

**APPENDIX B**  
**LABORATORY TEST RESULTS**



Leighton

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# MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name: Crowther Tested By: O. Figueroa Date: 06/05/17  
 Project No.: 11263.002 Input By: J. Ward Date: 06/05/17  
 Boring No.: B-3 Depth (ft.): 0-5  
 Sample No.: BB-1  
 Soil Identification: Dark olive brown clayey sand (SC)

Preparation Method:  Moist  Dry  Mechanical Ram  Manual Ram  
**Mold Volume (ft<sup>3</sup>)** 0.03330 *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3814	3918	3901			
Weight of Mold (g)	1864	1864	1864			
Net Weight of Soil (g)	1950	2054	2037			
Wet Weight of Soil + Cont. (g)	752.2	787.0	758.1			
Dry Weight of Soil + Cont. (g)	716.3	736.7	697.9			
Weight of Container (g)	223.7	223.0	222.9			
Moisture Content (%)	7.29	9.79	12.67			
Wet Density (pcf)	129.1	136.0	134.9			
Dry Density (pcf)	120.3	123.9	119.7			

**Maximum Dry Density (pcf)** 124.0 **Optimum Moisture Content (%)** 10.0

### PROCEDURE USED

**Procedure A**  
 Soil Passing No. 4 (4.75 mm) Sieve  
 Mold : 4 in. (101.6 mm) diameter  
 Layers : 5 (Five)  
 Blows per layer : 25 (twenty-five)  
 May be used if + #4 is 20% or less

**Procedure B**  
 Soil Passing 3/8 in. (9.5 mm) Sieve  
 Mold : 4 in. (101.6 mm) diameter  
 Layers : 5 (Five)  
 Blows per layer : 25 (twenty-five)  
 Use if + #4 is >20% and +3/8 in. is 20% or less

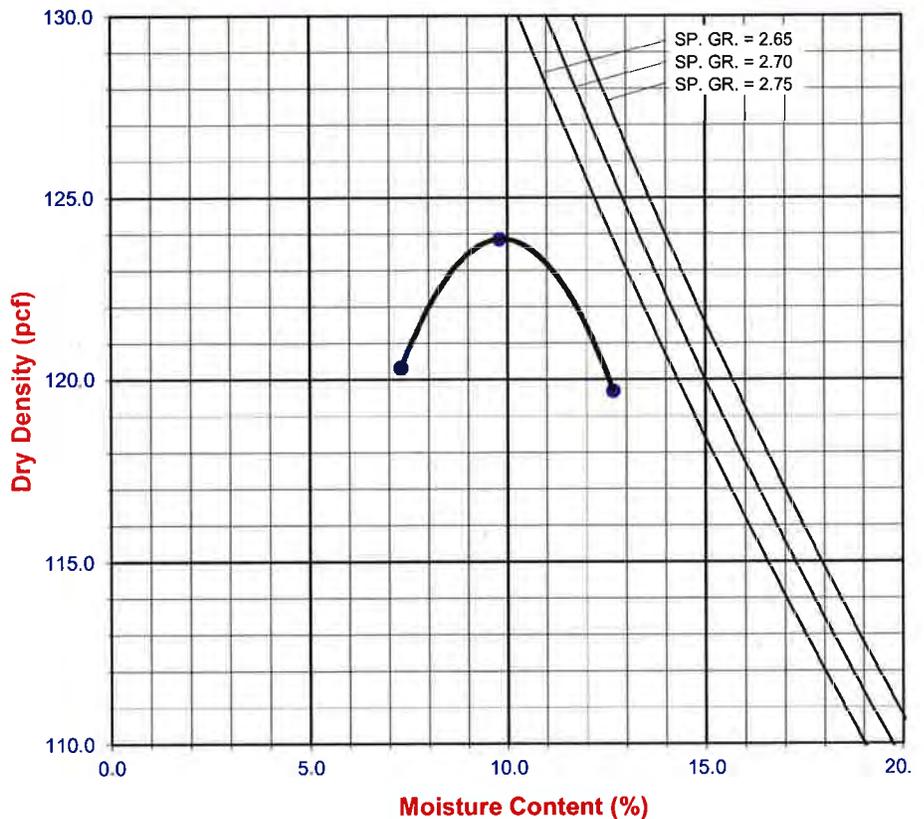
**Procedure C**  
 Soil Passing 3/4 in. (19.0 mm) Sieve  
 Mold : 6 in. (152.4 mm) diameter  
 Layers : 5 (Five)  
 Blows per layer : 56 (fifty-six)  
 Use if +3/8 in. is >20% and +3/4 in. is <30%

### Particle-Size Distribution:

GR:SA:FI

### Atterberg Limits:

LL,PL,PI



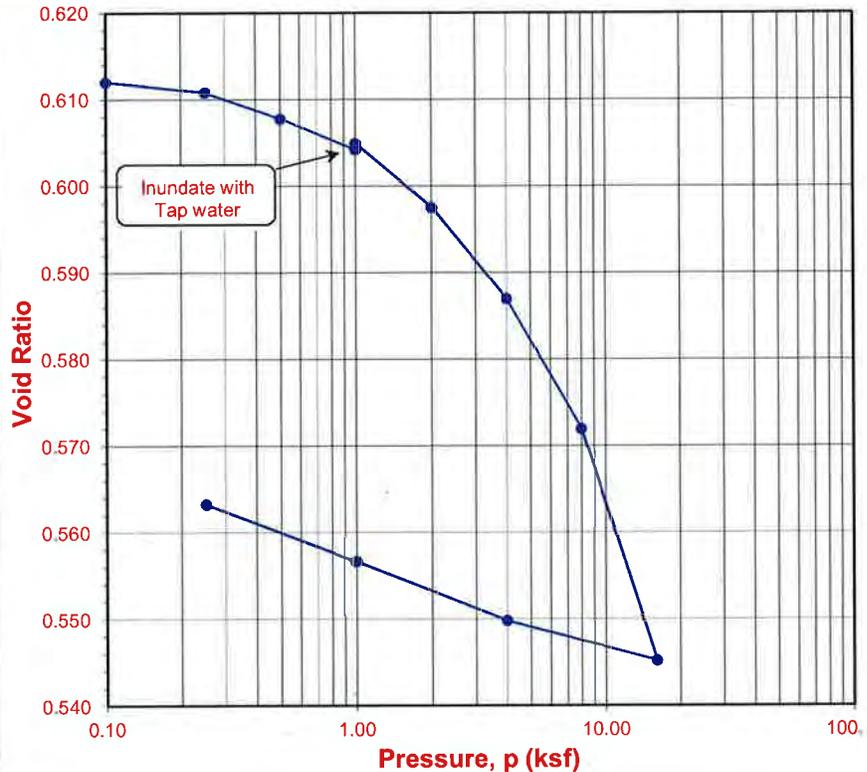


# ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS ASTM D 2435

Project Name: Crowther  
 Project No.: 11263.003  
 Boring No.: B-2  
 Sample No.: R1  
 Soil Identification: Brown sandy silt s(ML)

Tested By: G. Bathala Date: 06/01/17  
 Checked By: J. Ward Date: 06/13/17  
 Depth (ft.): 7.0  
 Sample Type: Ring

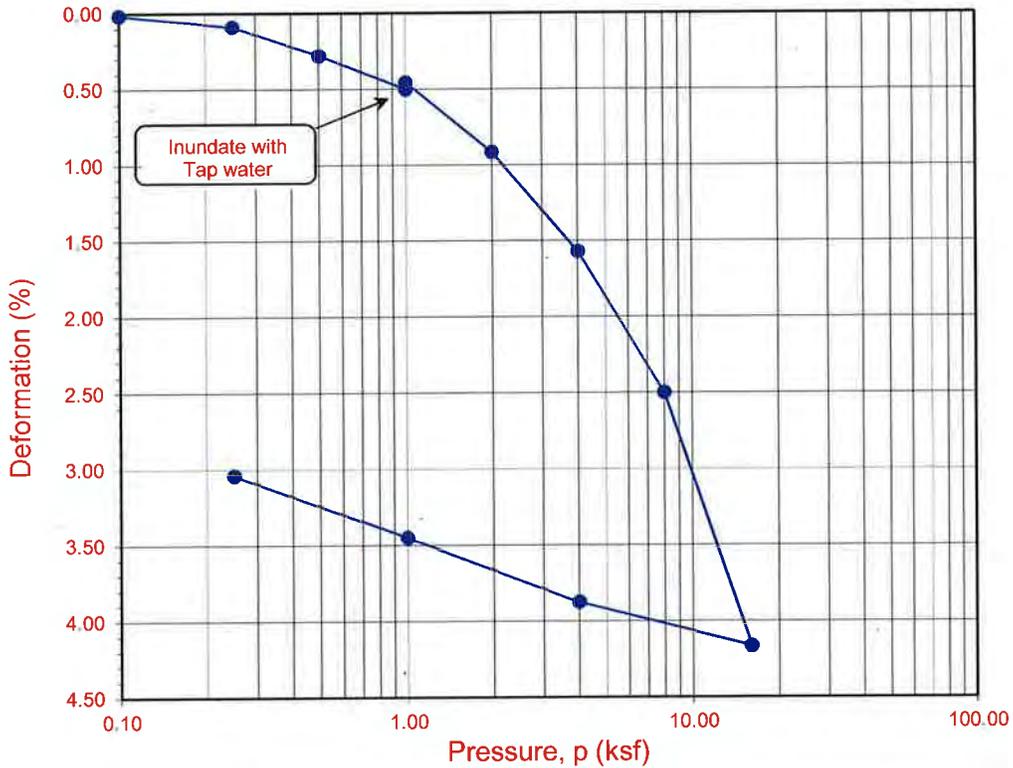
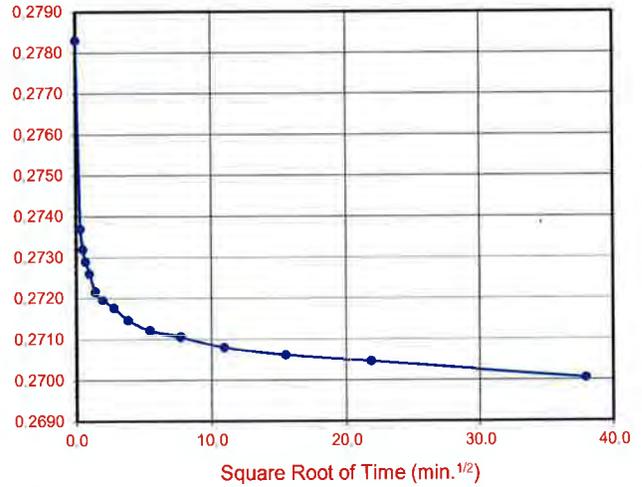
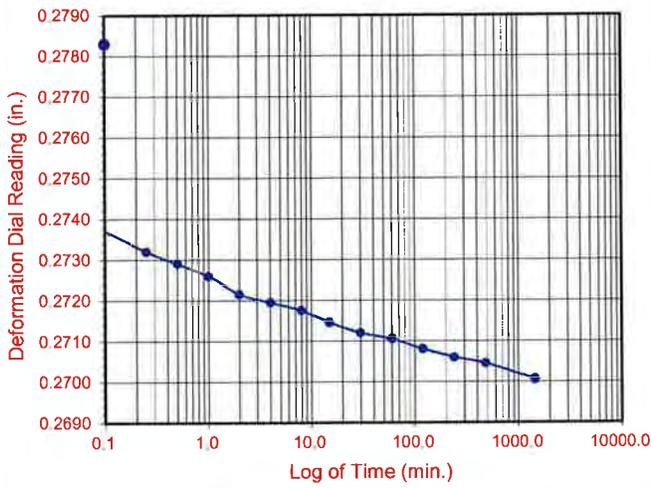
Sample Diameter (in.)	2.415
Sample Thickness (in.)	1.000
Wt. of Sample + Ring (g)	182.87
Weight of Ring (g)	43.35
Height after consol. (in.)	0.9696
<b>Before Test</b>	
Wt. Wet Sample+Cont. (g)	180.16
Wt. of Dry Sample+Cont. (g)	167.37
Weight of Container (g)	50.95
Initial Moisture Content (%)	11.0
Initial Dry Density (pcf)	104.5
Initial Saturation (%)	48
Initial Vertical Reading (in.)	0.2922
<b>After Test</b>	
Wt. of Wet Sample+Cont. (g)	251.53
Wt. of Dry Sample+Cont. (g)	229.03
Weight of Container (g)	59.07
Final Moisture Content (%)	17.77
Final Dry Density (pcf)	108.6
Final Saturation (%)	87
Final Vertical Reading (in.)	0.2586
Specific Gravity (assumed)	2.70
Water Density (pcf)	62.43



Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.10	0.2920	0.9999	0.00	0.02	0.612	0.02
0.25	0.2907	0.9985	0.06	0.15	0.611	0.09
0.50	0.2878	0.9956	0.16	0.44	0.608	0.28
1.00	0.2841	0.9919	0.31	0.81	0.604	0.50
1.00	0.2845	0.9924	0.31	0.77	0.605	0.46
2.00	0.2783	0.9862	0.47	1.39	0.598	0.92
4.00	0.2701	0.9779	0.64	2.21	0.587	1.57
8.00	0.2591	0.9669	0.81	3.31	0.572	2.50
16.00	0.2406	0.9484	1.00	5.16	0.545	4.16
4.00	0.2455	0.9534	0.79	4.67	0.550	3.88
1.00	0.2522	0.9600	0.55	4.00	0.557	3.45
0.25	0.2586	0.9664	0.32	3.36	0.563	3.04

Time Readings @ 4.0 ksf				
Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)
6/5/17	9:10:00	0.0	0.0	0.2783
6/5/17	9:10:06	0.1	0.3	0.2737
6/5/17	9:10:15	0.2	0.5	0.2732
6/5/17	9:10:30	0.5	0.7	0.2729
6/5/17	9:11:00	1.0	1.0	0.2726
6/5/17	9:12:00	2.0	1.4	0.2722
6/5/17	9:14:00	4.0	2.0	0.2720
6/5/17	9:18:00	8.0	2.8	0.2718
6/5/17	9:25:00	15.0	3.9	0.2715
6/5/17	9:40:00	30.0	5.5	0.2712
6/5/17	10:10:00	60.0	7.7	0.2711
6/5/17	11:10:00	120.0	11.0	0.2708
6/5/17	13:10:00	240.0	15.5	0.2706
6/5/17	17:08:00	478.0	21.9	0.2705
6/6/17	9:10:00	1440.0	37.9	0.2701

Time Readings @ 4.0 ksf



Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
<b>B-2</b>	<b>R1</b>	<b>7.0</b>	<b>11.0</b>	<b>17.8</b>	<b>104.5</b>	<b>108.6</b>	<b>0.612</b>	<b>0.563</b>	<b>48</b>	<b>87</b>

Soil Identification: Brown sandy silt s(ML)



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**ONE-DIMENSIONAL CONSOLIDATION  
PROPERTIES of SOILS  
ASTM D 2435**

Project No.: 11263.003

Crowther

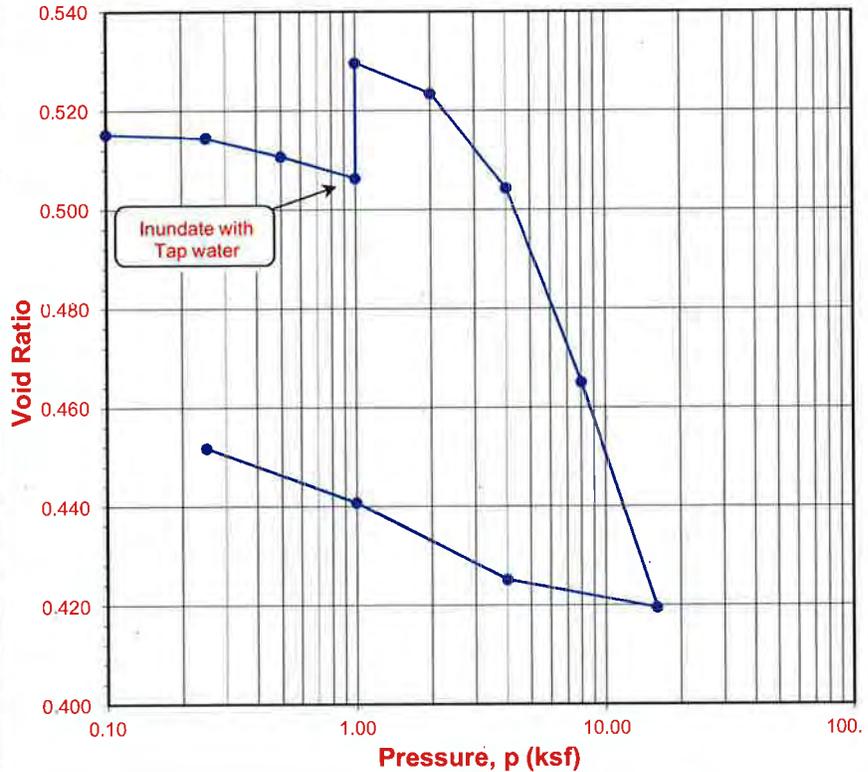


# ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS ASTM D 2435

Project Name: Crowther  
 Project No.: 11263.003  
 Boring No.: B-3  
 Sample No.: BB-1  
 Soil Identification: Dark olive brown clayey sand (SC)

Tested By: G. Bathala Date: 06/06/17  
 Checked By: J. Ward Date: 06/15/17  
 Depth (ft.): 0-5  
 Sample Type: 90% Remold

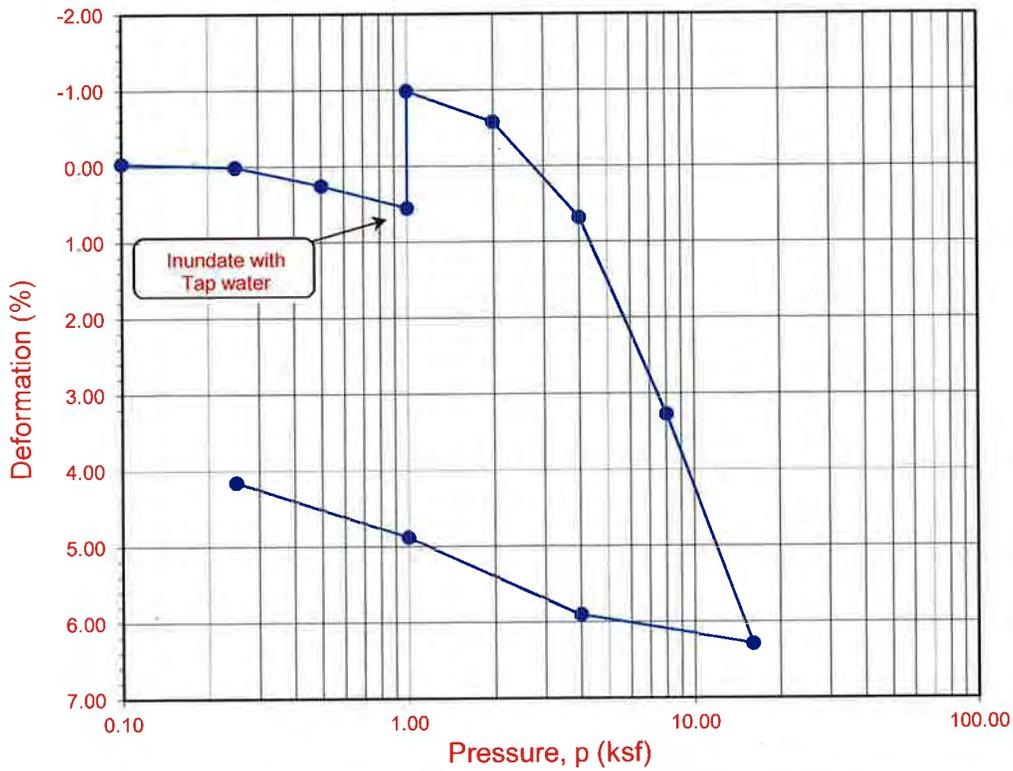
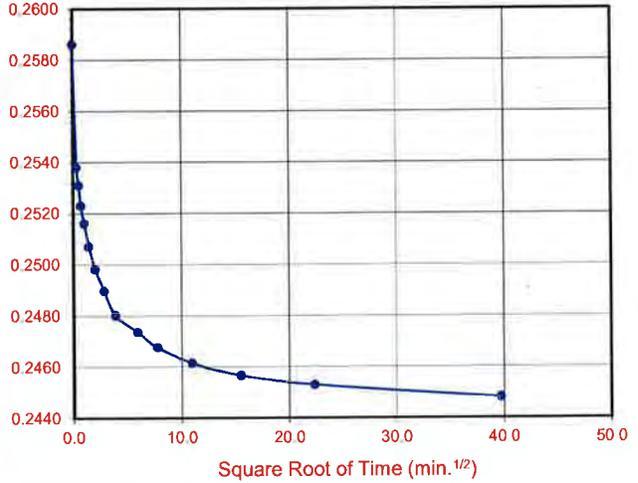
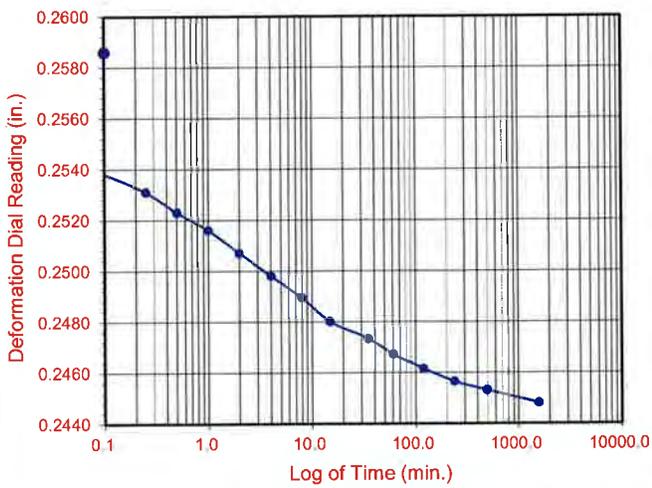
Sample Diameter (in.)	2.415
Sample Thickness (in.)	1.000
Wt. of Sample + Ring (g)	191.05
Weight of Ring (g)	43.26
Height after consol. (in.)	0.9585
<b>Before Test</b>	
Wt. Wet Sample+Cont. (g)	183.54
Wt. of Dry Sample+Cont. (g)	169.96
Weight of Container (g)	39.93
Initial Moisture Content (%)	10.4
Initial Dry Density (pcf)	111.3
Initial Saturation (%)	55
Initial Vertical Reading (in.)	0.2559
<b>After Test</b>	
Wt. of Wet Sample+Cont. (g)	255.00
Wt. of Dry Sample+Cont. (g)	233.77
Weight of Container (g)	57.14
Final Moisture Content (%)	15.92
Final Dry Density (pcf)	115.7
Final Saturation (%)	94
Final Vertical Reading (in.)	0.2124
Specific Gravity (assumed)	2.70
Water Density (pcf)	62.43



Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.10	0.2563	1.0004	0.00	-0.04	0.515	-0.04
0.25	0.2551	0.9992	0.07	0.08	0.514	0.01
0.50	0.2521	0.9962	0.13	0.39	0.511	0.26
1.00	0.2483	0.9924	0.21	0.76	0.506	0.55
1.00	0.2637	1.0078	0.21	-0.78	0.530	-0.99
2.00	0.2586	1.0027	0.31	-0.27	0.523	-0.58
4.00	0.2448	0.9889	0.43	1.11	0.504	0.68
8.00	0.2172	0.9613	0.60	3.87	0.465	3.27
16.00	0.1845	0.9286	0.86	7.14	0.420	6.28
4.00	0.1916	0.9357	0.53	6.44	0.425	5.91
1.00	0.2035	0.9476	0.36	5.24	0.441	4.88
0.25	0.2124	0.9565	0.20	4.35	0.452	4.15

Time Readings @ 4.0 ksf				
Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)
6/9/17	8:10:00	0.0	0.0	0.2586
6/9/17	8:10:06	0.1	0.3	0.2538
6/9/17	8:10:15	0.2	0.5	0.2531
6/9/17	8:10:30	0.5	0.7	0.2523
6/9/17	8:11:00	1.0	1.0	0.2516
6/9/17	8:12:00	2.0	1.4	0.2507
6/9/17	8:14:00	4.0	2.0	0.2498
6/9/17	8:18:00	8.0	2.8	0.2490
6/9/17	8:25:00	15.0	3.9	0.2480
6/9/17	8:45:00	35.0	5.9	0.2474
6/9/17	9:10:00	60.0	7.7	0.2468
6/9/17	10:10:00	120.0	11.0	0.2462
6/9/17	12:10:00	240.0	15.5	0.2457
6/9/17	16:29:00	499.0	22.3	0.2453
6/10/17	10:25:00	1575.0	39.7	0.2448

Time Readings @ 4.0 ksf



Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
<b>B-3</b>	<b>BB-1</b>	<b>0-5</b>	<b>10.4</b>	<b>15.9</b>	<b>111.3</b>	<b>115.7</b>	<b>0.515</b>	<b>0.452</b>	<b>55</b>	<b>94</b>

Soil Identification: Dark olive brown clayey sand (SC)



Leighton

**ONE-DIMENSIONAL CONSOLIDATION  
PROPERTIES of SOILS  
ASTM D 2435**

Project No.: 11263.003

Crowther

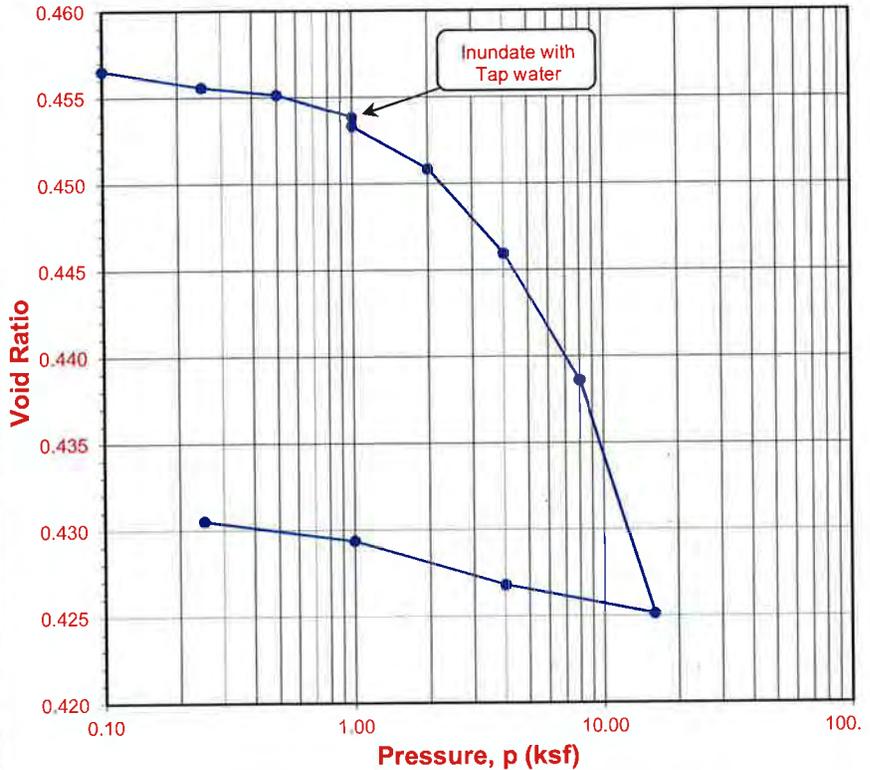


# ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS ASTM D 2435

Project Name: Crowther  
 Project No.: 11263.003  
 Boring No.: B-3  
 Sample No.: R2  
 Soil Identification: Light olive brown silty sand (SM)

Tested By: G. Bathala Date: 06/01/17  
 Checked By: J. Ward Date: 06/13/17  
 Depth (ft.): 12.0  
 Sample Type: Ring

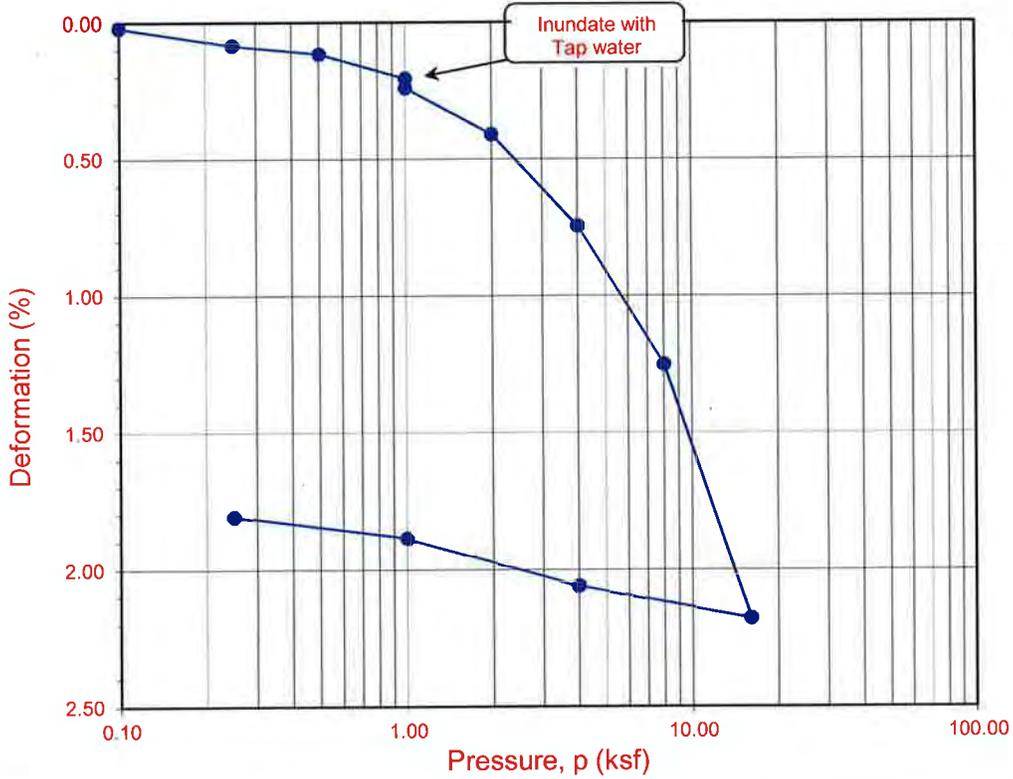
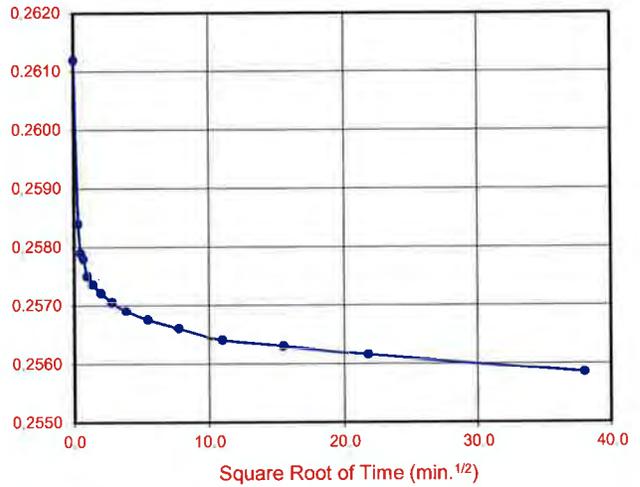
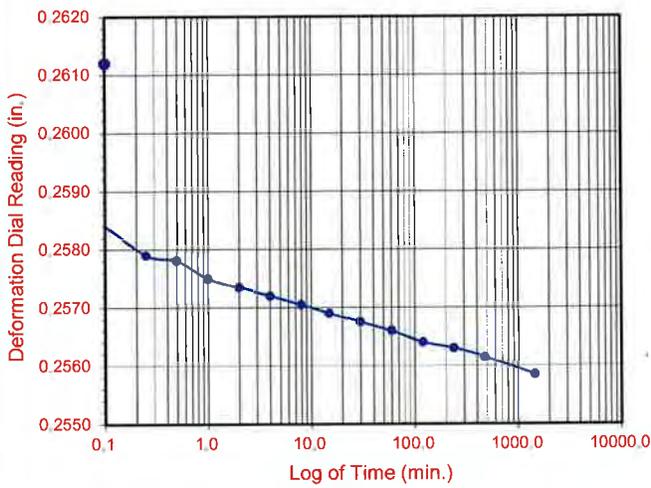
Sample Diameter (in.)	2.415
Sample Thickness (in.)	1.000
Wt. of Sample + Ring (g)	189.65
Weight of Ring (g)	43.67
Height after consol. (in.)	0.9820
<b>Before Test</b>	
Wt. Wet Sample+Cont. (g)	188.43
Wt. of Dry Sample+Cont. (g)	182.33
Weight of Container (g)	58.54
Initial Moisture Content (%)	4.9
Initial Dry Density (pcf)	115.7
Initial Saturation (%)	29
Initial Vertical Reading (in.)	0.2700
<b>After Test</b>	
Wt. of Wet Sample+Cont. (g)	272.23
Wt. of Dry Sample+Cont. (g)	255.56
Weight of Container (g)	75.50
Final Moisture Content (%)	12.22
Final Dry Density (pcf)	115.5
Final Saturation (%)	72
Final Vertical Reading (in.)	0.2480
Specific Gravity (assumed)	2.70
Water Density (pcf)	62.43



Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.10	0.2698	0.9998	0.00	0.02	0.457	0.02
0.25	0.2688	0.9988	0.04	0.12	0.456	0.08
0.50	0.2675	0.9975	0.14	0.26	0.455	0.12
1.00	0.2652	0.9952	0.28	0.49	0.454	0.21
1.00	0.2648	0.9948	0.28	0.52	0.453	0.24
2.00	0.2612	0.9912	0.47	0.88	0.451	0.41
4.00	0.2559	0.9859	0.67	1.42	0.446	0.75
8.00	0.2485	0.9785	0.90	2.15	0.439	1.25
16.00	0.2365	0.9665	1.18	3.36	0.425	2.18
4.00	0.2406	0.9706	0.88	2.94	0.427	2.06
1.00	0.2449	0.9749	0.63	2.52	0.429	1.89
0.25	0.2480	0.9780	0.40	2.21	0.431	1.81

Time Readings @ 4.0 ksf				
Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)
6/5/17	9:15:00	0.0	0.0	0.2612
6/5/17	9:15:06	0.1	0.3	0.2584
6/5/17	9:15:15	0.2	0.5	0.2579
6/5/17	9:15:30	0.5	0.7	0.2578
6/5/17	9:16:00	1.0	1.0	0.2575
6/5/17	9:17:00	2.0	1.4	0.2574
6/5/17	9:19:00	4.0	2.0	0.2572
6/5/17	9:23:00	8.0	2.8	0.2571
6/5/17	9:30:00	15.0	3.9	0.2569
6/5/17	9:45:00	30.0	5.5	0.2568
6/5/17	10:15:00	60.0	7.7	0.2566
6/5/17	11:15:00	120.0	11.0	0.2564
6/5/17	13:15:00	240.0	15.5	0.2563
6/5/17	17:09:00	474.0	21.8	0.2562
6/6/17	9:15:00	1440.0	37.9	0.2559

Time Readings @ 4.0 ksf



Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
<b>B-3</b>	<b>R2</b>	<b>12.0</b>	<b>4.9</b>	<b>12.2</b>	<b>115.7</b>	<b>115.5</b>	<b>0.457</b>	<b>0.431</b>	<b>29</b>	<b>72</b>

Soil Identification: Light olive brown silty sand (SM)



Leighton

**ONE-DIMENSIONAL CONSOLIDATION  
PROPERTIES of SOILS  
ASTM D 2435**

Project No.: 11263.003

Crowther

06-17



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**DIRECT SHEAR TEST**  
**Consolidated Drained - ASTM D. 3080**

Project Name: Crowther  
Project No.: 11263.003  
Boring No.: B-2  
Sample No.: R1  
Soil Identification: Brown sandy silt s(ML)

Tested By: G. Bathala  
Checked By: J. Ward  
Sample Type: Ring  
Depth (ft.): 7.0

Date: 06/07/17  
Date: 06/13/17

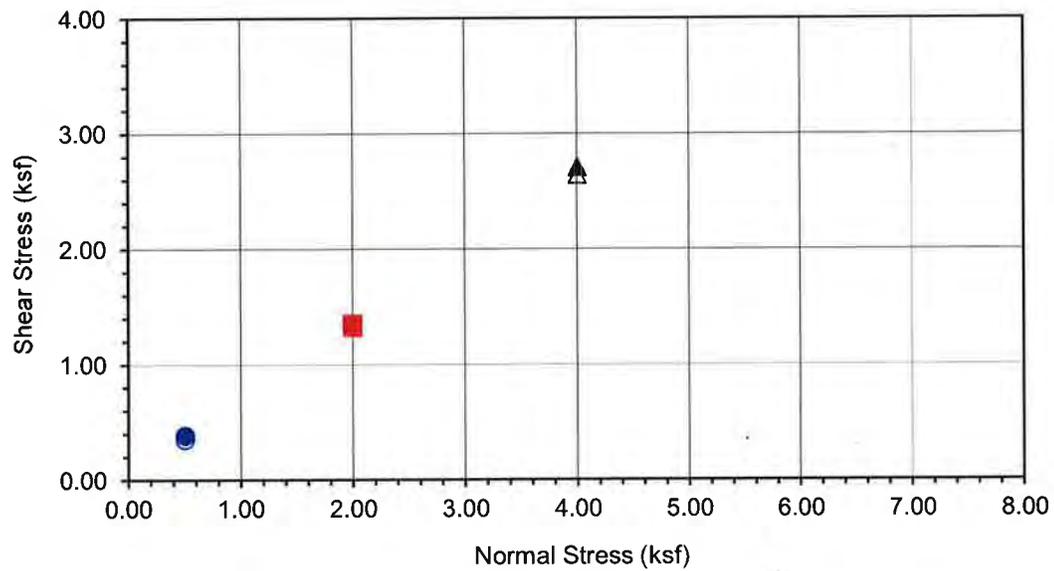
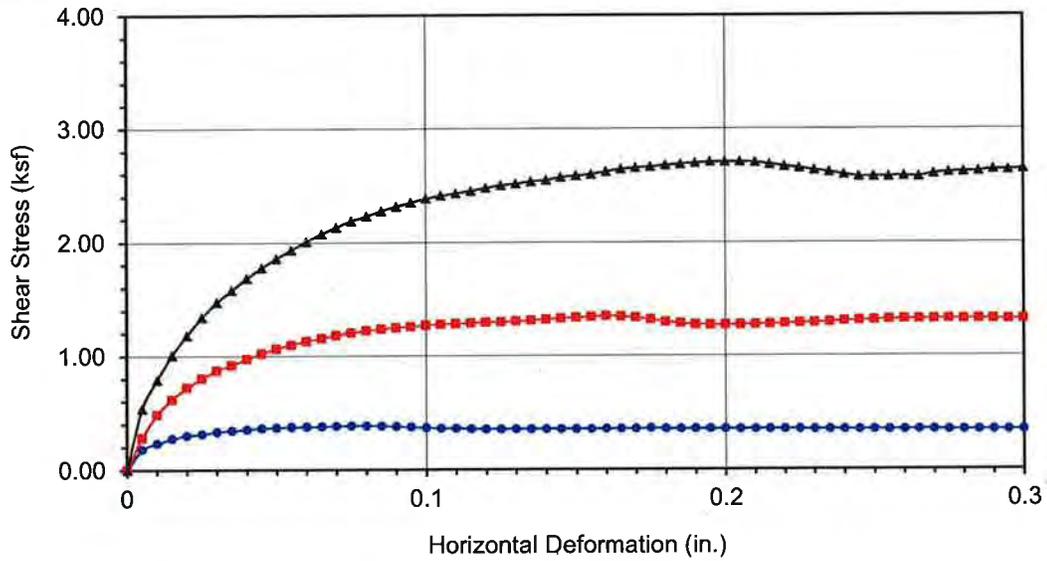
Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	170.63	173.34	174.64
Weight of Ring(gm):	42.92	45.12	43.69

**Before Shearing**

Weight of Wet Sample+Cont.(gm):	168.18	168.18	168.18
Weight of Dry Sample+Cont.(gm):	156.89	156.89	156.89
Weight of Container(gm):	66.54	66.54	66.54
Vertical Rdg.(in): Initial	0.0000	0.3435	0.2665
Vertical Rdg.(in): Final	-0.0050	0.3602	0.2840

**After Shearing**

Weight of Wet Sample+Cont.(gm):	212.78	200.82	198.65
Weight of Dry Sample+Cont.(gm):	190.37	179.51	178.33
Weight of Container(gm):	71.79	61.24	58.64
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43



<b>Boring No.</b>	<b>B-2</b>
<b>Sample No.</b>	<b>R1</b>
<b>Depth (ft)</b>	<b>7</b>
<b>Sample Type:</b>	
Ring	
<b>Soil Identification:</b>	
Brown sandy silt s(ML)	

