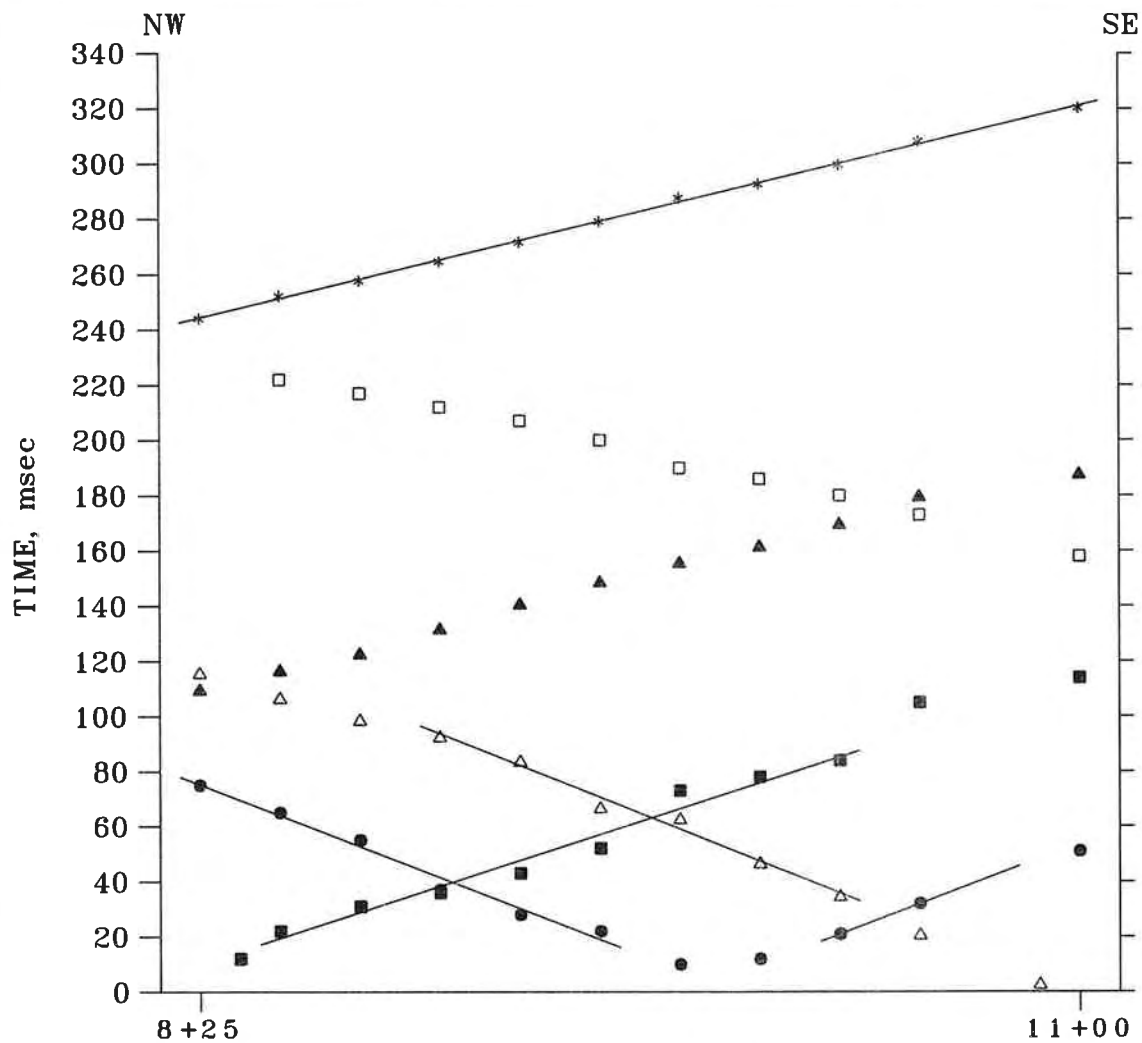
RS08-2

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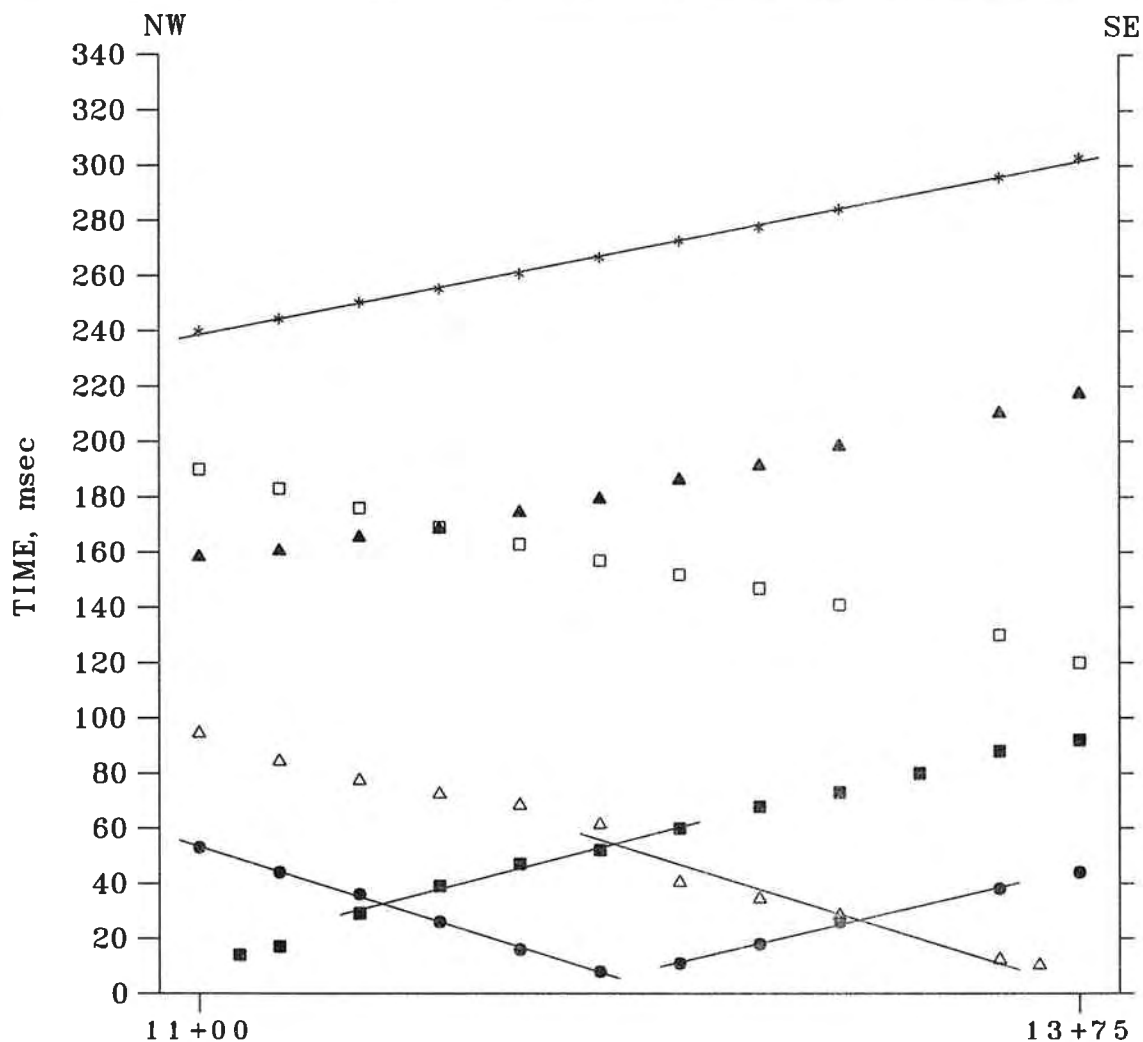
Fig. B-11



Geophone spacing = 25 ft

Arrival Time, msec	▲	110	117	123	132	141	149	156	162	170	180	188
	■	12	22	31	36	43	52	73	78	84	105	114
	●	75	65	55	37	28	22	10	12	21	32	51
	△	116	107	99	93	84	67	63	47	35	21	3
	□		222	217	212	207	200	190	186	180	173	158
		$t_{ab} = 115 \text{ msec}; \quad XY = 0$										
	$t_a =$	35	42	48	57	66	74	81	87	95	105	114
	$t_b =$	116	107	102	97	92	85	75	71	65	58	43
*	$\frac{1}{2}\Delta t =$	$-40\frac{1}{2}$	$-32\frac{1}{2}$	-27	-20	-13	$-5\frac{1}{2}$	3	8	15	$23\frac{1}{2}$	$35\frac{1}{2}$
	$t_g =$	18	17	$17\frac{1}{2}$	$19\frac{1}{2}$	$21\frac{1}{2}$	22	$20\frac{1}{2}$	$21\frac{1}{2}$	$22\frac{1}{2}$	24	21
	$t_c =$	5	5	5	5	6	7	0	1	1	1	1
	$z_0 =$	5	5	5	5	6	7	0	1	1	1	1 ft
	$z_1 =$	42	45	47	50	54	54	67	68	69	68	60 ft
	$v_0 =$						1000					fps
	$v_1 =$		2660			2220		2270		2160		fps
	$v_2 =$						3590					fps