Normal Stress (kip/ft <sup>2</sup> )	0.500	2.000	4.000
Peak Shear Stress (kip/ft <sup>2</sup> )	● 0.387	■ 1.349	▲ 2.707
Shear Stress @ End of Test (ksf)	○ 0.349	□ 1.324	△ 2.644
Deformation Rate (in./min.)	0.0025	0.0025	0.0025
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	12.50	12.50	12.50
Dry Density (pcf)	94.4	94.8	96.8
Saturation (%)	43.0	43.4	45.5
Soil Height Before Shearing (in.)	0.9950	0.9833	0.9825
Final Moisture Content (%)	18.9	18.0	17.0



Leighton

**DIRECT SHEAR TEST RESULTS**  
Consolidated Drained - ASTM D 3080

Project No.:

11263.003

Crowther

06-17



Leighton

**DIRECT SHEAR TEST**  
Consolidated Drained - ASTM D 3080

Project Name: Crowther  
Project No.: 11263.003  
Boring No.: B-3  
Sample No.: BB-1  
Soil Identification: Dark olive brown clayey sand (SC)

Tested By: G. Bathala  
Checked By: J. Ward  
Sample Type: 90% Remold  
Depth (ft.): 0-5

Date: 06/06/17  
Date: 06/13/17

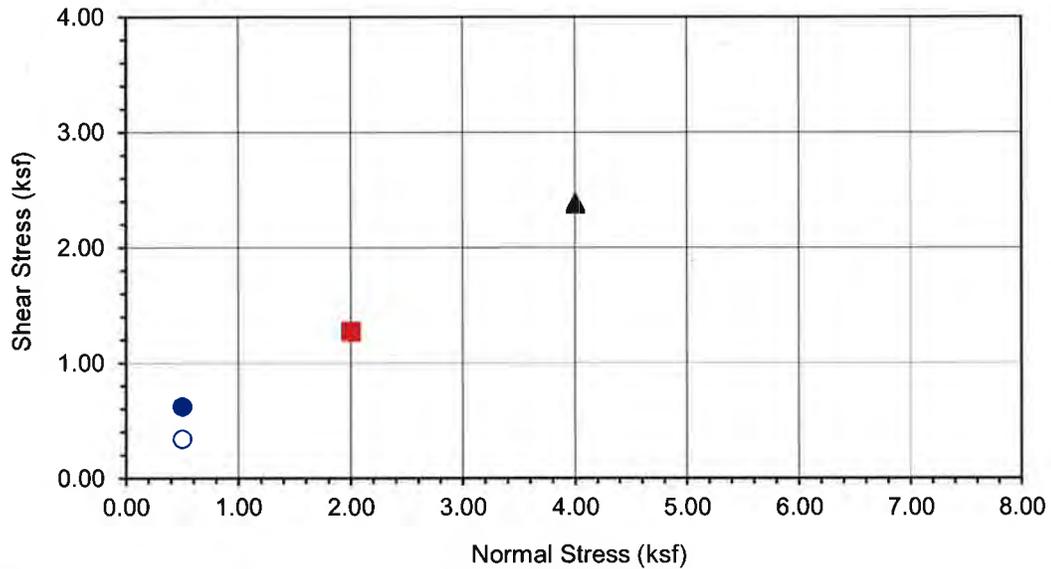
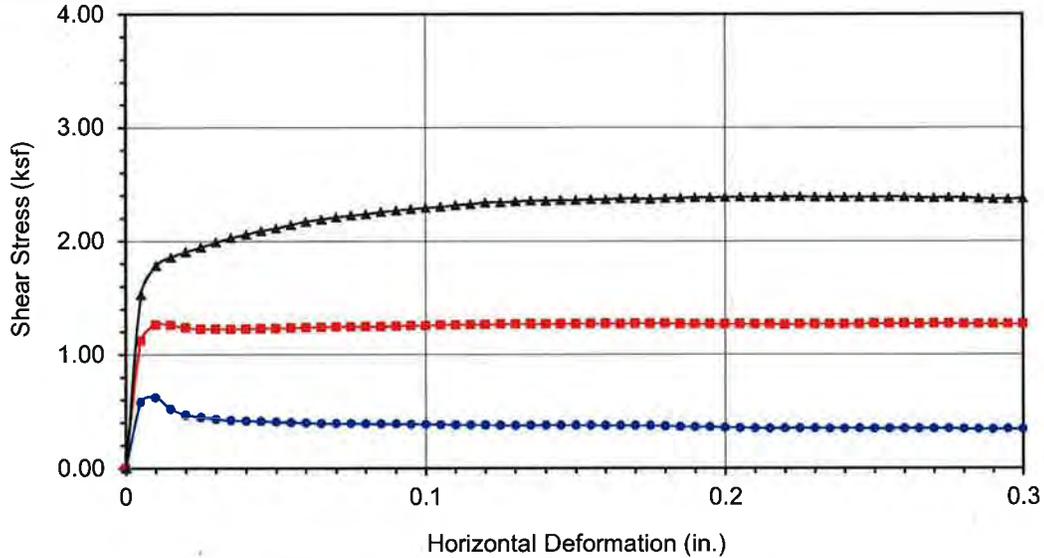
Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	191.22	190.85	190.79
Weight of Ring(gm):	43.43	43.01	42.97

**Before Shearing**

Weight of Wet Sample+Cont.(gm):	183.54	183.54	183.54
Weight of Dry Sample+Cont.(gm):	169.96	169.96	169.96
Weight of Container(gm):	39.93	39.93	39.93
Vertical Rdg.(in): Initial	0.3354	0.3094	0.3146
Vertical Rdg.(in): Final	0.3073	0.3031	0.3205

**After Shearing**

Weight of Wet Sample+Cont.(gm):	233.29	194.86	212.75
Weight of Dry Sample+Cont.(gm):	207.37	171.42	190.15
Weight of Container(gm):	75.49	39.05	57.91
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43



<b>Boring No.</b>	<b>B-3</b>
<b>Sample No.</b>	<b>BB-1</b>
<b>Depth (ft)</b>	<b>0-5</b>
<u>Sample Type:</u>	
90% Remold	
<u>Soil Identification:</u>	
Dark olive brown clayey sand (SC)	

Normal Stress (kip/ft <sup>2</sup> )	0.500	2.000	4.000
Peak Shear Stress (kip/ft <sup>2</sup> )	● 0.622	■ 1.276	▲ 2.392
Shear Stress @ End of Test (ksf)	○ 0.343	□ 1.270	△ 2.374
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	10.44	10.44	10.44
Dry Density (pcf)	111.3	111.3	111.3
Saturation (%)	54.8	54.8	54.8
Soil Height Before Shearing (in.)	N/A	1.0063	0.9941
Final Moisture Content (%)	19.7	17.7	17.1



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**DIRECT SHEAR TEST RESULTS**  
Consolidated Drained - ASTM D 3080

Project No.:

11263.003

Crowther

06-17



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**DIRECT SHEAR TEST**  
**Consolidated Drained - ASTM D 3080**

Project Name: Crowther  
 Project No.: 11263.003  
 Boring No.: B-3  
 Sample No.: R1  
 Soil Identification: Dark yellowish brown clayey sand (SC)

Tested By: G. Bathala  
 Checked By: J. Ward  
 Sample Type: Ring  
 Depth (ft.): 5.0

Date: 06/06/17  
 Date: 06/13/17

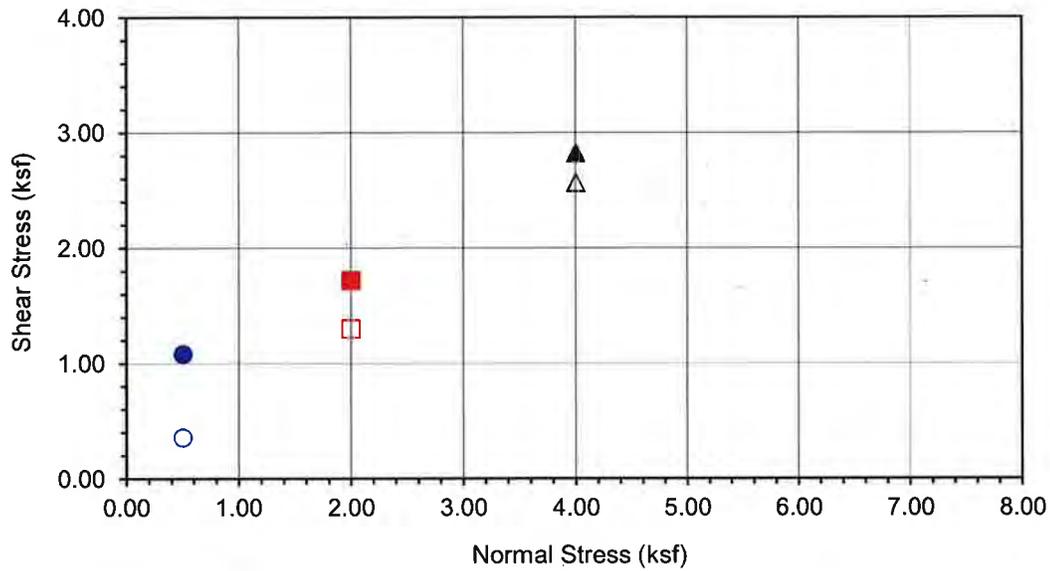
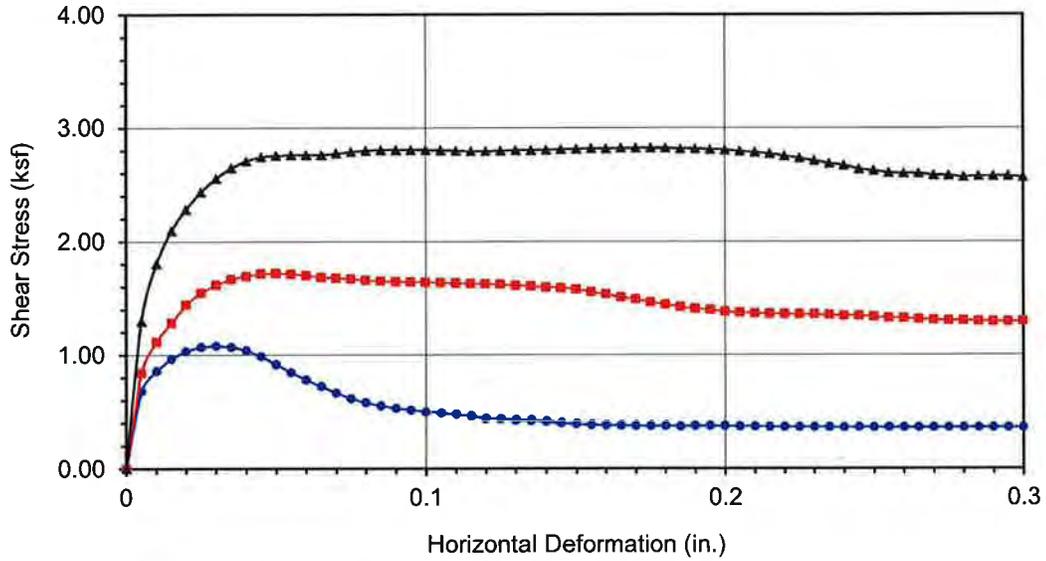
Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	202.78	203.25	206.56
Weight of Ring(gm):	41.90	42.34	45.40

**Before Shearing**

Weight of Wet Sample+Cont.(gm):	218.02	218.02	218.02
Weight of Dry Sample+Cont.(gm):	198.16	198.16	198.16
Weight of Container(gm):	58.18	58.18	58.18
Vertical Rdg.(in): Initial	0.3369	0.3399	0.3554
Vertical Rdg.(in): Final	N/A	0.3501	0.3639

**After Shearing**

Weight of Wet Sample+Cont.(gm):	218.55	201.61	223.28
Weight of Dry Sample+Cont.(gm):	195.18	179.31	201.30
Weight of Container(gm):	56.05	39.51	62.79
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43



<b>Boring No.</b>	<b>B-3</b>
<b>Sample No.</b>	<b>R1</b>
<b>Depth (ft)</b>	<b>5</b>
<u>Sample Type:</u>	
Ring	
<u>Soil Identification:</u>	
Dark yellowish brown clayey sand (SC)	

Normal Stress (kip/ft <sup>2</sup> )	0.500	2.000	4.000
Peak Shear Stress (kip/ft <sup>2</sup> )	● 1.081	■ 1.720	▲ 2.823
Shear Stress @ End of Test (ksf)	○ 0.362	□ 1.298	△ 2.565
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	14.19	14.19	14.19
Dry Density (pcf)	117.2	117.2	117.4
Saturation (%)	87.3	87.4	87.8
Soil Height Before Shearing (in.)	N/A	0.9898	0.9915
Final Moisture Content (%)	16.8	16.0	15.9



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**DIRECT SHEAR TEST RESULTS**  
Consolidated Drained - ASTM D 3080

Project No.:

11263.003

Crowther

06-17



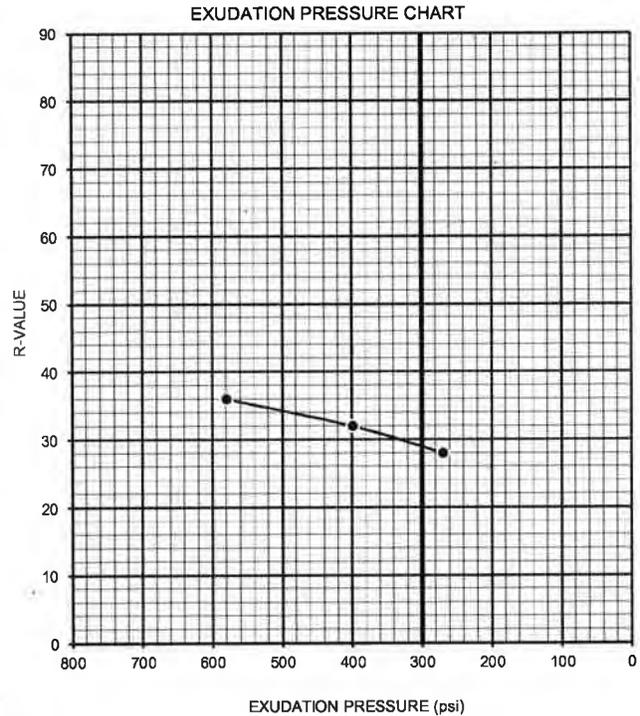
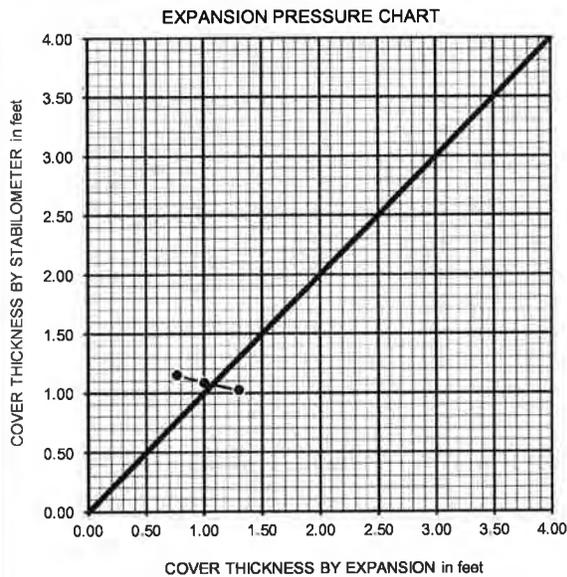
# R-VALUE TEST RESULTS

DOT CA Test 301

PROJECT NAME: Crowther PROJECT NUMBER: 11263.003  
 BORING NUMBER: B-3 DEPTH (FT.): 0-5  
 SAMPLE NUMBER: BB-1 TECHNICIAN: S. Felter  
 SAMPLE DESCRIPTION: Dark olive brown clayey sand (SC) DATE COMPLETED: 6/7/2017

TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	14.6	15.3	15.9
HEIGHT OF SAMPLE, Inches	2.41	2.48	2.45
DRY DENSITY, pcf	120.0	117.0	117.1
COMPACTOR PRESSURE, psi	125	90	50
EXUDATION PRESSURE, psi	580	399	270
EXPANSION, Inches x 10exp-4	39	30	23
STABILITY Ph 2,000 lbs (160 psi)	93	100	107
TURNS DISPLACEMENT	2.95	3.20	3.13
R-VALUE UNCORRECTED	38	32	28
R-VALUE CORRECTED	36	32	28

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	1.02	1.09	1.15
EXPANSION PRESSURE THICKNESS, ft.	1.30	1.00	0.77



R-VALUE BY EXPANSION: 33  
 R-VALUE BY EXUDATION: 29  
 EQUILIBRIUM R-VALUE: 29



**TESTS for SULFATE CONTENT  
CHLORIDE CONTENT and pH of SOILS**

Project Name: Crowther  
Project No. : 11263.003

Tested By : ACS/OHF Date: 06/05/17  
Data Input By: J. Ward Date: 06/13/17

Boring No.	B-3			
Sample No.	BB-1			
Sample Depth (ft)	0-5			
Soil Identification:	Dark olive brown SC			
Wet Weight of Soil + Container (g)	104.81			
Dry Weight of Soil + Container (g)	103.14			
Weight of Container (g)	70.35			
Moisture Content (%)	5.09			
Weight of Soaked Soil (g)	100.13			

**SULFATE CONTENT, DOT California Test 417, Part II**

Beaker No.	95			
Crucible No.	9			
Furnace Temperature (°C)	860			
Time In / Time Out	9:10/9:55			
Duration of Combustion (min)	45			
Wt. of Crucible + Residue (g)	21.1998			
Wt. of Crucible (g)	21.1969			
Wt. of Residue (g) (A)	0.0029			
PPM of Sulfate (A) x 41150	119.34			
<b>PPM of Sulfate, Dry Weight Basis</b>	<b>126</b>			

**CHLORIDE CONTENT, DOT California Test 422**

ml of Extract For Titration (B)	30			
ml of AgNO3 Soln. Used in Titration (C)	2.7			
PPM of Chloride (C -0.2) * 100 * 30 / B	250			
<b>PPM of Chloride, Dry Wt. Basis</b>	<b>263</b>			

**pH TEST, DOT California Test 643**

<b>pH Value</b>	<b>7.51</b>			
<b>Temperature °C</b>	<b>21.1</b>			



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**SOIL RESISTIVITY TEST**  
**DOT CA TEST 643**

Project Name: Crowther  
 Project No. : 11263.003  
 Boring No.: B-3  
 Sample No. : BB-1

Tested By : A. Santos Date: 06/06/17  
 Data Input By: J. Ward Date: 06/13/17  
 Depth (ft.) : 0-5

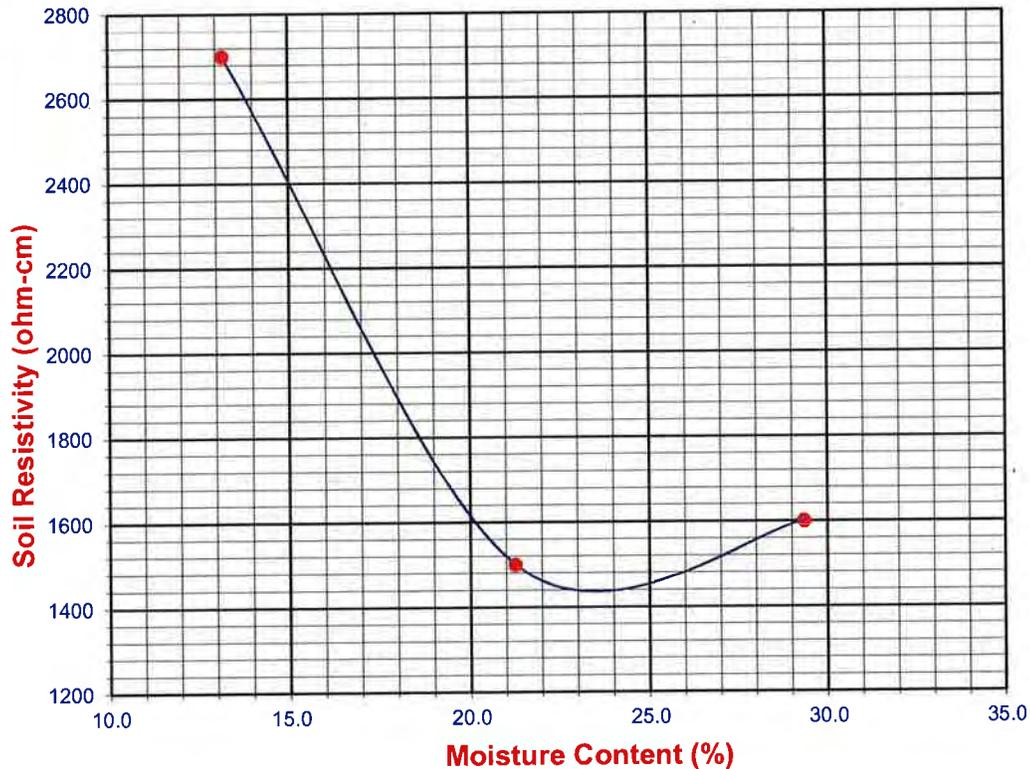
Soil Identification:\* Dark olive brown SC

\*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	10	13.18	2700	2700
2	20	21.26	1500	1500
3	30	29.35	1600	1600
4				
5				

Moisture Content (%) (Mci)	5.09
Wet Wt. of Soil + Cont. (g)	104.81
Dry Wt. of Soil + Cont. (g)	103.14
Wt. of Container (g)	70.35
Container No.	
Initial Soil Wt. (g) (Wt)	130.00
Box Constant	1.000
MC = (((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
<b>1435</b>	<b>23.5</b>	<b>126</b>	<b>263</b>	<b>7.51</b>	<b>21.1</b>





**EXPANSION INDEX of SOILS**  
ASTM D 4829

Project Name: Crowther Tested By: OHF/ACS Date: 06/23/17  
 Project No.: 11263.003 Checked By: J. Ward Date: 06/24/17  
 Boring No.: B-2 Depth (ft.): 0-5  
 Sample No.: BB-1  
 Soil Identification: Very dark brown fat clay with sand (CH)s

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.1058
Wt. Comp. Soil + Mold (g)	569.10	436.40
Wt. of Mold (g)	188.10	0.00
Specific Gravity (Assumed)	2.70	2.70
Container No.	0	0
Wet Wt. of Soil + Cont. (g)	766.70	624.50
Dry Wt. of Soil + Cont. (g)	687.00	529.50
Wt. of Container (g)	0.00	188.10
Moisture Content (%)	11.60	27.83
Wet Density (pcf)	114.9	119.0
Dry Density (pcf)	103.0	93.1
Void Ratio	0.637	0.810
Total Porosity	0.389	0.448
Pore Volume (cc)	80.6	102.4
Degree of Saturation (%) [ S <sub>meas</sub> ]	49.2	92.7

**SPECIMEN INUNDATION** in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
06/23/17	13:08	1.0	0	0.1752
06/23/17	13:18	1.0	10	0.1750
Add Distilled Water to the Specimen				
06/23/17	14:40	1.0	82	0.2560
06/24/17	7:00	1.0	1062	0.2810
06/24/17	8:45	1.0	1167	0.2810

Expansion Index (EI <sub>meas</sub> ) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	<b>106</b>
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**EXPANSION INDEX of SOILS**  
ASTM D 4829

Project Name: Crowther Tested By: OHF/ACS Date: 06/23/17  
 Project No.: 11263.003 Checked By: J. Ward Date: 06/24/17  
 Boring No.: B-1 Depth (ft.): 0-5  
 Sample No.: BB-1  
 Soil Identification: Dark brown clayey sand (SC)

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0680
Wt. Comp. Soil + Mold (g)	608.20	436.20
Wt. of Mold (g)	209.00	0.00
Specific Gravity (Assumed)	2.70	2.70
Container No.	0	0
Wet Wt. of Soil + Cont. (g)	787.90	645.20
Dry Wt. of Soil + Cont. (g)	713.10	570.27
Wt. of Container (g)	0.00	209.00
Moisture Content (%)	10.49	20.74
Wet Density (pcf)	120.4	123.2
Dry Density (pcf)	109.0	102.0
Void Ratio	0.547	0.652
Total Porosity	0.354	0.395
Pore Volume (cc)	73.2	87.3
Degree of Saturation (%) [ S <sub>meas</sub> ]	<b>51.8</b>	85.9

**SPECIMEN INUNDATION** in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
06/23/17	13:50	1.0	0	0.0830
06/23/17	14:00	1.0	10	0.0830
Add Distilled Water to the Specimen				
06/23/17	15:40	1.0	100	0.1205
06/24/17	7:00	1.0	1020	0.1510
06/24/17	8:45	1.0	1125	0.1510

Expansion Index (EI <sub>meas</sub> ) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	<b>68</b>
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**APPENDIX C**  
**PERCOLATION TEST RESULTS**



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**Boring Percolation Test Data Sheet**

<b>Project Number:</b>	11263.002	<b>Test Hole Number:</b>	P-1
<b>Project Name:</b>	Integral Crowther	<b>Date Excavated:</b>	2/1/2017
<b>Earth Description:</b>	Alluvium	<b>Date Tested:</b>	2/1/2017
<b>Liquid Description:</b>	Tap water	<b>Depth of boring (ft):</b>	15
<b>Tested By:</b>	SM	<b>Diameter of boring (in):</b>	8
<b><u>Time Interval Standard</u></b>		<b>Diameter of casing (in):</b>	2
<b>Start Time for Pre-Soak:</b>	2/1/2017 12:00am	<b>Length of slotted of casing (ft):</b>	5
<b>Start Time for Standard:</b>	2/1/2017 12:33pm	<b>Depth to Initial Water Depth (ft):</b>	10
<b>Standard Time Interval</b>		<b>Porosity of Annulus Material, <i>n</i> :</b>	0.35
<b>Between Readings, mins:</b>	10	<b>Bentonite Plug at Bottom:</b>	No

**Percolation Data**

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H <sub>0</sub> /H <sub>f</sub> (in.)	Total Water Drop, Δd (in.)	Percolation Rate (min./in.)	Infiltration Rate (in./hr.)
1	12:33	10	10.00	60.0	37.2	0.27	4.02
	12:43		13.10	22.8			
2	12:45	10	10.00	60.0	35.0	0.29	3.69
	12:55		12.92	25.0			
3	12:57	10	10.00	60.0	35.6	0.28	3.78
	13:07		12.97	24.4			
4	13:08	10	10.00	60.0	34.8	0.29	3.66
	13:18		12.90	25.2			
5	13:19	10	10.00	60.0	34.2	0.29	3.57
	13:29		12.85	25.8			
6	13:31	10	10.00	60.0	34.9	0.29	3.68
	13:41		12.91	25.1			
7	13:42	10	10.00	60.0	34.0	0.29	3.54
	13:52		12.83	26.0			
8	13:55	10	10.00	60.0	33.7	0.30	3.50
	14:05		12.81	26.3			
9	14:07	10	10.00	60.0	35.2	0.28	3.71
	14:17		12.93	24.8			

Infiltration Rate (I) = Flow Volume/Flow Area/Δt

Infiltration Rate, I (Last Reading) = 3.71 in./hr.

**Boring Percolation Test Data Sheet**

<b>Project Number:</b>	11263.002	<b>Test Hole Number:</b>	P-2
<b>Project Name:</b>	Integral Crowther	<b>Date Excavated:</b>	2/1/2017
<b>Earth Description:</b>	Alluvium	<b>Date Tested:</b>	2/2/2017
<b>Liquid Description:</b>	Tap water	<b>Depth of boring (ft):</b>	15
<b>Tested By:</b>	JMP	<b>Diameter of boring (in):</b>	8
<b>Time Interval Standard</b>		<b>Diameter of casing (in):</b>	2
<b>Start Time for Pre-Soak:</b>	2/1/2017 9:30am	<b>Length of slotted of casing (ft):</b>	5
<b>Start Time for Standard:</b>	2/2/2017 9:26am	<b>Depth to Initial Water Depth (ft):</b>	10
<b>Standard Time Interval</b>		<b>Porosity of Annulus Material, n :</b>	0.35
<b>Between Readings, mins:</b>	30	<b>Bentonite Plug at Bottom:</b>	No

**Percolation Data**

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H <sub>0</sub> /H <sub>f</sub> (in.)	Total Water Drop, Δd (in.)	Percolation Rate (min./in.)	Infiltration Rate (in./hr.)
1	9:26	30	10.00	60.0	6.2	4.81	0.17
	9:56		10.52	53.8			
2	10:03	30	10.00	60.0	10.6	2.84	0.29
	10:33		10.88	49.4			
3	10:38	30	10.00	60.0	10.7	2.81	0.29
	11:08		10.89	49.3			
4	11:10	30	10.00	60.0	10.7	2.81	0.29
	11:40		10.89	49.3			
5	11:42	30	10.00	60.0	10.2	2.94	0.28
	12:12		10.85	49.8			
6	12:13	30	10.00	60.0	10.4	2.87	0.29
	12:43		10.87	49.6			
7	12:44	30	10.00	60.0	10.3	2.91	0.28
	13:14		10.86	49.7			
8	13:15	30	10.00	60.0	10.1	2.98	0.28
	13:45		10.84	49.9			
9	13:46	30	10.00	60.0	10.1	2.98	0.28
	14:16		10.84	49.9			
10	14:18	30	10.00	60.0	10.0	3.01	0.27
	14:48		10.83	50.0			
11	14:50	30	10.00	60.0	10.0	3.01	0.27
	15:20		10.83	50.0			

Infiltration Rate (I) = Flow Volume/Flow Area/Δt

Infiltration Rate, I (Last Reading) = 0.27 in./hr.

**Boring Percolation Test Data Sheet**

<b>Project Number:</b>	11263.002	<b>Test Hole Number:</b>	P-3
<b>Project Name:</b>	Integral Crowther	<b>Date Excavated:</b>	2/1/2017
<b>Earth Description:</b>	Alluvium	<b>Date Tested:</b>	2/2/2017
<b>Liquid Description:</b>	Tap water	<b>Depth of boring (ft):</b>	20
<b>Tested By:</b>	JMP	<b>Diameter of boring (in):</b>	8
<b>Time Interval Standard</b>		<b>Diameter of casing (in):</b>	2
<b>Start Time for Pre-Soak:</b>	2/1/2017 11:00am	<b>Length of slotted of casing (ft):</b>	5
<b>Start Time for Standard:</b>	2/2/2017 8:40am	<b>Depth to Initial Water Depth (ft):</b>	15
<b>Standard Time Interval</b>		<b>Porosity of Annulus Material, n :</b>	0.35
<b>Between Readings, mins:</b>	30	<b>Bentonite Plug at Bottom:</b>	No

**Percolation Data**

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H <sub>0</sub> /H <sub>f</sub> (in.)	Total Water Drop, Δd (in.)	Percolation Rate (min./in.)	Infiltration Rate (in./hr.)
1	8:40	30	15.00	60.0	23.3	1.29	0.72
	9:10		16.94	36.7			
2	9:12	30	15.00	60.0	23.2	1.30	0.72
	9:42		16.93	36.8			
3	9:43	30	15.00	60.0	23.0	1.30	0.71
	10:13		16.92	37.0			
4	10:15	30	15.00	60.0	23.2	1.30	0.72
	10:45		16.93	36.8			
5	10:47	30	15.00	60.0	23.2	1.30	0.72
	11:17		16.93	36.8			
6	11:18	30	15.00	60.0	22.7	1.32	0.70
	11:48		16.89	37.3			
7	11:50	30	15.00	60.0	22.4	1.34	0.69
	12:20		16.87	37.6			
8	12:21	30	15.00	60.0	23.0	1.30	0.71
	12:51		16.92	37.0			
9	12:53	30	15.00	60.0	23.2	1.30	0.72
	13:23		16.93	36.8			
10	13:24	30	15.00	60.0	23.2	1.30	0.72
	13:54		16.93	36.8			
11	13:56	30	15.00	60.0	23.2	1.30	0.72
	14:26		16.93	36.8			
12	14:27	30	15.00	60.0	23.2	1.30	0.72
	14:57		16.93	36.8			

Infiltration Rate (I) = Flow Volume/Flow Area/Δt

Infiltration Rate, I (Last Reading) = 0.72 in./hr.

**APPENDIX D**  
**SEISMICITY DATA**



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**Design Maps Detailed Report**

ASCE 7-10 Standard (33.8676°N, 117.8711°W)

Site Class D – “Stiff Soil”, Risk Category I/II/III

**Section 11.4.1 — Mapped Acceleration Parameters**

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain  $S_s$ ) and 1.3 (to obtain  $S_1$ ). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From **Figure 22-1** <sup>[1]</sup>

$S_s = 1.755 \text{ g}$

From **Figure 22-2** <sup>[2]</sup>

$S_1 = 0.634 \text{ g}$

**Section 11.4.2 — Site Class**

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
Any profile with more than 10 ft of soil having the characteristics:			
<ul style="list-style-type: none"> <li>• Plasticity index <math>PI &gt; 20</math>,</li> <li>• Moisture content <math>w \geq 40\%</math>, and</li> <li>• Undrained shear strength <math>\bar{s}_u &lt; 500</math> psf</li> </ul>			
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft<sup>2</sup> = 0.0479 kN/m<sup>2</sup>

**Section 11.4.3 — Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE<sub>R</sub>) Spectral Response Acceleration Parameters**

Table 11.4-1: Site Coefficient F<sub>a</sub>

Site Class	Mapped MCE <sub>R</sub> Spectral Response Acceleration Parameter at Short Period				
	S <sub>s</sub> ≤ 0.25	S <sub>s</sub> = 0.50	S <sub>s</sub> = 0.75	S <sub>s</sub> = 1.00	S <sub>s</sub> ≥ 1.25
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S<sub>s</sub>

**For Site Class = D and S<sub>s</sub> = 1.755 g, F<sub>a</sub> = 1.000**

Table 11.4-2: Site Coefficient F<sub>v</sub>

Site Class	Mapped MCE <sub>R</sub> Spectral Response Acceleration Parameter at 1-s Period				
	S <sub>1</sub> ≤ 0.10	S <sub>1</sub> = 0.20	S <sub>1</sub> = 0.30	S <sub>1</sub> = 0.40	S <sub>1</sub> ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S<sub>1</sub>

**For Site Class = D and S<sub>1</sub> = 0.634 g, F<sub>v</sub> = 1.500**

**Equation (11.4-1):**  $S_{MS} = F_a S_S = 1.000 \times 1.755 = 1.755 \text{ g}$

**Equation (11.4-2):**  $S_{M1} = F_v S_1 = 1.500 \times 0.634 = 0.952 \text{ g}$

Section 11.4.4 — Design Spectral Acceleration Parameters

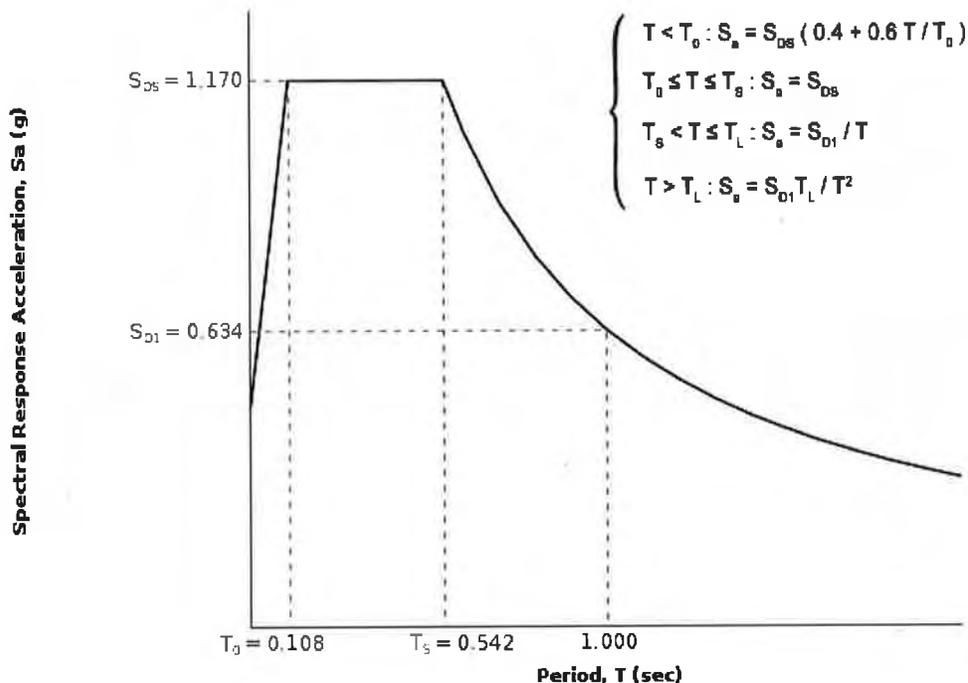
**Equation (11.4-3):**  $S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 1.755 = 1.170 \text{ g}$

**Equation (11.4-4):**  $S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 0.952 = 0.634 \text{ g}$

Section 11.4.5 — Design Response Spectrum

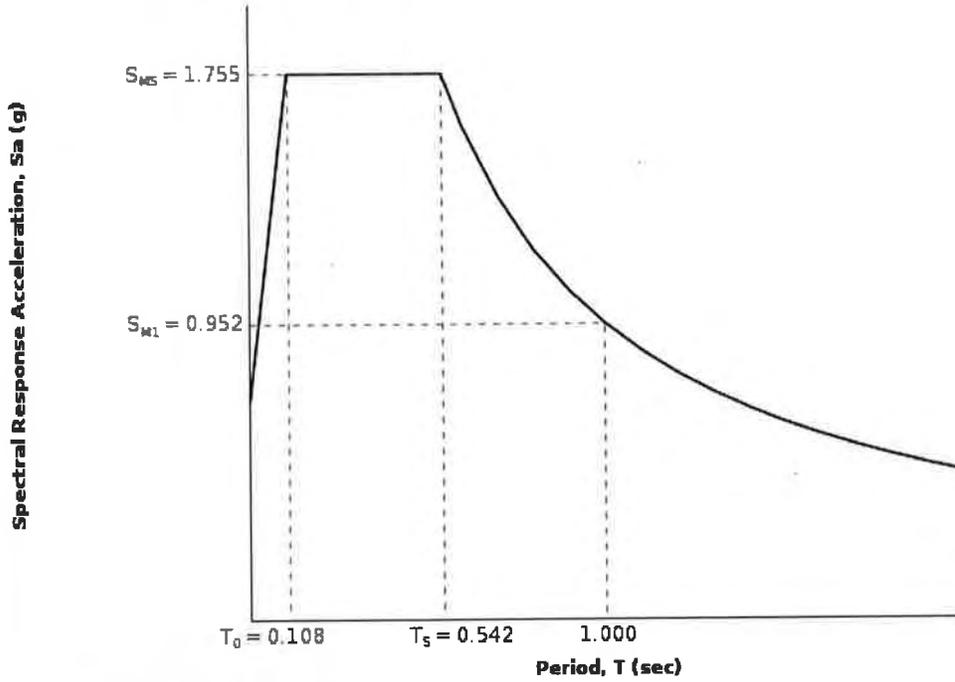
From **Figure 22-12** <sup>[3]</sup>  $T_L = 8 \text{ seconds}$

Figure 11.4-1: Design Response Spectrum



### Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE<sub>R</sub>) Response Spectrum

The MCE<sub>R</sub> Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From **Figure 22-7** <sup>[4]</sup>

$$PGA = 0.648$$

**Equation (11.8-1):**

$$PGA_M = F_{PGA} PGA = 1.000 \times 0.648 = 0.648 \text{ g}$$

Table 11.8-1: Site Coefficient  $F_{PGA}$

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of PGA

**For Site Class = D and PGA = 0.648 g,  $F_{PGA} = 1.000$**

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From **Figure 22-17** <sup>[5]</sup>

$$C_{RS} = 0.994$$

From **Figure 22-18** <sup>[6]</sup>

$$C_{R1} = 1.019$$

## Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF $S_{DS}$	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \leq S_{DS} < 0.33g$	B	B	C
$0.33g \leq S_{DS} < 0.50g$	C	C	D
$0.50g \leq S_{DS}$	D	D	D

For Risk Category = I and  $S_{DS} = 1.170 g$ , Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF $S_{D1}$	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \leq S_{D1} < 0.133g$	B	B	C
$0.133g \leq S_{D1} < 0.20g$	C	C	D
$0.20g \leq S_{D1}$	D	D	D

For Risk Category = I and  $S_{D1} = 0.634 g$ , Seismic Design Category = D

Note: When  $S_1$  is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category  $\equiv$  "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

### References

1. Figure 22-1: [http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-1.pdf](http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf)
2. Figure 22-2: [http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-2.pdf](http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf)
3. Figure 22-12: [http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-12.pdf](http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf)
4. Figure 22-7: [http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-7.pdf](http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf)
5. Figure 22-17: [http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-17.pdf](http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf)
6. Figure 22-18: [http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-18.pdf](http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf)

# PSH Deaggregation on NEHRP D soil

Crowther 117.871° W, 33.868 N.

Peak Horiz. Ground Accel.  $\geq 0.6655$  g

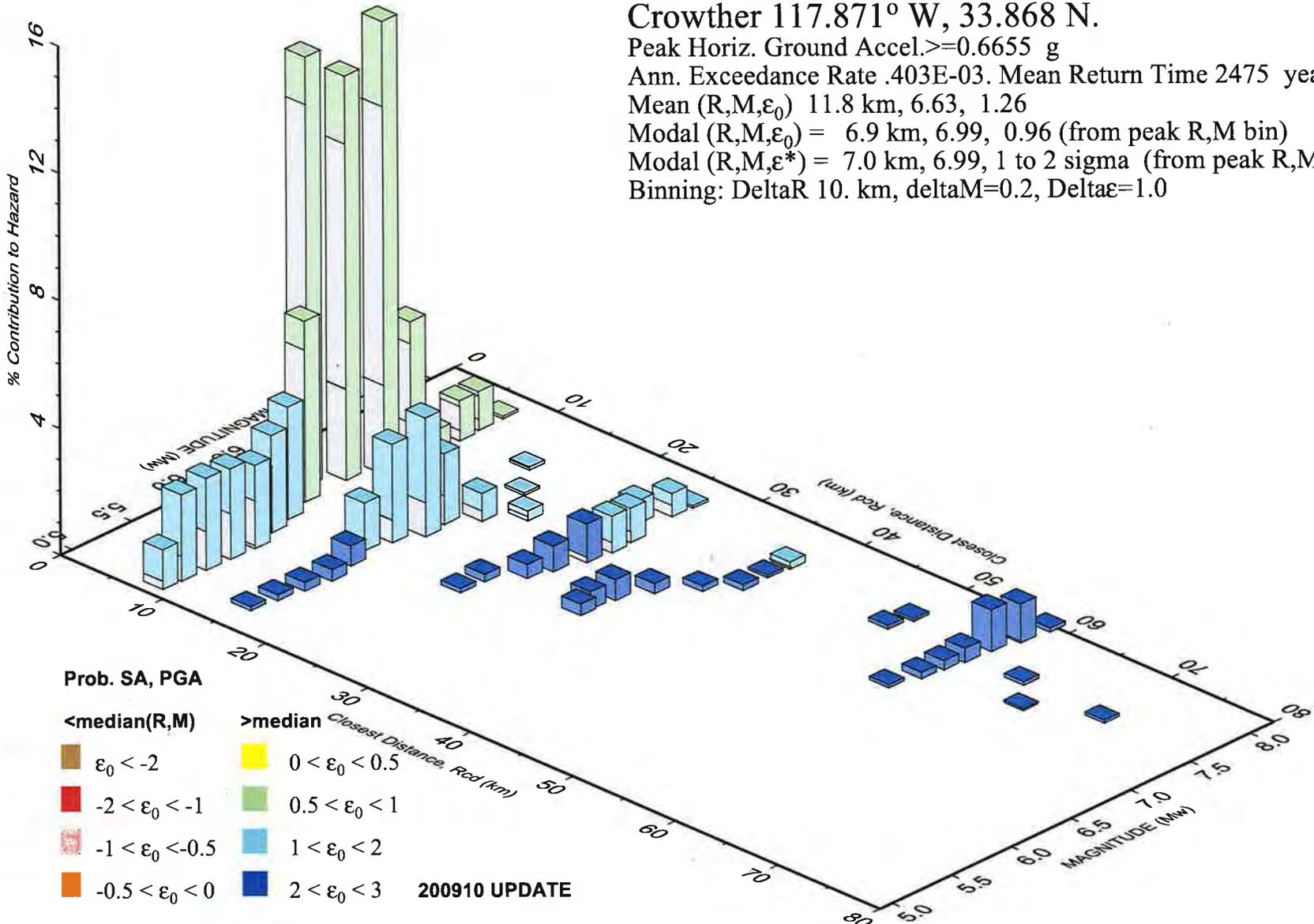
Ann. Exceedance Rate .403E-03. Mean Return Time 2475 years

Mean (R,M, $\epsilon_0$ ) 11.8 km, 6.63, 1.26

Modal (R,M, $\epsilon_0$ ) = 6.9 km, 6.99, 0.96 (from peak R,M bin)

Modal (R,M, $\epsilon^*$ ) = 7.0 km, 6.99, 1 to 2 sigma (from peak R,M, $\epsilon$  bin)

Binning: DeltaR 10. km, deltaM=0.2, Delta $\epsilon$ =1.0



**Prob. SA, PGA**

<median(R,M)

>median

- $\epsilon_0 < -2$
- $-2 < \epsilon_0 < -1$
- $-1 < \epsilon_0 < -0.5$
- $-0.5 < \epsilon_0 < 0$
- $0 < \epsilon_0 < 0.5$
- $0.5 < \epsilon_0 < 1$
- $1 < \epsilon_0 < 2$
- $2 < \epsilon_0 < 3$

**200910 UPDATE**

11263.003EQSearch

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*  
*   E Q S E A R C H   *  
*  
*   Version 3.00     *  
*  
*****
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ESTIMATION OF  
PEAK ACCELERATION FROM  
CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: 11263.003

DATE: 06-09-2017

JOB NAME: Crowther

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

MAGNITUDE RANGE:

MINIMUM MAGNITUDE: 4.00  
MAXIMUM MAGNITUDE: 9.00

SITE COORDINATES:

SITE LATITUDE: 33.8676  
SITE LONGITUDE: 117.8711

SEARCH DATES:

START DATE: 1800  
END DATE: 2016

SEARCH RADIUS:

62.0 mi  
99.8 km

ATTENUATION RELATION: 3) Boore et al. (1997) Horiz. - NEHRP D (250)

UNCERTAINTY (M=Median, S=Sigma): M Number of Sigmas: 0.0

ASSUMED SOURCE TYPE: DS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]

SCOND: 0 Depth Source: A

Basement Depth: 5.00 km Campbell SSR: Campbell SHR:

COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 0.0

## 11263.003EQSearch

## EARTHQUAKE SEARCH RESULTS

Page 1

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
MGI	33.8000	117.9000	05/22/1902	740 0.0	0.0	4.30	0.117	VII	4.9( 8.0)
GSG	33.9325	117.9172	03/29/2014	040942.3	4.8	5.10	0.174	VIII	5.2( 8.4)
GSP	33.9050	117.7920	08/08/2012	062334.1	10.0	4.50	0.127	VIII	5.2( 8.4)
GSP	33.9040	117.7910	08/08/2012	163322.1	10.0	4.50	0.126	VIII	5.2( 8.4)
GSP	33.9090	117.7920	06/14/2012	031715.7	9.0	4.00	0.096	VII	5.4( 8.6)
GSP	33.9070	117.7880	08/29/2012	203100.3	9.0	4.10	0.100	VII	5.5( 8.8)
MGI	33.8000	117.8000	11/07/1926	1948 0.0	0.0	4.60	0.121	VII	6.2( 10.0)
MGI	33.8000	117.8000	11/09/1926	1535 0.0	0.0	4.60	0.121	VII	6.2( 10.0)
MGI	33.8000	117.8000	05/20/1917	945 0.0	0.0	4.00	0.088	VII	6.2( 10.0)
MGI	33.8000	117.8000	11/04/1926	2238 0.0	0.0	4.60	0.121	VII	6.2( 10.0)
MGI	33.8000	117.8000	05/19/1917	635 0.0	0.0	4.00	0.088	VII	6.2( 10.0)
MGI	33.8000	117.8000	05/19/1917	719 0.0	0.0	4.00	0.088	VII	6.2( 10.0)
MGI	33.8000	117.8000	11/10/1926	1723 0.0	0.0	4.60	0.121	VII	6.2( 10.0)
GSP	33.9170	117.7760	09/03/2002	070851.9	12.0	4.80	0.132	VIII	6.4( 10.3)
GSG	33.9613	117.8923	03/29/2014	213245.9	9.4	4.14	0.092	VII	6.6( 10.6)
PAS	33.9650	117.8860	01/01/1976	172012.9	6.2	4.20	0.093	VII	6.8( 10.9)
DMG	33.8540	117.7520	10/04/1961	22131.6	4.3	4.10	0.087	VII	6.9( 11.1)
DMG	33.7670	117.8170	08/22/1936	521 0.0	0.0	4.00	0.078	VII	7.6( 12.2)
GSG	33.9530	117.7610	07/29/2008	184215.7	14.0	5.30	0.142	VIII	8.6( 13.9)
DMG	33.8000	118.0000	10/21/1913	938 0.0	0.0	4.00	0.071	VI	8.7( 14.1)
GSP	33.9550	117.7460	12/14/2001	120135.5	13.0	4.00	0.068	VI	9.4( 15.1)
GSP	33.8060	117.7150	03/07/2000	002028.2	11.0	4.00	0.065	VI	9.9( 15.9)
DMG	33.9960	117.9750	06/15/1967	458 5.5	10.0	4.10	0.065	VI	10.7( 17.2)
GSP	33.9510	117.7090	01/05/1998	181406.5	11.0	4.30	0.071	VI	10.9( 17.6)
DMG	33.7500	118.0000	11/16/1934	2126 0.0	0.0	4.00	0.061	VI	11.0( 17.7)
MGI	33.7000	117.9000	07/08/1902	945 0.0	0.0	4.00	0.058	VI	11.7( 18.8)
MGI	34.0000	118.0000	05/05/1929	1 7 0.0	0.0	4.60	0.079	VII	11.7( 18.9)
MGI	34.0000	118.0000	12/25/1903	1745 0.0	0.0	5.00	0.098	VII	11.7( 18.9)
MGI	34.0000	118.0000	05/05/1929	735 0.0	0.0	4.00	0.058	VI	11.7( 18.9)
PAS	34.0060	117.7390	02/18/1989	717 4.8	3.3	4.30	0.066	VI	12.2( 19.6)
DMG	33.9670	118.0500	01/30/1941	13446.9	0.0	4.10	0.059	VI	12.3( 19.8)
DMG	33.9000	118.1000	07/08/1929	1646 6.7	13.0	4.70	0.076	VII	13.3( 21.4)
MGI	34.0000	117.7000	12/03/1929	9 5 0.0	0.0	4.00	0.052	VI	13.4( 21.6)
DMG	33.7500	118.0830	03/11/1933	611 0.0	0.0	4.40	0.061	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	11 0 0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	2354 0.0	0.0	4.50	0.064	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	1129 0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	1138 0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/19/1933	2123 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/21/1933	326 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	2231 0.0	0.0	4.40	0.061	VI	14.6( 23.5)
DMG	33.7500	118.0830	04/01/1933	642 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	553 0.0	0.0	4.00	0.049	VI	14.6( 23.5)

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DMG	33.7500	118.0830	03/11/1933	22 0 0.0	0.0	4.40	0.061	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	832 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	618 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	740 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	635 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	027 0.0	0.0	4.40	0.061	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	1045 0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	1738 0.0	0.0	4.50	0.064	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	1825 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	2128 0.0	0.0	4.10	0.052	VI	14.6( 23.5)

EARTHQUAKE SEARCH RESULTS

Page 2

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.7500	118.0830	03/11/1933	259 0.0	0.0	4.60	0.068	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/13/1933	343 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/13/1933	432 0.0	0.0	4.70	0.071	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/13/1933	617 0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/13/1933	131828.0	0.0	5.30	0.098	VII	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	751 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	759 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	546 0.0	0.0	4.40	0.061	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	6 1 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	837 0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/14/1933	2242 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/15/1933	2 8 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	1547 0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	1653 0.0	0.0	4.80	0.075	VII	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	1944 0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	1956 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/16/1933	1529 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/16/1933	1530 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/17/1933	1651 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/18/1933	2052 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	2240 0.0	0.0	4.40	0.061	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/20/1933	1358 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	2 9 0.0	0.0	5.00	0.083	VII	14.6( 23.5)
DMG	33.7500	118.0830	03/23/1933	840 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/23/1933	1831 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/25/1933	1346 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/30/1933	1225 0.0	0.0	4.40	0.061	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/31/1933	1049 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	227 0.0	0.0	4.60	0.068	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	910 0.0	0.0	5.10	0.088	VII	14.6( 23.5)
DMG	33.7500	118.0830	03/15/1933	540 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	926 0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	1025 0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	258 0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	524 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	3 5 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	3 9 0.0	0.0	4.40	0.061	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	311 0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	1141 0.0	0.0	4.20	0.055	VI	14.6( 23.5)

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DMG	33.7500	118.0830	03/13/1933	1532	0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	339	0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/13/1933	1929	0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	1357	0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/14/1933	1219	0.0	0.0	4.50	0.064	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	440	0.0	0.0	4.70	0.071	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	616	0.0	0.0	4.60	0.068	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/15/1933	432	0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	515	0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	252	0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	521	0.0	0.0	4.40	0.061	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/16/1933	1456	0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	216	0.0	0.0	4.80	0.075	VII	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	555	0.0	0.0	4.00	0.049	VI	14.6( 23.5)

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]	
DMG	33.7500	118.0830	03/11/1933	2232	0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	439	0.0	0.0	4.90	0.079	VII	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	23 5	0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	2 5	0.0	0.0	4.30	0.058	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	210	0.0	0.0	4.60	0.068	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	448	0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	034	0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	211	0.0	0.0	4.40	0.061	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	222	0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	257	0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	230	0.0	0.0	5.10	0.088	VII	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	911	0.0	0.0	4.40	0.061	VI	14.6( 23.5)
DMG	33.7500	118.0830	04/02/1933	1536	0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	1147	0.0	0.0	4.40	0.061	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	1651	0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/14/1933	036	0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	436	0.0	0.0	4.60	0.068	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	15 2	0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	8 8	0.0	0.0	4.50	0.064	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	323	0.0	0.0	5.00	0.083	VII	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	336	0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/12/1933	835	0.0	0.0	4.20	0.055	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	347	0.0	0.0	4.10	0.052	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	513	0.0	0.0	4.70	0.071	VI	14.6( 23.5)
DMG	33.7500	118.0830	04/02/1933	8 0	0.0	0.0	4.00	0.049	VI	14.6( 23.5)
DMG	33.7500	118.0830	03/11/1933	2 4	0.0	0.0	4.90	0.079	VII	14.6( 23.5)
DMG	33.6800	117.9930	11/20/1961	85334.7	4.4	4.00	0.049	VI	14.7( 23.7)	
GSP	33.9920	118.0820	03/16/2010	110400.2	18.0	4.40	0.060	VI	14.8( 23.8)	
DMG	33.6650	117.9790	10/20/1961	214240.7	7.2	4.00	0.048	VI	15.3( 24.6)	
DMG	33.7670	118.1170	11/04/1939	2141 0.0	0.0	4.00	0.047	VI	15.7( 25.3)	
DMG	33.6590	117.9810	10/20/1961	20 714.5	6.1	4.00	0.047	VI	15.7( 25.3)	
DMG	33.6710	118.0120	10/20/1961	223534.2	5.6	4.10	0.049	VI	15.8( 25.4)	
DMG	33.9500	118.1330	10/25/1933	7 046.0	0.0	4.30	0.054	VI	16.0( 25.8)	
DMG	33.7330	118.1000	03/11/1933	1447 0.0	0.0	4.40	0.057	VI	16.1( 25.9)	
DMG	33.7330	118.1000	03/11/1933	15 9 0.0	0.0	4.40	0.057	VI	16.1( 25.9)	

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DMG	33.7330	118.1000	03/11/1933	1350 0.0	0.0	4.40	0.057	VI	16.1( 25.9)
DMG	33.7830	118.1330	01/13/1940	749 7.0	0.0	4.00	0.046	VI	16.1( 25.9)
DMG	33.7830	118.1330	11/20/1933	1032 0.0	0.0	4.00	0.046	VI	16.1( 25.9)
DMG	33.7830	118.1330	10/02/1933	91017.6	0.0	5.40	0.096	VII	16.1( 25.9)
DMG	33.7000	118.0670	03/11/1933	85457.0	0.0	5.10	0.082	VII	16.1( 26.0)
DMG	33.7000	118.0670	03/11/1933	51022.0	0.0	5.10	0.082	VII	16.1( 26.0)
DMG	33.7000	118.0670	02/08/1940	165617.0	0.0	4.00	0.046	VI	16.1( 26.0)
DMG	33.7000	118.0670	07/20/1940	4 113.0	0.0	4.00	0.046	VI	16.1( 26.0)
DMG	33.8000	117.6000	09/16/1903	1210 0.0	0.0	4.00	0.046	VI	16.2( 26.1)
MGI	33.8000	117.6000	04/22/1918	2115 0.0	0.0	5.00	0.077	VII	16.2( 26.1)
DMG	33.6540	117.9940	10/20/1961	194950.5	4.6	4.30	0.053	VI	16.2( 26.3)
DMG	33.6830	118.0500	03/11/1933	658 3.0	0.0	5.50	0.100	VII	16.4( 26.3)
DMG	33.6830	118.0500	03/11/1933	1250 0.0	0.0	4.40	0.056	VI	16.4( 26.3)
DMG	34.1000	117.8000	03/31/1931	2033 0.0	0.0	4.00	0.045	VI	16.5( 26.6)
DMG	33.7500	118.1330	03/11/1933	11 4 0.0	0.0	4.60	0.060	VI	17.1( 27.5)
GSP	33.6200	117.9000	04/07/1989	200730.2	13.0	4.50	0.057	VI	17.2( 27.6)
DMG	33.9500	117.5830	04/11/1941	12024.0	0.0	4.00	0.043	VI	17.5( 28.1)
PAS	34.0770	118.0470	02/11/1988	152555.7	12.5	4.70	0.062	VI	17.6( 28.3)

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
PAS	34.0500	118.0870	10/01/1987	155953.5	10.4	4.00	0.043	VI	17.6( 28.4)
MGI	34.1000	118.0000	01/27/1930	2026 0.0	0.0	4.60	0.059	VI	17.7( 28.4)
PAS	34.0520	118.0900	10/01/1987	151231.8	10.8	4.70	0.061	VI	17.9( 28.7)
PAS	34.0610	118.0790	10/01/1987	144220.0	9.5	5.90	0.115	VII	17.9( 28.8)
DMG	33.6170	117.9670	03/11/1933	154 7.8	0.0	6.30	0.141	VIII	18.2( 29.2)
PAS	34.0490	118.1010	10/01/1987	144541.5	13.6	4.70	0.061	VI	18.2( 29.2)
PAS	34.0600	118.1000	10/01/1987	1449 5.9	11.7	4.70	0.059	VI	18.7( 30.0)
DMG	33.7500	118.1670	05/16/1933	205855.0	0.0	4.00	0.041	V	18.8( 30.3)
GSP	34.1100	117.7200	04/17/1990	223227.2	4.0	4.60	0.056	VI	18.8( 30.3)
DMG	33.8670	118.2000	11/13/1933	2128 0.0	0.0	4.00	0.041	V	18.9( 30.3)
MGI	33.9000	118.2000	10/08/1927	1914 0.0	0.0	4.60	0.056	VI	19.0( 30.5)
PAS	34.0760	118.0900	10/01/1987	1448 3.1	11.7	4.10	0.043	VI	19.1( 30.7)
DMG	33.6170	118.0170	10/02/1933	1326 1.0	0.0	4.00	0.040	V	19.2( 30.9)
DMG	33.6170	118.0170	03/15/1933	111332.0	0.0	4.90	0.065	VI	19.2( 30.9)
DMG	33.6170	118.0170	03/14/1933	19 150.0	0.0	5.10	0.072	VI	19.2( 30.9)
PAS	34.0730	118.0980	10/04/1987	105938.2	8.2	5.30	0.080	VII	19.2( 30.9)
DMG	34.1000	117.6830	01/09/1934	1410 0.0	0.0	4.50	0.052	VI	19.3( 31.1)
DMG	34.1000	117.6830	01/18/1934	214 0.0	0.0	4.00	0.040	V	19.3( 31.1)
DMG	33.6170	118.0330	05/21/1938	944 0.0	0.0	4.00	0.040	V	19.6( 31.6)
DMG	33.7500	118.1830	08/04/1933	41748.0	0.0	4.00	0.039	V	19.6( 31.6)
DMG	33.7830	118.2000	12/27/1939	192849.0	0.0	4.70	0.057	VI	19.7( 31.8)
DMG	33.9390	118.2050	01/11/1950	214135.0	0.4	4.10	0.041	V	19.8( 31.8)
DMG	33.8670	118.2170	06/19/1944	3 6 7.0	0.0	4.40	0.048	VI	19.8( 31.9)
DMG	33.8670	118.2170	06/19/1944	0 333.0	0.0	4.50	0.051	VI	19.8( 31.9)
DMG	33.6000	118.0000	03/11/1933	217 0.0	0.0	4.50	0.051	VI	19.9( 32.0)
DMG	33.6000	118.0000	03/11/1933	231 0.0	0.0	4.40	0.048	VI	19.9( 32.0)
DMG	33.8170	118.2170	10/22/1941	65718.5	0.0	4.90	0.062	VI	20.1( 32.4)
DMG	33.6000	118.0170	12/25/1935	1715 0.0	0.0	4.50	0.050	VI	20.3( 32.6)
GSP	34.0200	118.1800	06/12/1989	172225.5	16.0	4.10	0.040	V	20.6( 33.1)
GSP	34.1300	117.7000	03/01/1990	003457.1	4.0	4.00	0.038	V	20.6( 33.1)
MGI	34.1000	118.1000	07/11/1855	415 0.0	0.0	6.30	0.128	VIII	20.7( 33.3)

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PAS	34.1360	117.7090	06/26/1988	15 458.5	7.9	4.60	0.052	VI	20.7( 33.3)
MGI	34.0000	118.2000	02/13/1917	13 5 0.0	0.0	4.60	0.052	VI	20.9( 33.7)
MGI	34.0000	118.2000	06/26/1917	2120 0.0	0.0	4.60	0.052	VI	20.9( 33.7)
MGI	34.0000	118.2000	06/26/1917	2130 0.0	0.0	4.60	0.052	VI	20.9( 33.7)
MGI	34.0000	118.2000	06/26/1917	2115 0.0	0.0	4.60	0.052	VI	20.9( 33.7)
MGI	34.0000	118.2000	06/26/1917	424 0.0	0.0	4.00	0.038	V	20.9( 33.7)
GSP	34.0300	118.1800	06/12/1989	165718.4	16.0	4.40	0.046	VI	20.9( 33.7)
DMG	33.5750	117.9830	03/11/1933	518 4.0	0.0	5.20	0.070	VI	21.2( 34.1)
GSP	34.1400	117.7000	02/28/1990	234336.6	5.0	5.20	0.070	VI	21.2( 34.1)
GSP	34.1500	117.7200	03/01/1990	032303.0	11.0	4.70	0.054	VI	21.3( 34.3)
GSP	34.1400	117.6900	03/02/1990	172625.4	6.0	4.60	0.051	VI	21.5( 34.6)
DMG	33.5670	117.9830	07/07/1937	1112 0.0	0.0	4.00	0.037	V	21.7( 35.0)
DMG	33.5670	117.9830	04/17/1934	1833 0.0	0.0	4.00	0.037	V	21.7( 35.0)
DMG	33.6820	117.5530	07/05/1938	18 655.7	10.0	4.50	0.047	VI	22.3( 35.9)
DMG	33.6170	118.1170	01/20/1934	2117 0.0	0.0	4.50	0.047	VI	22.3( 35.9)
DMG	33.7830	118.2500	11/14/1941	84136.3	0.0	5.40	0.075	VII	22.5( 36.2)
DMG	33.5450	117.8070	10/27/1969	1316 2.3	6.5	4.50	0.046	VI	22.6( 36.3)
DMG	33.8500	118.2670	03/11/1933	629 0.0	0.0	4.40	0.044	VI	22.7( 36.6)
DMG	33.8500	118.2670	03/11/1933	1425 0.0	0.0	5.00	0.060	VI	22.7( 36.6)
DMG	33.7170	117.5170	06/19/1935	1117 0.0	0.0	4.00	0.035	V	22.8( 36.7)
DMG	34.2000	117.9000	07/13/1935	105416.5	0.0	4.70	0.051	VI	23.0( 37.0)
DMG	34.2000	117.9000	08/28/1889	215 0.0	0.0	5.50	0.077	VII	23.0( 37.0)

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
MGI	34.0000	117.5000	12/16/1858	10 0 0.0	0.0	7.00	0.170	VIII	23.1( 37.2)
DMG	34.0000	117.5000	07/03/1908	1255 0.0	0.0	4.00	0.035	V	23.1( 37.2)
DMG	33.7590	118.2530	08/31/1938	31814.2	10.0	4.50	0.045	VI	23.2( 37.3)
GSP	33.9220	118.2700	10/28/2001	162745.6	21.0	4.00	0.035	V	23.2( 37.3)
DMG	33.7170	117.5070	08/06/1938	22 056.0	10.0	4.00	0.035	V	23.3( 37.5)
T-A	34.0000	118.2500	01/10/1856	0 0 0.0	0.0	5.00	0.058	VI	23.5( 37.9)
T-A	34.0000	118.2500	05/04/1857	6 0 0.0	0.0	4.30	0.040	V	23.5( 37.9)
T-A	34.0000	118.2500	03/21/1880	1425 0.0	0.0	4.30	0.040	V	23.5( 37.9)
T-A	34.0000	118.2500	03/26/1860	0 0 0.0	0.0	5.00	0.058	VI	23.5( 37.9)
T-A	34.0000	118.2500	09/23/1827	0 0 0.0	0.0	5.00	0.058	VI	23.5( 37.9)
T-A	34.0000	118.2500	01/17/1857	1 0 0.0	0.0	4.30	0.040	V	23.5( 37.9)
T-A	34.0000	118.2500	05/02/1856	810 0.0	0.0	4.30	0.040	V	23.5( 37.9)
DMG	33.7250	117.4980	01/03/1956	02548.9	13.7	4.70	0.050	VI	23.6( 37.9)
DMG	33.6990	117.5110	05/31/1938	83455.4	10.0	5.50	0.075	VII	23.7( 38.2)
DMG	33.5610	118.0580	01/15/1937	183547.0	10.0	4.00	0.034	V	23.7( 38.2)
DMG	33.7480	117.4790	06/22/1971	104119.0	8.0	4.20	0.038	V	24.0( 38.6)
MGI	34.2000	118.0000	01/09/1921	530 0.0	0.0	4.60	0.046	VI	24.1( 38.8)
PAS	34.1490	118.1350	12/03/1988	113826.4	13.3	4.90	0.053	VI	24.6( 39.6)
MGI	34.1000	118.2000	01/27/1860	830 0.0	0.0	4.30	0.039	V	24.7( 39.8)
MGI	34.1000	118.2000	05/02/1916	1432 0.0	0.0	4.00	0.033	V	24.7( 39.8)
MGI	34.1000	118.2000	04/21/1921	1538 0.0	0.0	4.00	0.033	V	24.7( 39.8)
DMG	33.6330	118.2000	11/01/1940	20 046.0	0.0	4.00	0.033	V	24.9( 40.0)
DMG	33.7330	117.4670	10/26/1954	162226.0	0.0	4.10	0.035	V	25.0( 40.2)
DMG	33.6300	118.2000	09/13/1929	132338.2	0.0	4.00	0.033	V	25.0( 40.2)
GSP	33.7330	117.4660	09/02/2007	172914.0	2.0	4.70	0.048	VI	25.0( 40.3)
DMG	33.8000	118.3000	11/03/1931	16 5 0.0	0.0	4.00	0.033	V	25.0( 40.3)
MGI	33.8000	118.3000	12/31/1928	1045 0.0	0.0	4.00	0.033	V	25.0( 40.3)

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DMG	33.8830	118.3170	03/11/1933	1457 0.0	0.0	4.90	0.052	VI	25.6( 41.2)
DMG	33.9830	118.3000	02/11/1940	192410.0	0.0	4.00	0.032	V	25.8( 41.6)
MGI	34.0000	118.3000	06/30/1920	350 0.0	0.0	4.00	0.032	V	26.2( 42.2)
MGI	34.0000	118.3000	09/03/1905	540 0.0	0.0	5.30	0.063	VI	26.2( 42.2)
MGI	34.0000	118.3000	06/22/1920	2035 0.0	0.0	4.00	0.032	V	26.2( 42.2)
MGI	34.0800	118.2600	07/16/1920	18 8 0.0	0.0	5.00	0.053	VI	26.7( 42.9)
DMG	34.1270	117.5210	12/27/1938	10 928.6	10.0	4.00	0.031	V	26.9( 43.2)
T-A	34.1700	118.1700	03/07/1888	1554 0.0	0.0	4.30	0.036	V	27.0( 43.4)
GSP	33.9380	118.3360	05/18/2009	033936.3	13.0	4.70	0.045	VI	27.1( 43.6)
DMG	33.8330	117.4000	06/05/1940	82727.0	0.0	4.00	0.031	V	27.1( 43.6)
GSP	34.2500	117.9900	06/28/1991	170055.5	9.0	4.30	0.036	V	27.3( 43.9)
DMG	34.1830	117.5830	10/03/1948	24628.0	0.0	4.00	0.031	V	27.3( 43.9)
PAS	33.5080	118.0710	11/20/1988	53928.7	6.0	4.50	0.040	V	27.4( 44.0)
T-A	34.0000	117.4200	09/10/1920	1415 0.0	0.0	4.30	0.036	V	27.4( 44.1)
T-A	34.0000	117.4200	04/12/1888	1315 0.0	0.0	4.30	0.036	V	27.4( 44.1)
DMG	33.5170	118.1000	03/22/1941	82240.0	0.0	4.00	0.031	V	27.5( 44.3)
DMG	34.1400	117.5150	01/01/1965	8 418.0	5.9	4.40	0.038	V	27.7( 44.6)
GSP	34.2620	118.0020	06/28/1991	144354.5	11.0	5.40	0.063	VI	28.2( 45.4)
DMG	34.1670	117.5330	03/01/1948	81213.0	0.0	4.70	0.043	VI	28.3( 45.6)
DMG	34.1160	117.4750	06/28/1960	20 048.0	12.0	4.10	0.031	V	28.4( 45.7)
MGI	34.0000	117.4000	05/22/1907	652 0.0	0.0	4.60	0.041	V	28.5( 45.8)
DMG	34.1240	117.4800	05/15/1955	17 326.0	7.6	4.00	0.030	V	28.5( 45.9)
DMG	34.1830	117.5480	09/01/1937	163533.5	10.0	4.50	0.039	V	28.6( 46.0)
DMG	33.9330	117.3670	10/24/1943	02921.0	0.0	4.00	0.029	V	29.2( 47.0)
MGI	34.1000	118.3000	07/26/1920	1215 0.0	0.0	4.00	0.029	V	29.3( 47.2)
MGI	34.1000	118.3000	07/16/1920	2127 0.0	0.0	4.60	0.040	V	29.3( 47.2)

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
MGI	34.1000	118.3000	07/16/1920	2022 0.0	0.0	4.60	0.040	V	29.3( 47.2)
MGI	34.1000	118.3000	07/16/1920	2130 0.0	0.0	4.60	0.040	V	29.3( 47.2)
DMG	33.7000	117.4000	05/15/1910	1547 0.0	0.0	6.00	0.083	VII	29.4( 47.3)
DMG	33.7000	117.4000	04/11/1910	757 0.0	0.0	5.00	0.049	VI	29.4( 47.3)
DMG	33.7000	117.4000	05/13/1910	620 0.0	0.0	5.00	0.049	VI	29.4( 47.3)
PAS	33.4710	118.0610	02/27/1984	101815.0	6.0	4.00	0.029	V	29.5( 47.4)
PAS	33.5380	118.2070	05/25/1982	134430.3	13.7	4.10	0.030	V	29.8( 48.0)
GSP	34.1390	117.4650	03/09/2008	092232.1	3.0	4.00	0.029	V	29.9( 48.0)
PAS	34.1350	117.4480	01/08/1983	71930.4	4.6	4.10	0.030	V	30.4( 49.0)
GSP	34.1250	117.4380	01/06/2005	143527.7	4.0	4.40	0.035	V	30.5( 49.1)
DMG	34.1120	117.4260	03/19/1937	12338.4	10.0	4.00	0.028	V	30.6( 49.2)
PAS	34.2110	117.5300	10/19/1979	122237.8	4.9	4.10	0.030	V	30.7( 49.4)
DMG	34.2110	117.5300	09/01/1937	1348 8.2	10.0	4.50	0.037	V	30.7( 49.4)
GSG	34.1430	117.4425	01/15/2014	093518.9	3.6	4.43	0.035	V	31.0( 49.9)
DMG	34.2000	117.5000	06/14/1892	1325 0.0	0.0	4.90	0.045	VI	31.3( 50.3)
DMG	34.1320	117.4260	04/15/1965	20 833.3	5.5	4.50	0.036	V	31.3( 50.4)
MGI	34.0000	118.4000	10/01/1930	040 0.0	0.0	4.60	0.038	V	31.6( 50.9)
MGI	34.0000	118.4000	02/07/1927	429 0.0	0.0	4.60	0.038	V	31.6( 50.9)
MGI	34.0000	118.4000	02/22/1920	1610 0.0	0.0	4.60	0.038	V	31.6( 50.9)
MGI	34.0000	118.4000	01/29/1927	2324 0.0	0.0	4.00	0.027	V	31.6( 50.9)
DMG	33.7830	118.4170	10/12/1940	024 0.0	0.0	4.00	0.027	V	31.8( 51.3)
DMG	33.7830	118.4170	10/14/1940	205111.0	0.0	4.00	0.027	V	31.8( 51.3)
DMG	33.7830	118.4170	11/01/1940	725 3.0	0.0	4.00	0.027	V	31.8( 51.3)

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DMG	33.7830	118.4170	11/02/1940	25826.0	0.0	4.00	0.027	V	31.8( 51.3)
DMG	34.0330	117.3500	04/18/1940	184343.9	0.0	4.40	0.034	V	32.0( 51.4)
DMG	33.9030	118.4310	11/29/1938	192115.8	10.0	4.00	0.027	V	32.2( 51.8)
GSG	33.6580	118.3720	05/15/2013	200006.2	1.2	4.00	0.027	V	32.2( 51.8)
GSG	33.6583	118.3722	05/15/2013	200006.2	1.2	4.00	0.027	V	32.2( 51.8)
GSP	34.0590	118.3870	09/09/2001	235918.0	4.0	4.20	0.030	V	32.4( 52.1)
DMG	34.0000	118.4170	12/07/1938	338 0.0	0.0	4.00	0.027	V	32.6( 52.4)
DMG	34.2170	117.4670	03/25/1941	234341.0	0.0	4.00	0.026	V	33.4( 53.8)
DMG	33.5000	118.2500	06/18/1920	10 8 0.0	0.0	4.50	0.034	V	33.4( 53.8)
USG	34.1390	117.3860	02/21/1987	231530.1	2.6	4.07	0.027	V	33.5( 53.9)
DMG	34.2700	117.5400	09/12/1970	143053.0	8.0	5.40	0.055	VI	33.6( 54.1)
DMG	34.3000	117.6000	07/30/1894	512 0.0	0.0	6.00	0.075	VII	33.6( 54.1)
DMG	34.0330	117.3170	09/03/1935	647 0.0	0.0	4.50	0.034	V	33.7( 54.3)
DMG	34.2810	117.5520	09/13/1970	44748.6	8.0	4.40	0.032	V	33.9( 54.5)
DMG	33.7670	118.4500	10/11/1940	55712.3	0.0	4.70	0.038	V	33.9( 54.6)
DMG	33.6630	118.4130	01/08/1967	738 5.3	17.7	4.00	0.026	V	34.2( 55.0)
DMG	34.2670	117.5180	09/12/1970	141011.2	8.0	4.10	0.027	V	34.2( 55.0)
DMG	33.6330	118.4000	10/17/1934	938 0.0	0.0	4.00	0.026	V	34.4( 55.4)
DMG	34.3040	117.5700	05/05/1969	16 2 9.6	8.8	4.40	0.032	V	34.7( 55.8)
DMG	34.0000	117.2830	11/07/1939	1852 8.4	0.0	4.70	0.037	V	34.9( 56.2)
DMG	34.1180	117.3410	09/22/1951	82239.1	11.9	4.30	0.030	V	34.9( 56.2)
DMG	33.5430	118.3400	09/14/1963	35116.2	2.2	4.20	0.028	V	35.0( 56.4)
DMG	34.1270	117.3380	02/23/1936	222042.7	10.0	4.50	0.033	V	35.4( 56.9)
DMG	34.2000	117.4000	07/22/1899	046 0.0	0.0	5.50	0.056	VI	35.4( 57.0)
GSP	34.1900	117.3900	12/28/1989	094108.1	15.0	4.50	0.033	V	35.4( 57.0)
DMG	33.9960	117.2700	02/17/1952	123658.3	16.0	4.50	0.033	V	35.6( 57.2)
DMG	33.7700	118.4800	04/24/1931	182754.8	0.0	4.40	0.031	V	35.6( 57.2)
DMG	34.1400	117.3390	02/26/1936	93327.6	10.0	4.00	0.025	V	35.8( 57.6)
MGI	33.8000	118.5000	06/18/1915	15 5 0.0	0.0	4.00	0.025	V	36.4( 58.5)
DMG	34.1000	117.3000	02/16/1931	1327 0.0	0.0	4.00	0.025	V	36.4( 58.6)

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
MGI	34.1000	117.3000	12/27/1901	11 0 0.0	0.0	4.60	0.034	V	36.4( 58.6)
MGI	34.1000	117.3000	11/22/1911	257 0.0	0.0	4.00	0.025	V	36.4( 58.6)
MGI	34.1000	117.3000	07/15/1905	2041 0.0	0.0	5.30	0.049	VI	36.4( 58.6)
GSP	34.1070	117.3040	01/09/2009	034946.3	14.0	4.50	0.032	V	36.4( 58.6)
DMG	34.3000	117.5000	07/22/1899	2032 0.0	0.0	6.50	0.092	VII	36.6( 58.9)
DMG	34.0000	117.2500	07/23/1923	73026.0	0.0	6.25	0.080	VII	36.7( 59.1)
DMG	34.0000	117.2500	11/01/1932	445 0.0	0.0	4.00	0.024	V	36.7( 59.1)
DMG	34.3700	117.6500	12/08/1812	15 0 0.0	0.0	7.00	0.118	VII	36.9( 59.4)
GSP	34.1680	117.3370	06/28/1997	214525.1	9.0	4.20	0.027	V	36.9( 59.4)
DMG	34.4000	117.8000	02/24/1946	6 752.0	0.0	4.10	0.026	V	37.0( 59.5)
DMG	34.0000	118.5000	11/08/1914	1140 0.0	0.0	4.50	0.032	V	37.2( 59.8)
MGI	34.0000	118.5000	03/08/1918	1230 0.0	0.0	4.00	0.024	V	37.2( 59.8)
DMG	34.0000	118.5000	06/22/1920	248 0.0	0.0	4.90	0.039	V	37.2( 59.8)
MGI	34.0000	118.5000	06/23/1920	1220 0.0	0.0	4.00	0.024	V	37.2( 59.8)
DMG	34.0000	118.5000	08/04/1927	1224 0.0	0.0	5.00	0.041	V	37.2( 59.8)
MGI	34.0000	118.5000	11/19/1918	2018 0.0	0.0	5.00	0.041	V	37.2( 59.8)
DMG	34.0000	118.5000	03/06/1918	1820 0.0	0.0	4.00	0.024	V	37.2( 59.8)
GSP	34.3740	117.6490	08/20/1998	234958.4	9.0	4.40	0.030	V	37.2( 59.9)
GSP	34.0470	117.2550	02/21/2000	134943.1	15.0	4.50	0.031	V	37.4( 60.2)