RS08-2



Geophone spacing = 25 ft

Arrival Time, msec	▲	159	161	166	169	175	180	187	192	199		211	218					
	■	14	17	29	39	47	52	60	68	73	80	88	92					
	●	53	44	36	26	16	8	11	18	26		38	44					
	△	95	85	78	73	69	62	41	35	29		13	11					
	□	190	183	176	169	163	157	152	147	141		130	120					
		$t_{ab}= 94 \text{ msec};$																
		$XY = 0$																
*	$t_a=$	36	38	43	46	52	57	64	69	76		88	92					
	$t_b=$	95	88	81	74	69	62	57	52	46		35	25					
	$\frac{1}{2}\Delta t=$	$-29\frac{1}{2}$	-25	-19	-14	$-8\frac{1}{2}$	$-2\frac{1}{2}$	$3\frac{1}{2}$	$8\frac{1}{2}$	15		$26\frac{1}{2}$	$33\frac{1}{2}$					
	$t_g=$	$18\frac{1}{2}$	16	15	13	$13\frac{1}{2}$	$12\frac{1}{2}$	$13\frac{1}{2}$	$13\frac{1}{2}$	14		$14\frac{1}{2}$	$11\frac{1}{2}$					
	$t_c=$	8	6	6	4	3	2	4	4	4	3	3	1					
	$z_0=$	8	6	6	4	3	2	4	4	4		3	1 ft					
	$z_1=$	45	41	44	42	47	44	51	50	52		58	52 ft					
	$v_0=$	1000											fps					
	$v_1=$	3330					2740					3690						
	$v_2=$											2780						
		4370																
												2780						

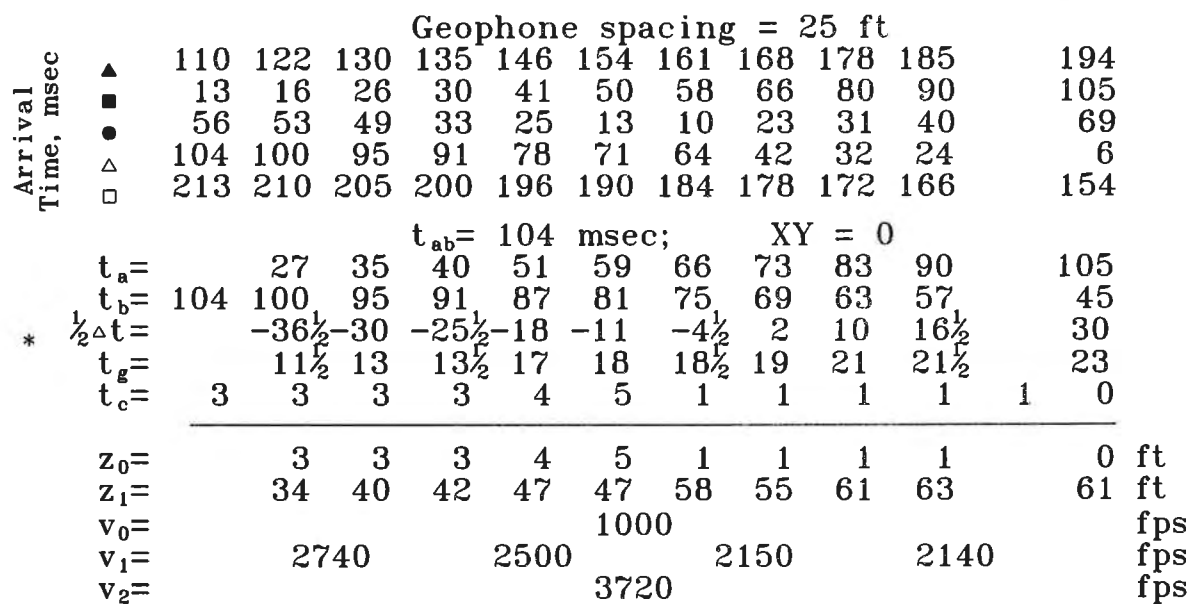
RS08-2

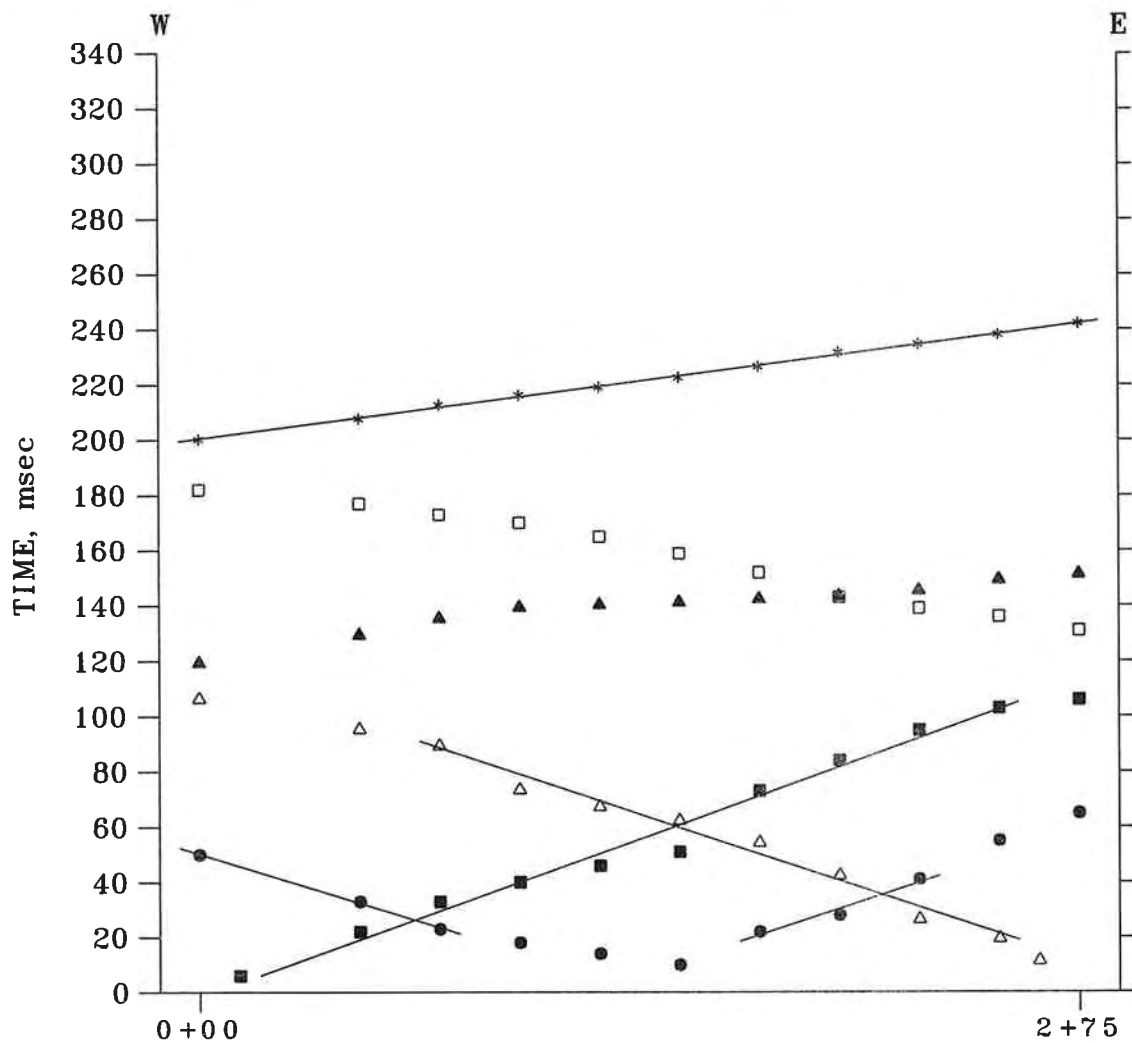
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Fig. B-13





Geophone spacing = 25 ft

Arrival Time, msec	▲	120	130	136	140	141	142	143	144	146	150	152
■	6	22	33	40	46	51	73	84	95	103	106	
●	50	33	23	18	14	10	22	28	41	55	65	
△	107	96	90	74	68	63	55	43	27	20	12	
□	182	177	173	170	165	159	152	143	139	136	131	
$t_{ab} = 106$ msec; $XY = 0$												
$t_a =$	73	83	89	93	94	95	96	97	99	103	106	
$t_b =$	107	102	98	95	90	84	77	68	64	61	56	
$\frac{1}{2}\Delta t =$	-17	$-9\frac{1}{2}$	$-4\frac{1}{2}$	-1	2	$5\frac{1}{2}$	$9\frac{1}{2}$	$14\frac{1}{2}$	$17\frac{1}{2}$	21	25	
$t_g =$	37	$39\frac{1}{2}$	$40\frac{1}{2}$	41	39	$36\frac{1}{2}$	$33\frac{1}{2}$	$29\frac{1}{2}$	$28\frac{1}{2}$	29	28	
$t_c =$	0	1	1	1	1	3	3	3	4	5	6	
$z_0 =$	0	1	1	1	1	3	3	3	4	5	6	ft
$z_1 =$	114	110	113	109	104	94	87	76	72	70	65	ft
$v_0 =$					1000							fps
$v_1 =$		2400		2800		2630		2600				fps
$v_2 =$					6580							fps