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PAS	34.0230	117.2450	10/02/1985	234412.4	15.2	4.80	0.037	V	37.4( 60.2)
T-A	34.1700	117.3200	12/02/1859	2210 0.0	0.0	4.30	0.028	V	37.8( 60.9)
DMG	33.6320	118.4670	01/08/1967	73730.4	11.4	4.00	0.024	IV	37.9( 61.0)
DMG	33.3670	118.1500	04/16/1942	72833.0	0.0	4.00	0.024	IV	38.1( 61.3)
GSP	34.3850	117.6350	10/16/2007	085344.1	8.0	4.20	0.026	V	38.2( 61.4)
GSP	34.0240	117.2300	03/11/1998	121851.8	14.0	4.50	0.031	V	38.3( 61.6)
T-A	34.0800	117.2500	10/07/1869	0 0 0.0	0.0	4.30	0.028	V	38.5( 61.9)
DMG	33.9000	117.2000	12/19/1880	0 0 0.0	0.0	6.00	0.068	VI	38.5( 62.0)
DMG	34.0430	117.2280	04/03/1939	25044.7	10.0	4.00	0.023	IV	38.8( 62.4)
GSG	34.0958	118.4912	06/02/2014	023643.9	4.4	4.16	0.026	V	38.8( 62.5)
GSG	34.1347	118.4858	03/17/2014	132536.9	9.9	4.39	0.028	V	39.7( 63.9)
MGI	34.2000	117.3000	04/13/1913	1045 0.0	0.0	4.00	0.023	IV	39.9( 64.3)
DMG	33.7380	117.1870	04/27/1962	91232.1	5.7	4.10	0.024	V	40.3( 64.8)
GSP	34.0050	117.1800	02/13/2010	213906.6	8.0	4.10	0.024	IV	40.7( 65.5)
DMG	34.3350	118.3310	02/09/1971	155820.7	14.2	4.80	0.034	V	41.6( 67.0)
MGI	34.1000	117.2000	04/23/1923	2113 0.0	0.0	4.00	0.022	IV	41.6( 67.0)
GSP	34.2930	118.3890	12/06/1994	034834.5	9.0	4.50	0.029	V	41.7( 67.1)
DMG	34.3390	118.3320	02/09/1971	141612.9	11.1	4.10	0.023	IV	41.9( 67.4)
GSP	34.2840	118.4040	01/14/2001	022614.1	8.0	4.30	0.026	V	41.9( 67.4)
GSP	34.2890	118.4030	01/14/2001	025053.7	8.0	4.00	0.022	IV	42.1( 67.7)
DMG	34.3610	118.3060	02/09/1971	141021.5	5.0	4.70	0.032	V	42.2( 67.9)
DMG	34.3700	118.3020	02/10/1971	31212.0	0.8	4.00	0.022	IV	42.5( 68.5)
GSP	34.2310	118.4750	03/20/1994	212012.3	13.0	5.30	0.043	VI	42.7( 68.7)
GSP	34.3120	118.3930	05/25/1994	125657.1	7.0	4.40	0.027	V	42.8( 68.9)
DMG	34.3680	118.3140	04/25/1971	1448 6.5	-2.0	4.00	0.022	IV	42.8( 68.9)
DMG	34.2680	118.4450	08/30/1964	225737.1	15.4	4.00	0.022	IV	42.9( 69.1)
GSP	34.3110	118.3980	06/15/1994	055948.6	7.0	4.20	0.024	V	42.9( 69.1)
GSP	34.2450	118.4710	01/18/1994	155144.9	12.0	4.00	0.022	IV	43.1( 69.3)
PAS	33.9190	118.6270	01/19/1989	65328.8	11.9	5.00	0.036	V	43.5( 69.9)
GSB	34.2990	118.4280	01/23/1994	085508.7	6.0	4.20	0.024	IV	43.6( 70.2)
GSP	34.2150	118.5100	01/19/1994	140914.8	17.0	4.50	0.028	V	43.7( 70.4)
DMG	33.9500	118.6320	08/31/1930	04036.0	0.0	5.20	0.040	V	44.0( 70.8)
GSP	34.2990	118.4390	02/03/1994	162335.4	8.0	4.20	0.024	IV	44.1( 70.9)
GSP	34.2870	118.4660	01/19/1994	071406.2	11.0	4.00	0.021	IV	44.7( 71.9)

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.3010	118.4520	01/21/1994	185244.2	7.0	4.30	0.025	V	44.7( 71.9)
GSP	34.2970	118.4580	01/21/1994	185344.6	7.0	4.30	0.025	V	44.8( 72.1)
GSP	34.2920	118.4660	01/19/1994	144635.2	6.0	4.00	0.021	IV	44.9( 72.2)
GSP	34.2130	118.5370	01/17/1994	123055.4	18.0	6.70	0.087	VII	44.9( 72.3)
DMG	34.2960	118.4640	03/30/1971	85443.3	2.6	4.10	0.022	IV	45.0( 72.4)
DMG	34.3080	118.4540	02/09/1971	144346.7	6.2	5.20	0.039	V	45.1( 72.6)
GSB	34.3000	118.4660	01/21/1994	183915.3	10.0	4.70	0.030	V	45.3( 72.8)
GSP	34.2910	118.4760	02/06/1994	131926.9	11.0	4.10	0.022	IV	45.3( 72.9)
GSP	34.3110	118.4560	01/17/1994	193534.3	2.0	4.00	0.021	IV	45.3( 73.0)
DMG	34.3570	118.4060	02/09/1971	141950.2	11.8	4.00	0.021	IV	45.6( 73.3)
GSP	34.3170	118.4550	01/17/1994	132644.7	2.0	4.70	0.030	V	45.6( 73.3)
DMG	34.3870	118.3640	02/09/1971	143917.8	-1.6	4.00	0.021	IV	45.6( 73.4)
GSP	34.3310	118.4420	01/17/1994	141430.3	1.0	4.50	0.027	V	45.7( 73.5)
DMG	33.7000	117.1000	06/11/1902	245 0.0	0.0	4.50	0.027	V	45.7( 73.6)
DMG	34.4110	118.3290	02/10/1971	5 636.0	4.7	4.30	0.024	V	45.7( 73.6)

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GSP	34.3040	118.4730	01/17/1994	150703.2	2.0	4.20	0.023	IV	45.7( 73.6)
GSP	33.9530	117.0760	09/14/2011	144451.0	16.0	4.10	0.022	IV	45.9( 73.9)
PAS	33.9330	118.6690	10/17/1979	205237.3	5.5	4.20	0.023	IV	45.9( 73.9)
GSB	34.3100	118.4740	01/21/1994	184228.8	7.0	4.20	0.023	IV	46.1( 74.1)
DMG	34.3960	118.3660	02/10/1971	173855.1	6.2	4.20	0.023	IV	46.2( 74.3)
GSP	34.2610	118.5340	01/17/1994	123939.8	14.0	4.50	0.026	V	46.6( 75.1)
PAS	33.9440	118.6810	01/01/1979	231438.9	11.3	5.00	0.034	V	46.7( 75.2)
DMG	34.2860	118.5150	03/31/1971	145222.5	2.1	4.60	0.028	V	46.8( 75.3)
GSP	34.2540	118.5450	01/17/1994	130627.9	0.0	4.60	0.028	V	46.9( 75.4)
DMG	34.2730	118.5320	06/21/1971	16 1 8.5	4.1	4.00	0.020	IV	47.0( 75.7)
GSP	34.2280	118.5730	01/17/1994	175608.2	19.0	4.60	0.028	V	47.2( 76.0)
DMG	34.2840	118.5280	04/02/1971	54025.0	3.0	4.00	0.020	IV	47.3( 76.1)
DMG	34.3530	118.4560	03/07/1971	13340.5	3.3	4.50	0.026	V	47.3( 76.2)
GSP	34.3390	118.4750	09/01/2011	204708.0	7.0	4.20	0.022	IV	47.4( 76.4)
GSG	34.3340	118.4840	01/17/1994	223152.1	10.0	4.20	0.022	IV	47.6( 76.6)
DMG	34.0170	117.0500	02/19/1940	12 655.7	0.0	4.60	0.027	V	48.1( 77.5)
DMG	34.3920	118.4270	02/21/1971	71511.7	7.2	4.50	0.026	V	48.2( 77.5)
DMG	34.4310	118.3690	08/14/1974	144555.2	8.2	4.20	0.022	IV	48.2( 77.5)
DMG	34.4110	118.4010	02/09/1971	14 041.8	8.4	6.40	0.070	VI	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 838.0	8.0	4.50	0.026	V	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 853.0	8.0	4.60	0.027	V	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 434.0	8.0	4.20	0.022	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 439.0	8.0	4.10	0.021	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	141028.0	8.0	5.30	0.039	V	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 159.0	8.0	4.10	0.021	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 231.0	8.0	4.70	0.029	V	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 2 3.0	8.0	4.10	0.021	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 230.0	8.0	4.30	0.023	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 4 7.0	8.0	4.10	0.021	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 154.0	8.0	4.20	0.022	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 444.0	8.0	4.10	0.021	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 133.0	8.0	4.20	0.022	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 150.0	8.0	4.50	0.026	V	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 730.0	8.0	4.00	0.020	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 8 7.0	8.0	4.20	0.022	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 745.0	8.0	4.50	0.026	V	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 346.0	8.0	4.10	0.021	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 710.0	8.0	4.00	0.020	IV	48.2( 77.6)

EARTHQUAKE SEARCH RESULTS

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	34.4110	118.4010	02/09/1971	14 8 4.0	8.0	4.00	0.020	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 541.0	8.0	4.10	0.021	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 244.0	8.0	5.80	0.051	VI	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 550.0	8.0	4.10	0.021	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 140.0	8.0	4.10	0.021	IV	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 1 8.0	8.0	5.80	0.051	VI	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 325.0	8.0	4.40	0.024	V	48.2( 77.6)
DMG	34.4110	118.4010	02/09/1971	14 446.0	8.0	4.20	0.022	IV	48.2( 77.6)
DMG	34.3560	118.4740	03/25/1971	2254 9.9	4.6	4.20	0.022	IV	48.2( 77.6)
DMG	34.3990	118.4190	02/10/1971	134953.7	9.7	4.30	0.023	IV	48.2( 77.6)
GSP	34.2740	118.5630	01/27/1994	171958.8	14.0	4.60	0.027	V	48.5( 78.1)

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GSP	34.3570	118.4800	02/25/1994	125912.6	1.0	4.10	0.021	IV	48.5( 78.1)
GSP	34.2180	118.6070	01/18/1994	113509.9	12.0	4.20	0.022	IV	48.6( 78.1)
DMG	34.5190	118.1980	08/23/1952	10 9 7.1	13.1	5.00	0.033	V	48.7( 78.4)
PAS	34.3800	118.4590	08/12/1977	21926.1	9.5	4.50	0.026	V	48.8( 78.5)
GSP	33.9320	117.0230	01/16/2010	120325.7	13.0	4.30	0.023	IV	48.8( 78.5)
DMG	34.2650	118.5770	04/15/1971	111432.0	4.2	4.20	0.022	IV	48.8( 78.6)
DMG	34.3840	118.4550	02/10/1971	113134.6	6.0	4.20	0.022	IV	48.8( 78.6)
DMG	34.3970	118.4390	02/21/1971	55052.6	6.9	4.70	0.028	V	48.9( 78.7)
GSP	34.2690	118.5760	01/17/1994	125546.8	16.0	4.10	0.021	IV	48.9( 78.7)
DMG	34.3610	118.4870	02/10/1971	143526.7	4.4	4.20	0.022	IV	49.0( 78.8)
DMG	34.4330	118.3980	02/09/1971	144017.4	-2.0	4.10	0.021	IV	49.3( 79.3)
DMG	34.4260	118.4140	02/10/1971	518 7.2	5.8	4.50	0.025	V	49.5( 79.6)
DMG	34.4280	118.4130	04/01/1971	15 3 3.6	8.0	4.10	0.020	IV	49.6( 79.7)
GSB	34.3010	118.5650	01/17/1994	204602.4	9.0	5.20	0.036	V	49.7( 80.0)
DMG	34.2000	117.1000	09/20/1907	154 0.0	0.0	6.00	0.056	VI	49.7( 80.0)
GSP	34.1920	117.0950	04/06/1994	190104.1	7.0	4.80	0.030	V	49.7( 80.0)
GSP	34.0540	117.0300	06/27/2005	221733.6	12.0	4.00	0.019	IV	49.9( 80.2)
GSP	34.3740	118.4950	01/28/1994	200953.4	0.0	4.20	0.021	IV	49.9( 80.4)
DMG	34.5650	118.1130	02/28/1969	45612.4	5.3	4.30	0.023	IV	50.1( 80.6)
GSB	34.3190	118.5580	01/18/1994	132444.1	1.0	4.50	0.025	V	50.1( 80.7)
DMG	33.8000	117.0000	12/25/1899	1225 0.0	0.0	6.40	0.068	VI	50.2( 80.7)
DMG	34.3990	118.4730	03/09/1974	05431.9	24.4	4.70	0.028	V	50.3( 80.9)
GSP	34.3050	118.5790	01/29/1994	112036.0	1.0	5.10	0.034	V	50.5( 81.3)
DMG	33.7500	117.0000	06/06/1918	2232 0.0	0.0	5.00	0.032	V	50.6( 81.5)
DMG	33.7500	117.0000	04/21/1918	223225.0	0.0	6.80	0.084	VII	50.6( 81.5)
DMG	34.0000	117.0000	06/30/1923	022 0.0	0.0	4.50	0.025	V	50.7( 81.6)
GSP	34.2780	118.6110	01/29/1994	121656.4	2.0	4.30	0.022	IV	50.9( 81.9)
GSB	34.3450	118.5520	01/24/1994	041518.8	6.0	4.80	0.029	V	51.0( 82.1)
GSP	34.0580	117.0100	06/16/2005	205326.0	11.0	4.90	0.031	V	51.0( 82.1)
DMG	34.3000	118.6000	04/04/1893	1940 0.0	0.0	6.00	0.054	VI	51.3( 82.5)
PAS	34.4630	118.4090	09/24/1977	212824.3	5.0	4.20	0.021	IV	51.3( 82.6)
DMG	34.4460	118.4360	02/10/1971	185441.7	8.1	4.20	0.021	IV	51.3( 82.6)
DMG	34.4570	118.4270	02/09/1971	161926.5	-1.0	4.20	0.021	IV	51.6( 83.1)
GSB	34.2850	118.6240	01/17/1994	135602.4	19.0	4.70	0.027	V	51.8( 83.4)
GSP	34.3000	118.6200	08/09/2007	075849.0	4.0	4.40	0.023	IV	52.2( 84.0)
GSB	34.3600	118.5710	01/19/1994	044048.0	2.0	4.50	0.024	V	52.5( 84.5)
GSP	34.0970	116.9960	12/05/1997	170438.9	4.0	4.10	0.020	IV	52.5( 84.6)
T-A	33.5000	117.0700	12/29/1880	7 0 0.0	0.0	4.30	0.022	IV	52.6( 84.6)
GSP	34.0850	116.9890	06/30/1992	214900.3	3.0	4.40	0.023	IV	52.7( 84.8)
GSP	34.3790	118.5610	01/18/1994	152346.9	7.0	4.80	0.028	V	52.9( 85.2)
GSP	34.1200	116.9980	06/29/1992	144126.0	4.0	4.40	0.023	IV	52.9( 85.2)
GSP	34.3790	118.5630	01/18/1994	003935.0	7.0	4.40	0.023	IV	53.0( 85.3)

EARTHQUAKE SEARCH RESULTS

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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.1800	117.0200	12/04/1991	081703.5	11.0	4.00	0.018	IV	53.3( 85.7)
GSB	34.3330	118.6230	01/18/1994	072356.0	14.0	4.30	0.021	IV	53.7( 86.4)
GSP	34.0840	116.9680	10/02/2008	094149.3	12.0	4.10	0.019	IV	53.8( 86.6)
GSG	34.4080	118.5590	01/17/1994	200205.4	0.0	4.00	0.018	IV	54.2( 87.2)
GSP	34.3620	118.6150	03/20/1996	073759.8	13.0	4.10	0.019	IV	54.5( 87.7)
GSB	34.3580	118.6220	01/18/1994	040126.8	1.0	4.50	0.023	IV	54.7( 88.0)
DMG	34.3440	118.6360	02/09/1971	143436.1	-2.0	4.90	0.029	V	54.7( 88.1)

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DMG	34.1670	116.9830	10/16/1951	1241 5.0	0.0	4.00	0.018	IV	54.9( 88.3)
GSP	34.1570	116.9760	12/19/2007	121409.0	7.0	4.00	0.018	IV	55.0( 88.5)
GSP	34.3590	118.6290	01/24/1994	055024.3	12.0	4.30	0.021	IV	55.0( 88.5)
PAS	34.1510	116.9720	11/20/1978	655 9.5	6.1	4.30	0.021	IV	55.1( 88.6)
GSP	34.3630	118.6270	01/24/1994	055421.1	10.0	4.20	0.020	IV	55.1( 88.7)
GSP	34.3780	118.6180	01/19/1994	211144.9	11.0	5.10	0.032	V	55.4( 89.1)
GSP	34.3740	118.6220	01/17/1994	155410.8	12.0	4.80	0.027	V	55.4( 89.1)
DMG	33.7100	116.9250	09/23/1963	144152.6	16.5	5.00	0.030	V	55.4( 89.1)
DMG	34.1000	118.8000	05/10/1911	1340 0.0	0.0	4.00	0.018	IV	55.5( 89.4)
DMG	34.3800	118.6230	10/29/1936	223536.1	10.0	4.00	0.018	IV	55.7( 89.6)
PAS	34.3470	118.6560	04/08/1976	152138.1	14.5	4.60	0.024	V	55.8( 89.7)
GSP	34.3680	118.6370	01/17/1994	194353.4	13.0	4.10	0.019	IV	55.8( 89.7)
GSP	34.3970	118.6090	07/22/1999	095724.0	11.0	4.00	0.018	IV	55.8( 89.8)
DMG	34.1330	116.9500	06/10/1938	1440 0.0	0.0	4.00	0.018	IV	55.8( 89.8)
MGI	33.8000	116.9000	06/14/1918	1024 0.0	0.0	4.00	0.018	IV	55.9( 89.9)
MGI	33.8000	116.9000	04/23/1918	1415 0.0	0.0	4.00	0.018	IV	55.9( 89.9)
MGI	33.8000	116.9000	04/29/1918	2 0 0.0	0.0	4.00	0.018	IV	55.9( 89.9)
MGI	33.8000	116.9000	12/18/1920	1726 0.0	0.0	4.00	0.018	IV	55.9( 89.9)
GSG	34.2800	117.0278	07/05/2014	165934.1	8.7	4.58	0.024	V	56.0( 90.1)
GSB	34.3430	118.6660	01/17/1994	234925.4	8.0	4.30	0.021	IV	56.1( 90.2)
DMG	33.5000	117.0000	08/08/1925	1013 0.0	0.0	4.50	0.023	IV	56.1( 90.3)
GSP	34.3610	118.6570	01/29/2002	055328.9	14.0	4.20	0.020	IV	56.4( 90.7)
DMG	34.4850	118.5210	07/16/1965	74622.4	15.1	4.00	0.018	IV	56.5( 91.0)
GSP	34.3770	118.6490	04/27/1997	110928.4	15.0	4.80	0.027	V	56.7( 91.2)
GSP	34.1210	116.9280	08/16/1998	133440.2	6.0	4.70	0.025	V	56.7( 91.3)
GSP	34.3260	118.6980	01/17/1994	233330.7	9.0	5.60	0.041	V	56.9( 91.6)
PAS	34.1980	116.9590	04/01/1978	105227.4	8.0	4.00	0.017	IV	57.0( 91.7)
GSP	34.1120	116.9200	10/01/1998	181816.0	4.0	4.70	0.025	V	57.0( 91.7)
DMG	33.9680	116.8820	06/27/1959	162211.1	13.8	4.00	0.017	IV	57.1( 91.9)
GSG	34.3040	118.7220	01/17/1994	221922.3	10.0	4.00	0.017	IV	57.2( 92.1)
GSP	34.3690	118.6720	04/26/1997	103730.7	16.0	5.10	0.031	V	57.4( 92.4)
GSP	33.9660	116.8760	01/12/2010	023608.4	10.0	4.30	0.020	IV	57.4( 92.4)
PAS	33.0330	117.9440	02/22/1983	21830.4	10.0	4.30	0.020	IV	57.8( 93.0)
GSP	34.3040	118.7370	01/19/1994	091310.9	13.0	4.10	0.018	IV	58.0( 93.3)
GSP	34.3540	118.7040	05/01/1996	194956.4	14.0	4.10	0.018	IV	58.3( 93.8)
GSP	34.3940	118.6690	06/26/1995	084028.9	13.0	5.00	0.029	V	58.3( 93.8)
GSP	34.1780	116.9220	06/28/1992	170131.9	13.0	4.70	0.025	V	58.4( 94.0)
DMG	34.1800	116.9200	01/16/1930	02433.9	0.0	5.20	0.032	V	58.5( 94.2)
DMG	34.1800	116.9200	01/16/1930	034 3.6	0.0	5.10	0.030	V	58.5( 94.2)
DMG	34.2670	116.9670	08/29/1943	35754.0	0.0	4.00	0.017	IV	58.6( 94.3)
DMG	34.2670	116.9670	08/29/1943	34513.0	0.0	5.50	0.038	V	58.6( 94.3)
DMG	34.2670	116.9670	08/29/1943	51630.0	0.0	4.00	0.017	IV	58.6( 94.3)
GSP	34.5000	118.5600	07/05/1991	174157.1	11.0	4.10	0.018	IV	58.8( 94.6)
DMG	33.9500	116.8500	09/28/1946	719 9.0	0.0	5.00	0.029	V	58.8( 94.6)
DMG	34.1000	116.8830	10/24/1935	1452 0.0	0.0	4.50	0.022	IV	58.8( 94.6)
DMG	34.1000	116.8830	10/24/1935	1527 0.0	0.0	4.00	0.017	IV	58.8( 94.6)

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EARTHQUAKE SEARCH RESULTS  
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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	34.1000	116.8830	10/24/1935	1451 0.0	0.0	4.50	0.022	IV	58.8( 94.6)
USG	33.0170	117.8170	07/16/1986	1247 3.7	10.0	4.11	0.018	IV	58.8( 94.6)
USG	33.0170	117.8170	07/14/1986	11112.6	10.0	4.12	0.018	IV	58.8( 94.6)

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GSP	34.3650	118.7080	01/19/1994	044314.5	12.0	4.10	0.018	IV	58.9( 94.8)
GSP	34.3770	118.6980	01/18/1994	004308.9	11.0	5.20	0.032	V	58.9( 94.8)
DMG	34.3330	117.0000	02/27/1942	1 853.0	0.0	4.00	0.017	IV	59.3( 95.4)
GSP	34.0690	118.8820	05/02/2009	011113.7	14.0	4.40	0.021	IV	59.5( 95.8)
GSB	34.3790	118.7110	01/19/1994	210928.6	14.0	5.50	0.037	V	59.6( 95.9)
MGI	34.2000	116.9000	10/10/1915	5 6 0.0	0.0	4.00	0.017	IV	60.1( 96.7)
DMG	33.5000	116.9170	11/04/1935	355 0.0	0.0	4.50	0.022	IV	60.4( 97.2)
GSP	34.2900	116.9460	02/10/2001	210505.8	9.0	5.10	0.030	V	60.4( 97.2)
PAS	33.7010	116.8370	08/22/1979	2 136.3	5.0	4.10	0.018	IV	60.4( 97.3)
GSP	34.2870	116.9420	02/11/2001	003916.0	8.0	4.20	0.018	IV	60.5( 97.4)
PAS	32.9900	117.8490	07/13/1986	14 133.0	12.0	4.60	0.023	IV	60.6( 97.5)
PAS	32.9860	117.8440	10/01/1986	201218.6	6.0	4.00	0.017	IV	60.9( 98.0)
GSP	32.9850	117.8180	06/21/1995	211736.2	6.0	4.30	0.019	IV	61.0( 98.2)
GSP	34.1410	116.8570	09/19/1997	223714.5	10.0	4.10	0.017	IV	61.0( 98.2)
GSP	34.2560	116.9120	06/28/1992	170557.5	8.0	4.60	0.023	IV	61.1( 98.3)
GSP	34.0490	118.9150	02/19/1995	212418.1	15.0	4.30	0.019	IV	61.1( 98.3)
PAS	34.2460	116.9010	06/29/1979	55320.5	5.7	4.60	0.023	IV	61.3( 98.7)
PAS	34.2490	116.9000	06/30/1979	7 353.0	5.6	4.50	0.021	IV	61.5( 98.9)
PAS	34.2430	116.8960	06/30/1979	03411.6	5.8	4.90	0.026	V	61.5( 99.0)
GSP	34.1630	116.8550	06/28/1992	144321.0	6.0	5.30	0.033	V	61.6( 99.2)
DMG	33.9670	116.8000	09/07/1945	153424.0	0.0	4.30	0.019	IV	61.7( 99.4)
PAS	32.9710	117.8700	07/13/1986	1347 8.2	6.0	5.30	0.032	V	61.9( 99.6)

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 -END OF SEARCH- 555 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 2016

LENGTH OF SEARCH TIME: 217 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 4.9 MILES (8.0 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.0

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.174 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:

a-value= 3.636

b-value= 0.813

beta-value= 1.873

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 TABLE OF MAGNITUDES AND EXCEEDANCES:  
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Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	555	2.56944
4.5	213	0.98611
5.0	76	0.35185
5.5	25	0.11574
6.0	15	0.06944
6.5	5	0.02315
7.0	2	0.00926

**APPENDIX E**  
**GENERAL EARTHWORK AND GRADING**  
**RECOMMENDATIONS**



Leighton

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APPENDIX E  
LEIGHTON AND ASSOCIATES, INC.  
GENERAL EARTHWORK AND GRADING SPECIFICATIONS FOR ROUGH GRADING

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LEIGHTON AND ASSOCIATES, INC.

GENERAL EARTHWORK AND GRADING SPECIFICATIONS FOR ROUGH GRADING

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B - Oversize Rock Disposal	Rear of Text
C - Canyon Subdrains	Rear of Text
D - Buttress or Replacement Fill Subdrains	Rear of Text
E - Transition Lot Fills and Side Hill Fills	Rear of Text

## 1.0 GENERAL

### 1.1 Intent

These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

### 1.2 The Geotechnical Consultant of Record

Prior to commencement of work, the owner shall employ the Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultants shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction.

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General Earthwork and Grading Specifications

The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

**1.3 The Earthwork Contractor**

The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified.

**2.0 PREPARATION OF AREAS TO BE FILLED**

**2.1 Clearing and Grubbing**

Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

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General Earthwork and Grading Specifications

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

**2.2 Processing**

Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

**2.3 Overexcavation**

In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

**2.4 Benching**

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical

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Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

**2.5 Evaluation/Acceptance of Fill Areas**

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

**3.0 FILL MATERIAL**

**3.1 General**

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

**3.2 Oversize**

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

**3.3 Import**

If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

#### **4.0 FILL PLACEMENT AND COMPACTION**

##### **4.1 Fill Layers**

Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

##### **4.2 Fill Moisture Conditioning**

Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557).

##### **4.3 Compaction of Fill**

After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

##### **4.4 Compaction of Fill Slopes**

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.

##### **4.5 Compaction Testing**

Field-tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify

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General Earthwork and Grading Specifications

adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

**4.6 Frequency of Compaction Testing**

Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

**4.7 Compaction Test Locations**

The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

**5.0 SUBDRAIN INSTALLATION**

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

**6.0 EXCAVATION**

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of

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General Earthwork and Grading Specifications

the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

**7.0 TRENCH BACKFILLS**

**7.1 Safety**

The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations.

**7.2 Bedding and Backfill**

All bedding and backfill of utility trenches shall be performed in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 ( $SE > 30$ ). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of relative compaction from 1 foot above the top of the conduit to the surface.

The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

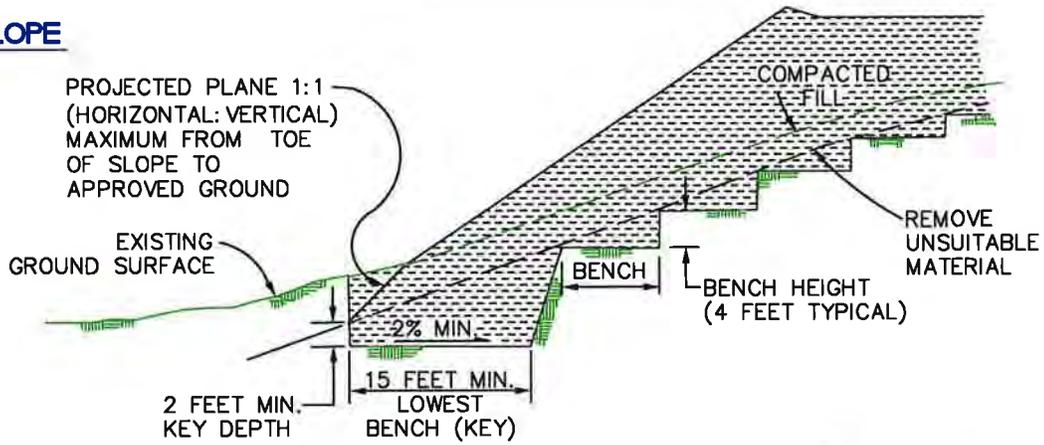
**7.3 Lift Thickness**

Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

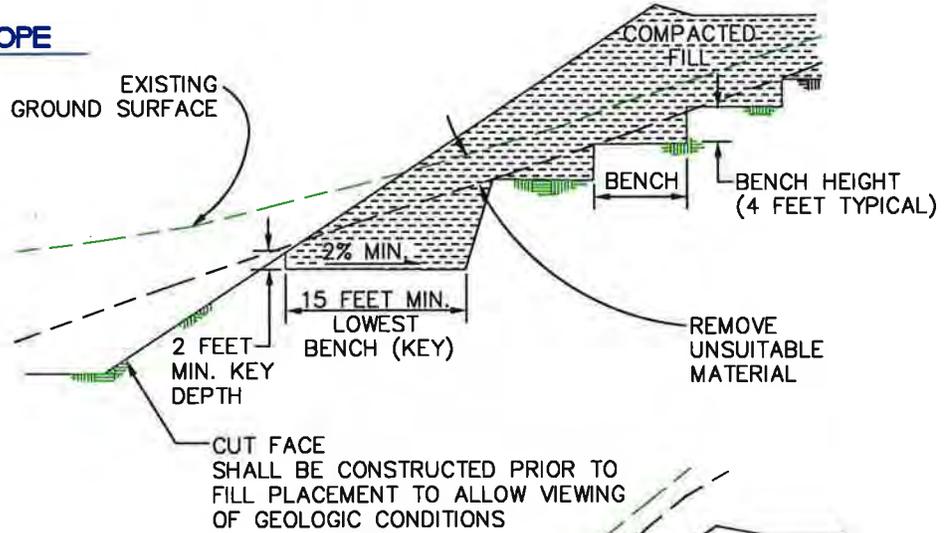
**7.4 Observation and Testing**

The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

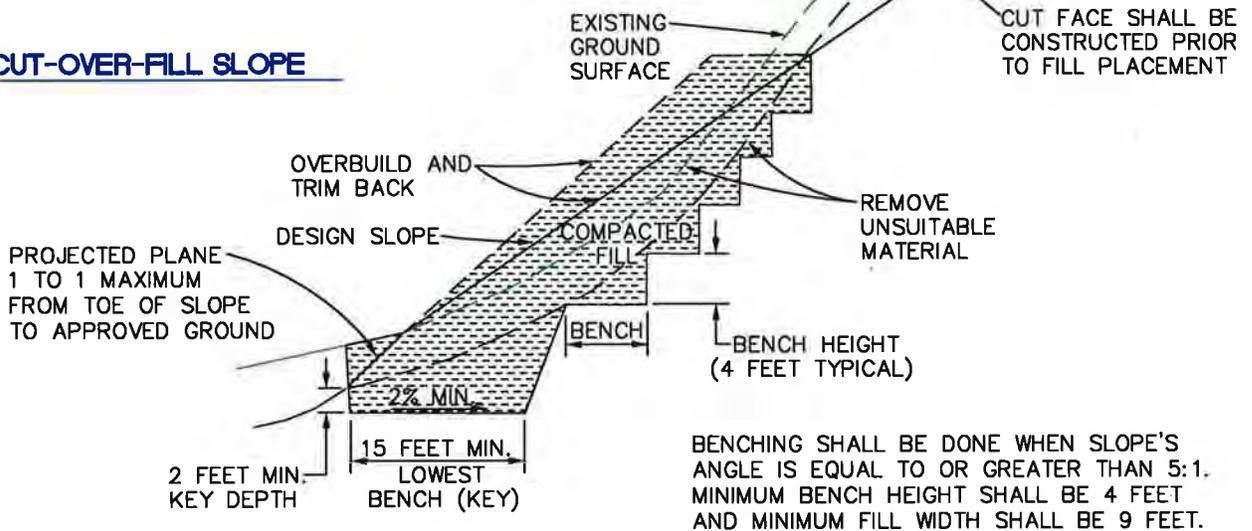
**FILL SLOPE**



**FILL-OVER-CUT SLOPE**



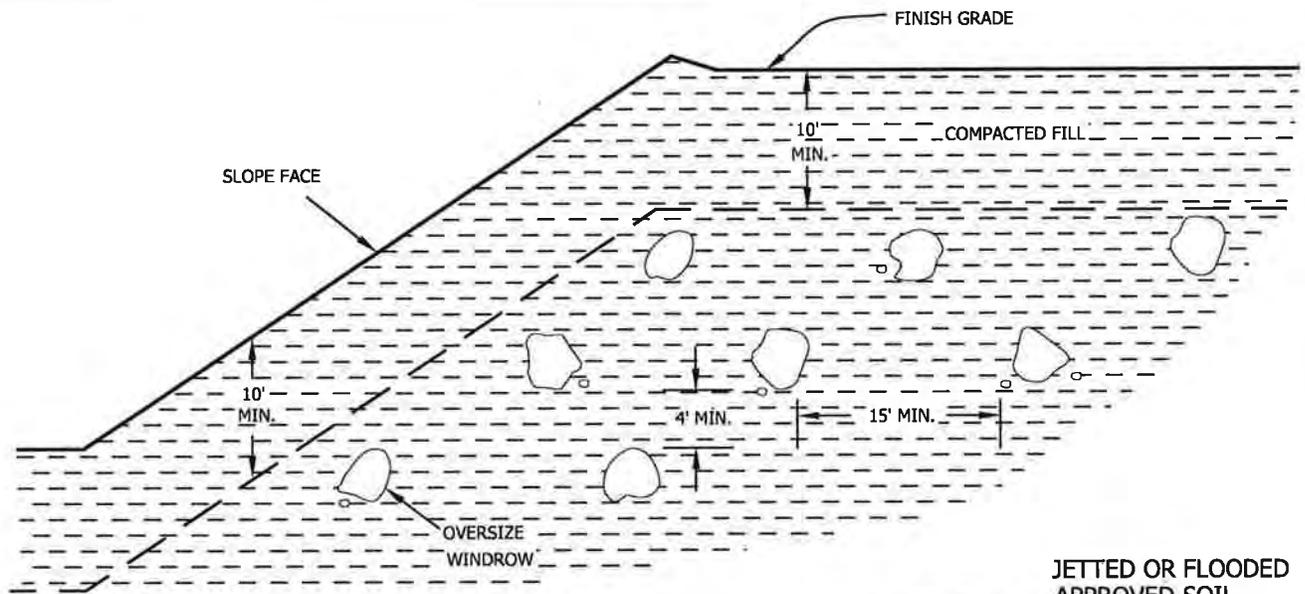
**CUT-OVER-FILL SLOPE**



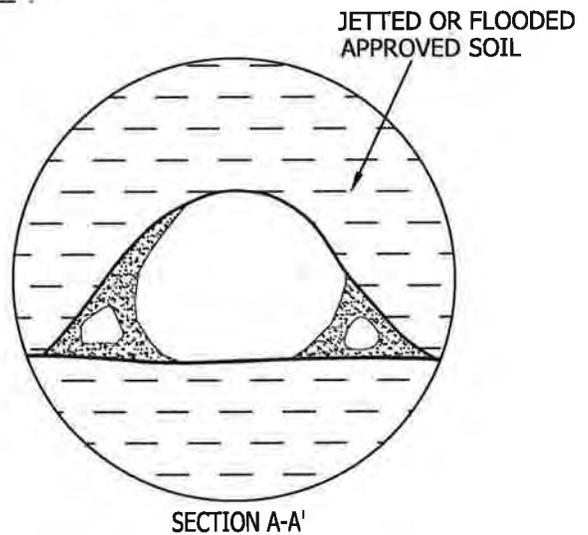
KEYING AND BENCHING

GENERAL EARTHWORK AND GRADING  
SPECIFICATIONS  
STANDARD DETAILS A

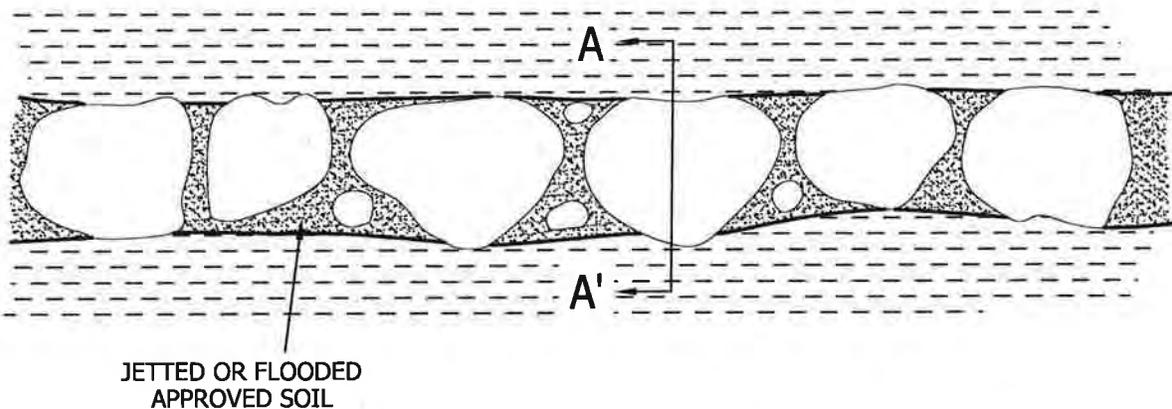




- Oversize rock is larger than 8 inches in largest dimension.
- Backfill with approved soil jetted or flooded in place to fill all the voids.
- Do not bury rock within 10 feet of finish grade.
- Windrow of buried rock shall be parallel to the finished slope face.