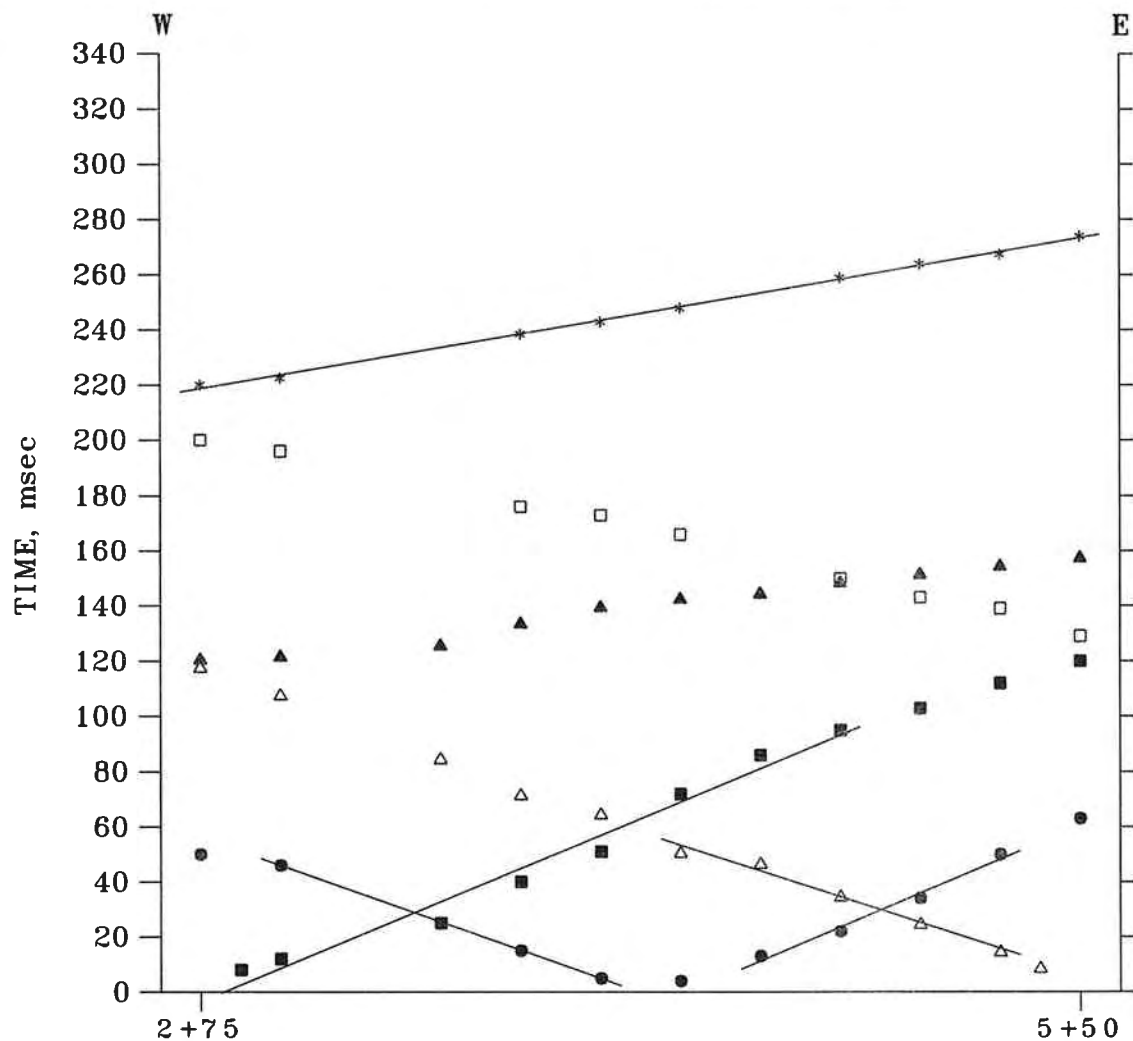
RS08-3

Project No.: 27667021

Date: 3-24-08

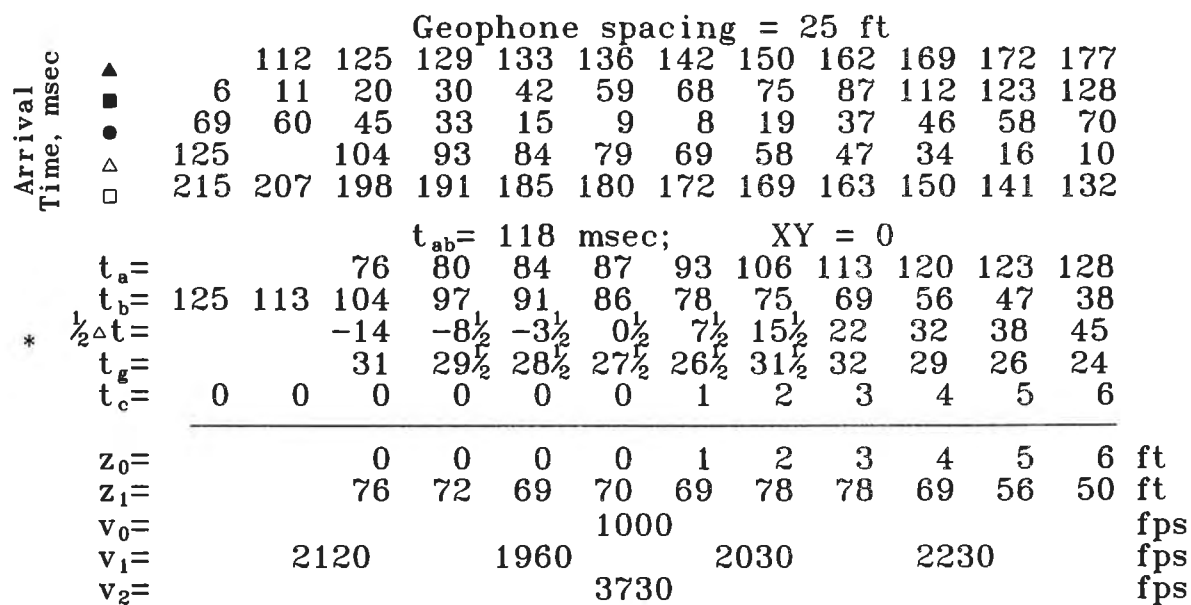
Project: East County Substation

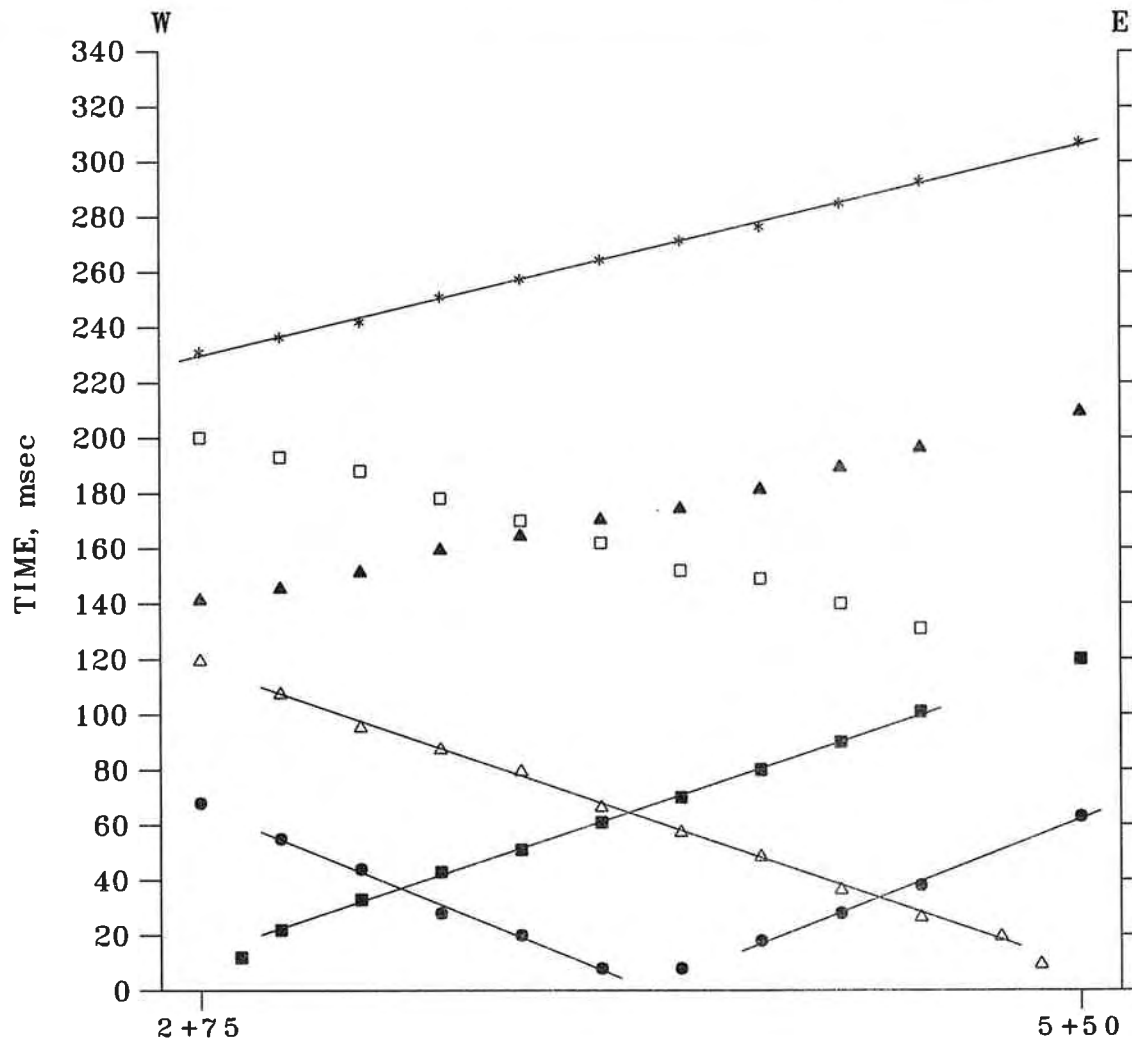
Fig. B-15



Geophone spacing = 25 ft												
▲	121	122	126	134	140	143	145	149	152	155	158	
■	8	12	25	40	51	72	86	95	103	112	120	
●	50	46		15	5	4	13	22	34	50	63	
△	118	108	85	72	65	51	47	35	25	15	9	
□	200	196		176	173	166		150	143	139	129	
$t_{ab} = 119$ msec; XY = 0												
$t_a =$	83	84	88	96	102	105	107	111	114	117	120	
$t_b =$	118	114	94	91	84			68	61	57	47	
$\frac{1}{2}\Delta t =$	$-17\frac{1}{2}$	-15	1	$5\frac{1}{2}$	$10\frac{1}{2}$			$21\frac{1}{2}$	$26\frac{1}{2}$	30	$36\frac{1}{2}$	
$t_g =$	41	$39\frac{1}{2}$		$35\frac{1}{2}$	37	35		30	28	$27\frac{1}{2}$	24	
$t_c =$	0	0	0	0	0	0	1	2	3	3	3	
$z_0 =$	0	0	0	0	0	0		2	3	3	3	ft
$z_1 =$	93	99	89	93	94			73	69	68	59	ft
$v_0 =$					1000							fps
$v_1 =$		2070	2430			2030			2660			fps
$v_2 =$					5020							fps

RS08-3





Geophone spacing = 25 ft

Arrival Time, msec	▲	142	146	152	160	165	171	175	182	190	197	210
	■	12	22	33	43	51	61	70	80	90	101	120
	●	68	55	44	28	20	8	8	18	28	38	63
	△	120	108	96	88	80	67	58	49	37	27	20
	□	200	193	188	178	170	162	152	149	140	131	120
$t_{ab} = 120$ msec; $XY = 0$												
$t_a =$		48	52	58	66	71	77	81	88	96	103	120
$t_b =$		120	113	108	98	90	82	72	69	60	51	40
$\frac{1}{2}\Delta t =$		-36	-30 $\frac{1}{2}$	-25	-16	-9 $\frac{1}{2}$	-2 $\frac{1}{2}$	4 $\frac{1}{2}$	9 $\frac{1}{2}$	18	26	40
$t_g =$		24	22 $\frac{1}{2}$	23	22	20 $\frac{1}{2}$	19 $\frac{1}{2}$	16 $\frac{1}{2}$	18 $\frac{1}{2}$	18	17	20
$t_c =$		6	5	4	3	2	1	0	1	1	2	3
$z_0 =$		6	5	4	3	2	1	0	1	1	2	4 ft
$z_1 =$		65	62	66	65	62	61	60	60	58	52	49 ft
$v_0 =$							1000					fps
$v_1 =$			2590			2120		2220		2530		fps
$v_2 =$							3590					fps

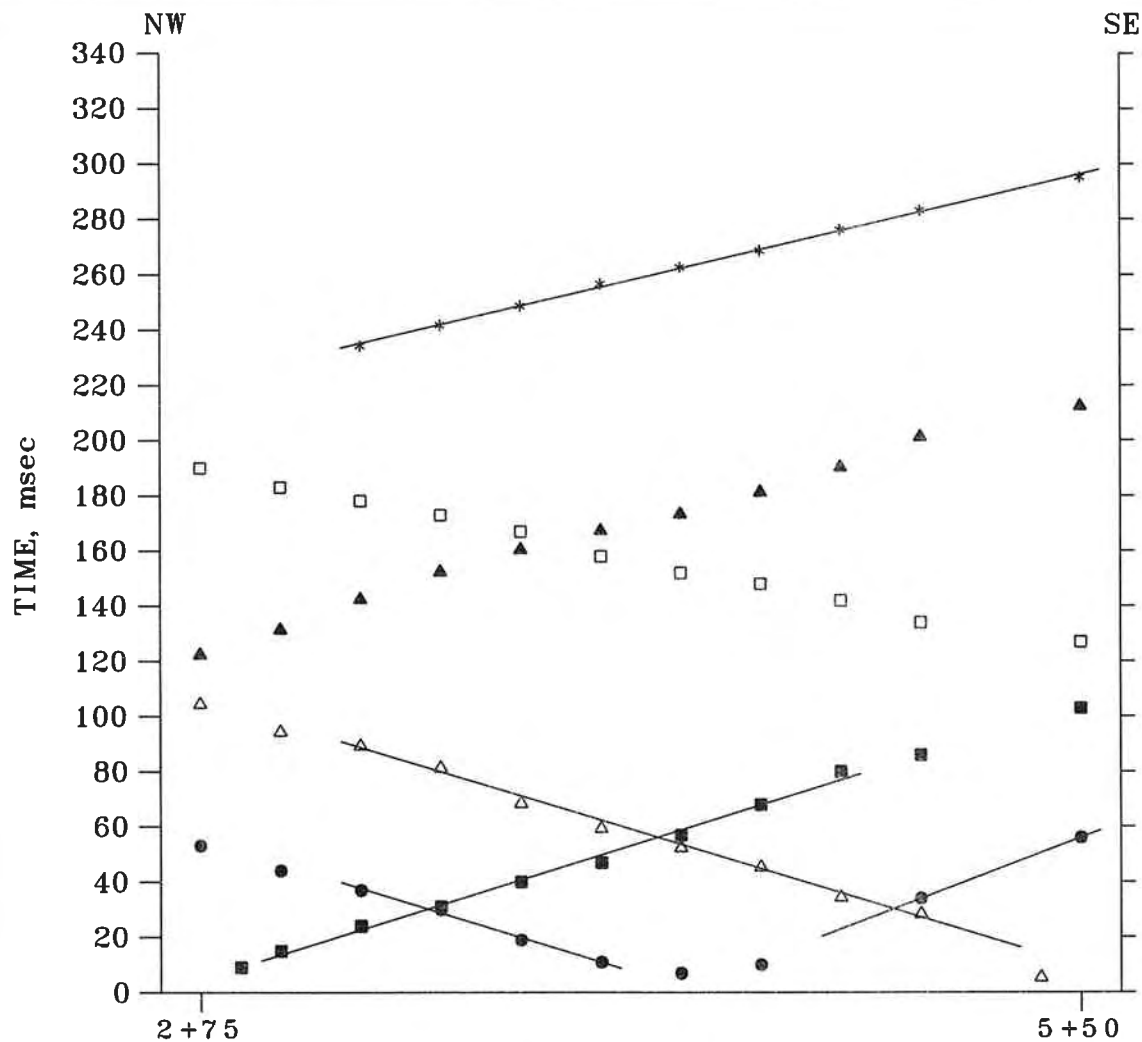
RS08-4

Project No.: 27667021

Date: 3-24-08

Project: East County Substation

Fig. B-18



Geophone spacing = 25 ft

Arrival Time, msec	▲	■	●	△	□	123	132	143	153	161	168	174	182	191	202	213
						9	15	24	31	40	47	57	68	80	86	103
						53	44	37	30	19	11	7	10		34	56
						105	95	90	82	69	60	53	46	35	29	6
						190	183	178	173	167	158	152	148	142	134	127
						$t_{ab} = 104$ msec; XY = 0										
						$t_a =$		32	42	50	57	63	71	80	86	103
						$t_b =$	105	98	93	88	82	73	67	63	57	49
*						$\frac{1}{2}\Delta t =$		$-30\frac{1}{2}$	-23	-16	-8	-2	4	$11\frac{1}{2}$	$18\frac{1}{2}$	$30\frac{1}{2}$
						$t_g =$		$10\frac{1}{2}$	13	14	13	13	15	$16\frac{1}{2}$	$15\frac{1}{2}$	$20\frac{1}{2}$
						$t_c =$	2	2	2	3	3	3	0	2	3	5
						$z_0 =$		2	3	3	3	0	2	3	4	5 ft
						$z_1 =$		39	46	51	46	56	58	54	45	50 ft
						$v_0 =$						1000				fps
						$v_1 =$		2760		2810			2270		2850	fps
						$v_2 =$					3680					fps