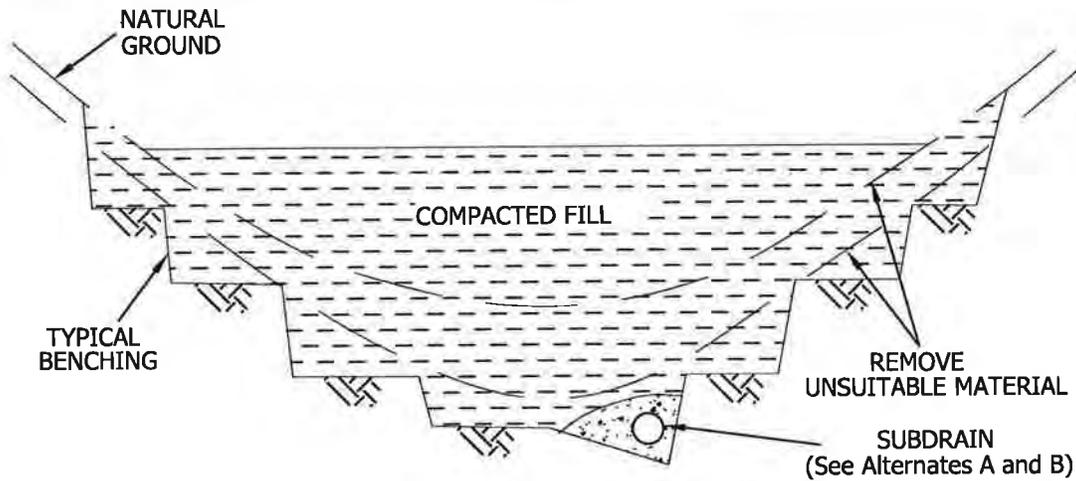
PROFILE ALONG WINDROW



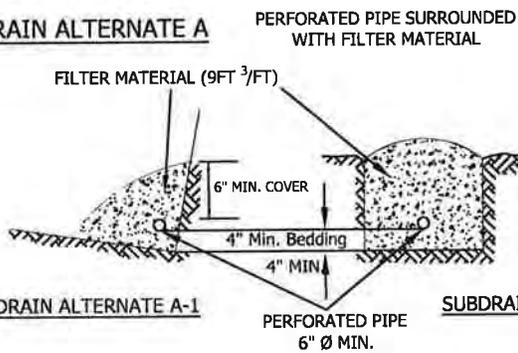
OVERSIZE ROCK DISPOSAL

GENERAL EARTHWORK AND GRADING  
SPECIFICATIONS  
STANDARD DETAILS B





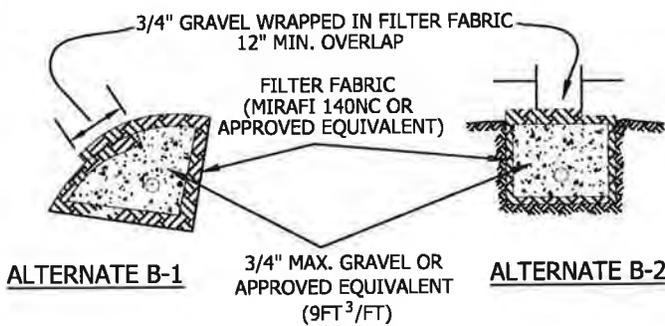
**SUBDRAIN ALTERNATE A**



**FILTER MATERIAL**  
 FILTER MATERIAL SHALL BE CLASS 2 PERMEABLE MATERIAL PER STATE OF CALIFORNIA STANDARD SPECIFICATION, OR APPROVED ALTERNATE.  
 CLASS 2 GRADING AS FOLLOWS:

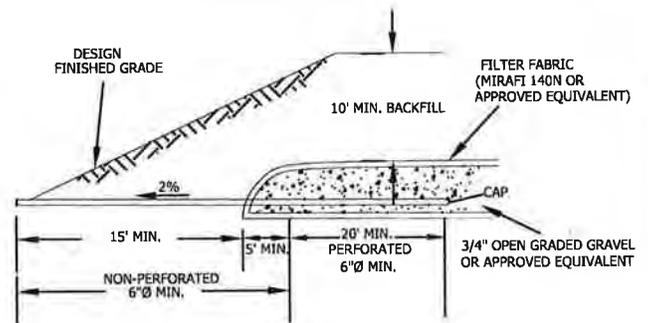
Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

**SUBDRAIN ALTERNATE B**



○ PERFORATED PIPE IS OPTIONAL PER GOVERNING AGENCY'S REQUIREMENTS

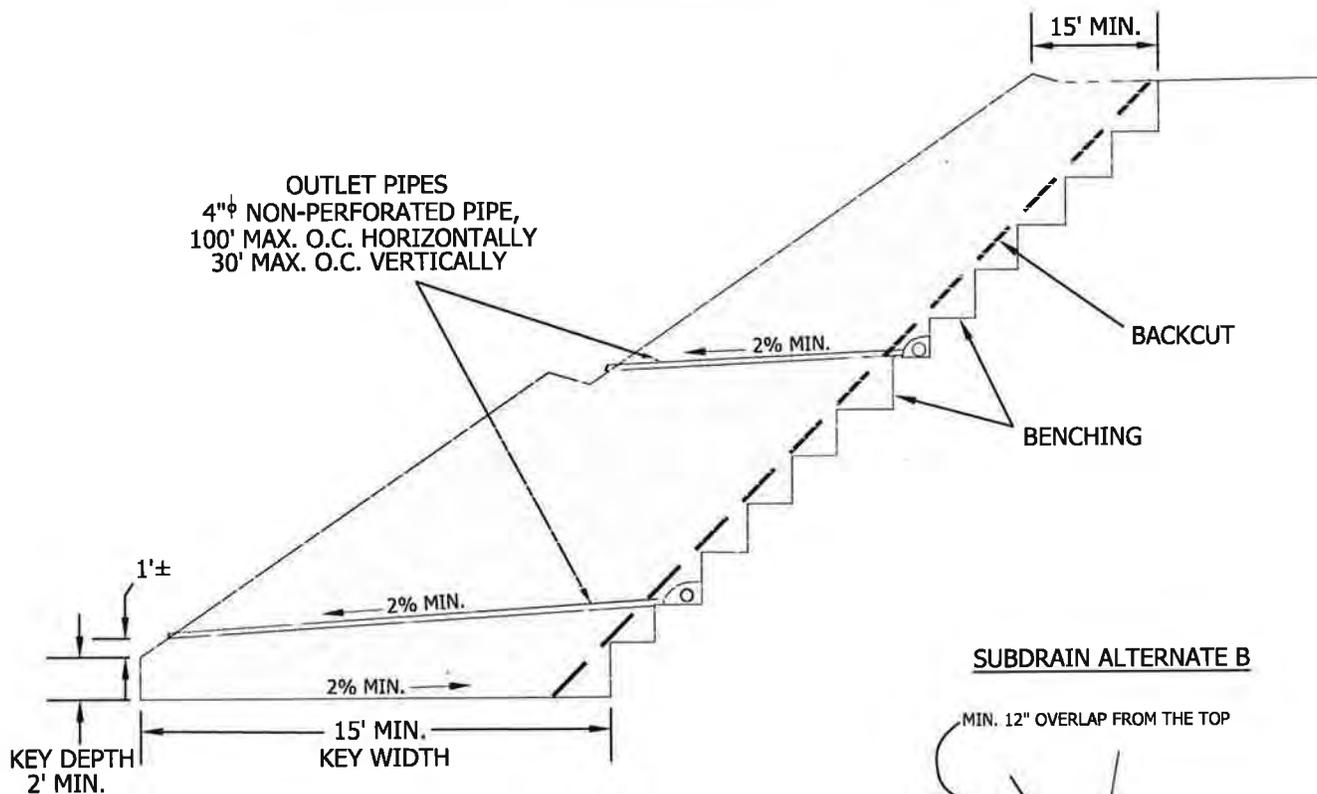
**DETAIL OF CANYON SUBDRAIN TERMINAL**



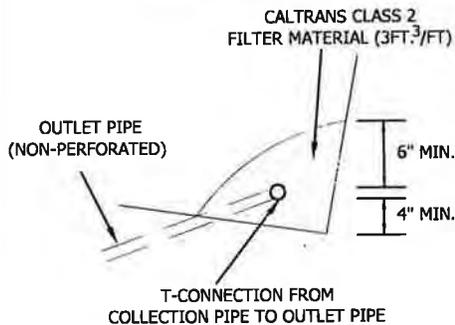
CANYON  
SUBDRAIN

GENERAL EARTHWORK AND GRADING  
SPECIFICATIONS  
STANDARD DETAILS C



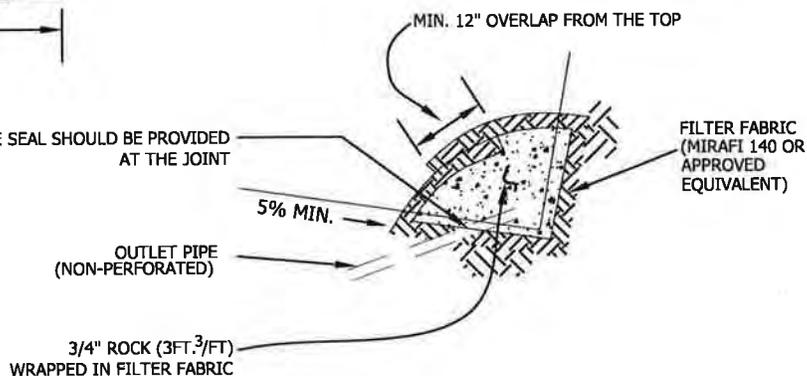


**SUBDRAIN ALTERNATE A**



POSITIVE SEAL SHOULD BE PROVIDED  
 AT THE JOINT

**SUBDRAIN ALTERNATE B**



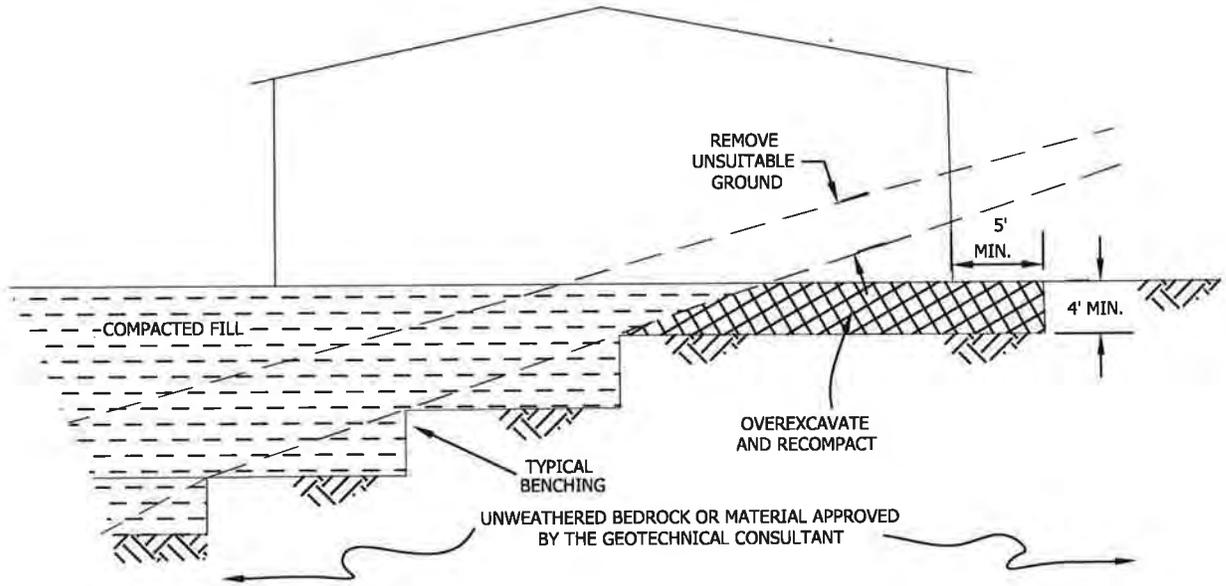
- **SUBDRAIN INSTALLATION** - Subdrain collector pipe shall be installed with perforations down or, unless otherwise designated by the geotechnical consultant. Outlet pipes shall be non-perforated pipe. The subdrain pipe shall have at least 8 perforations uniformly spaced per foot. Perforation shall be 1/4" to 1/2" if drilled holes are used. All subdrain pipes shall have a gradient at least 2% towards the outlet.
- **SUBDRAIN PIPE** - Subdrain pipe shall be ASTM D2751, ASTM D1527 (Schedule 40) or SDR 23.5 ABS pipe or ASTM D3034 (Schedule 40) or SDR 23.5 PVC pipe.
- All outlet pipe shall be placed in a trench and, after fill is placed above it, rodged to verify integrity.

**BUTTRESS OR  
 REPLACEMENT FILL  
 SUBDRAINS**

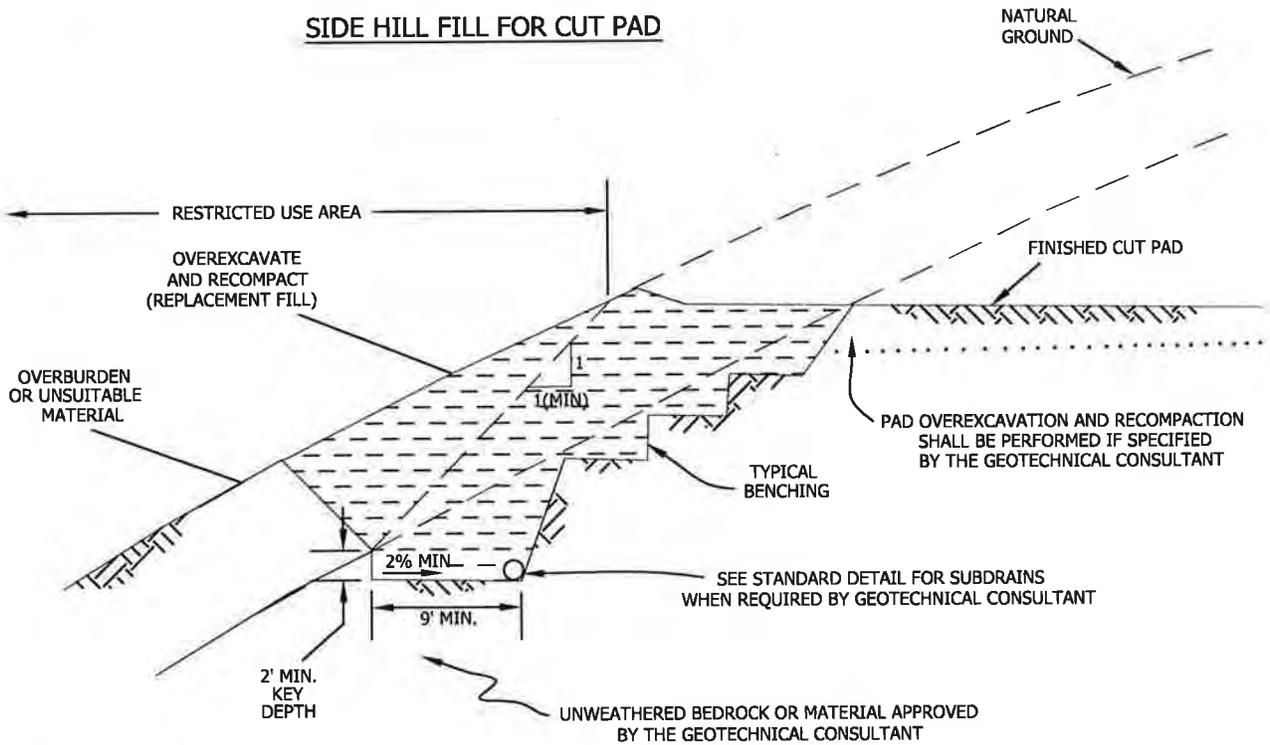
**GENERAL EARTHWORK AND GRADING  
 SPECIFICATIONS  
 STANDARD DETAILS D**



**CUT-FILL TRANSITION LOT OVEREXCAVATION**



**SIDE HILL FILL FOR CUT PAD**



**TRANSITION LOT FILLS  
AND SIDE HILL FILLS**

**GENERAL EARTHWORK AND GRADING  
SPECIFICATIONS  
STANDARD DETAILS E**



C2

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Due-Diligence Level Geotechnical  
Exploration Report

**DUE-DILIGENCE LEVEL GEOTECHNICAL  
EXPLORATION REPORT  
PROPOSED APARTMENT BUILDING  
110 AND 132 EAST CROWTHER AVENUE  
PLACENTIA, CALIFORNIA**

Prepared for:

**Integral Communities**

888 San Clemente, Suite 100  
Newport Beach, California 92660

Project No. 11263.001

March 11, 2016



**Leighton and Associates, Inc.**

A LEIGHTON GROUP COMPANY



Leighton and Associates, Inc.  
A LEIGHTON GROUP COMPANY

March 11, 2016

Project No. 11263.001

Integral Communities  
888 San Clemente Drive, Suite 100  
Newport Beach, California 92600

Attention: Mr. Erik Weeks, Vice President

**Subject: Due-Diligence Level Geotechnical Exploration Report  
Proposed Apartment Building  
110 and 132 East Crowther Avenue  
Placentia, California**

Per your request and authorization, Leighton and Associates, Inc. (Leighton) has prepared this due-diligence level geotechnical exploration report for the subject project. Review of a conceptual development plan for the project (Urban Arena, 2015) indicates the 3-acre project site will consist of a 5-story apartment building, a 5-level parking structure with an amenities rooftop deck that includes a lounge and pool, paving, hardscaping, landscaping, and associated utility infrastructure. No subterranean levels are currently being considered. The purpose of our work was to evaluate the general geotechnical conditions of the site and provide preliminary geotechnical recommendations for project planning.

Based on our due-diligence level exploration and a review of available data, the site is underlain by 8 to 10 feet of undocumented artificial fill overlying very old alluvial fan deposits. The proposed development may be supported on shallow spread footings established in engineered fill or undisturbed natural soils.

No known active or potentially active faults are mapped as crossing the site and the site is not located within an Alquist-Priolo Special Studies Zones. In addition, the site is not located within a liquefaction hazard zone as mapped by the California Geological Survey (CGS); however, significant ground shaking should be anticipated at the site during the expected life of the proposed structures.

We appreciate the opportunity to work with you on this project. If you have any questions or if we can be of further service, please contact us at **(866) LEIGHTON**; specifically at the phone extensions or e-mail as listed below.

Respectfully submitted,

LEIGHTON AND ASSOCIATES, INC.



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EBP/JAR/CCK

Distribution: (1) Addressee



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Appendix A – Cone Penetrometer Test (CPT) Logs



## 1.0 INTRODUCTION

### 1.1 Site Description and Proposed Development

The project site is located at 110 and 132 East Crowther Avenue in Placentia, California. The site location (latitude 33.8676°, longitude -117.8711°) and immediate vicinity are shown on Figure 1, *Site Location Map*. The project site is a 3-acre trapezoidal-shaped parcel of land consisting of two properties, a western roughly triangular shaped parcel and an eastern narrow rectangular parcel. The site is located within an industrial district and is currently occupied by warehouse structures. The site is bordered by East Crowther Avenue to the north and commercial developments to the west, south, and east.

Review of a topographic map of the vicinity (USGS, 1981) indicates that the ground surface at the project site is approximately at Elevation (El.) +236 feet mean sea level (msl). Site topography is relatively flat and drainage is accomplished as sheet flow over paved surfaces to curbs and gutters.

Based on review of aerial photographs, the site appears to have been utilized as an orchard prior to 1947 with three to four wood framed farm dwellings located near the west entrance to the parcel fronting East Crowther Avenue. By 1963 the orchards had been removed while the farm buildings remained onsite, a large windrow of trees remain visible along the eastern boundary of the site. The residential structure remained at the property until it was demolished in 1973. Construction of the existing Boys and Girls Club began in 1972 and appears to have been completed by approximately 1976 (NETR, 2015).

Leighton prepared a Phase 1 Environmental Site Assessment (Leighton, 2010) for the eastern parcel located at 132 East Crowther Avenue, Placentia, California. At the time of our assessment, the site was occupied by The Boys and Girls Club of Placentia.

Review of a conceptual development plan for the project (Urban Arena, 2015) indicates the 3-acre project site will consist of a 5-story apartment building, a 5-level parking structure with an amenities rooftop deck that includes a lounge and pool, paving, hardscaping, landscaping, fire access road and associated utility infrastructure.



## 1.2 Purpose and Scope

The purpose of our work was to evaluate the subsurface conditions at the site relative to the proposed development and provide preliminary geotechnical recommendations to aid in project planning. The scope of this evaluation included the following tasks:

- Background Review – We reviewed in-house geotechnical reports, reports published in the literature, aerial photographs, and maps relevant to the site. We evaluated geological hazards and potential geotechnical issues that may significantly impact the site. The documents reviewed are listed in Section 4.0.
- Field Exploration – Prior to field exploration, we marked proposed exploration locations and contacted Underground Service Alert (USA) for utility clearance. We advanced 3 Cone Penetrometer Test soundings (CPT-1, CPT-2, and CPT-3) to depths ranging from 38 feet to 45 feet below the existing ground surface (bgs) at the locations shown on Figure 2, *Exploration Map*. Shear wave velocity measurements were recorded in CPT-2 to develop seismic design parameters. Upon completion, the CPTs were backfilled with bentonite grout to the ground surface and patched with cold patch asphalt concrete (AC) where AC was penetrated.
- Engineering Analysis – The data obtained from our background review and field exploration were analyzed to develop preliminary recommendations for the proposed development.
- Report Preparation – This report presents our findings, conclusions, and preliminary recommendations for the proposed development.

## 2.0 GEOTECHNICAL FINDINGS

### 2.1 Regional Geologic Setting

The subject site is located in the Coastal Plain within the southeastern margin of the Los Angeles Basin, a large structural depression within the Peninsular Ranges geomorphic province of California. In general, the Coastal Plain is bordered by the Puente Hills on the north and northeast; the Santa Ana Mountains, Peralta Hills, and Tustin Plain to the east; the Pacific Ocean to the south; and Los Angeles County to the west.

As the Santa Ana Mountains and Puente Hills were uplifted along mountain frontal faults, a system of southwesterly draining canyons formed on the mountain flank that carried detritus out into the Coastal Plain. Geologic mapping of the project area indicates near-surface native soils consist of Quaternary-aged very old alluvial fan deposits (map symbol: Qvof) that have coalesced along the range front forming the broad alluvial plain, which extends across the southern margin of the mountain front into the Coastal Plain. These alluvial materials are comprised of varying proportions of gravel, sand, silt, and clay derived primarily from the Santa Ana Mountains and Puente Hills (Morton, 2004). These fan deposits are underlain by a thick (several thousands of feet) sequence of Tertiary and Quaternary age sediments of marine and continental origin. The geologic units mapped in the vicinity of the project site are shown on Figure 3, *Regional Geology Map*.

The subsurface conditions at the site are summarized below. Descriptions of the materials interpreted from the CPTs and the approximate stratigraphy are presented on the CPT logs included in Appendix A, *Exploration Logs*.

### 2.2 Subsurface Soil Conditions

As indicated above, the project site is generally underlain by Quaternary-aged dense very old alluvial fan deposits (Morton, 2004). Undocumented artificial fill (8 to 10 feet thick), which likely predates modern methods of fill placement, certification, and documentation overlies the native alluvial materials. The CPT explorations suggest fluvial and alluvial deposition has occurred at the site with massive thick sand channels grading laterally to thinly bedded sand, silty, and clay.



### 2.2.1 Expansive Soil Characteristics

Expansive soils contain significant amounts of clay particles that swell considerably when wetted and which shrink when dried. Foundations constructed on these soils are subject to uplifting forces caused by the swelling. Without proper mitigation measures, heaving and cracking of both building foundations and slabs-on-grade could result.

Although sandy materials (silty sand and sandy silt) are anticipated within the foundation level, the exploration indicates thin layers of expansive clay are present. These clay layers should not be left in place or used as fill under the proposed foundations or slab on grade. Expansive soils will likely not impact the proposed construction. Nonetheless, laboratory testing is recommended during future geotechnical exploration to confirm the expansion potential of onsite soils.

### 2.2.2 Excavation Characteristics

Based on the recent subsurface exploration performed at the site and our experience from grading jobs in the vicinity of the site, we anticipate that the onsite artificial fill and near surface alluvial materials can be readily excavated using conventional excavation equipment in good operating condition.

## 2.3 Groundwater Conditions

Groundwater was not encountered at the site to the maximum depth explored of 45 feet bgs where refusal was met during the CPT exploration. In the vicinity of the project site, the historically shallowest groundwater depth is reported to be between approximately 50 to 60 feet bgs (CGS, 1997).

Groundwater levels are on the order of Elevation +154 feet msl (80 feet bgs) and the direction of groundwater flow is southwest, according to data provided by GeoTracker for Unocal Station 4629, 820 West Chapman Avenue, located approximately 0.6 mile northwest of the Subject Property (Leighton, 2010). Accordingly, groundwater is not expected to impact the proposed development

Fluctuations of the groundwater level, localized zones of perched water, and an increase in soil moisture should be anticipated during and following the rainy

seasons or periods of locally intense rainfall or storm water runoff. Stormwater infiltration potential was not addressed during this study. Future design level geotechnical investigation(s) should take into account the underlying stratigraphy and suitable infiltration testing should be performed to quantify the infiltration rate for use in design of any stormwater infiltration systems. Based on the results of the current study future infiltration testing should target the thick sand beds located at 12 to 14 feet below grade at this site.

#### **2.4 Surface Fault Rupture**

No active faults are mapped or known to cross the site, and the site is not currently located within an Alquist-Priolo Earthquake Fault Zone (Bryant and Hart, 2007). The locations of the nearest known active and potentially active faults with the potential for surface fault rupture in the region surrounding the project site are shown on Figure 4, *Regional Seismicity Map*.

Distances to the closest known active surface faults were calculated using the United States Geological Survey (USGS) Earthquake Hazards Program (USGS, 2008b). The closest active fault is the Puente Hills Blind Thrust Fault. This subsurface (blind-thrust) fault is mapped at a distance of approximately 1.7 miles to the northeast and is responsible for uplift of the Puente Hills. The closest active faults to the site with surface expression are the Whittier-Elsinore and Newport-Inglewood Fault Zone, located 4.3 miles to the north and 14.9 miles to the southwest, respectively. The San Andreas Fault, which is the largest active fault in California, is approximately 36 miles northeast of the site.

The closest mapped fault to the site, located 2.1 miles to the southeast, is the potentially active El Modeno fault (Figure 4). The El Modeno fault is a northwest trending, southwest dipping normal fault mapped for 10 to 18 km (6.2 to 11 miles) from Peter's Canyon Wash to Burrell Point. The El Modeno fault is poorly defined as it is covered by Quaternary alluvium for all of its length. A fault investigation study and report prepared by Woodward-Clyde Consultants (1997) concluded that the El Modena fault is masked over large areas by Quaternary age sediments and that contradictory evidence exists as to its precise location and age of most recent activity. The State of California does not consider it an active fault.



## 2.5 Seismicity and Ground Shaking

The principal seismic hazard to the site is ground shaking resulting from an earthquake occurring along any of several major active and potentially active faults in southern California. The intensity of ground shaking at a given location depends primarily upon the earthquake magnitude, the distance from the source, and the site response characteristics. Peak horizontal ground accelerations are generally used to evaluate the intensity of ground motion. Using the United States Geological Survey (USGS) Seismic Design Maps (USGS, 2013), the peak ground acceleration for the Maximum Considered Earthquake ( $MCE_G$ ) adjusted for the Site Class effects ( $PGA_M$ ) is 0.648g. Based on the USGS online interactive deaggregation program (USGS, 2008a), the modal seismic event has a moment magnitude ( $M_W$ ) of 7.0 at a distance of 6.9 kilometers.

## 2.6 Secondary Seismic Hazards

Secondary seismic hazards in the region could include soil liquefaction and associated surface manifestation, earthquake-induced landsliding and flooding, seiches, and tsunamis. The potential for seismic hazards at the site is discussed below.

### 2.6.1 Liquefaction Potential

Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similarly to a fluid when subjected to high-intensity ground shaking. Liquefaction occurs when three general conditions exist: 1) shallow groundwater; 2) low density, fine, clean sandy soils; and 3) high-intensity ground motion. Studies indicate that saturated, loose and medium dense, near-surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential.

As shown on Figure 5, *Seismic Hazard Map*, the site is not mapped within a liquefaction hazard zone as delineated by the State of California (CGS, 1998).

Because the site is underlain predominantly by medium dense and stiff soils, and the historic high groundwater level is deeper than 50 feet bgs,



the potential for liquefaction is considered low and should not impact the planned development.

### 2.6.2 Seismically-Induced Settlement

Seismically-induced settlement consists of dynamic settlement of unsaturated soil (above groundwater) and liquefaction-induced settlement (below groundwater). These settlements occur primarily within low density sandy soil due to reduction in volume during and shortly after an earthquake event.

If the grading recommendations presented below are implemented, the potential total earthquake-induced settlement is estimated to be on the order of ½ inch or less. The differential settlement can be taken as half the total settlement over a horizontal distance of 30 feet.

### 2.6.3 Lateral Spreading

Liquefaction may also cause lateral spreading. For lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along gently sloping ground toward an unconfined area. As the site has a low liquefaction potential and it is relatively constrained laterally, the potential for earthquake-induced lateral spreading at the site is low.

### 2.6.4 Earthquake-Induced Landsliding

As shown on Figure 5, the site is not mapped within a seismically-induced landslide hazard zone identified by the State of California (CGS, 1998). In addition, due to project site being relatively flat, it is our opinion that the potential for seismically-induced landslide hazard at the site is negligible.

### 2.6.5 Earthquake-Induced Flooding

Earthquake-induced flooding can be caused by failure of dams or other water-retaining structures as a result of earthquakes. Prado Dam is an earth-fill dam across the Santa Ana River in the Chino Hills near Corona, California in Riverside County with the resulting impounded water creating Prado Flood Control Basin reservoir. The U.S. Army Corps of Engineers



(ACOE) completed the dam in the Lower Santa Ana River Canyon in 1941 for the primary purpose of downstream flood control. The area upstream from the dam contains 2,255 square miles (5,840 km<sup>2</sup>) of the watershed's 2,650 square miles (6,900 km<sup>2</sup>). The Prado Flood Control Basin also provides water storage for groundwater recharge operations. The height of Prado Dam was raised approximately 28 feet adding 140,000 acre-feet to the basin and increasing the dam's level of protection to 190-years. New outlet works and a new outlet channel increased Prado Dam's controlled discharge capacity from 9,500 cubic feet per second (cfs) to 30,000 cfs.

As shown on Figure 6, *Dam Inundation Map*, the project is located approximately 13.4 miles downstream from Prado Dam and is mapped within a Prado Dam inundation zone. Catastrophic failure of the dam is a very unlikely event and dam safety regulations are enforced by the Division of Dams, Army Corp of Engineers and Department of Water Resources. Inspectors may require dam owners to perform work, maintenance or implement controls if issues are found with the safety of the dam. Due to the new improvements, raising the height of the dam and continuous monitoring by the ACOE and others, it is our opinion that the potential for earthquake induced flooding to affect the site is low.

#### 2.6.6 Seiches and Tsunamis

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Tsunamis are waves generated in large bodies of water by fault displacement or major ground movement. Based on the absence of an enclosed water body near the site and the inland location of the site, seiche and tsunami risks at the site are considered negligible.

### 2.7 Flooding

The project site is not located within a flood hazard zone as indicated on Figure 7, *Flood Hazard Zone Map*. Regionally, storm runoff flow is generally directed to the southwest. The majority of this area is urbanized and storm water runoff is directed through streets and storm drains to the Pacific Ocean located approximately 15.5 miles from the site.

## 2.8 **Methane**

The Subject Property is located in Township 3 South, Range 9 West, Section 31, San Bernardino Baseline and Meridian, within the City of Placentia, County of Orange, California. Leighton reviewed the California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR) online Regional Oilfield Map 108 (DOGGR, 2003). The Subject Property is located within the Richfield Oil Field. The Orange County Fire Authority (OCFA) requires that a methane survey be conducted prior to any new construction for any property located within their jurisdiction and within an oil field. There are three wells described as "plugged and abandoned - dry holes" or "idle" located within 1,000 feet of the Subject Property to the east; these wells were named "TEPI 'Bennett' 1", "Majestic Oil Co. 1," and "CalResources LLC 'Peter J. Allec' 1." Oil wells are not depicted on the Subject Property.



### 3.0 PRELIMINARY RECOMMENDATIONS

Presented below are the preliminary geotechnical recommendations for planning purposes. A design-level geotechnical investigation that includes additional subsurface explorations will be required once the proposed design and project plan become available. Design of the project in accordance with standard engineering practice, including requirements of the 2013 California Building Code (CBC), and the recommendations of the project civil and structural engineers, geotechnical consultant, and others will reduce the potential for adverse geotechnical conditions impacting the proposed improvements.

The proposed building may be supported on shallow spread footings established in undisturbed natural soils or engineered fill.

#### 3.1 Site Grading

All site grading should be performed in accordance with the applicable local codes and in accordance with the project specifications that are prepared by the appropriate design professional.

##### 3.1.1 Site Preparation

Prior to construction, the site should be cleared of any vegetation, trash, and/or debris within the area of proposed grading. Foundation elements from previous structures and/or septic wells, if discovered during grading should be removed from the site. Any underground obstructions onsite should be removed. Efforts should be made to locate any existing utility lines to be removed or rerouted where interfering with the proposed construction. Any resulting cavities should be properly backfilled and compacted. After the site is cleared, the soils should be carefully observed for the removal of all unsuitable deposits. All unsuitable deposits should be excavated and removed from proposed building/structure footprint prior to fill placement.

##### 3.1.2 Overexcavation

To provide a uniform support and reduce the potential for differential settlement, all undocumented fill should be removed under the proposed improvements to expose suitable bearing soils and replaced as

engineered fill. The depths of remedial removals should be considered to range from 8 to 10 feet bgs. These recommended depths should be verified during the next stage of investigation and during grading as local conditions may be encountered that may require variations in removal depths. The exact extent of removals can best be determined during grading when direct observation and evaluation of materials are possible.

After completion of the overexcavation and prior to fill placement, the exposed soils should be scarified to a minimum depth of 12 inches, moisture conditioned and compacted to at least 95 percent relative compaction based on ASTM Test Method D 1557. Any soft or unsuitable earth materials encountered at the bottom of the excavations should be removed and replaced with compacted fill.

### 3.1.3 Subgrade Preparation

After completion of the excavation and prior to fill placement, any exposed disturbed soils should be scarified to a minimum depth of 12 inches, moisture conditioned as necessary and compacted to at least 95 percent relative compaction based on ASTM Test Method D 1557. The moisture content of the soils should be determined, and the soils slowly and uniformly moistened (or dried) as necessary to bring the soils to a uniform moist condition. The moisture content of relatively non-expansive and predominantly granular soils should be brought to within 2 percent of optimum moisture content to a depth of 18 inches. The moisture content of any clayey soils should be brought to about 4 percent over optimum moisture content to a depth of 18 inches. The moisture content of the subgrade should be checked and approved by Leighton prior to placing the required fill.

### 3.1.4 Fill Materials

On-site soil that is free of construction debris, organics, cobbles, boulders, rubble, or rock larger than 4-inches in largest dimension is suitable to be used as fill for support of structures. Any imported fill soil should be approved by the geotechnical engineer prior to placement as fill.



### 3.1.5 Fill Placement and Compaction

Fill soils should be placed in loose lifts not exceeding 8 inches, moisture-conditioned to within 2 percent of optimum moisture content for sandy soils and at least 4 percent above optimum moisture content for clayey soils, and compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM Test Method D 1557. Aggregate base should be compacted to a minimum of 95 percent relative compaction.

### 3.1.6 Construction Dewatering

Groundwater was not encountered in our explorations and the historic high groundwater is reported to be greater than 50 feet bgs (CGS, 1997) at the site. Therefore, groundwater is not expected to be encountered within the proposed overexcavation. Construction dewatering is not anticipated to be needed during development.

## 3.2 Preliminary Foundation Design

Conventional spread footings established in engineered fill or undisturbed natural soils may be used to support the proposed building. Footings should be embedded a minimum 12 inches below the lowest adjacent grade. An allowable soil bearing pressure of 4,000 pounds per square foot (psf) may be used for footings with a minimum width of 12 inches for continuous footings and 18 inches for isolated footings.

A one-third increase in the bearing value for short duration loading, such as wind or seismic forces may be used. The ultimate bearing capacity can be taken as 12,000 psf, which does not incorporate a factor of safety. A resistance factor of 0.5 should be used for initial bearing capacity evaluation with factored loads.

The allowable bearing capacity for shallow footings is based on a total static settlement of ½ inch. Differential settlement can be taken as half the total settlement over a horizontal distance of 30 feet.

Since settlement is a function of footing size and contact bearing pressure, differential settlement can be expected between adjacent columns or walls where a large differential loading condition exists. Leighton should review the

settlement estimates when final foundation plans and loads for the proposed structures become available.

Resistance to lateral loads will be provided by a combination of friction between the soil and structure interface and passive pressure acting against the vertical portion of the footings structures. For calculating lateral resistance, a passive pressure of 300 psf per foot of depth to a maximum of 3,000 psf and a frictional coefficient of 0.30 may be used. Note that the passive and frictional coefficients do not include a factor of safety. The frictional resistance and the passive resistance of the soils can be combined without reduction in determining the total lateral resistance.

### 3.3 Preliminary Retaining Wall Design

The following soil parameters may be used for the design of retaining walls with level backfill:

Conditions	Equivalent Fluid Pressure (psf per foot)
Active	35
At-Rest	55
Passive	300
Seismic Increment (add to active pressure)	30

Care should be taken to provide appropriate drainage so as no water is allowed to remain behind retaining walls for any significant length of time. In addition to the recommended earth pressures, walls below grade adjacent to existing structures or streets and areas of traffic should be designed to accommodate surcharge loads. For traffic surcharge, a uniform lateral pressure of 100 pounds per square foot acting as a result of an assumed 300 pounds per square foot surcharge behind the wall due to normal traffic; the traffic surcharge load may be neglected provided a minimum of 10 foot clearance between the wall and the traffic is maintained. We will provide surcharge loading from adjacent foundations if applicable based on future design.



### **3.4 Slabs-on-Grade**

Concrete slabs may be designed using a modulus of subgrade reaction of 100 pci provided the subgrade is prepared as described in Section 3.1. From a geotechnical standpoint, we recommend slab-on-grade be a minimum 5 inches thick with No. 3 rebar placed at the center of the slab at 24 inches on center in each direction. The structural engineer should design the actual thickness and reinforcement based on anticipated loading conditions. Where moisture-sensitive floor coverings or equipment is planned, the slabs should be protected by a minimum 10-mil-thick vapor barrier between the slab and subgrade. A coefficient of friction of 0.35 can be used between the floor slab and the vapor barrier.

Minor cracking of concrete after curing due to drying and shrinkage is normal and should be expected; however, concrete is often aggravated by a high water/cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. The use of low-slump concrete or low water/cement ratios can reduce the potential for shrinkage cracking. Additionally, our experience indicates that the use of reinforcement in slabs and foundations can generally reduce the potential but not eliminate for concrete cracking.

To reduce the potential for excessive cracking, concrete slabs-on-grade should be provided with construction or weakened plane joints at frequent intervals. Joints should be laid out to form approximately square panels.

### **3.5 Temporary Excavation and Shoring Design**

All temporary excavations, including utility trenches, retaining wall excavations, and foundation excavations should be performed in accordance with project plans, specifications, and all OSHA requirements. Excavations 5 feet or deeper should be laid back or shored in accordance with OSHA requirements before personnel are allowed to enter.

No surcharge loads should be permitted within a horizontal distance equal to the height of cut or 5 feet, whichever is greater from the top of the cut, unless the cut is shored appropriately. Excavations that extend below an imaginary plane inclined



at 45 degrees below the edge of any adjacent existing site foundation should be properly shored to maintain support of the adjacent structure.

Typical cantilever shoring should be designed based on the active fluid pressure of 35 pcf. If excavations are braced at the top and at specific design intervals, the active pressure may then be approximated by a rectangular soil pressure distribution with the pressure per foot of width equal to  $30H$ , where  $H$  is equal to the depth of the excavation being shored.

If any planned excavation will be adjacent to existing buildings, the shoring should be designed to accommodate the surcharge pressure from existing structures and vehicular loading within a 1:1 plane projected upward from the bottom of the excavation perimeter. A uniform horizontal pressure equal to  $\frac{1}{2}$  of the foundation bearing pressure may be assumed for preliminary design.

### **3.6 Seismic Design Parameters**

To accommodate effects of ground shaking produced by regional seismic events, seismic design can be performed by the designing structural engineer, should be performed in accordance with the 2013 edition of the California Building Code (CBC). Table 1, *2013 CBC Seismic Parameters*, below tabulates seismic design parameters based on the 2013 CBC methodology, which is based on ASCE/SEI 7-10.



### 2013 CBC Based Seismic Design Parameter

CBC Categorization/Coefficient	Design Value
Site Longitude (decimal degrees)	-117.8711
Site Latitude (decimal degrees)	33.8676
Site Class Definition	D
Seismic Design Category	E
Mapped spectral response acceleration parameter at short period, $S_s$	1.755 g
Mapped spectral response acceleration parameter at a period of 1 sec, $S_1$	0.634 g
Short Period (0.2 sec) Site Coefficient, $F_a$	1.0
Long Period (1.0 sec) Site Coefficient, $F_v$	1.5
Adjusted spectral response acceleration parameter at short period, $S_{MS}$	1.755 g
Adjusted spectral response acceleration parameter at a period of 1 sec, $S_{M1}$	0.952 g
Design spectral response acceleration parameter at short period, $S_{DS}$	1.170 g
Design spectral response acceleration parameter at a period of 1 sec, $S_{D1}$	0.634 g
Peak Ground Acceleration, $PGA_M$	0.648 g

### 3.7 Drainage and Landscaping

Building walls below grade should be waterproofed or at least damp proofed, depending upon the degree of moisture protection desired. Surface drainage should be designed to direct water away from foundations and toward approved drainage devices. Irrigation of landscaping should be controlled to maintain, as much as possible, consistent moisture content sufficient to provide healthy plant growth without overwatering.

### 3.8 Future Geotechnical Exploration

Geotechnical recommendations presented in this report are preliminary based on the information gained from our limited subsurface exploration, review of available documents, and our understanding of the current conceptual plan. A comprehensive geotechnical investigation should be performed to develop specific geotechnical recommendations with respect to the site grading,

foundation design, infiltration facilities and other geotechnical aspects of a proposed project.

### **3.9 Limitations**

It should be noted that the recommendations in this report are subject to the limitations presented in this section. This report was based in part on data obtained from a limited number of observations, site visits, and soil excavations. Such information is, by necessity, incomplete. The nature of many sites is such that differing soil or geologic conditions can be present within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, the findings, conclusions, and recommendations presented in this report are only valid if Leighton has the opportunity to observe subsurface conditions during future geotechnical exploration, grading, and construction, to confirm that our preliminary data are representative for the site. Leighton should also review the construction plans and project specifications, when available, to comment on the geotechnical aspects.

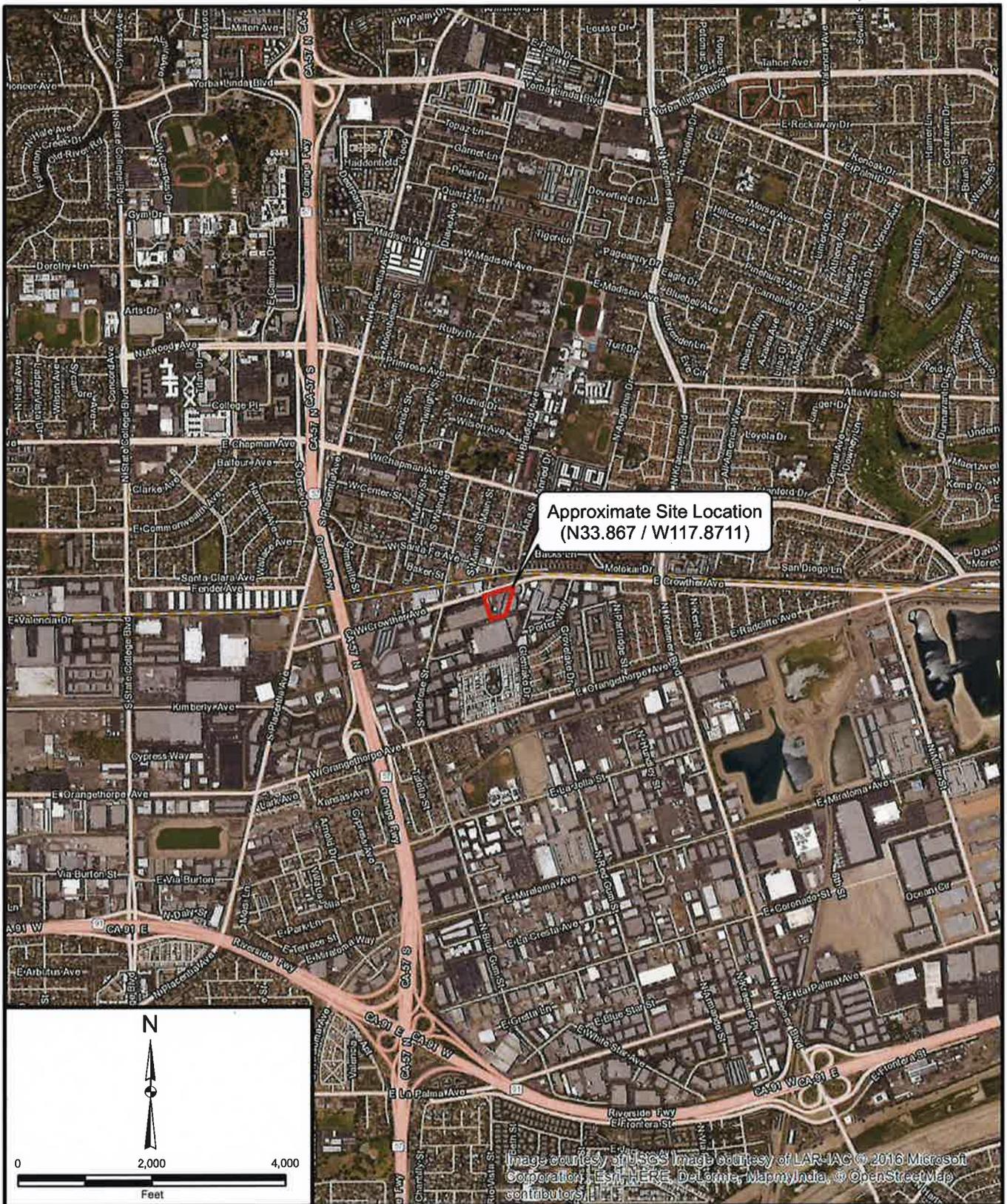
Our professional services were performed in accordance with the prevailing standard of professional care as practiced by other geotechnical engineers in the area. We make no other warranty either expressed or implied. The report may not be used by others or for other projects without the expressed written consent of our client and our firm.

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Approximate Site Location  
(N33.867 / W117.8711)

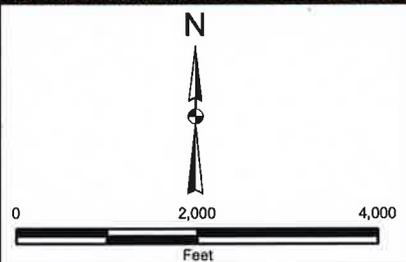


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Project: 11263.001	Eng/Geol:CCK/JAR
Scale: 1" = 2,000'	Date: March 2016
Base Map: ESRI ArcGIS Online 2016	
Thematic Information: Leighton	
Author: Leighton Geomatics (asakowicz)	

## SITE LOCATION MAP

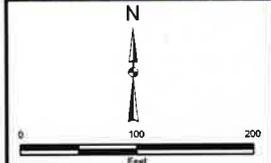
110 and 132 East Crowther Avenue  
Placentia, California

Figure 1

Leighton

**Legend**

- Approximate Site Boundary
- CPT-3 ▼ Approximate Cone Penetration Test Location  
Showing Total Depth (T.D.)
- T.D.45.0'



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroVISTA, GeoEye, IGN, CNR, Swire, and the GIS User Community, Esri, HERE, DeLorme, Mapbox, © OpenStreetMap contributors

Project: 11263.001	Eng/Geol:CCKJAR
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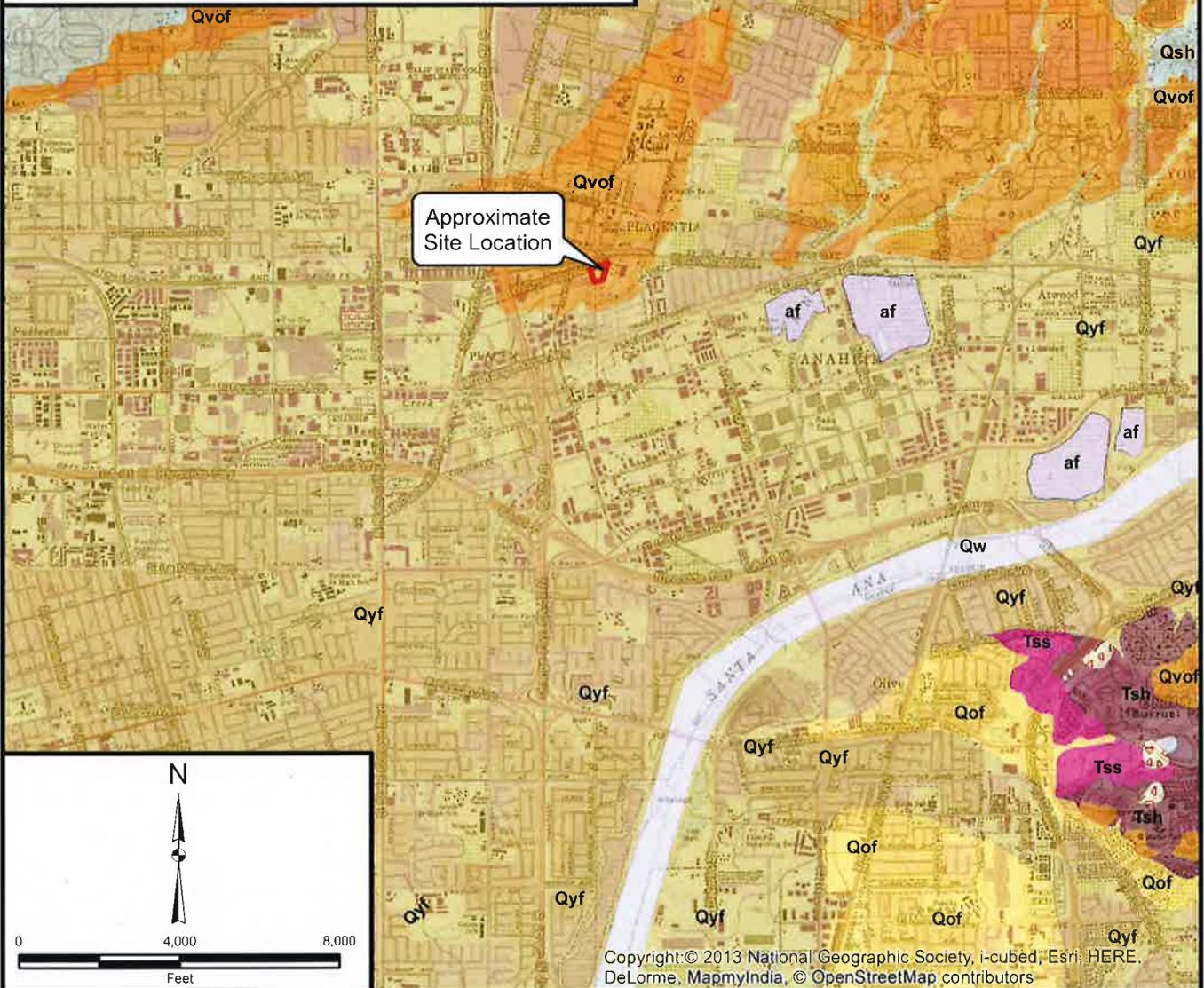
**EXPLORATION MAP**  
110 and 132 East Crowther Avenue  
Placentia, California

**Figure 2**  
  
Leighton

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# Legend

- af - Artificial Fill
- Qls - Landslide Deposits; may include debris flows and older landslides
- Qw - Alluvial Wash Deposits
- Qyf - Young Alluvial Fan Deposits
- Qof - Old Alluvial Fan Deposits
- Qvof - Very Old Alluvial Fan Deposits
- Qss - Coarse-grained formations of Pleistocene age and younger; primarily sandstone and conglomerate
- Qsh - Fine-grained formations of Pleistocene age and younger; includes fine-grained sandstone, siltstone, mudstone, shale, siliceous and calcareous sediments
- Tss - Coarse-grained Tertiary age formations of sedimentary origin
- Tsh - Fine-grained Tertiary age formations of sedimentary origin



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Project: 11263.001	Eng/Geol:CCK/JAR
Scale: 1" = 4,000'	Date: March 2016
Base Map: ESRI ArcGIS Online 2016 Thematic Information: Leighton, USGS Author: Leighton Geomatics (asakowicz)	

## REGIONAL GEOLOGY MAP

110 and 132 East Crowther Avenue  
Placentia, California

Figure 3



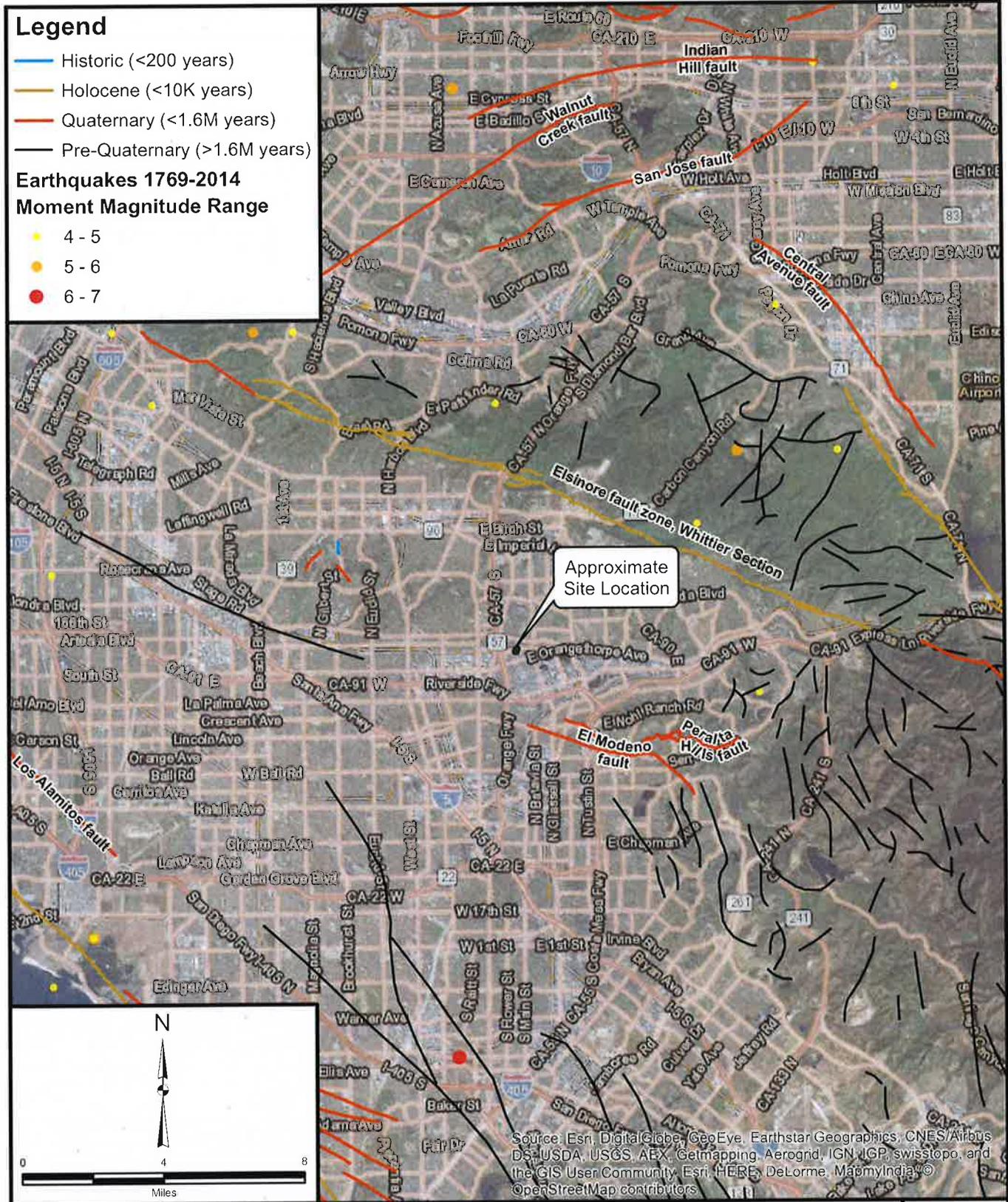


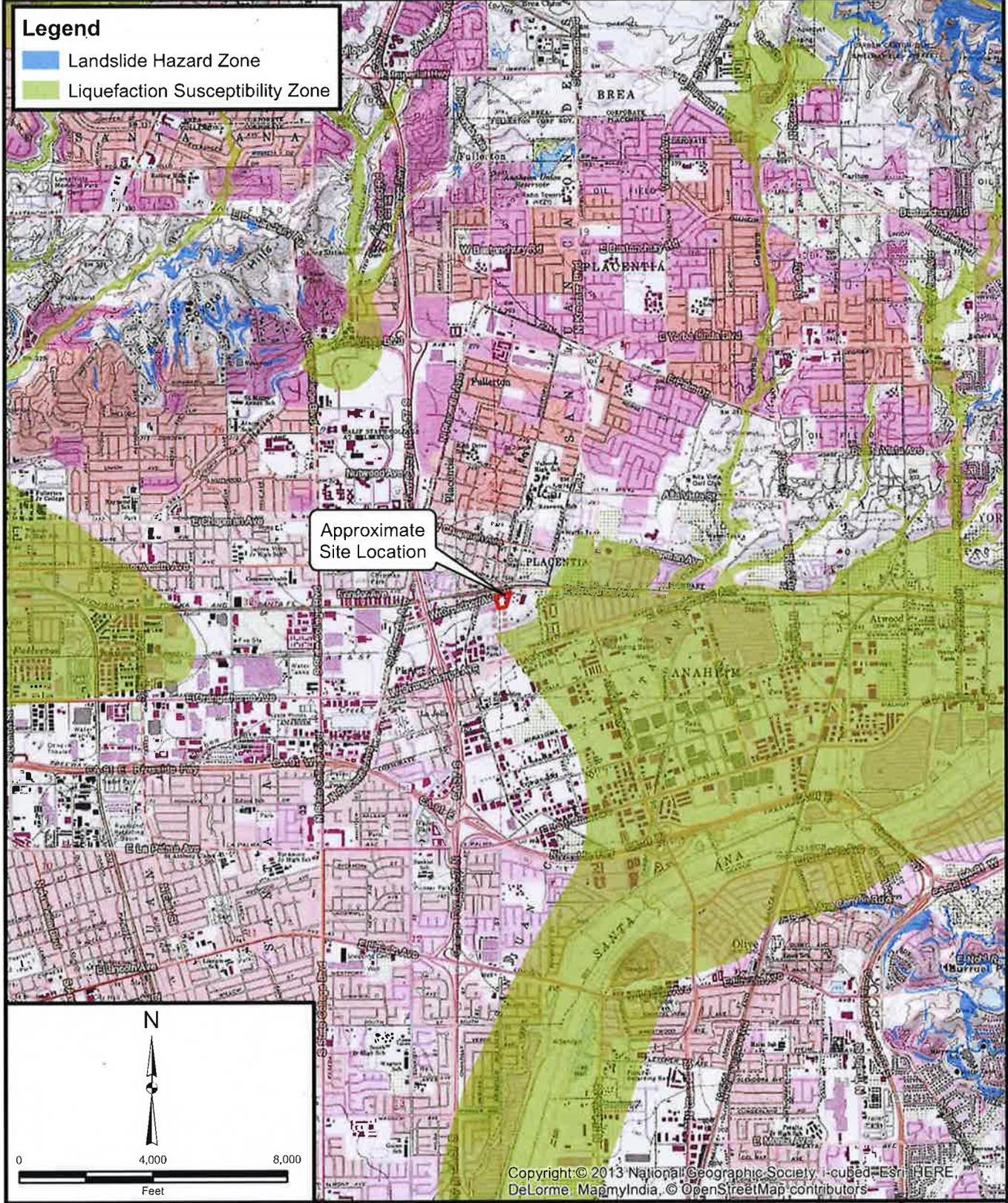
Figure 4

# REGIONAL SEISMICITY MAP

110 and 132 East Crowther Avenue  
Placentia, California



Project: 11263.001	Eng/Geol:CCK/JAR
Scale: 1" = 4 miles	Date: March 2016
Base Map: ESRI ArcGIS Online 2016	
Thematic Information: Leighton, CGS, Bryant 2010	
Author: Leighton Geomatics (asakowicz)	



Project: 11263.001	Eng/Geol:CCK/JAR
Scale: 1" = 4,000'	Date: March 2016
Base Map: ESRI ArcGIS Online 2016	
Thematic Information: Leighton, CGS	
Author: Leighton Geomatics (asakowicz)	

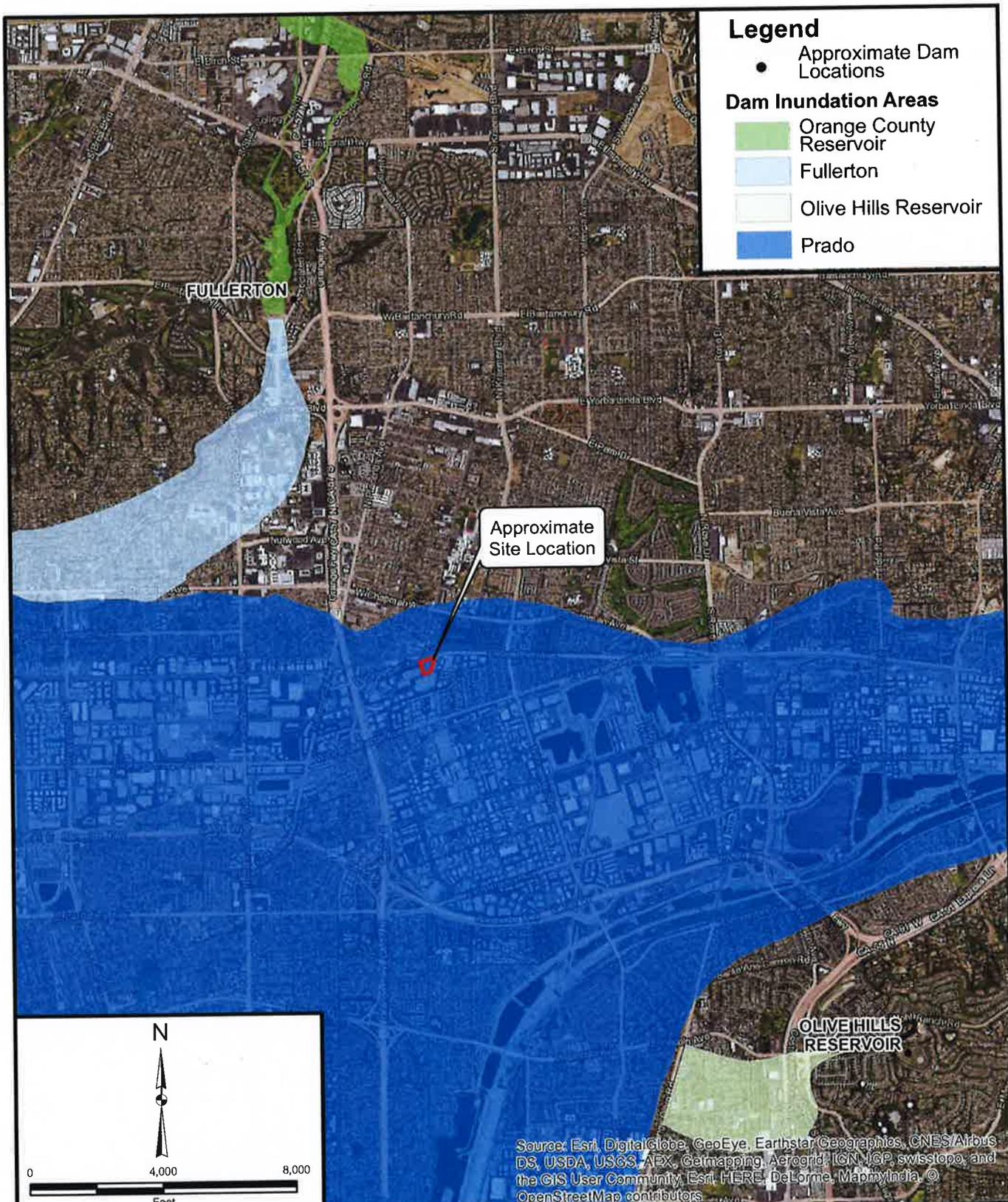
# SEISMIC HAZARD MAP

110 and 132 East Crowther Avenue  
Placentia, California

Figure 5



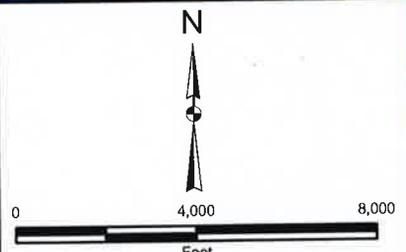
Leighton



**Legend**

- Approximate Dam Locations
- Dam Inundation Areas**
- Orange County Reservoir
- Fullerton
- Olive Hills Reservoir
- Prado

Approximate Site Location



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Geomatics, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors

Project: 11263.001	Eng/Geol:CCK/JAR
Scale: 1" = 4,000'	Date: March 2016
Base Map: ESRI ArcGIS Online 2016 Thematic Information: Leighton, CA DWR, FEMA Author: Leighton Geomatics (asakowicz)	

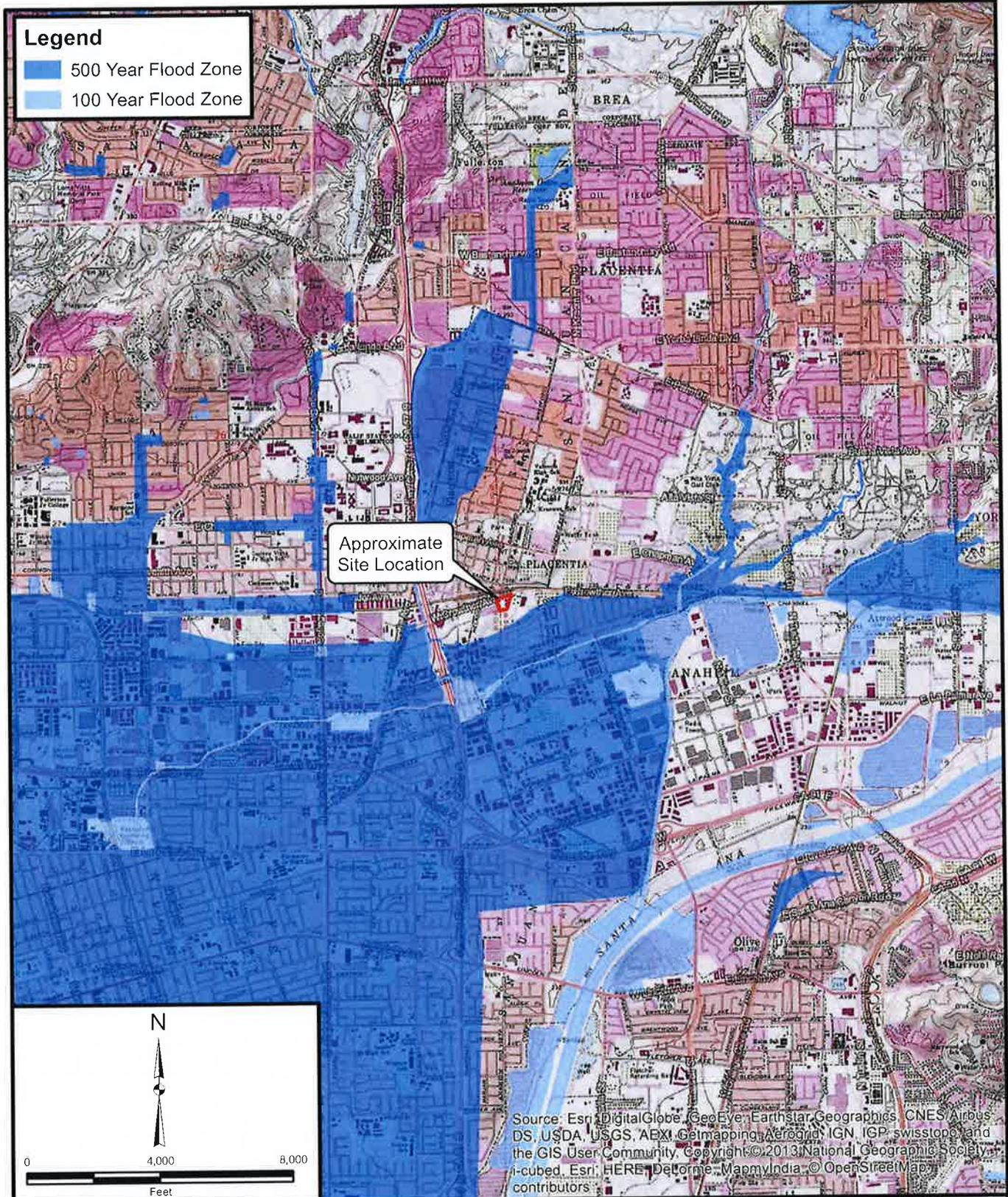
**DAM INUNDATION MAP**

110 and 132 East Crowther Avenue  
Placentia, California

Figure 6



Leighton



Project: 11263.001	Eng/Geol: CCK/JAR
Scale: 1" = 4,000'	Date: March 2016
Base Map: ESRI ArcGIS Online 2016	
Thematic Information: Leighton, CA DWR, FEMA	
Author: Leighton Geomatics (asakowicz)	

# FLOOD HAZARD ZONE MAP

110 and 132 East Crowther Avenue  
Placentia, California

Figure 7



**APPENDIX A**  
**CONE PENETROMETER TEST (CPT) LOGS**



Leighton

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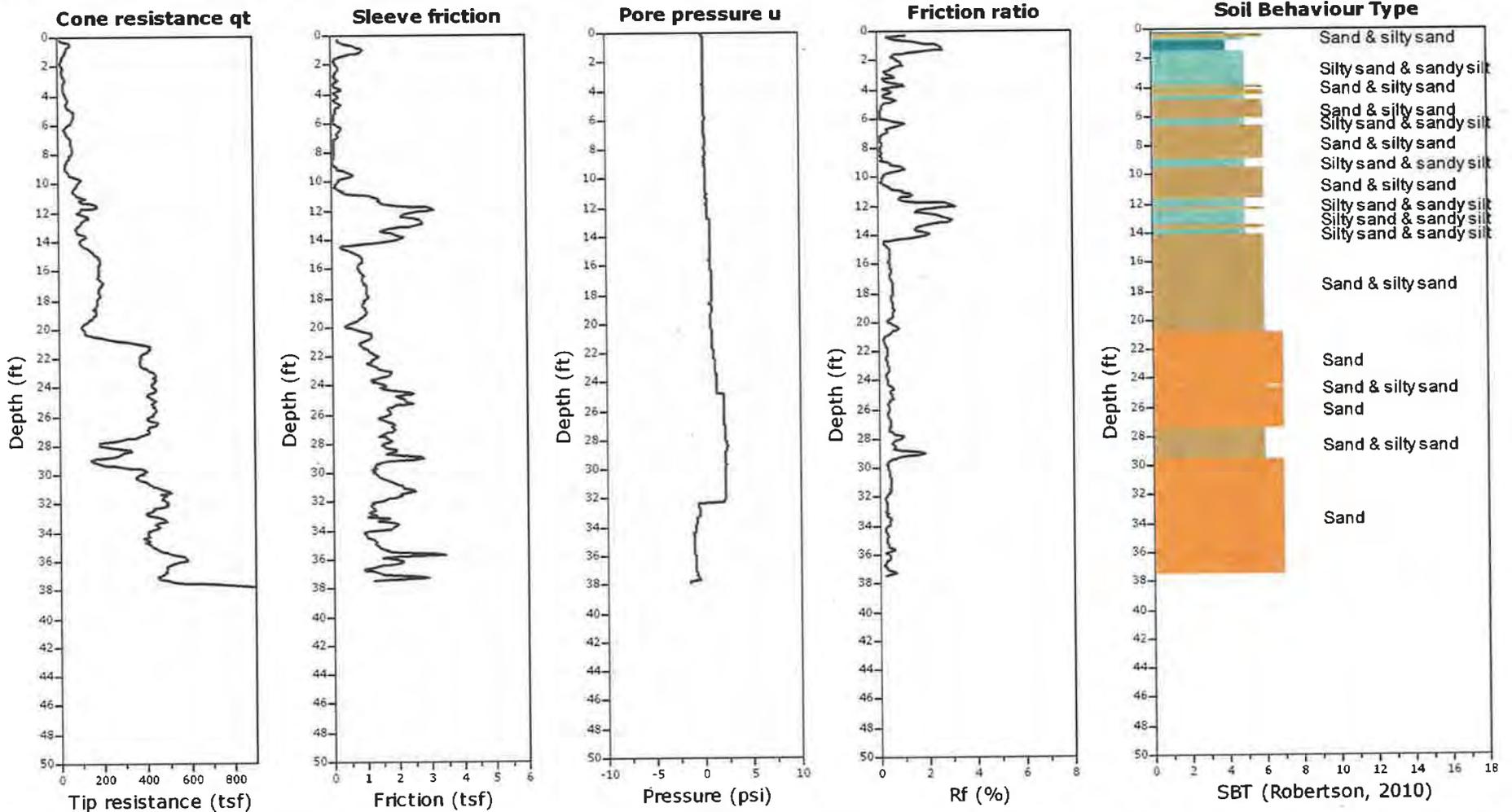
**Kehoe Testing and Engineering**  
 714-901-7270  
 rich@kehoetesting.com  
 www.kehoetesting.com

**Project:** Leighton & Associates/Integral/Crowther Avenue  
**Location:** 110 & 132 E, Crowther Ave Placentia, CA

**CPT: CPT-1**

Total depth: 37.84 ft, Date: 3/8/2016

Cone Type: Vertek





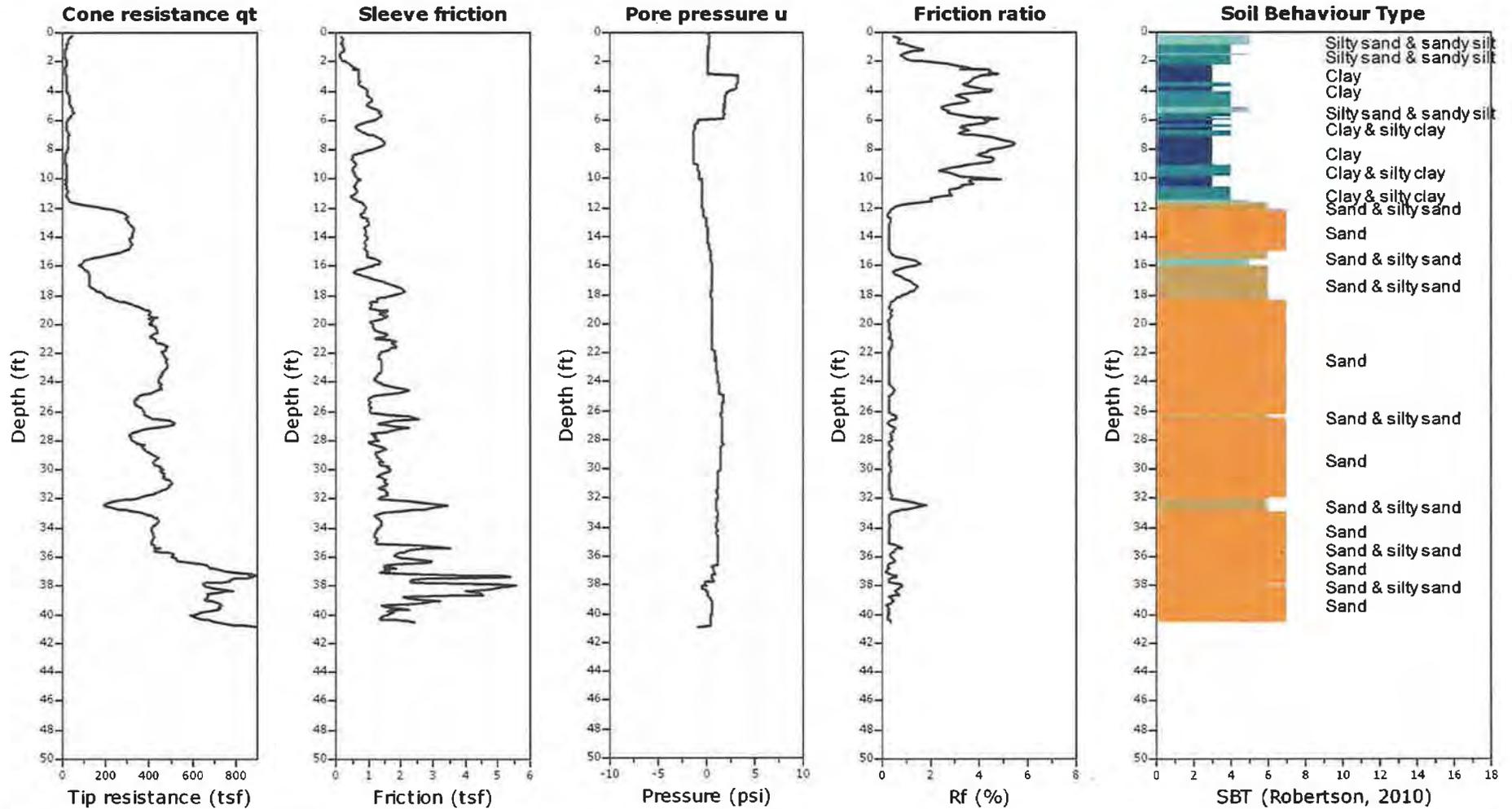
**Kehoe Testing and Engineering**  
 714-901-7270  
 rich@kehoetesting.com  
 www.kehoetesting.com

**Project:** Leighton & Associates/Integral/Crowther Avenue  
**Location:** 110 & 132 E. Crowther Ave Placentia, CA

**CPT: CPT-2**

Total depth: 40.89 ft, Date: 3/8/2016

Cone Type: Vertek





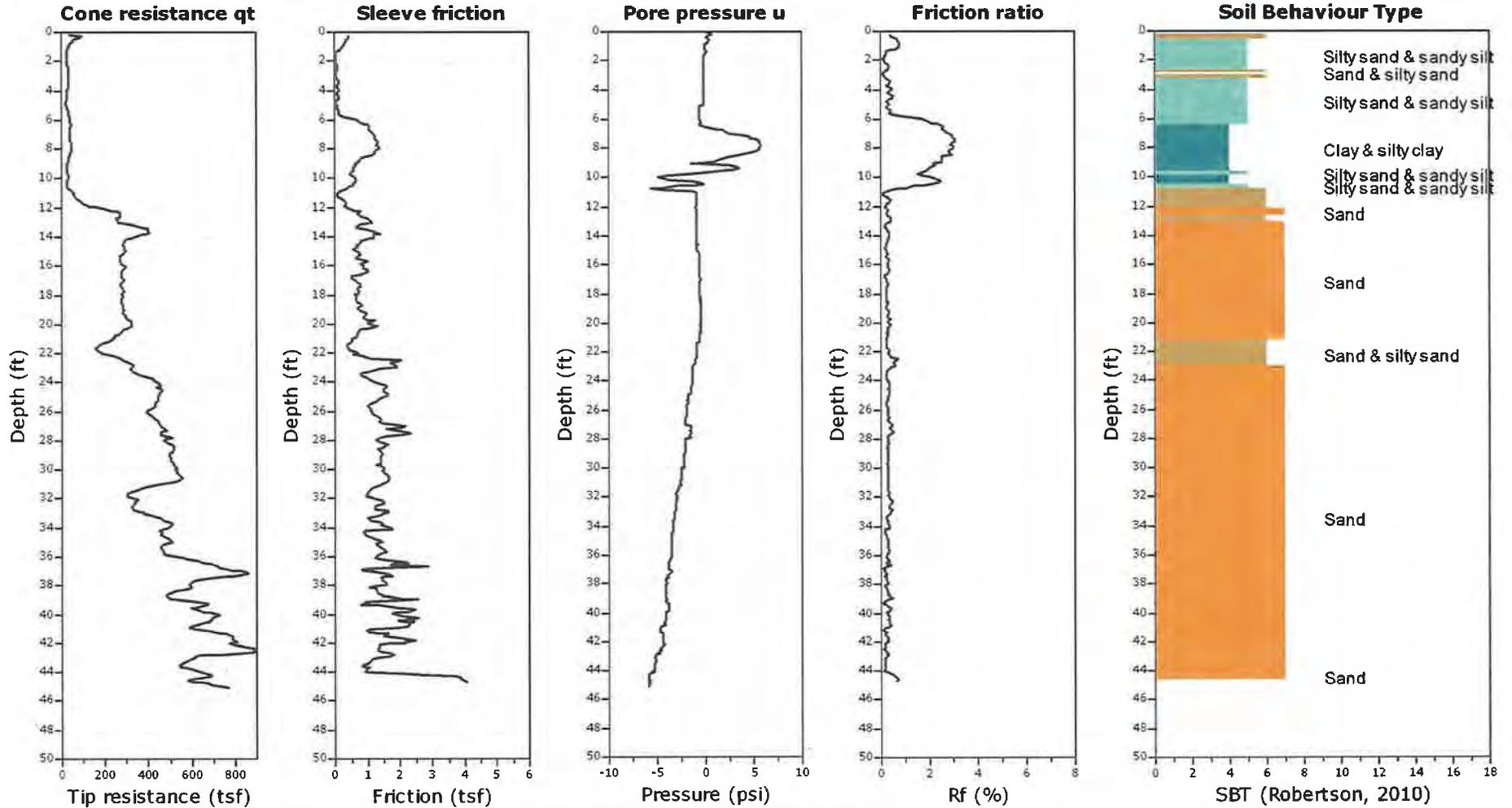
**Kehoe Testing and Engineering**  
 714-901-7270  
 rich@kehoetesting.com  
 www.kehoetesting.com

**Project:** Leighton & Associates/Integral/Crowther Avenue  
**Location:** 110 & 132 E. Crowther Ave Placentia, CA

**CPT: CPT-3**

Total depth: 45.02 ft, Date: 3/8/2016

Cone Type: Vertek



C3

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Percolation Testing Results



Leighton and Associates, Inc.  
A LEIGHTON GROUP COMPANY

## PROJECT MEMORANDUM

**To:** Integral Partners Funding, LLC      **Date:** February 7, 2017  
888 San Clemente, Suite 100  
Newport Beach, California 92660      **Project No.** 11263.002

**Attention:** Mr. Ed Galigher, Vice President Acquisitions and Entitlements

**From:** Joe A. Roe, CEG 2456, Principal Geologist

**Subject:** **Percolation Testing Results**  
**Proposed East Crowther Avenue Site**  
**Placentia, California**

**Reference:** *Leighton & Associates, Inc., 2016, Due Diligence Level Geotechnical Exploration Report Proposed Apartment Building 110 and 132 East Crowther Avenue, Placentia, California, dated March 11, 2016.*

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Leighton and Associates, Inc. (Leighton) has performed limited subsurface exploration and field percolation testing at the subject site in support of the planned WQMP improvements proposed in the northwestern region (Fire Access Road) and eastern region (Drive Access) at the project site. These improvements are understood to include subsurface detention systems, a filtration/biofiltration device with design invert at approximately 10 to 12 feet below ground surface. This project memorandum presents a summary of our field exploration, the results of our percolation testing and infiltration BMP design considerations.

### Field Exploration

Our field exploration included drilling, logging and sampling of three (3) hollow-stem auger borings at locations to be evaluated for infiltration. The locations were selected by the civil engineer and were advanced as close to the planned locations as was possible considering the existing site improvements. The borings were each drilled to a depth of

approximately 41.5 feet below ground surface (bgs) for confirmation of subsurface stratigraphy. At each of the three boring locations, a separate test hole was drilled within approximately 5 feet of the boring for construction of a temporary percolation test well. The temporary percolation test wells (P-1, P-2, P-3) consisted of 2-inch-diameter, 0.020-inch slotted PVC pipe within the zone that was tested. The filter pack material surrounding the slotted section of pipe consisted of #3 Monterey Sand and extend from the bottom of the test well to approximately 1 foot above the screened interval. Percolation testing was then performed in general accordance with the *County of Orange Technical Guidance Document (TGD), Appendix VII Infiltration Rate Evaluation Protocol and Factor of Safety Recommendations*, revised date December 20, 2013. Upon completion of infiltration testing, the temporary wells were removed and the borings were backfilled with excess soil cuttings and patched to match pre-existing conditions.

### **Infiltration Rate**

The percolation test performed at each test well was performed using the falling-head method which records the drop of water level inside the test well over the specified time interval, and is then repeated several times until consistent measurements are achieved. The measured infiltration rate for each percolation test was calculated by dividing the rate of discharge (i.e., volume of water discharged from the well during the test) by the infiltration surface area, or flow area. A porosity reduction factor was applied to account for the filter pack material installed in the annulus of each test well. The flow area was determined based on the average height of water within the test well during each time interval. Results of the field testing data and measured infiltration rate for each test well are attached to this memorandum.

**Table 1 – Measured (Unfactored) Infiltration Rate**

<b>Boring-Percolation Test Well Designation and Location Onsite</b>	<b>Approximate Depth of Test Zone Below Ground Surface (feet)</b>	<b>Measured Infiltration Rate (inches per hour)</b>
P-1, northwest corner Fire Access Road	10 to 15	3.71
P-2, northeastern portion of drive access	10 to 15	0.27
P-3, southeastern portion of drive access	15 to 20	0.72

The percolation test performed at test well location P-1, yielded an infiltration rate of 3.71 inches per hour within the test zone of 10 to 15 feet bgs. The percolation tests performed at test well locations P-2 and P-3 yielded much lower infiltration rates of 0.27 inches per hour (test zone between 10 to 15 feet bgs) and 0.72 inches per hour (test zone between 15 to 20 feet bgs), respectively. Our exploration (Leighton, 2016) and current study indicate the site is generally capped by interbedded, thin to thick clay, silt and silty sand to a depth ranging from 10 to 12 feet below grade. Below these depths the site material is characterized as silty sand and sand with fine gravel to maximum depth explored. The more granular materials encountered within the test zone at test well P-1 and below 10 to 12 feet in P-2 and P-3 are generally more permeable and provide higher infiltration potential.