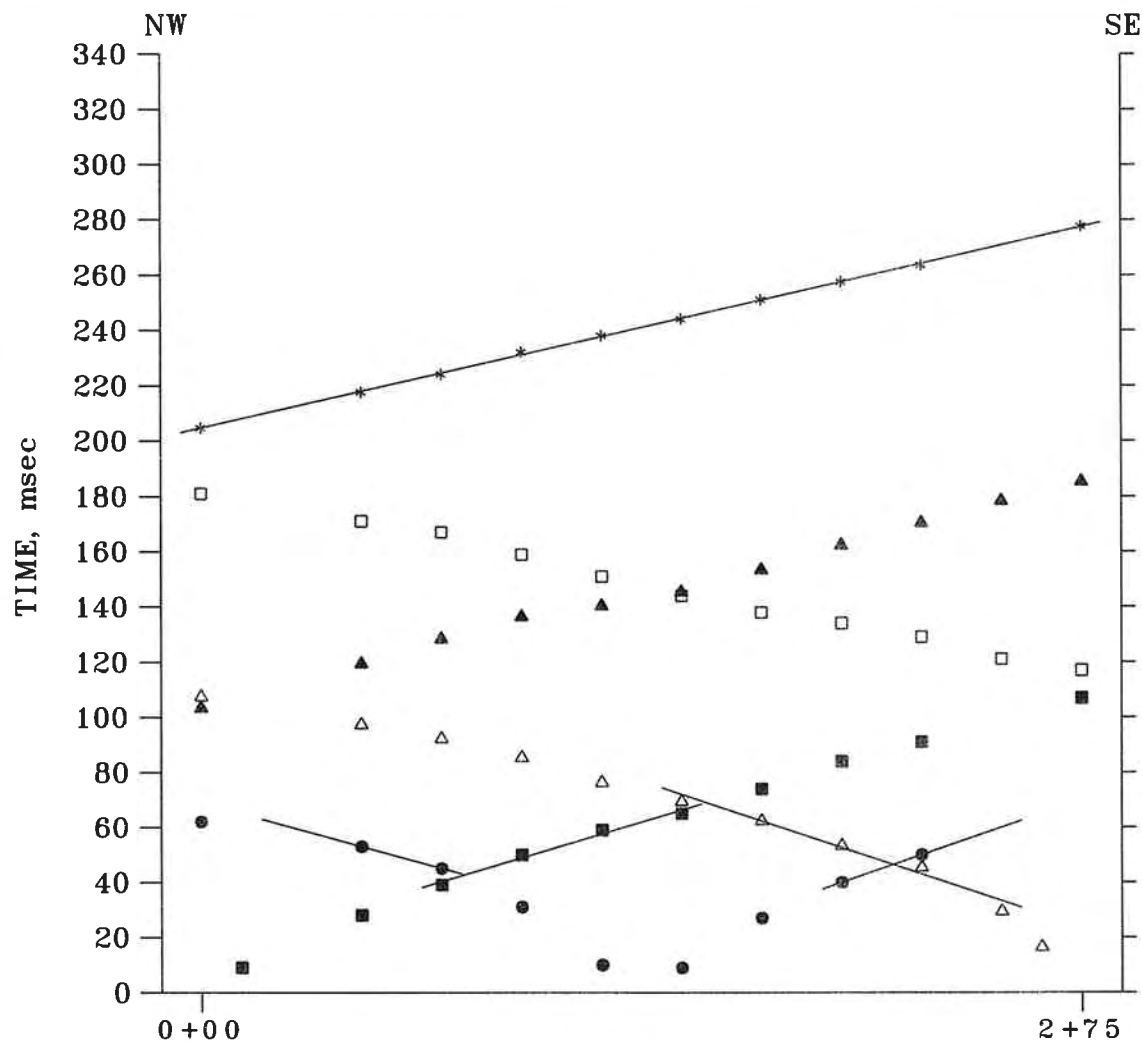
RS08-5

Project No.: 27667021

Date: 3-24-08

Project: East County Substation

Fig. B-20



Geophone spacing = 25 ft												
Arrival Time, msec	▲	104	120	129	137	141	146	154	163	171	179	186
	■	9	28	39	50	59	65	74	84	91		107
	●	62	53	45	31	10	9	27	40	50		
	△	108	98	93	86	77	70	63	54	46	30	17
	□	181	171	167	159	151	144	138	134	129	121	117
$t_{ab}= 108$ msec; XY = 0												
*	$t_a=$	25	41	50	58	62	67	75	84	91		107
	$t_b=$	108	98	94	86	78	71	65	61	56	48	44
	$\frac{1}{2}\Delta t=$	$-41\frac{1}{2}$	$-28\frac{1}{2}$	-22	-14	-8	-2	5	$11\frac{1}{2}$	$17\frac{1}{2}$		$31\frac{1}{2}$
	$t_g=$	$12\frac{1}{2}$	$15\frac{1}{2}$	18	18	16	15	16	$18\frac{1}{2}$	$19\frac{1}{2}$		$21\frac{1}{2}$
	$t_c=$	7	7	7	9	11	13	12	12	12	12	12
$z_0=$	7	7	9	11	13	12	12	12	12		12	ft
$z_1=$	38	54	53	42	26	24	26	34	38		45	ft
$v_0=$					1000							fps
$v_1=$		2870		3130		2500		2580				fps
$v_2=$					3780							fps

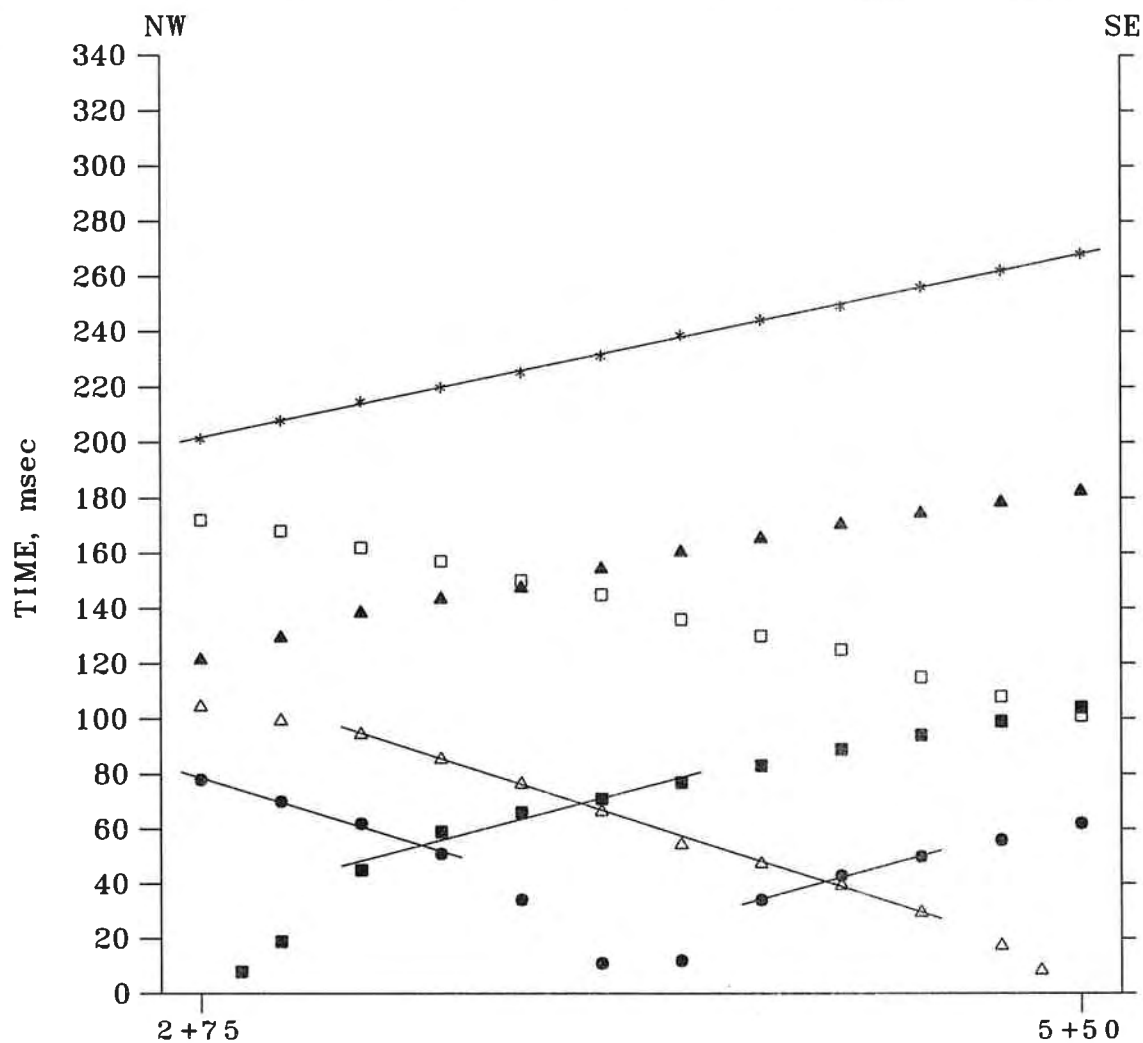
RS08-6

Project No.: 27667021

Date: 3-24-08

Project: East County Substation

Fig. B-21



Geophone spacing = 25 ft												
Arrival Time, msec	122	130	139	144	148	155	161	166	171	175	179	183
▲	8	19	45	59	66	71	77	83	89	94	99	104
■	78	70	62	51	34	11	12	34	43	50	56	62
●	105	100	95	86	77	67	55	48	40	30	18	9
△	172	168	162	157	150	145	136	130	125	115	108	101
□												
$t_{ab} = 104$ msec; $XY = 0$												
$t_a =$	41	49	58	63	67	74	80	85	90	94	99	104
$t_b =$	105	100	95	90	83	78	69	63	58	48	41	34
$\frac{1}{2}\Delta t =$	-32	-25 $\frac{1}{2}$	-18 $\frac{1}{2}$	-13 $\frac{1}{2}$	-8	-2	5 $\frac{1}{2}$	11	16	23	29	35
$t_g =$	21	22 $\frac{1}{2}$	24 $\frac{1}{2}$	24 $\frac{1}{2}$	23	24	22 $\frac{1}{2}$	22	22	19	18	17
$t_c =$	17	16	16	16	16	15	11	10	9	7	6	5
$z_0 =$	17	16	16	16	16	15	11	10	9	7	6	5 ft
$z_1 =$	32	41	51	51	46	54	61	59	62	56	55	54 ft
$v_0 =$						1000						fps
$v_1 =$		3290			2810		3130			2680		fps
$v_2 =$						4130						fps

RS08-6

Project No.: 27667021

Date: 3-24-08

Project: East County Substation

Fig. B-22

Four electrical resistivity surveys were performed at the site on March 19 and 20, 2008 by GeoVision Geophysical Services (GeoVision) of Corona, California. The surveys were performed across original configurations of the proposed substation pads, and are now to the east of the existing substation layout. The locations of the surveys are presented on Figure 2.

Soil resistivity measurements are the basis of designing grounding systems. The purpose of the geophysical surveys was to measure the soil resistivity in accordance with ASTM G57. The results of the survey are presented in a report dated April 3, 2008, prepared by GeoVision, which is included in this appendix.



April 3, 2008

Project Number 8137

Mr. Mike Hatch
URS Corporation
1615 Murray Canyon Road, Suite 1000
San Diego, CA 92108
(619) 683-6114

Subject: **Four Electrode Wenner Resistivity Tests
Proposed Substations Near Jacumba, California**

Dear Mr. Hatch:

A geophysical survey was conducted on March 19 and 20, 2008 near Jacumba, California. The purpose of the geophysical survey was to measure soil resistivity in accordance with ASTM Standard G57-06. Site conditions consisted of uneven terrain with moderately dense brush. The approximate locations of the center of the resistivity soundings are presented in Table 1 below.

Table 1: Resistivity Sounding Locations

Approximate Location	Resistivity Soundings	Northing (Meters)	Easting (Meters)
West Pad - Center Point C1	C1WE, C1SN	3,610,320.5	582,570.5
East Pad – Center Point C2	C2WE, C2SN	3,610,382.38	583,065.83

Note: UTM NAD 83, Zone 11. Provided by URS using a Garmin handheld GPS

METHODOLOGY

Resistivity equipment used during this investigation included an Advanced Geosciences Supersting R8/IP earth resistivity meter coupled to 1/4- inch diameter stainless steel electrode stakes with 18 gauge insulated copper wire. A test resistor, rated at 19.82 ohms, was used to verify the Supersting R8/IP was operating within manufacturer specifications. The Supersting transmitter is rated at 200W and is capable of continuous output current between 1 mA and 1 A with an output voltage of 800 V peak to peak. The operator may select a maximum output current, which the instrument will automatically reduce as needed depending on soil conditions and ground impedance. The transmitter then maintains a steady current through the measurement cycle, recording input voltage and writing V/I to internal memory.

FIELD PROCEDURES

Before conducting the geophysical survey the battery level was checked on the resistivity meter and found to be within acceptable limits. General site conditions were recorded on the field log. Electrode spacing was pre-determined based on previously conducted surveys.

A test resistor rated at 19.82 ohms was connected to the positive and negative current and potential leads on the Supersting R8/IP immediately before and after each sounding at the survey location. The resistance value across the test resistor and the time of the test measurement was recorded on the field log.

Resistivity measurements (soundings) were made at four locations (C1WE and C1SN on the west pad, C2WE and C2SN on the east pad), at the selected electrode spacings, using a surveyor's measuring tape for spatial control. A west to east and south to north sounding were approximately centered on each proposed pad midpoint (Table 1). C1WE and C2WE were oriented west to east and C1SN and C2SN were oriented south to north.

Resistivity measurements at thirteen (13) electrode spacings were made on each line. For each resistivity measurement, four stainless steel electrodes were placed at equal distances (a-spacing) in a straight line. A current was applied from the outer electrodes, and the potential difference (voltage) was measured across the inner electrodes. The Supersting R8/IP displays the resistance value equal to V/I . This value was recorded, along with the a-spacing, on a field data sheet and later transferred to a spreadsheet. Two or more measurements were recorded at each station for quality control. If there was significant variation between the first and second measurements, the control leads, electrode cable and electrode coupling were field checked to ensure proper survey conditions. After each measurement, the electrodes were moved to the next a-spacing and another set of measurements were taken.

DATA REDUCTION

Four spreadsheets were generated from the collected resistivity data. Electrode spacing (a-spacing) and resistance reading (V/I), were entered for each resistivity measurement. The generalized form of the four-electrode array is shown in Figure 1

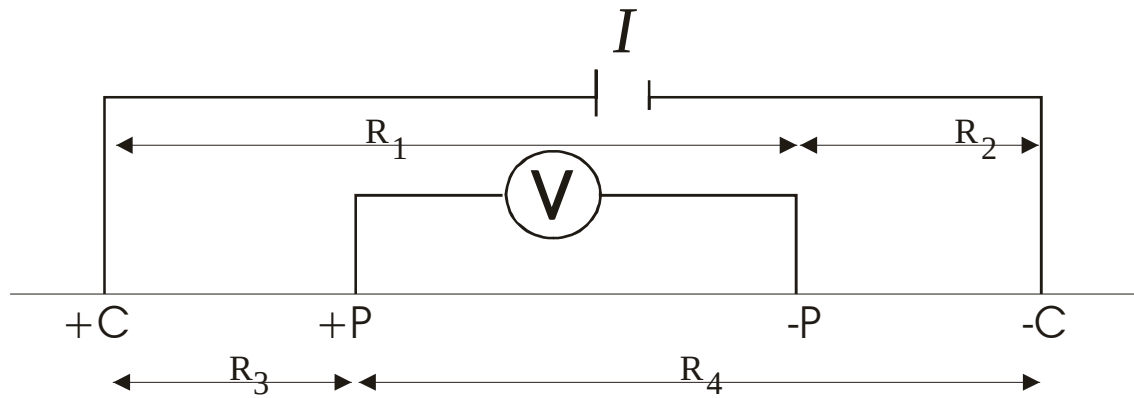


Figure 1: The generalized form of the four electrode array

When the material upon which the current is induced is uniform, the resistivity calculated will be constant independent of electrode configuration. However, in a field investigation where subsurface heterogeneities exist, the calculated resistivity values will vary with electrode array. This calculated resistivity is referred to as apparent resistivity (ρ_a), and can be calculated using the relationship:

$$\rho_a = \frac{2\pi V}{I \left\{ \left(\frac{1}{R_3} - \frac{1}{R_4} \right) - \left(\frac{1}{R_1} - \frac{1}{R_2} \right) \right\}}$$

For the Wenner array, which was used during this investigation, where $R_1 = R_4$; $R_3 = R_2$ and $R_1 = 2R_2 = 2a$, it can be shown that the formula for calculated apparent resistivity can be reduced to the following form:

$$\rho_a = 2\pi a \left(\frac{V}{I} \right)$$

RESULTS

Data collected from the four Wenner resistivity arrays are attached as Tables 2, 3, 4 and 5. All calculations were conducted using known geometry and measured resistance (V/I) values which were recorded in the daily field logs. Apparent resistivity (magnitude) values are presented in ohm-ft, ohm-m and ohm-cm. The ASTM Standard G57-06 specifies that apparent resistivity (magnitude) is presented in the ohm-centimeter unit.

All completed data processing forms are retained in project files. All files generated during the processing sequence were archived on a back up drive.

SUMMARY

Four-electrode soil resistivity measurements were made near Jacumba, California in accordance with ASTM Standard G57-06. Apparent soil was measured at thirteen (13)

electrode spacings each sounding. Field measurements and calculated values were consistent and repeatable at all locations, as summarized in Tables 2, 3, 4 and 5.

If you have any questions concerning this investigation, please call us at 951-549-1234.