### **Infiltration BMP Design Considerations**

The measured infiltration rates were the result of small-scale tests performed at specific locations. The actual infiltration rate over the area of the proposed infiltration device could vary significantly from the test location. Therefore, care must be used in the selection of infiltration rate for use in design and the potential for variances in soil conditions that could significantly affect field performance. The small-scale infiltration rates should be converted to a large-scale rate using a reduction factor. In addition, infiltration rates will degrade over time due to complete saturation of underlying soils, and fines build-up and plugging if pretreatment of the storm water is not performed. As such, in accordance with the TGD, a minimum factor of safety of 2 or more should be used to establish a more realistic infiltration rate for the service life of the system.

In general, a vast majority of geotechnical distress issues are related to improper drainage. Distress in the form of foundation movement could occur. Direct infiltration to the subsurface is not recommended adjacent to curb and gutter and public pavements as soil saturation could lead to a loss of soil support, settlement or collapse, and internal erosion (piping). Additionally, infiltration water can and will migrate along pipe backfill (typically sand or gravel bedding) affecting improvements far from the point of infiltration.

We understand that WQMP improvements are proposed in the central and southwestern portions of the project site; including a subsurface detention system, a proprietary filtration/biofiltration device, and an infiltration well with discharge zones from approximately 10 to 15 feet below the ground surface. The planned underground detention/infiltration devices and design saturation zone should be established at least 10 feet away from planned foundations. The design saturation zone may be assumed

as a 1:1 plane projected downward from the top of an infiltration device's discharge zone.

Prior to construction of any infiltration device intended for the site, the WQMP and foundation/grading plans should be reviewed by the geotechnical consultant to verify that our geotechnical recommendations have been appropriately incorporated into the plans and not compromised by the addition of an infiltration system to the site. The designer of any infiltration system should contact the geotechnical consultant for geotechnical input during the design process as they feel necessary. Proper compaction oversight during construction is required to ensure the bottoms of infiltration facilities are not overly compacted. Facilities that do not have proper compaction oversight should have more restrictive safety factors applied (double the factor of safety, but may be higher at the discretion of the design engineer).

Attachments:        Field Percolation Test Results



**Boring Percolation Test Data Sheet**

<b>Project Number:</b>	11263.002	<b>Test Hole Number:</b>	P-1
<b>Project Name:</b>	Integral Crowther	<b>Date Excavated:</b>	2/1/2017
<b>Earth Description:</b>	Alluvium	<b>Date Tested:</b>	2/1/2017
<b>Liquid Description:</b>	Tap water	<b>Depth of boring (ft):</b>	15
<b>Tested By:</b>	SM	<b>Diameter of boring (in):</b>	8
<b><u>Time Interval Standard</u></b>		<b>Diameter of casing (in):</b>	2
<b>Start Time for Pre-Soak:</b>	2/1/2017 12:00am	<b>Length of slotted of casing (ft):</b>	5
<b>Start Time for Standard:</b>	2/1/2017 12:33pm	<b>Depth to Initial Water Depth (ft):</b>	10
<b>Standard Time Interval</b>		<b>Porosity of Annulus Material, <i>n</i> :</b>	0.35
<b>Between Readings, mins:</b>	10	<b>Bentonite Plug at Bottom:</b>	No

**Percolation Data**

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H <sub>0</sub> /H <sub>f</sub> (in.)	Total Water Drop, Δd (in.)	Percolation Rate (min./in.)	Infiltration Rate (in./hr.)
1	12:33	10	10.00	60.0	37.2	0.27	4.02
	12:43		13.10	22.8			
2	12:45	10	10.00	60.0	35.0	0.29	3.69
	12:55		12.92	25.0			
3	12:57	10	10.00	60.0	35.6	0.28	3.78
	13:07		12.97	24.4			
4	13:08	10	10.00	60.0	34.8	0.29	3.66
	13:18		12.90	25.2			
5	13:19	10	10.00	60.0	34.2	0.29	3.57
	13:29		12.85	25.8			
6	13:31	10	10.00	60.0	34.9	0.29	3.68
	13:41		12.91	25.1			
7	13:42	10	10.00	60.0	34.0	0.29	3.54
	13:52		12.83	26.0			
8	13:55	10	10.00	60.0	33.7	0.30	3.50
	14:05		12.81	26.3			
9	14:07	10	10.00	60.0	35.2	0.28	3.71
	14:17		12.93	24.8			

Infiltration Rate (I) = Flow Volume/Flow Area/Δt

Infiltration Rate, I (Last Reading) = 3.71 in./hr.

**Boring Percolation Test Data Sheet**

<b>Project Number:</b>	11263.002	<b>Test Hole Number:</b>	P-2
<b>Project Name:</b>	Integral Crowther	<b>Date Excavated:</b>	2/1/2017
<b>Earth Description:</b>	Alluvium	<b>Date Tested:</b>	2/2/2017
<b>Liquid Description:</b>	Tap water	<b>Depth of boring (ft):</b>	15
<b>Tested By:</b>	JMP	<b>Diameter of boring (in):</b>	8
<b><u>Time Interval Standard</u></b>		<b>Diameter of casing (in):</b>	2
<b>Start Time for Pre-Soak:</b>	2/1/2017 9:30am	<b>Length of slotted of casing (ft):</b>	5
<b>Start Time for Standard:</b>	2/2/2017 9:26am	<b>Depth to Initial Water Depth (ft):</b>	10
<b>Standard Time Interval</b>		<b>Porosity of Annulus Material, <i>n</i> :</b>	0.35
<b>Between Readings, mins:</b>	30	<b>Bentonite Plug at Bottom:</b>	No

**Percolation Data**

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H <sub>0</sub> /H <sub>f</sub> (in.)	Total Water Drop, Δd (in.)	Percolation Rate (min./in.)	Infiltration Rate (in./hr.)																																																																																																									
1	9:26	30	10.00	60.0	6.2	4.81	0.17																																																																																																									
	9:56		10.52	53.8				2	10:03	30	10.00	60.0	10.6	2.84	0.29	10:33	10.88	49.4	3	10:38	30	10.00	60.0	10.7	2.81	0.29	11:08	10.89	49.3	4	11:10	30	10.00	60.0	10.7	2.81	0.29	11:40	10.89	49.3	5	11:42	30	10.00	60.0	10.2	2.94	0.28	12:12	10.85	49.8	6	12:13	30	10.00	60.0	10.4	2.87	0.29	12:43	10.87	49.6	7	12:44	30	10.00	60.0	10.3	2.91	0.28	13:14	10.86	49.7	8	13:15	30	10.00	60.0	10.1	2.98	0.28	13:45	10.84	49.9	9	13:46	30	10.00	60.0	10.1	2.98	0.28	14:16	10.84	49.9	10	14:18	30	10.00	60.0	10.0	3.01	0.27	14:48	10.83	50.0	11	14:50	30	10.00	60.0	10.0
2	10:03	30	10.00	60.0	10.6	2.84	0.29																																																																																																									
	10:33		10.88	49.4				3	10:38	30	10.00	60.0	10.7	2.81	0.29	11:08	10.89	49.3	4	11:10	30	10.00	60.0	10.7	2.81	0.29	11:40	10.89	49.3	5	11:42	30	10.00	60.0	10.2	2.94	0.28	12:12	10.85	49.8	6	12:13	30	10.00	60.0	10.4	2.87	0.29	12:43	10.87	49.6	7	12:44	30	10.00	60.0	10.3	2.91	0.28	13:14	10.86	49.7	8	13:15	30	10.00	60.0	10.1	2.98	0.28	13:45	10.84	49.9	9	13:46	30	10.00	60.0	10.1	2.98	0.28	14:16	10.84	49.9	10	14:18	30	10.00	60.0	10.0	3.01	0.27	14:48	10.83	50.0	11	14:50	30	10.00	60.0	10.0	3.01	0.27	15:20	10.83	50.0						
3	10:38	30	10.00	60.0	10.7	2.81	0.29																																																																																																									
	11:08		10.89	49.3				4	11:10	30	10.00	60.0	10.7	2.81	0.29	11:40	10.89	49.3	5	11:42	30	10.00	60.0	10.2	2.94	0.28	12:12	10.85	49.8	6	12:13	30	10.00	60.0	10.4	2.87	0.29	12:43	10.87	49.6	7	12:44	30	10.00	60.0	10.3	2.91	0.28	13:14	10.86	49.7	8	13:15	30	10.00	60.0	10.1	2.98	0.28	13:45	10.84	49.9	9	13:46	30	10.00	60.0	10.1	2.98	0.28	14:16	10.84	49.9	10	14:18	30	10.00	60.0	10.0	3.01	0.27	14:48	10.83	50.0	11	14:50	30	10.00	60.0	10.0	3.01	0.27	15:20	10.83	50.0																	
4	11:10	30	10.00	60.0	10.7	2.81	0.29																																																																																																									
	11:40		10.89	49.3				5	11:42	30	10.00	60.0	10.2	2.94	0.28	12:12	10.85	49.8	6	12:13	30	10.00	60.0	10.4	2.87	0.29	12:43	10.87	49.6	7	12:44	30	10.00	60.0	10.3	2.91	0.28	13:14	10.86	49.7	8	13:15	30	10.00	60.0	10.1	2.98	0.28	13:45	10.84	49.9	9	13:46	30	10.00	60.0	10.1	2.98	0.28	14:16	10.84	49.9	10	14:18	30	10.00	60.0	10.0	3.01	0.27	14:48	10.83	50.0	11	14:50	30	10.00	60.0	10.0	3.01	0.27	15:20	10.83	50.0																												
5	11:42	30	10.00	60.0	10.2	2.94	0.28																																																																																																									
	12:12		10.85	49.8				6	12:13	30	10.00	60.0	10.4	2.87	0.29	12:43	10.87	49.6	7	12:44	30	10.00	60.0	10.3	2.91	0.28	13:14	10.86	49.7	8	13:15	30	10.00	60.0	10.1	2.98	0.28	13:45	10.84	49.9	9	13:46	30	10.00	60.0	10.1	2.98	0.28	14:16	10.84	49.9	10	14:18	30	10.00	60.0	10.0	3.01	0.27	14:48	10.83	50.0	11	14:50	30	10.00	60.0	10.0	3.01	0.27	15:20	10.83	50.0																																							
6	12:13	30	10.00	60.0	10.4	2.87	0.29																																																																																																									
	12:43		10.87	49.6				7	12:44	30	10.00	60.0	10.3	2.91	0.28	13:14	10.86	49.7	8	13:15	30	10.00	60.0	10.1	2.98	0.28	13:45	10.84	49.9	9	13:46	30	10.00	60.0	10.1	2.98	0.28	14:16	10.84	49.9	10	14:18	30	10.00	60.0	10.0	3.01	0.27	14:48	10.83	50.0	11	14:50	30	10.00	60.0	10.0	3.01	0.27	15:20	10.83	50.0																																																		
7	12:44	30	10.00	60.0	10.3	2.91	0.28																																																																																																									
	13:14		10.86	49.7				8	13:15	30	10.00	60.0	10.1	2.98	0.28	13:45	10.84	49.9	9	13:46	30	10.00	60.0	10.1	2.98	0.28	14:16	10.84	49.9	10	14:18	30	10.00	60.0	10.0	3.01	0.27	14:48	10.83	50.0	11	14:50	30	10.00	60.0	10.0	3.01	0.27	15:20	10.83	50.0																																																													
8	13:15	30	10.00	60.0	10.1	2.98	0.28																																																																																																									
	13:45		10.84	49.9				9	13:46	30	10.00	60.0	10.1	2.98	0.28	14:16	10.84	49.9	10	14:18	30	10.00	60.0	10.0	3.01	0.27	14:48	10.83	50.0	11	14:50	30	10.00	60.0	10.0	3.01	0.27	15:20	10.83	50.0																																																																								
9	13:46	30	10.00	60.0	10.1	2.98	0.28																																																																																																									
	14:16		10.84	49.9				10	14:18	30	10.00	60.0	10.0	3.01	0.27	14:48	10.83	50.0	11	14:50	30	10.00	60.0	10.0	3.01	0.27	15:20	10.83	50.0																																																																																			
10	14:18	30	10.00	60.0	10.0	3.01	0.27																																																																																																									
	14:48		10.83	50.0				11	14:50	30	10.00	60.0	10.0	3.01	0.27	15:20	10.83	50.0																																																																																														
11	14:50	30	10.00	60.0	10.0	3.01	0.27																																																																																																									
	15:20		10.83	50.0																																																																																																												

Infiltration Rate (I) = Flow Volume/Flow Area/Δt

Infiltration Rate, I (Last Reading) = 0.27 in./hr.

**Boring Percolation Test Data Sheet**

<b>Project Number:</b>	11263.002	<b>Test Hole Number:</b>	P-3
<b>Project Name:</b>	Integral Crowther	<b>Date Excavated:</b>	2/1/2017
<b>Earth Description:</b>	Alluvium	<b>Date Tested:</b>	2/2/2017
<b>Liquid Description:</b>	Tap water	<b>Depth of boring (ft):</b>	20
<b>Tested By:</b>	JMP	<b>Diameter of boring (in):</b>	8
<b><u>Time Interval Standard</u></b>		<b>Diameter of casing (in):</b>	2
<b>Start Time for Pre-Soak:</b>	2/1/2017 11:00am	<b>Length of slotted of casing (ft):</b>	5
<b>Start Time for Standard:</b>	2/2/2017 8:40am	<b>Depth to Initial Water Depth (ft):</b>	15
<b>Standard Time Interval</b>		<b>Porosity of Annulus Material, n :</b>	0.35
<b>Between Readings, mins:</b>	30	<b>Bentonite Plug at Bottom:</b>	No

**Percolation Data**

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H <sub>0</sub> /H <sub>f</sub> (in.)	Total Water Drop, Δd (in.)	Percolation Rate (min./in.)	Infiltration Rate (in./hr.)
1	8:40	30	15.00	60.0	23.3	1.29	0.72
	9:10		16.94	36.7			
2	9:12	30	15.00	60.0	23.2	1.30	0.72
	9:42		16.93	36.8			
3	9:43	30	15.00	60.0	23.0	1.30	0.71
	10:13		16.92	37.0			
4	10:15	30	15.00	60.0	23.2	1.30	0.72
	10:45		16.93	36.8			
5	10:47	30	15.00	60.0	23.2	1.30	0.72
	11:17		16.93	36.8			
6	11:18	30	15.00	60.0	22.7	1.32	0.70
	11:48		16.89	37.3			
7	11:50	30	15.00	60.0	22.4	1.34	0.69
	12:20		16.87	37.6			
8	12:21	30	15.00	60.0	23.0	1.30	0.71
	12:51		16.92	37.0			
9	12:53	30	15.00	60.0	23.2	1.30	0.72
	13:23		16.93	36.8			
10	13:24	30	15.00	60.0	23.2	1.30	0.72
	13:54		16.93	36.8			
11	13:56	30	15.00	60.0	23.2	1.30	0.72
	14:26		16.93	36.8			
12	14:27	30	15.00	60.0	23.2	1.30	0.72
	14:57		16.93	36.8			

Infiltration Rate (I) = Flow Volume/Flow Area/Δt

Infiltration Rate, I (Last Reading) = 0.72 in./hr.

# Attachment D

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## Hazardous Materials Studies

D1

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Soil Vapor Survey



**OPTIMAL TECHNOLOGY**  
Specializing in Environmental Field Services

March 24, 2016

Mr. Jon Buck  
Advanced Environmental Concepts, Inc.  
220 E. Truxtun Avenue  
Bakersfield, CA 93305

Dear Mr. Buck:

This letter presents the results of the soil vapor investigation conducted by Optimal Technology (Optimal), for Advanced Environmental Concepts, Inc. on March 22-23, 2016. The study was performed at 110 & 132 E. Crowther Ave., Placentia, California.

Optimal was contracted to perform a soil vapor survey at this site to screen for possible chlorinated solvents and aromatic hydrocarbons. The primary objective of this soil vapor investigation was to determine if soil vapor contamination is present in the subsurface soil.

**Gas Sampling Method**

Gas sampling was performed by hydraulically pushing soil gas probes to a depth of 5.0-15.0 feet below ground surface (bgs). When necessary one-quarter inch Nylaflo tubing was installed at depth in a one-foot sand pack. Hydrated bentonite filled the hole from the top of the sand pack to the surface. An electric rotary hammer drill was used to drill a 1.0-inch diameter hole through the overlying surface to allow probe placement when required. The same electric hammer drill was used to push probes in areas of resistance during placement.

At each sampling location an electric vacuum pump set to draw 0.2 liters per minute (L/min) of soil vapor was attached to the probe and purged prior to sample collection. Vapor samples were obtained in SGE gas-tight syringes by drawing the sample through a luer-lock connection which connects the sampling probe and the vacuum pump. Samples were immediately injected into the gas chromatograph/purge and trap after collection. New tubing was used at each sampling point to prevent cross contamination.

All analyses were performed on a laboratory grade Hewlett Packard model 5890 Series II gas chromatograph equipped with a Hewlett Packard model 5971 Mass Spectra Detector and Tekmar LSC 2000 Purge and Trap. An SGE capillary column using helium as the carrier gas was used to perform all analysis. All results were collected on a personal computer utilizing Hewlett Packard's 5971 MS and chromatographic data collection and handling system.

## Quality Assurance

### *5-Point Calibration*

The initial five point calibration consisted of 20, 50, 100, 200 and 500 ul injections of the calibration standard. A calibration factor on each analyte was generated using a best fit line method using the HP data system. If the  $r^2$  factor generated from this line was not greater than 0.990, an additional five point calibration would have been performed. Method reporting limits were calculated to be 0.01-1.0 micrograms per Liter (ug/L) for the individual compounds.

A daily calibration check and end of run calibration check was performed using a pre-mixed standard supplied by Scotty Analyzed Gases. The standard contained common halogenated solvents and aromatic hydrocarbons (see Table 1). The individual compound concentrations in the standards ranged between 0.025 nanograms per microliter (ng/ul) and 0.25 ng/ul.

**TABLE 1**

Dichlorodifluoromethane	Carbon Tetrachloride	Chloroethane
Trichlorofluoromethane	1,2-Dichloroethane	Benzene
1,1-Dichloroethene	Trichloroethene	Toluene
Methylene Chloride	1,1,2-Trichloroethane	Ethylbenzene
trans-1,2-Dichloroethene	Tetrachloroethene	m-/p-Xylene
1,1-Dichloroethane	Chloroform	o-Xylene
cis-1,2-Dichloroethene	1,1,1,2-Tetrachloroethane	Vinyl Chloride
1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	Freon 113
4-Methyl-2-Pentanone	Cyclohexane	Acetone
Chlorobenzene	2-Butanone	Isobutane

### *Sample Replicates*

A replicate analysis (duplicate) was run to evaluate the reproducibility of the sampling system and instrument. The difference between samples did not vary more than 20%.

### *Equipment Blanks*

Blanks were run at the beginning of each workday and after calibrations. The blanks were collected using an ambient air sample. These blanks checked the septum, syringe, GC column, GC detector and the ambient air. Contamination was not found in any of the blanks analyzed during this investigation. Blank results are given along with the sample results.

### *Tracer Gas Leak Test*

A tracer gas was applied to the soil gas probes at each point of connection in which ambient air could enter the sampling system. These points include the top of the sampling probe where the tubing meets the probe connection and the surface bentonite seals. Isobutane was used as the tracer gas. No Isobutane was found in any of the samples collected.

### *Purge Volume*

The standard purge volume of three volumes was purged in accordance with the July 2015 DTSC/RWQCB Advisory for Active Soil Gas Investigations.

### *Shut-in Test*

A shut-in test was conducted prior to purging or sampling each location to check for leaks in the above-ground sampling system. The system was evaluated to a minimum measured vacuum of 100 inches of water. The vacuum gauge was calibrated and sensitive enough to indicate a water pressure change of at least 0.5 inches.

### **Scope of Work**

To achieve the objective of this investigation a total of 28 vapor samples were collected from 13 locations at the site. Sampling depths, vacuum readings, purge volume and sampling volumes are given on the analytical results page. All the collected vapor samples were analyzed on-site using Optimal's mobile laboratory.

### **Subsurface Conditions**

Subsurface soil conditions at this site were predominately silty-clay from ground surface to 15.0 feet bgs. These soil conditions offered sampling flows at 0-10" water vacuum.

### **Results**

During this vapor investigation seventeen samples contained levels of Tetrachloroethene (PCE). PCE levels ranged from 0.14 ug/L to 0.64 ug/L. Additionally, EE-1-15' contained 0.05 ug/L of Benzene. None of the other compounds listed in Table 1 above were detected above the listed reporting limits. A complete table of analytical results is included with this report.

### **Disclaimer**

All conclusions presented in this letter are based solely on the information collected by the soil vapor survey conducted by Optimal Technology. Soil vapor testing is only a subsurface screening tool and does not represent actual contaminant concentrations in either the soil and/or groundwater. We enjoyed working with you on this project and look forward to future projects. If you have any questions please contact me at (877) 764-5427.

Sincerely,



John Rice  
Project Manager



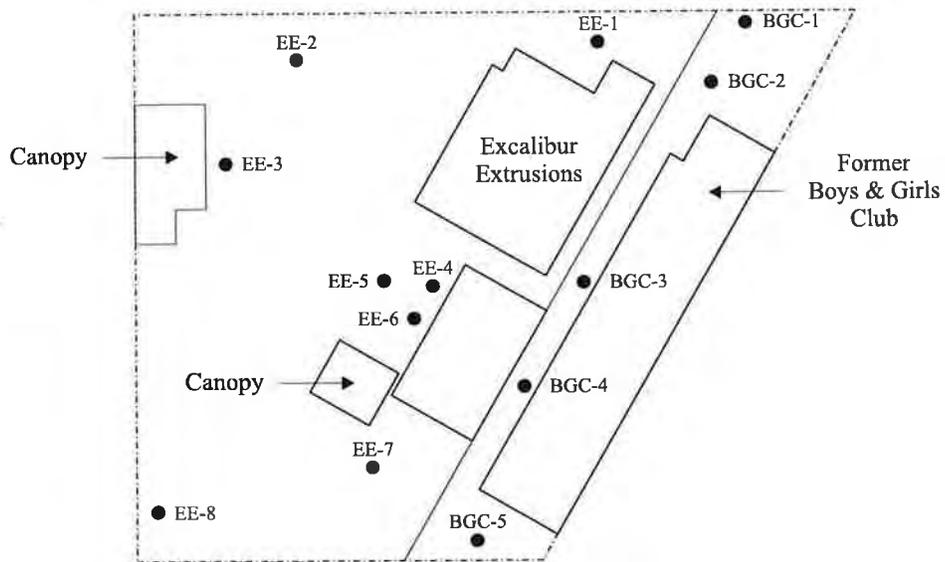








Crowther Ave.



Approximate Scale

**Legend**

- EE-1; BGC-1 - Soil Vapor Sample Number
- - Soil Vapor Sample Location

**Optimal Technology**

1667 Cross Bridge Place  
Thousand Oaks, CA 91362  
Toll-free (877) SOIL GAS  
Tel: (818) 734-6230 \* Fax: (818) 734-6235

**DATE:** March 22-23, 2016

**COMPANY:**  
Advanced Environmental  
Concepts, Inc.

**APPROXIMATE SCALE:** 1" = 120'

**TITLE:** Soil Vapor Sampling Location Map  
110 & 132 E. Crowther Ave., Placentia, CA

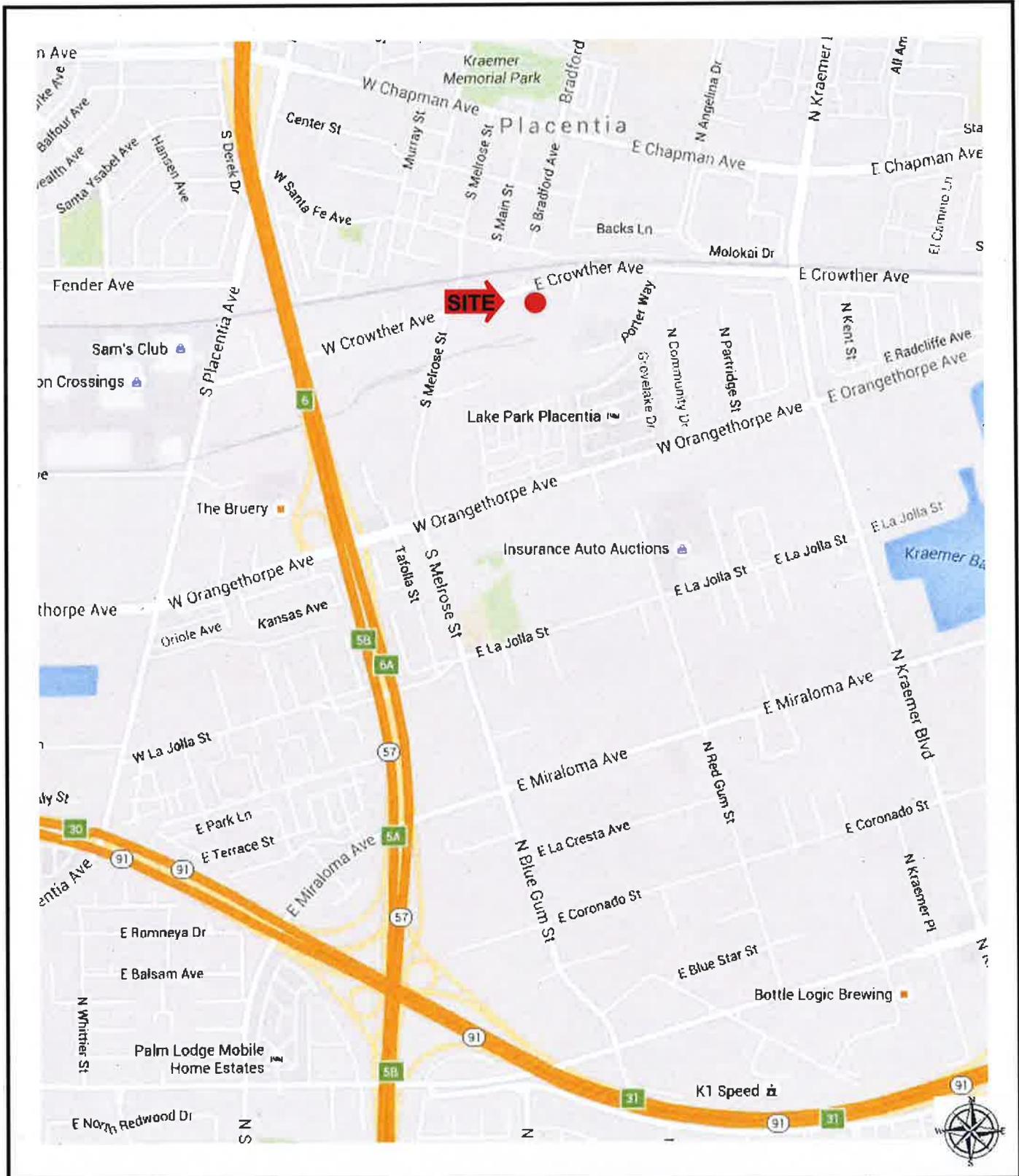
**FIGURE**

**1**

D2

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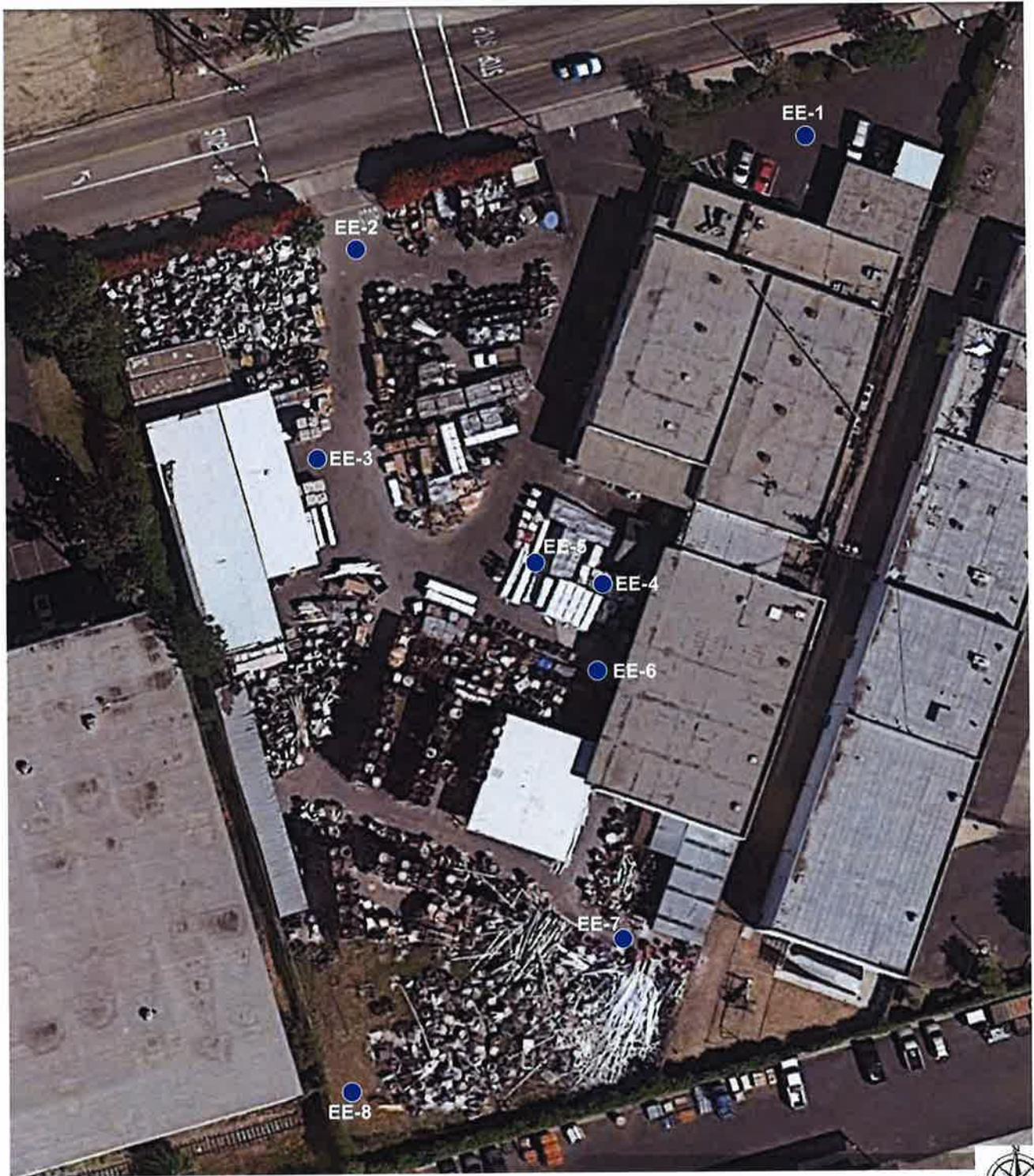
Soil Vapor Testing Figures and Pictures



**AEC**  
 -ADVANCED ENVIRONMENTAL CONCEPTS INC -  
 220 East Truxtun Avenue  
 Bakersfield, California 93305  
 (661) 395-1646

**Site Location Map**  
**2.95-acre Industrial Property**  
**110 and 132 East Crowther Avenue**  
**County of Kern • Bakersfield, California**

**FIGURE**  
**1**



● Soil Gas Sample Location

Scale: 1" = 61'



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**Soil Gas Locations**  
**Excalibur Extrusions**  
**110 East Crowther Avenue**  
**County of Orange • Placentia, California**

**FIGURE**  
**2a**



● Soil Gas Sample Location

Scale: 1" = 55'



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 - ADVANCED ENVIRONMENTAL CONCEPTS INC -  
 220 East Truxtun Avenue  
 Bakersfield, California 93305  
 (661) 395-1646

**Soil Gas Locations**  
**Former Boys & Girls Club**  
**132 East Crowther Avenue**  
**County of Orange • Placentia, California**

**FIGURE**  
**2b**

Excalibur Extrusion  
March 22, 2016

1. View of soil gas sample location EE-1. "Wells" were required due to elevated clay content. Wells installed at 5' and 15' bgs.



2. View of location EE-6 which is in area of former USTs that exhibited solvent detection. Flow was good, therefore, probe sampling occurred.

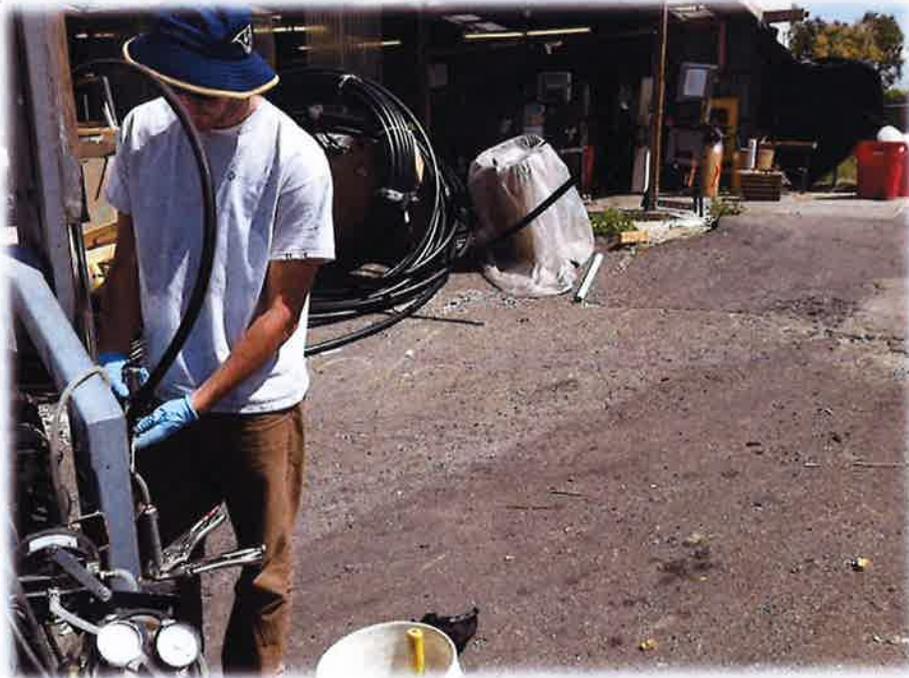


Excalibur Extrusion  
March 22, 2016

3. View of soil gas sample collection using glass barrel syringe.



4. View of soil gas location EE-7 near southwest corner of building.



Excalibur Extrusion  
March 22, 2016

5. View of location EE-8 in southwest corner of property.



Boys & Girls Club  
March 23, 2016

1. View of soil gas location BGC-1 near driveway entrance off of E. Crowther.



2. View of soil gas location BGC-2.



Boys & Girls Club  
March 23, 2016

3. Using roto-hammer to advance 15' probe at location BGC-5 at south portion of lot.



D3

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Phase I Environmental Site Assessment



## Phase I Environmental Site Assessment

for

**Excalibur Extrusions**  
110 East Crowther Avenue  
County of Orange • Placentia, California

&

**Former Boys & Girls Club of Placentia**  
132 East Crowther Avenue  
County of Orange • Placentia, California



**This report has been prepared for:**

**Mr. Erik Weeks**  
**Integral Partners Funding, LLC**

**Prepared: February 2016**

• ENVIRONMENTAL CONCEPTS WITH DESIGN IN MIND •

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- Appendix A: Figures and Site Photographs
- Appendix B: EDR Environmental Database Survey
- Appendix C: Tank Closure Reports, OCHCA Closure Summary and Closure Letter
- Appendix D: OCHCA Hazardous Materials Inventory
- Appendix E: Asbestos Survey

## EXECUTIVE SUMMARY

Advanced Environmental Concepts, Inc. (AEC) performed a Phase I Environmental Site Assessment (ESA) on two parcels totaling 2.95-acres having addresses of 110 and 132 East Crowther Avenue, Placentia, California on behalf of Mr. Erik Weeks of Integral Partners Funding, LLC (Integral). Also, this subject property is described by two Orange County Assessor's Parcel Numbers (APNs) of 339-091-08 (0.85-acres) and 339-091-09 (2.1-acres).

The larger of the two subject parcels is the western 2.1-acre property having an address of 110 E. Crowther Avenue and is currently occupied by Excalibur Extrusions; a plastic pipe, nipple, and coupling manufacturing facility. The owner of the subject business (Mr. Glenn Baldwin) stated that his company has been onsite since 1970 and that he purchased the site from a ceramics manufacturing company at that time. However, a review of the City Directory indicated that a ceramics company still occupied the site during 1972. In any event, following the ceramics company occupancy, the property has been used as a plastics manufacturing site for a minimum of 44 years. The property is improved with 17,892 square feet of building space in which it appears additions have been added over the years. The northeastern portion of the subject building is improved with asphalt-paved parking area that adjoins approximately 1,500 square feet of office space. The interior of the office space is improved with drop ceilings, linoleum flooring and HVAC system. The warehouse and manufacturing space are within approximate 14' to 18' high ceilings and sited on a slab-on-grade. The building is improved with loading bays along the west side and along the eastern exterior wall AEC observed a few air compressors and the cooling tower used to chill the water that cools the pipe following extrusion. AEC was informed by Mr. Baldwin that there used to be seven underground storage tanks (USTs) of varying capacities that formerly contained chemicals such as Methyl Ethyl Ketone (MEK) sited in the subsurface along the west side of the second loading dock. However, a review of the UST removal documents indicate there were nine USTs onsite having capacities of 5,000-gallons (5 tanks); 3,000-gallons (1 tank); 2,000-gallons (1 tank); and 1,000-gallons (2 tanks). Note that the tank capacities vary based on which document is reporting. The USTs were installed by the original property owner (ceramics manufacturing company) during the late 1960s and transferred to Excalibur during the property sale. The reports indicate gasoline was stored in the tanks, although this does not make complete sense in that the USTs were plumbed into the central manufacturing room and the product lines entered through a concrete wall. AEC was still able to observe the 2-inch diameter piping guides through the wall. The USTs were removed during 1992 under permit with the Orange County Health Care Agency (OCHCA) and soil samples collected beneath the east ends of Tank Nos. 2 and 3 indicated 400 ug/kg and 300 ug/kg of 1,1,1-Trichloroethane (TCA), respectively. Therefore, the OCHCA requested an additional investigation which consisted of drilling three soil borings to a maximum depth of 21' bgs. The analytical results indicated non-detectable TCA at 16' and 21' bgs, therefore, the OCHCA closed the site.

The western half of the subject site is basically an open yard used for storage of raw plastic pellets that are imported to the site to be melted and used in the manufacturing process, or storage for manufacturing "mistakes" that will either be re-used in the manufacturing process or disposed at an offsite recycling facility. AEC also observed a steel-constructed canopy in the northwest portion of the site that is used for covered storage of raw product and finished product.

The eastern portion of the subject property has an address of 132 E. Crowther Avenue and consists of an approximate 15,457 square foot building on an approximate 0.85-acre parcel. The elongated rectangular-shaped building borders the east boundary and there is an asphalt-paved parking lot within the northern portion adjoining E. Crowther Avenue. Also, there is a triangular-shaped open space area improved with grass and a cement slab-on-grade patio along the south end of the property. Currently, the masonry block and concrete tilt-up building is just a shell; the interior was gutted during the past year by the current owner (Mr. Brian Johnson) in preparation for re-development. The building has historically been occupied by the Boys & Girls Club of Placentia from at least 1972 to approximately 2013. During the Boys & Girls Club occupancy the interior was improved with offices, classrooms, bathrooms, an atrium, and indoor sporting facilities.

The ESA process under ASTM Standard 1527 was created to identify *recognized environmental conditions* (RECs) which present a material risk of harm to public health or the environment and generally be the subject of an enforcement action if brought to the attention of appropriate governmental agencies. The ESA process additionally identifies *controlled recognized environmental conditions*, which are specified under ASTM Standard 1527 as a REC resulting from a past release that has been addressed to the satisfaction of the applicable regulatory authority with hazardous substances allowed to remain in place subject to institutional controls; and/or *historical recognized environmental conditions*, i.e. conditions which may have presented a material risk to public health and/or the environment but have now been mitigated to the satisfaction of a regulatory agency at the Subject Property. The descriptive term "recognized environmental condition" means the presence, or likely presence, of any hazardous substances or petroleum products in, at, or on a property due to any release to the environment; under conditions that indicate an existing release, a past release, or a material threat of a release to the environment. In addition, AEC will identify non-ASTM conditions ("housekeeping conditions") which are considered de minimis and generally do not present a material risk of harm to public health or the environment and would not be the subject of an enforcement action if brought to the attention of an appropriate governmental agency.