Sincerely,

GEOVision Geophysical Services



Submitted by:
William Dalrymple
Project Geophysicist



Reviewed and Approved by:
Antony Martin, P. GP 989
Technical Director

Attachments:

Table 2: Resistivity Sounding C1WE

Table 3: Resistivity Sounding C1SN

Table 4: Resistivity Sounding C2WE

Table 4: Resistivity Sounding C2SN

Applied Technical Services, Incorporated Certificate of Calibration

Applied Technical Services, Incorporated Calibration Data Sheet

TABLE 2 ELECTRICAL RESISTIVITY SOUNDING RES C1WE - West Pad (West to East)
 Job Number 8137 Date 19-Mar-08
 19.82 ohm Test Resistor Reading
 19.80 ohm at 1330 hours Repeat 19.79 ohm

A-Spacing	Resistance Reading	Geometric Multiplier	Calculated Magnitude	Converted Magnitude	Calculated to Ohm-cm	Repeat Resistance	Repeat Magnitude	Repeat Conversion	Repeat Calculation to Ohm-cm
[ft.]	[Ohm]	[2(p)A]	[Ohm-ft.]	[Ohm-m]	[Ohm-cm]	[Ohm]	[Ohm-ft.]	[Ohm-m]	[Ohm-cm]
1.5	99.15	9.425	934.467	284.825	28482.546	99.22	935.126	285.027	28502.655
2.0	85.96	12.566	1080.205	329.247	32924.655	85.89	1079.326	328.978	32897.843
3.0	54.93	18.850	1035.406	315.592	31559.178	54.84	1033.710	315.075	31507.470
5.0	19.83	31.416	622.978	189.884	18988.364	19.83	622.978	189.884	18988.364
7.5	6.792	47.124	320.065	97.556	9755.595	6.794	320.160	97.585	9758.468
10.0	3.508	62.832	220.414	67.182	6718.223	3.506	220.288	67.144	6714.393
15.0	1.449	94.248	136.565	41.625	4162.502	1.45	136.659	41.654	4165.375
30.0	0.5204	188.496	98.093	29.899	2989.877	0.5209	98.187	29.928	2992.750
50.0	0.2474	314.159	77.723	23.690	2368.997	0.2471	77.629	23.661	2366.124
75.0	0.1452	471.239	68.424	20.856	2085.560	0.1451	68.377	20.841	2084.124
100.0	0.1066	628.319	66.979	20.415	2041.512	0.1066	66.979	20.415	2041.512
150.0	0.06253	942.478	58.933	17.963	1796.282	0.06247	58.877	17.946	1794.558
300.0	0.0357	1884.956	67.293	20.511	2051.088	0.03565	67.199	20.482	2048.215

TABLE 3 ELECTRICAL RESISTIVITY SOUNDING RES C1SN - West Pad (South to North)

Job Number 8137

Date 19-Mar-08

19.82 ohm Test Resistor Reading

19.79 ohm at 1137 hours

Repeat 19.79 ohm

A-Spacing	Resistance Reading	Geometric Multiplier	Calculated Magnitude	Converted Magnitude	Calculated to Ohm-cm	Repeat Resistance	Repeat Magnitude	Repeat Conversion	Repeat Calculation to Ohm-cm
[ft.]	[Ohm]	[2(pi)A]	[Ohm-ft.]	[Ohm-m]	[Ohm-cm]	[Ohm]	[Ohm-ft.]	[Ohm-m]	[Ohm-cm]
1.5	92.46	9.425	871.415	265.607	26560.728	92.56	872.357	265.895	26589.455
2.0	71.14	12.566	893.972	272.483	27248.255	71.05	892.841	272.138	27213.782
3.0	38.89	18.850	733.059	223.436	22343.645	38.86	732.494	223.264	22326.409
5.0	12.58	31.416	395.212	120.461	12046.073	12.59	395.527	120.556	12055.648
7.5	5.529	47.124	260.548	79.415	7941.503	5.532	260.689	79.458	7945.812
10.0	3.234	62.832	203.198	61.935	6193.482	3.233	203.135	61.916	6191.566
15.0	1.47	94.248	138.544	42.228	4222.828	1.47	138.544	42.228	4222.828
30.0	0.2991	188.496	56.379	17.184	1718.433	0.299	56.360	17.179	1717.858
50.0	0.143	314.159	44.925	13.693	1369.307	0.1428	44.862	13.674	1367.392
75.0	0.09271	471.239	43.689	13.316	1331.627	0.09292	43.788	13.346	1334.644
100.0	0.07215	628.319	45.333	13.818	1381.755	0.07318	45.980	14.015	1401.481
150.0	0.0549	942.478	51.742	15.771	1577.097	0.05502	51.855	15.805	1580.544
300.0	0.03448	1884.956	64.993	19.810	1980.995	0.03454	65.106	19.844	1984.442

TABLE 4 ELECTRICAL RESISTIVITY SOUNDING RES C2WE - East Pad (West to East)
 Job Number 8137 Date 20-Mar-08
 19.82 ohm Test Resistor Reading
 19.81 ohm at 0810 hours Repeat 19.81 ohm

A-Spacing	Resistance Reading	Geometric Multiplier	Calculated Magnitude	Converted Magnitude	Calculated to Ohm-cm	Repeat Resistance	Repeat Magnitude	Repeat Conversion	Repeat Calculation to Ohm-cm
[ft.]	[Ohm]	[2(p)A]	[Ohm-ft.]	[Ohm-m]	[Ohm-cm]	[Ohm]	[Ohm-ft.]	[Ohm-m]	[Ohm-cm]
1.5	66.65	9.425	628.161	191.464	19146.361	67.63	637.398	194.279	19427.883
2.0	45.98	12.566	577.802	176.114	17611.396	46	578.053	176.191	17619.057
3.0	29.23	18.850	550.973	167.936	16793.642	29.2	550.407	167.764	16776.406
5.0	18.75	31.416	589.049	179.542	17954.202	18.76	589.363	179.638	17963.778
7.5	12.17	47.124	573.498	174.802	17480.211	12.18	573.969	174.946	17494.574
10.0	8.51	62.832	534.699	162.976	16297.628	8.519	535.265	163.149	16314.864
15.0	4.918	94.248	463.511	141.278	14127.802	4.915	463.228	141.192	14119.184
30.0	1.133	188.496	213.565	65.095	6509.475	1.132	213.377	65.037	6503.730
50.0	0.4615	314.159	144.985	44.191	4419.128	0.4616	145.016	44.201	4420.085
75.0	0.3204	471.239	150.985	46.020	4602.021	0.3202	150.891	45.991	4599.148
100.0	0.2406	628.319	151.173	46.078	4607.766	0.2404	151.048	46.039	4603.936
150.0	0.1416	942.478	133.455	40.677	4067.704	0.1417	133.549	40.706	4070.577
300.0	0.05481	1884.956	103.314	31.490	3149.023	0.05496	103.597	31.576	3157.641

TABLE 5 ELECTRICAL RESISTIVITY SOUNDING RES C2SN - East Pad (South to North)

Job Number 8137

Date 20-Mar-08

19.82 ohm Test Resistor Reading

19.81 ohm at 0938 hours

Repeat 19.80 ohm

A-Spacing	Resistance Reading	Geometric Multiplier	Calculated Magnitude	Converted Magnitude	Calculated to Ohm-cm	Repeat Resistance	Repeat Magnitude	Repeat Conversion	Repeat Calculation to Ohm-cm
[ft.]	[Ohm]	[2(pi)A]	[Ohm-ft.]	[Ohm-m]	[Ohm-cm]	[Ohm]	[Ohm-ft.]	[Ohm-m]	[Ohm-cm]
1.5	63.13	9.425	594.986	181.352	18135.180	63.11	594.798	181.294	18129.435
2.0	52.62	12.566	661.242	201.547	20154.669	52.58	660.740	201.393	20139.348
3.0	32.94	18.850	620.904	189.252	18925.165	32.01	603.374	183.908	18390.848
5.0	18.64	31.416	585.593	178.489	17848.871	18.62	584.965	178.297	17829.720
7.5	10.87	47.124	512.237	156.130	15612.974	10.85	511.294	155.842	15584.247
10.0	8.002	62.832	502.780	153.247	15324.749	8.019	503.849	153.573	15357.306
15.0	4.052	94.248	381.892	116.401	11640.068	4.052	381.892	116.401	11640.068
30.0	0.9411	188.496	177.393	54.069	5406.944	0.9416	177.487	54.098	5409.817
50.0	0.4391	314.159	137.947	42.046	4204.635	0.4392	137.979	42.056	4205.592
75.0	0.275	471.239	129.591	39.499	3949.924	0.2751	129.638	39.514	3951.361
100.0	0.1988	628.319	124.910	38.072	3807.248	0.1985	124.721	38.015	3801.503
150.0	0.1412	942.478	133.078	40.562	4056.213	0.1412	133.078	40.562	4056.213
300.0	0.05375	1884.956	101.316	30.881	3088.123	0.05379	101.392	30.904	3090.421



CERTIFICATE OF CALIBRATION
Accredited Calibration



Certificate Number: M505659-1

Manufacturer: Advanced Geosciences, Inc

Model No: Super Sting

Customer PO No.:

Description: Auto Resistivity Meter

Serial No: SS0609199

Customer Asset No.: SS0609199

Customer:

GeoVision
1151 Pomona Road
Suite P
Corona, CA 92882

Location of Calibration:

Applied Technical Services, Inc.
1049 Triad Court
Marietta, GA 30062

Calibration Procedure: ATS-1032 Rev. 2: Calibration of Resistance Bridges / MicroOhm Meters

Date of Calibration: March 26, 2007

Temperature: 70° F

Condition Received: In Tolerance

***Next Calibration Due:** March 26, 2008

Humidity: 40 %

Condition Returned: In Tolerance

This instrument has been calibrated using primary or secondary standards whose calibration is traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST). Some measurements are traceable to natural physical constants, consensus standards or ratio type measurements.

The reported expanded measurement uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a confidence level of approximately 95%. ATS maintains, wherever possible, at least a 4:1 Test Uncertainty Ratio. Statements of compliance, where applicable, are based on test results falling within specified limits with no reduction by the uncertainty of the measurement, unless otherwise allowed by procedure.

All calibrations are performed in accordance with the ATS Quality Manual QM1, Rev. 7 dated July 7, 2006. Applied Technical Services, Inc.'s Quality System complies with the applicable requirements of ANSI/NCSL Z540-1, ISO 9001-2000, 10CFR 50 Appendix B, 10CFR Part 21 and ISO/IEC 17025. ATS is an ISO/IEC 17025 Accredited Calibration Laboratory through A2LA.

The reported data is valid only at the time of the test and related only to the item calibrated. *Calibration due dates appearing on this Certificate of Calibration and calibration label are determined by the client and do not imply continued conformance to specifications.

This certificate shall not be reproduced except in full, without the permission of Applied Technical Services, Inc.

Notes:

Calibration Equipment Used::

Model: Guildline 9211A

Desc.: Master Shunt Box

ID No.: ATS-02014

Cal Due Date: 4/25/2007

Calibrated by:

Jeff L. Cook

Electrical Lab Supervisor



Page 2 of 2

Equipment Used:	<u>ATS-02014</u>	Due:	<u>04-25-07</u>	<u>Guidlind Resistance Standard</u>
	<u> </u>	Due:	<u> </u>	<u> </u>
	<u> </u>	Due:	<u> </u>	<u> </u>
	<u> </u>	Due:	<u> </u>	<u> </u>
	<u> </u>	Due:	<u> </u>	<u> </u>

Calibrated By: *Jeff L Cook*

Customer Instrument Under Test

[illegible]

* Indicates out of tolerance readings

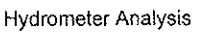
Remarks:

The materials observed in the borings and test pits were visually classified and evaluated with respect to strength, swelling, and compressibility, dry density, and moisture content. The classifications were substantiated by performing grain size analyses and Atterberg Limits tests on representative samples of the soils. The expansion potential was evaluated by performing expansion index tests. Compaction tests were performed to serve as a preliminary basis of relative compaction requirements for fill. R-value tests were also performed to provide data for pavement recommendations. The strength of the soils was preliminarily evaluated by considering the density, moisture content, and penetration resistance of the sampler. Chemical tests were performed to evaluate the potential corrosivity of the soil. The laboratory testing was performed in general accordance with ASTM standards.

The results of the testing are summarized on the boring and test pit logs at the corresponding sample depths. Results of the corrosion tests are summarized in Section 5. Detailed laboratory test results are presented as figures in this appendix, as listed below:

- Particle size distribution curves – Figures D-1 through D-32;
- Plasticity charts (Atterberg Limits) – Figures D-33 and D-34;
- Expansion index test –Figure D-35 and D-36;
- Compaction curves – Figures D-37 through D-39; and
- R-Value tests –Figures D-40 through D-44.

GRAVEL		SAND		SILT AND CLAY
COARSE	FINE	COARSE	MEDIUM	
U. S. STANDARD SIEVE SIZES				HYDROMETER
			FINE	



% Cobbles	
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D ₆₀	1.355
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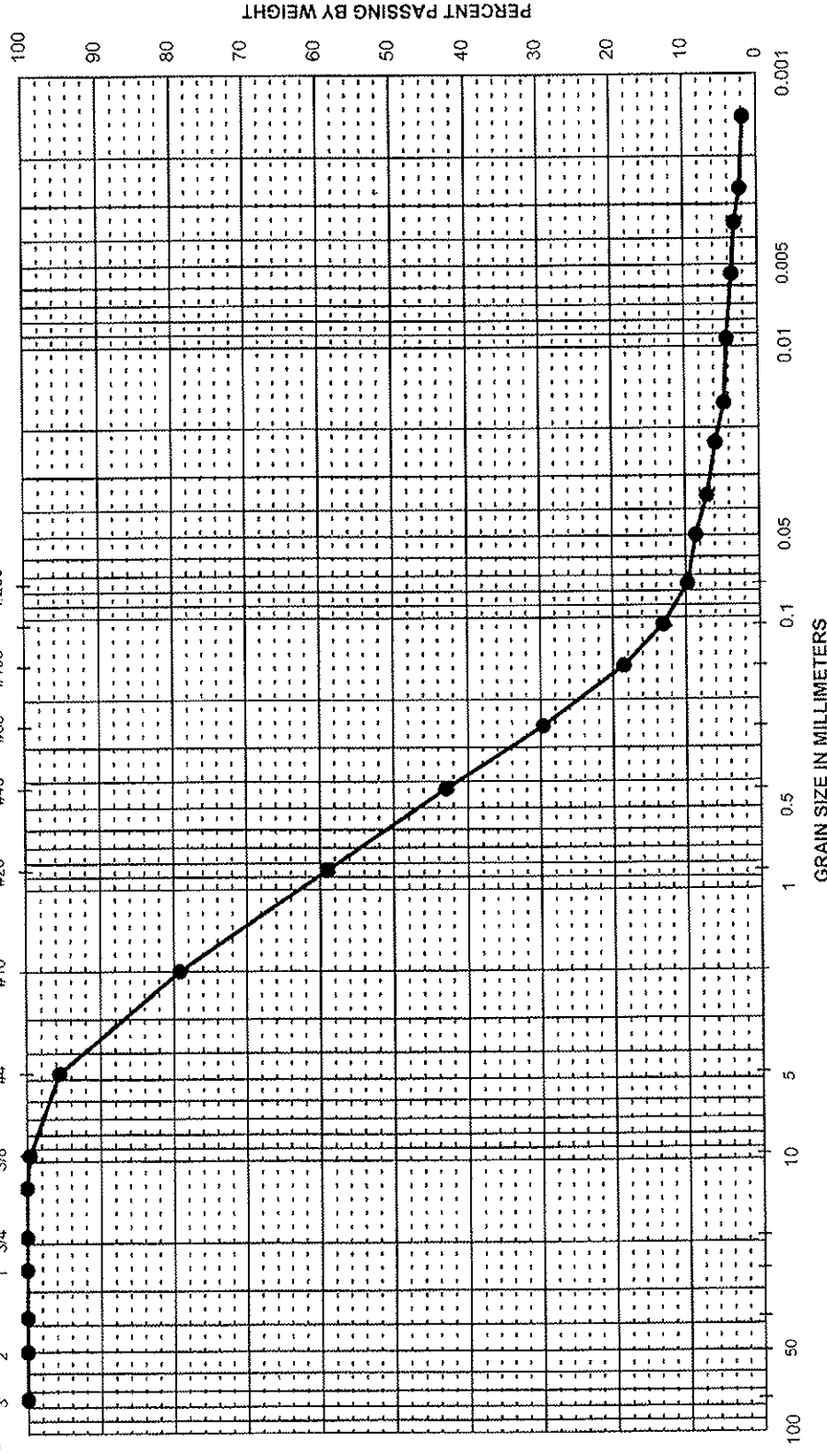
00	
D40	0.175

100

Figure: D-1

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT AND CLAY	
COARSE	FINE	COARSE	MEDIUM	FINE	HYDROMETER	
U. S. STANDARD SIEVE SIZES						
3"	3/8"	#4	#10	#20	#40	#60
2 1/2"	3/16"	#10	#20	#40	#60	#100
2"	3/32"	#20	#40	#60	#100	#200
1 1/2"	#10	#20	#40	#60	#100	#200
1"	#20	#40	#60	#100	#200	#400
3/4"	#40	#60	#100	#200	#400	#600
3/8"	#60	#100	#200	#400	#600	#840
3/16"	#100	#200	#400	#600	#840	#1060
3/32"	#200	#400	#600	#840	#1060	#1400
#10	#200	#400	#600	#840	#1060	#1400
#20	#400	#600	#840	#1060	#1400	#1400
#40	#600	#840	#1060	#1400	#1400	#1400
#60	#840	#1060	#1400	#1400	#1400	#1400
#100	#1400	#1400	#1400	#1400	#1400	#1400
#200	#1400	#1400	#1400	#1400	#1400	#1400
#400	#1400	#1400	#1400	#1400	#1400	#1400
#600	#1400	#1400	#1400	#1400	#1400	#1400
#840	#1400	#1400	#1400	#1400	#1400	#1400
#1060	#1400	#1400	#1400	#1400	#1400	#1400
#1400	#1400	#1400	#1400	#1400	#1400	#1400



Sieve No.	Dia. mm	% Finer
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.0	100.0
1/2"	12.5	100.0
3/8"	9.5	99.6
#4	4.75	95.5
#10	2.00	79.2
#20	0.850	59.0
#40	0.425	43.0
#60	0.250	29.6
#100	0.150	18.5
#140	0.106	13.1
#200	0.075	9.7
Hydrometer Analysis		
% Cobbles		
% Gravel		
% Sand		
% Fines		
D ₆₀		
D ₃₀		
D ₁₀		
C _u		
C _c		

Exploration	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% Clay	Description and Classification
B-1	4	20.0	•				2	Grayish Brown Poorly Graded SAND with Silt (SP-SM)
PROJECT NAME: East County Substation								
PROJECT NUMBER: 27667021								
PARTICLE-SIZE DISTRIBUTION CURVES								
Figure: D-2								

URS

Hydrometer ECSb01020

(SNA) sieve only (04/2000)