The results of this investigation have identified no *housekeeping conditions*, no *controlled recognized environmental conditions*, no *recognized environmental conditions*, no *historical offsite recognized environmental conditions*, and one *onsite historical recognized environmental condition*.

#### Historical Recognized Environmental Condition

- The Excalibur Extrusion facility had nine underground storage tanks (USTs) of varying capacities that were reported to have contained gasoline installed at the subject property along the west side of the manufacturing building outside a loading bay. The USTs were removed under Orange County Health Care Agency (OCHCA) permit during June 1992 and soil samples collected beneath USTs identified as Nos. 2 and 3 exhibited elevated concentrations of 1,1,1-TCA, a chlorinated solvent (400 ug/kg and 330 ug/kg, respectively at a depth of 14' bgs). The OCHCA required a subsurface investigation to evaluate the vertical migration of the TCA, therefore, three soil borings were drilled to 21' bgs and soil samples were collected at 16' bgs and 21' bgs. The confirmation samples collected at 16' and 21' bgs indicated non-detectable concentrations of TCA, therefore, closure was issued by the OCHCA in a letter dated November 13, 1992.

*Since the property is scheduled for conversion from industrial-use to residential-use AEC recommends conducting a multi-depth soil gas investigation focused in the area of the former nine USTs, and also conduct a site-wide soil gas investigation at both 110 and 132 E. Crowther Avenue. The multi-depth soil gas investigation will evaluate the subject property for future vapor intrusion concerns.*

AEC has conducted this Phase I Environmental Site Assessment at 110 and 132 E. Crowther Avenue, Placentia, California (the Property) in conformance with the scope and limitations of ASTM Standard E1527-13. Any exceptions to, or deletions from this practice are described in Section 5.0 of this report. This assessment has revealed no evidence of recognized environmental conditions in connection with the Subject Property. Therefore, based on the results of our investigation, AEC recommends conducting a soil gas survey to identify if a potential vapor intrusion concern exists for residential development.

## 1.0 INTRODUCTION

Advanced Environmental Concepts, Inc. (AEC) was retained by Mr. Erik Weeks of Integral Partners Funding, LLC ("User"), to prepare a Phase I Environmental Site Assessment at 110 and 132 E. Crowther Avenue, Placentia, California (the "Property"). A location map for the Property is presented as Figure 1 in Appendix A. This assessment was performed in conformance with 40 CFR 312, Standards for Conducting All Appropriate Inquiries, and general conformance with ASTM E1527-13.

## 2.0 PURPOSE

The purpose of this assessment is to identify recognized environmental conditions located at the subject site or adjacent properties which could present material risk of harm to public health or to the environment. Recognized environmental conditions, as defined within ASTM Designation E1527-13, are the presence, or likely presence, of any hazardous substances or petroleum products in, at, or on a property due to any release to the environment; under conditions that indicate an existing release, a past release, or a material threat of a release to the environment.

This assessment is intended to constitute appropriate inquiry into the previous ownership and uses of the property, as required to support the assertion of the innocent landowner, contiguous property owner, and/or bona fide prospective purchaser defenses to liability (collectively the Landowner Liability Protections, or LLPs) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA a.k.a. Superfund), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the Small Business Liability Relief and Brownfields Revitalization Act of 2002.

If known or suspected contamination is identified, Users seeking to maintain Landowner Liability Protections have responsibilities in addition to completing an AAI-compliant Phase I Environmental Site Assessment. These "continuing obligations" include taking "appropriate care" and "reasonable steps" with respect to known or suspected releases of hazardous substances during the tenure of property ownership. In addition to these requirements under Federal law there are also different requirements under state law with respect to liability protections. On request, Advanced Environmental Concepts, Inc. can provide support for clients with continuing obligations, as appropriate.

## 3.0 SCOPE OF SERVICES

To evaluate the potential presence of recognized environmental conditions, this preliminary investigation consisted of the following:

- Contacting appropriate regulatory agencies for hazardous materials information concerning the subject site and surrounding areas located within an approximate 1-mile radius of the site boundaries. Inquiries were made regarding documentation of: (a) toxic spills; (b) underground storage tanks; (c) the use, storage, generation, and/or disposal of hazardous materials; (d) the presence of disposal wells and/or leach fields, drain fields, and septic systems; and, (e) violations of applicable environmental control standards;
- Conducting interviews and researching historical site usage for information regarding past or present recognized environmental conditions;
- Reviewing selected database reports, maps, and aerial photographs for information pertaining to potential sources or visual indications of soil and groundwater contamination;
- Conducting an on-site inspection and off-site reconnaissance to identify visible evidence of the generation, use, storage, spills, or disposal of hazardous materials;
- Evaluating investigational findings and the preparation of a detailed report inclusive of findings and recommendations.

#### 4.0 SPECIAL TERMS AND CONDITIONS

The information included in this report is intended for use exclusively as a preliminary assessment of potential environmental and human health concerns at the project site. Data is generally obtained through telephone conversations, personal interviews, public records, public information, general maps and aerial photographs. These services have been rendered by Advanced Environmental Concepts, Inc. (AEC) in accordance with generally accepted practices by professional geologists and environmental specialists. Also, the report has been prepared in accordance with the care and skill generally exercised by reputable professionals, under similar circumstances, in this or similar localities. Because of the limited nature of this investigation, the firm is precluded from providing a warranty, expressed or implied, regarding the presence of hazardous materials that could potentially adversely affect the subject site.

This report is provided with the understanding that it is the responsibility of the owner to convey the information and recommendations contained herein, to the appropriate regulatory agencies, as required. The services performed in the scope of this project are for the sole use of our client. Others who seek to rely on the findings contained within this report have a duty to determine the adequacy of the information presented herein, for their time, location, and intended use.

#### 5.0 LIMITATIONS AND ASSUMPTIONS

This report presents the results of a Phase I Environmental Site Assessment conducted by **Advanced Environmental Concepts, Inc. (AEC)** for Mr. Erik Weeks of Integral Partners Funding, LLC (client), on the following property(s):

**Excalibur Extrusions  
110 E. Crowther Avenue  
Approximate 2.1-acre Occupied Parcel  
County of Orange • Placentia, California**

**Former Boys & Girls Club of Placentia  
132 E. Crowther Avenue  
Approximate 0.85-acre Vacant Parcel  
County of Orange • Placentia, California**

No other properties were included within the scope of this assessment except as required for the off-site reconnaissance and for the regulatory agency database and file review pertaining to potential sources of offsite recognized environmental concerns. Historical information regarding the subject parcels is limited to review of maps, public documents, interviews with people knowledgeable with the past and present uses of the property, and aerial photography review.

The investigation focused on releases and threatened releases of hazardous substances or petroleum products that could be considered a recognized environmental condition and/or a liability due to their possible presence in significant concentrations (e.g., above acceptable limits set by the Federal or state government) or due to the potential for contaminant migration through exposure pathways (e.g., groundwater). Materials that may contain substances which are not currently deemed hazardous by the federal or state of California EPA were not considered as part of this study.

Unless specifically included in our scope of services, formal surveys for asbestos-containing materials, lead-based paints, fire safety, vapor intrusion, indoor air quality, mold, and similar matters were not part of this assessment. The Property was not evaluated for compliance with land use, zoning, wetlands, or similar laws. This report is not intended to be an environmental compliance audit.

Hazardous substances naturally occurring in plants, soils, and rocks, (e.g., heavy metals, naturally occurring asbestos, or radon) are not typically considered in these investigations. Similarly, construction debris (e.g., discarded concrete, asphalt) is not considered to be of concern unless observation determined that hazardous substances are likely to be present in "actionable" concentrations.

Unless otherwise noted, sampling and laboratory analyses of soil, water, air, building materials, or other media, were not performed as part of this investigation. Quantitative identification of hazardous substances can only be accomplished through sampling and appropriate laboratory analysis.

AEC assumes no responsibility for the accuracy of information obtained from, compiled by, or provided by third-party sources, such as regulatory agency listings. AEC assumes that information collected during this environmental site assessment is accurate and correct. Unless warranted, information collected has not been independently validated as part of this assessment.

The following information is the responsibility of the User (40 CFR 312.22) and is not included in this Phase I Assessment Report:

- The relationship of the "purchase price" to the "fair market value" of the Property. The purchaser of a Property is required to consider whether a difference between the purchase price and the fair market value of the Property is due to the presence of potential releases or identification of hazardous substances at the Property.

The following limitations/restrictions were placed on AEC:

- There were no limiting factors that impeded access to AEC for the entire subject property.

## 6.0 GENERAL SITE CHARACTERISTICS

### 6.1 Site Location and General Site Description

The subject property totals approximately 2.95-acres and is divided into two parcels described by Orange County Assessor's Parcel Numbers<sup>1</sup> (APNs) of 339-091-08 (0.85-acres) and 339-091-09 (2.1-acres). The larger westernmost parcel has a street address of 110 E. Crowther Avenue and the small easternmost parcel has a street address of 132 E. Crowther Avenue. The current registered owner(s) of the property are:

Glenn E. Baldwin and Kathryn E. Baldwin November 26, 1991 Living Trust  
c/o Mr. Glenn Baldwin  
110 E. Crowther Avenue  
Placentia, CA 92870

Paper Canyon, LLC a Wyoming Close Limited Liability Company  
c/o Mr. Brian Johnson  
132 E. Crowther Avenue  
Placentia, CA 92870

Also, the two parcels are identified as portions of Block "H" within the Kraemer Tract as shown by Map on File in Book 12, Pages 87 and 88 of Miscellaneous Maps, Records of Los Angeles County, California. Also, Parcel 2 as filed in Book 34, Page 26 in the Records of Orange County, California.

### 6.2 Current Use of the Property

The subject parcel having a street address of 110 E. Crowther Avenue is occupied by Excalibur Extrusions and manufactures plastic products consisting of pipe, nipples and couplings. The subject parcel having a street address of 132 E. Crowther Avenue is currently unoccupied.

### 6.3 Past Uses of the Property

The site was previously planted to citrus orchard and a farm compound was sited in the northwest corner of the property from prior to 1938 until the early 1960s. Both parcels were developed during the late 1960s with buildings following the removal of the citrus orchards and eucalyptus wind break. The property at 110 E. Crowther Avenue was reportedly a ceramics manufacturing facility from 1966 through 1970 and Excalibur Extrusions purchased the property for plastics manufacturing during that time. The property at 132 E. Crowther Avenue was improved with the elongated rectangular-shaped building during the late 1960s and operated as the Boys & Girls Club of Placentia until approximately 2013.

### 6.4 Current and Past Uses of Adjoining Properties

Historically, the surrounding properties were planted to citrus orchard from prior to 1938 into the early-1960s. During the mid to late 1960s the general area was converted from agricultural use to commercial, industrial and residential use.

Currently, the adjoining properties consist of the following:

North: The north boundary is E. Crowther Avenue, across this street is a temporary parking lot associated with the railroad. Across the railroad tracks is an apartment complex.

South: The south boundary consists of the loading dock and drive areas associated with a commercial facility identified as Arlon Graphics.

West: The adjoining western property is identified as Teetot & Company distribution facility.

East: The adjoining property to the east consists of parking lots and concrete tilt-up buildings associated with the Crowther Business Center.

## 7.0 SITE AND VICINITY CHARACTERISTICS

### 7.1 Physiographic Setting

The site is within the Downey Plain in an area known as San Juan Cajon De Santa Ana with an approximate elevation of 225-feet above mean sea level (msl). The East Coyote Hills are approximately 2-miles to the northwest with the Santa Ana River approximately 2.5-miles to the southeast. Beyond the Santa Ana River are the Peralta Hills, approximately 4-miles from the Site (USGS, 1964 and 1965).<sup>2,3</sup>

The subject property is approximately 4-miles east of the Norwalk fault zone and the Norwalk syncline. The Norwalk syncline extends along the south boundary of the Coyote Hills and plunges to the northwest in the direction of the city of Norwalk. The Coyote Hills are a result of uplift and folding associated with the Norwalk fault zone.

The two parcels are on the boundary of Quaternary alluvium and Pleistocene nonmarine sediments. The Pleistocene sediments are older alluvium and stream terrace deposits, most likely of the La Habra formation. The La Habra formation contains nonmarine conglomerates, conglomeritic sandstone and siltstone. Below the La Habra formation, a sequence comprised of the Coyote Hills, San Pedro, Fernando, Puente, El Modena Volcanics, Topanga, and undifferentiated Vaqueros and Sespe formations extend approximately 9,000 feet to basement. The basement is composed of granitic intrusive and metamorphic rocks.

The Site is within the Forebay section of the Lower Santa Ana River Basin. The Forebay designation refers to area of recharge for aquifers within the lower Santa Ana River Basin. Aquifers in the Lower Santa Ana River Basin have been divided into three categories: Upper, Middle, and Lower. The Upper aquifer system has been defined as all water bearing units above the Main aquifer, including the water-bearing strata of the Coyote Hills and San Pedro formations. The main aquifer includes the Semi-Perched, Talbert, and Bolsa aquifers. The Middle aquifer system is comprised of mostly the Main aquifer, including deeper unnamed aquifers that may be hydraulically connected. Finally, the Lower aquifer system has been identified as sandstones and conglomerates of the Fernando and Pico formations (DWR, 1967).

Subsurface investigations in the general area indicate that groundwater occurs beneath the site at depths ranging from 75 to 90-feet bgs and the flow direction is to the south-southwest with a shallow gradient.

## 8.0 SITE DESCRIPTION AND INSPECTION

An inspection of the Property and reconnaissance of the surrounding area was conducted on February 16, 2016 by Jonathan Buck, Registered Geologist, of AEC. The larger of the two subject parcels is the western 2.1-acre property having an address of 110 E. Crowther Avenue and is currently occupied by Excalibur Extrusions; a plastic pipe, nipple, and coupling manufacturing facility. The owner of the subject business (Mr. Glenn Baldwin) stated that his company has been onsite since 1970 and that he purchased the site from a ceramics manufacturing company at that time. However, a review of the City Directory indicated that a ceramics company still occupied the site during 1972. In any event, following the ceramics company occupancy, the property has been used as a plastics manufacturing site for a minimum of 44 years. The property is improved with 17,892 square feet of building space in which it appears additions have been added over the years. The northeastern portion of the subject building is improved with asphalt-paved parking area that adjoins approximately 1,500 square feet of office space. The interior of the office space is improved with drop ceilings, linoleum flooring and HVAC system. The warehouse and manufacturing space are within approximate 14' to 18' high ceilings and sited on a slab-on-grade. The building is improved with loading bays along the west side and along the eastern exterior wall AEC observed a few air compressors and the cooling tower used to chill the water that cools the pipe following extrusion. AEC was informed by Mr. Baldwin that there used to be seven underground storage tanks (USTs) of varying capacities that formerly contained chemicals such as Methyl Ethyl Ketone (MEK) sited in the subsurface along the west side of the second loading dock. However, a review of the UST removal documents indicate there were nine USTs onsite having capacities of 5,000-gallons (5 tanks); 3,000-gallons (1 tank); 2,000-gallons (1 tank); and 1,000-gallons (2 tanks). Note that the tank capacities vary based on which document is reporting. The USTs were installed by the original property owner (ceramics manufacturing company) during the late 1960s and transferred to Excalibur during the property sale. The reports indicate gasoline was stored in the tanks, although this does not make complete sense in that the USTs were plumbed into the central manufacturing room and the product lines entered through a concrete wall. AEC was still able to observe the 2-inch diameter piping guides through the wall. The USTs were removed during 1992 under permit with the Orange County Health Care Agency (OCHCA) and soil samples collected beneath the east ends of Tank Nos. 2 and 3 indicated 400 ug/kg and 300 ug/kg of 1,1,1-Trichloroethane (TCA), respectively. Therefore, the OCHCA requested an additional investigation which consisted of drilling three soil borings to a maximum depth of 21' bgs. The analytical results indicated non-detectable TCA at 16' and 21' bgs, therefore, the OCHCA closed the site.

The western half of the subject site is basically an open yard used for storage of raw plastic pellets that are imported to the site to be melted and used in the manufacturing process, or storage for manufacturing "mistakes" that will either be re-used in the manufacturing process or disposed at an offsite recycling facility. AEC also observed a steel-constructed canopy in the northwest portion of the site that is used for covered storage of raw product and finished product.

The eastern portion of the subject property has an address of 132 E. Crowther Avenue and consists of an approximate 15,457 square foot building on an approximate 0.85-acre parcel. The elongated rectangular-shaped building borders the east boundary and there is an asphalt-paved parking lot within the northern portion adjoining E. Crowther Avenue. Also, there is a triangular-shaped open space area improved with grass and a cement slab-on-grade patio along the south end of the property. Currently, the masonry block and concrete tilt-up building is just a shell; the interior was gutted during the past year by the current owner (Mr. Brian Johnson) in preparation for re-development. The building has historically been occupied by the Boys & Girls Club of Placentia from at least 1972 to approximately 2013. During the Boys & Girls Club occupancy the interior was improved with offices, classrooms, bathrooms, an atrium, and indoor sporting facilities.

### **8.1 Hazardous Substances**

No hazardous materials or hazardous wastes were observed on the vacant property at 132 E. Crowther Avenue. Hazardous substances stored onsite at 110 E. Crowther Avenue consists of propane, gear oil, propylene, butane, waste oil and Methyl Ethyl Ketone (MEK).

### **8.2 Natural Drainage**

There are a series of subsurface drains at the subject sites which appear to drain from south to north, then into the stormwater management system along E. Crowther Avenue.

### **8.3 Disturbed Areas**

Both parcels have been developed with buildings and asphalt-paved parking and drive areas.

### **8.4 Hydraulic Equipment**

No in-ground hydraulic equipment was observed on the Property.

### **8.5 Electrical Equipment**

Pole-mounted electrical transformers were observed along the border between 110 and 132 E. Crowther Avenue. These transformers did not appear to be leaking. Regional electric transformers are owned and operated by Southern California Edison (SCE).<sup>4</sup> According to information obtained from SCE, all transformers within the power distribution network suspected of containing PCBs in concentrations exceeding 50 parts per million were removed and replaced by 1990. Manufacture of PCB-containing electric power transformers was discontinued in 1984.

*PCB sampling and laboratory analysis is beyond the scope of this site assessment.*

### **8.6 Wastewater**

There were no indications of wastewater disposal systems observed within the limits of the subject property.

#### **8.6.1 Sewage Disposal Systems**

The bathrooms are connected to active onsite sewer lines associated with the municipal utility.

#### **8.6.2 Pools of Liquid**

AEC did not identify any areas of standing surface water during this site assessment.

### 8.6.3 Pits, Ponds, or Lagoons

AEC did not identify any pits, ponds, or lagoons during this site assessment.

### 8.6.4 Drains and Sumps

AEC identified stormwater collection drains in the parking and drive areas that are tied into the area-wide stormwater system. No sumps were identified onsite.

## 8.7 Solid Waste Disposal

There were no indications that solid waste is currently or historically being landfilled onsite. Onsite plastic waste at the Excalibur Extrusion facility is stored onsite in large cardboard boxes or other containers. The waste plastic is either re-used onsite in the manufacturing process or sent offsite for disposal.

## 8.8 Water Supply

The domestic water supply is currently provided by a public utility.

## 8.9 Storage Tanks

There are no fill tubes, vent pipes, dispenser islands, or other visual indication identifying the current presence of underground storage tanks (USTs) at this site. However, at the Excalibur Extrusion site there used to be nine USTs onsite having capacities of 5,000-gallons (5 tanks); 3,000-gallons (1 tank); 2,000-gallons (1 tank); and 1,000-gallons (2 tanks). Note that the tank capacities vary based on which document is reporting. The USTs were installed by the original property owner (ceramics manufacturing company) during the late 1960s and transferred to Excalibur during the property sale. The reports indicate gasoline was stored in the tanks, although this does not make complete sense in that the USTs were plumbed into the central manufacturing room and the product lines entered through a concrete wall. AEC was still able to observe the 2-inch diameter piping guides through the wall. The USTs were removed during 1992 under permit with the Orange County Health Care Agency (OCHCA) and soil samples collected beneath the east ends of Tank Nos. 2 and 3 indicated 400 ug/kg and 300 ug/kg of 1,1,1-Trichloroethane (TCA), respectively. Therefore, the OCHCA requested an additional investigation which consisted of drilling three soil borings to a maximum depth of 21' bgs. The analytical results indicated non-detectable TCA at 16' and 21' bgs, therefore, the OCHCA closed the site.

AEC did not observe any aboveground storage tanks (ASTs) at the subject property(s).

## 8.10 Designated Wetlands

Under the U. S. Army Corps of Engineers regulations, wetlands<sup>5</sup> are defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands generally include swamps, marshes, bogs and similar areas such as sloughs, prairie potholes, wet meadows, river overflows, mud flats, and natural ponds. A review of the subject site by AEC has identified no potential areas that may be Designated Wetlands. If there are any potential "Wetlands" concern, AEC recommends contracting an environmental firm well versed in wetlands mitigation.

### 8.11 Asbestos-Containing Materials (ACMs)

Asbestos containing materials (ACMs) were commonly used in building products such as roofing shingles, composite siding, linoleum flooring, acoustic ceiling tiles, furnace and water heater exhaust piping and insulation, glues and mastics, stucco, joint compounds, and composite wallboard prior to 1980. ACMs can be divided into material considered friable (easily crumbled or reduced to powder) and non-friable. Friable ACMs are regulated as hazardous materials due to the elevated long-term risk of developing lung cancer upon respiratory exposure and must be properly removed prior to renovation or demolition of any structure containing these materials. Also, ACMs have been found in 'Transite' irrigation piping commonly used in many agricultural areas of California. The onsite structures at both addresses were constructed prior to 1980, therefore, the presence of asbestos is suspected. Also, on September 9, 1992 an asbestos survey was performed at 110 E. Crowther Avenue by ECOS, Inc. The sample results indicated asbestos-containing material in the grey roof mastic; off-white floor tiles and mastic in the hall; beige floor tile and mastic in front offices; green floor tile and mastic in fabrication room; and brown floor tile and mastic in fabrication room.

*Asbestos sampling and laboratory analyses are beyond the scope of this site assessment conducted by AEC, however, prior to renovating and/or demolishing the onsite structures AEC recommends reviewing the prior report prepared by ECOS for 110 E. Crowther Avenue and also conducting an asbestos survey at 132 E. Crowther Avenue.*

### 8.12 Radon

Radon<sup>6</sup> is a colorless, odorless, tasteless, naturally occurring radioactive gas formed by the decay of uranium in soil and bedrock. Because uranium and radon occur naturally in varying amounts within rocks and soils found throughout the United States, radon is present in all the air that we breathe. Long-term exposure to elevated concentrations of radon in confined areas has been associated with an increased risk of lung cancer. The present action levels require exposure to concentrations of at least four picocuries/liter (4 pCi/L) of radon over an extended period of time. The State of California Department of Health Services conducted radon surveys across portions of Orange County, during 1990. Orange County has been classified as Zone 3 which has a predicted average indoor radon screening level less than 2 pCi/L. Sampling in the area of the Subject Property (Zip Code 92870) indicated that 8 out of 60 tests exhibited concentrations higher than 4 pCi/L. The United States Environmental Protection Agency (EPA) and the Surgeon General presently recommend that all homes in the United States be individually tested for radon.

*Radon sampling and laboratory analysis is beyond the scope of this assessment.*

### 8.13 Lead

According to information published by the United States Department of Housing and Urban development (HUD),<sup>7</sup> approximately three out of every four pre-1978 buildings contain lead-based paint and/or lead plumbing components. Since the two onsite structures at each address were constructed prior to 1978, the presence of lead-based paint is suspected.

*Lead sampling is not included within the scope of this site assessment, however, prior to conducting renovation and/or demolition of the subject buildings AEC recommends conducting a lead-based paint assessment.*

### 8.14 Odors

Strong, pungent, or noxious odors were not identified at the subject property during this site assessment.

### **8.15 Heating and Cooling**

HVAC units are currently located onsite at both structures.

### **8.16 Stains or Corrosion**

AEC did not identify any stains or corrosion during this site assessment, with the exception of hydrocarbon staining of surface asphalt proximal to the two air compressors and also corrosion of metal near the cooling tower.

### **8.17 Stressed Vegetation**

AEC did not observe any areas with stressed vegetation during this site assessment.

## **9.0 INTERVIEWS, DATA GAPS, AND PRIOR REPORTS**

### **9.1 Interviews**

#### **9.1.1 Interview with Owner**

AEC conducted a telephone interview on February 16, 2016 with Mr. Brian Johnson, owner of the subject parcel at 132 E. Crowther Avenue. He stated that he recently purchased the property and has gutted the interior of the existing building. He does not store any hazardous materials at the site. On February 16, 2016 AEC also conducted a site walk through the Excalibur Extrusion facility with the property owner (Mr. Glenn Baldwin). During the interview, questions were asked by AEC regarding past and present onsite activities that could potentially result in the environmental impairment of the subject site or adjoining properties. Mr. Baldwin was not aware of any hazardous material releases to the subject property with the exception of the contamination associated with the former operation of the USTs. Mr. Baldwin also provided AEC with a report to review regarding the removal and closure of the USTs.

#### **9.1.2 Interview with User**

Integral Partners Funding, LLC is considered the "User" for this assessment, and will not be aware of any environmental concerns unless notified of concerns in this report.

#### **9.1.3 Interview with Local Government Official(s)**

As part of the ESA for the subject property, Ms. Sandra Martin, Orange County Health Care Agency (OCHCA) was provided a written request from AEC regarding any environmental inspection records the County may have for the subject property. In addition, Ms. Martin was interviewed by AEC regarding any personal knowledge she may have regarding the subject site. Ms. Martin indicated that she has no personal knowledge of the property. Finally, AEC contacted the Orange County Fire Authority (OCFA) and the South Coast Air Quality Management District for records, however, did not conduct personal interviews. Details of the file reviews are discussed in Section 11.2.

### **9.2 Data Gaps**

A data gap is generally defined as a lack of or inability to obtain information required by this practice despite good faith efforts by the environmental professional to gather such information. Data gaps may include insufficient historical information, the inability to interview person(s) with direct site knowledge, or lack of access to all areas during the investigation.

Based on the availability of aerial photos and topographic maps for the subject site from years 1938 through 2015 in approximately 10-year intervals and interviews with personnel familiar with the property, there are no apparent data gaps related to the subject site.

### 9.3 Prior Reports

Prior reports/investigations performed at the subject property consist of the following:

*Site Investigation at Excalibur Extrusions, Inc.; 110 East Crowther Ave, Placentia, CA; prepared by Louis R. Reimer, Registered Geologist, dated July 29, 1992.*

*Excalibur Extrusions – Boring OC-3; prepared by Jeff D. Findl, Registered Geologist, dated October 8, 1992.*

*Case Summary and Closure Rationale, Excalibur Extrusions; prepared by Steve Sharp of the OCHCA, dated November 9, 1992.*

*Limited Asbestos Survey, 110 E. Crowther Avenue, Placentia, CA; prepared by ECOS, Inc., dated September 21, 1992.*

## 10.0 SITE HISTORY

### 10.1 Historical Use Information

#### 10.1.1 Aerial Photograph and Topographic Map Review

Historical aerial photographs and topographic maps of the site were reviewed in order to determine past site use by an AEC representative who noted the following observations:

**Flight Date: 1938**                      **Flyer: USGS**                      **Scale: 1"=630'**

Both parcels are planted to citrus and the property currently identified as 110 E. Crowther has been improved with a farm compound in the northwest corner. E. Crowther Avenue is visible along the north boundary of the two parcels and between E. Crowther Avenue and the northern railroad tracks are two very large structures that may be packing houses for the citrus. Residential property is visible north of the railroad tracks.

**Flight Date: 1946**                      **Flyer: USGS**                      **Scale: 1"=630'**

The eastern subject parcel currently identified as 132 E. Crowther Avenue has been cleared of the citrus orchard and a few structures erected on the site. The western parcel remains planted to citrus and still improved with the structure(s) in the northwest portion. The structures between E. Crowther Avenue and the railroad tracks appear to be associated with citrus production.

**Topographic Date: 1950**                      **Quad: Orange, et. al.**                      **Scale: 1"=2,000'**

The subject parcels are depicted as planted to citrus orchard and there are a few structures in the northwest portion of the western parcel. Also, there is a structure at the north end of the eastern parcel. The surrounding area is also primarily planted to citrus orchard.

**Flight Date: 1952****Flyer: USGS****Scale: 1"=630'**

The eastern subject parcel currently identified as 132 E. Crowther Avenue is still improved with a few onsite structures. The western parcel continues to be planted to citrus and still improved with the structure(s) in the northwest portion. The structures between E. Crowther Avenue and the railroad tracks appear to be associated with citrus production. Citrus orchards continue to dominate the general area.

**Flight Date: 1963****Flyer: USGS****Scale: 1"=630'**

The eastern subject parcel currently identified as 132 E. Crowther Avenue is still improved with a few onsite structures. The western parcel is no longer planted to citrus, however, still improved with the structure(s) in the northwest portion. The majority of the citrus trees have been cleared in the general area along E. Crowther Avenue, although the eucalyptus windbreaks remain onsite and on nearby property. The structures between E. Crowther Avenue and the railroad tracks still appear to be associated with citrus production. Citrus orchards are being cleared and no longer dominate the general area.

**Topographic Date: 1964/65****Quad: Orange et. al.****Scale: 1"=2,000'**

The subject property is now depicted as cleared of the citrus orchard, however, surrounding property remains planted to citrus. The three structures remain depicted at the subject parcels along the south side of E. Crowther Avenue.

**Flight Date: 1966****Flyer: USGS****Scale: 1"=630'**

The eastern subject parcel currently identified as 132 E. Crowther Avenue is still improved with a few onsite structures. The western parcel has now been improved with a large building in the central portion. The citrus trees have been cleared in the general area along E. Crowther Avenue, along with the onsite eucalyptus windbreak. The structures between E. Crowther Avenue and the railroad tracks are being re-developed into different uses. The citrus orchards are continuing to be removed.

**Topographic Date: 1972****Quad: Orange et. al.****Scale: 1"=2,000'**

The two parcels are now depicted as developed with structures. The majority of the citrus orchards have been cleared and structural development is occurring. The 57 Freeway has been constructed offsite to the west.

**Flight Date: 1972****USGS****Scale: 1"=605'**

The subject parcel at 110 E. Crowther Avenue has been improved with an add-on building to the south for the ceramic company. The parcel at 132 E. Crowther has now been improved with the elongated building that was constructed as the Boys & Girls Club of Placentia. The adjoining property to the west has been improved with a concrete tilt-up building and the majority of the general area is improved with commercial, industrial and residential development.

**Flight Date: 1977****USGS****Scale: 1"=605'**

The two subject parcels continue to be developed with their respective structures. The surrounding property remains improved with commercial, industrial and residential property.

**Topographic Date: 1981**                      **Quad: Orange et. al.**                      **Scale: 1"=2,000'**

The site remains developed with buildings and the surrounding area has been infilled with commercial, industrial and residential structures.

**Flight Date: 1985**                      **Flyer: USGS**                      **Scale: 1"=605'**

The subject parcels continue to be improved with structures and nearby open ground has now been in-filled with commercial buildings.

**Flight Date: 1989**                      **Flyer: USGS**                      **Scale: 1"=630'**

The subject parcels are still improved with their respective structures and the surrounding area has been developed with commercial, industrial and residential development.

**Flight Date: 1995**                      **Flyer: USGS/DOQQ**                      **Scale: 1"=605'**

The subject and surrounding property appear very similar as it does currently.

**Flight Date: 2003**                      **Flyer: Google**                      **Scale: 1"=151'**

The Excalibur Extrusion property is improved with the subject manufacturing, sales, and warehouse structures along with storage areas for raw and manufactured product. The elongated Boys & Girls Club building remains evident on the adjoining parcel to the east. The surrounding area is improved with concrete tilt-up structures.

**Flight Date: 2009**                      **Flyer: Google**                      **Scale 1" = 151'**

There does not appear to be any significant changes to the subject or surrounding parcels.

**Flight Date: 2015**                      **Flyer: Google**                      **Scale 1" = 151'**

The subject and surrounding parcels remain similar as today.

## 11.0 ENVIRONMENTAL DATABASE AND AGENCY FILE REVIEW

### 11.1 Review of Federal, State, Tribal, and Local Government Databases

AEC contracted Environmental Data Resources (EDR)<sup>8</sup> to perform database searches of readily available Federal, State, and Local database information systems for the purpose of identifying known recognized environmental conditions present on nearby properties which have the potential to adversely impact the site being assessed in this study.

A database search for sites listed on various federal, state, tribal, and local databases in the area around the Property was obtained. A description of each of the databases searched is included in the report, which is attached as Appendix B. Among the databases included in the EDR report are NPL (federal, tribal, and state-equivalent), proposed and delisted NPL, CORRACTS (RCRA facilities subject to corrective actions), hazardous waste sites identified for investigation or remediation (CERCLIS, State CERCLIS, VCP, Brownfields, Calsites, etc.), LUST, sites with engineering controls, former CERCLIS (NFRAP), RCRA and state hazardous waste generators, ERNS, SWLF, USTs, and Toxic Pits.

The review of the records satisfies all requirements as set forth in 40 CFR Section 312.26 (b) and (c) with regard to the review of federal, tribal, and state government records of databases of such government records and local government records and databases of such records pertaining to both the Subject Property and the nearby or adjoining properties. Further, the search distances for each particular database are as specified in 40 CFR 312.26.

Any known or suspected contaminated sites included on these lists within 0.25 miles of the Property are discussed in the following text. As a general rule, sites beyond 0.25 miles are not anticipated to impact a site significantly. Any sites beyond 0.25 miles with a high potential to impact the Property are also discussed. (Please note: the distances and directions listed in this report have been field verified and might not always match those in the EDR report.)

Sites such as TSD facilities, hazardous waste generators, HAZNET, FINDS, SQGs, LQGs, USTs, HIST UST, RCRA violations, and TRIS facilities with toxic chemical releases (generally in accordance with permitting requirements - into the air, water, or land as reported under SARA Title III) use or store hazardous materials and thus may pose a potential problem in the event of a spill or leak. However, unless these sites also appear in an agency list of contaminated sites, there is no evidence of any problems at this time. Therefore, sites on these lists will not be discussed unless on or in close proximity to the Property.

The subject property was identified as a site that has previously stored hazardous materials onsite and/or disposed hazardous materials offsite. In addition, the subject address at 110 E. Crowther Avenue formerly operated nine USTs that were removed during June 1992 and issued closure by the OCHCA during November 1992. Also, there were numerous properties either adjoining, or nearby that have had prior disposal of hazardous materials and/or releases of hazardous materials. The nearest identified releases were from the adjoining properties to the west (Microdot-Kayna) and south (Arlon Graphics).

Below is a list of the databases researched:

Databases Reviewed	Search Distance (SD)	Number of Sites Within SD
Federal National Priorities List (NPL) Site List	1-Mile	0
Federal Delisted NPL Site List	1-Mile	0
Federal Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)	1/2-Mile	0
Federal CERCLIS No Further Remedial Action Planned (NFRAP) Sites	1/2-Mile	0
Federal RCRA CORRACTS List	1-Mile	0
Federal RCRA non-CORRACTs TSD List	1/2-Mile	1
Federal RCRA Generators List	1/4-Mile	10
Federal Institutional/Engineering Control Registries	1/2-Mile	0
Federal ERNS List	On-Site	0
California and Tribal Lists of NPL Equivalent Hazardous Waste Sites Identified for Investigation and/or Remediation	1-Mile	1
California and Tribal Lists of CERCLIS Equivalent Hazardous Waste Sites Identified for Investigation and/or Remediation	1-Mile	13
California and Tribal Landfills or Solid Waste Facilities List	1/2-Mile	0
California and Tribal Leaking Underground Storage Tank (LUST) Facility List	1/2-Mile	14
California and Tribal Registered Storage Tank Facility List	1/4-Mile	5
California and Tribal Voluntary Cleanup Sites	1/2-Mile	0
Local Brownfields Sites	1/2-Mile	0
Local Landfill/Solid Waste Disposal Sites	On-Site to 1/2-Mile	2

Databases Reviewed	Search Distance (SD)	Number of Sites Within SD
Local List of Hazardous Waste/Contaminated Sites	On-Site to 1-Mile	0
Local List of Registered Storage Tanks	1/4-Mile	6
Local Land Records	On-Site to 1/2-Mile	0
Records of Emergency Release Reports	On-Site	1
Other Ascertainable Records	On-Site to 1-Mile	13

## 11.2 Regulatory Agency Records

### 11.2.1 City of Placentia Building Division<sup>9</sup>

The City of Placentia Building Division maintains records of building permits issued for construction undertaken at properties located within the city limits. AEC submitted a request for a file review; however, a response was not received prior to completion of this report. If any permits are identified they will be forwarded as an addendum to this report.

### 11.2.2 Orange County Agricultural Commission<sup>10</sup>

The Orange County Agricultural Commission (OCAC) maintains records of Restricted Agricultural Chemicals permitted for use and/or storage at agricultural facilities located throughout Orange County. Inventory information regarding restricted herbicides, pesticides, rodenticide, etc., is listed on Restricted Materials permits issued annually and archived within the OCAC database. The site has not been in agricultural production during the prior 50 years, therefore, there are no records regarding agricultural chemical application or storage.

### 11.2.3 Orange County Health Care Agency<sup>11</sup>

The Orange County Health Care Agency (OCHCA) maintains records of underground storage tanks (USTs) and incidents of unauthorized releases of hazardous materials from underground storage tanks at the subject site and surrounding areas. OCHCA is currently processing AEC's request for records. It is the opinion of AEC that there are records regarding the removal of USTs at 110 E. Crowther. However, since the client has provided the applicable removal and sampling reports AEC is not concerned if the file review occurs after this report has been submitted.

The site at 110 E. Crowther Avenue has been assigned Facility ID #FA0044283. Also, the site disposes its hazardous waste(s) generated onsite under EPA ID No. CAL000249906. The site also lists its hazardous materials inventory to consist of Methyl Ethyl Ketone (MEK), gear oil, propane, propylene, and butane.

### 11.2.4 Orange County Fire Authority<sup>12</sup>

The Orange County Fire Authority (OCFA) maintains records of hazardous materials storage at facilities in Orange County. A request for a records review was submitted to the OCFA; however, AEC did not receive a response prior to the completion of this report. If any records are identified, they will be forwarded as an addendum.

### 11.2.5 South Coast Air Quality Management District<sup>13</sup>

The South Coast Air Quality Management District (SCAQMD) maintains records of Air Discharge permits for facilities located throughout the SCAQMD. A request for a records review was submitted to the SCAQMD and the files indicated that the Excalibur Extrusion facility is assigned an ID of 3026. The last inspection was conducted on March 1, 1982. There were no Notice of Violations and/or asbestos records issued to either address.

### 11.2.6 California Department of Conservation - Division of Oil & Gas<sup>14</sup>

According to Division of Oil, Gas, and Geothermal Resources (DOGGR) Map W1-5 and Map 108 there are no oil or gas wells on the subject site, however, the property is within the Administrative Boundary of an Oil Field identified as "Richfield". Exploratory oil wells have been drilled near the subject property; however, they never produced and were "plugged & abandoned" following drilling.

### 11.2.7 Santa Ana Regional Water Quality Control Board<sup>15</sup>

The Santa Ana Regional Water Quality Control Board (RWQCB) maintains a database of contaminated groundwater sites (GeoTracker). AEC has accessed GeoTracker to identify if the subject property, or adjoining and/or nearby properties have former or current soil and/or groundwater contamination from leaking underground storage tanks (USTs). The results of AEC's database review indicate that the subject property is listed in the database as having removed USTs. The only item that was available for review was the OCHCA Closure Letter; the reports associated with this Closure Letter have not been uploaded.

### 11.2.8 Office of the State Fire Marshal Pipeline Safety Division<sup>16</sup>

AEC located the Subject Property on the National Pipeline Mapping System and determined that there are no pipelines on or bordering the Subject Property. The nearest pipeline is a Southern California Gas transmission pipeline approximately 0.25-miles south and there is also an abandoned crude oil pipeline (CUSA Pipeline) approximately 1-mile north.

## 12.0 VAPOR ENCROACHMENT SCREENING

ASTM Standard E 2600-10 Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactions (VES) was used as guidance for conducting a VES for the Subject Property. The purpose of the screening is to determine whether a Vapor Encroachment Condition (VEC) exists from chemicals of concern (COC) that may migrate as vapors onto a property as a result of contaminated soil and groundwater on or near the Subject Property. The screening involves a two tiered approach to assessing VEC risk as described below.

### 12.1 VES Tier I

#### 12.1.1 Search Distance Test/Chemicals of Concern Test

The search distance test involves a review of the regulatory database report and available historical records to make a determination if any *known or suspect potentially contaminated* properties exist within the Area of Concern (AOC). High risk sites are typically current and former gas stations, former and current dry cleaners, manufactured gas plants, and industrial sites (Brownfields). The AOC is defined as any up-gradient sites within the ASTM 1527 standard search distances and any cross or down-gradient sites within 1/3-mile for solvents and petroleum products.

If the contamination at the known or potentially contaminated site within the AOC consists of COCs, then a potential Vapor Encroachment Condition (pVEC) exists and Tier II is recommended. If no known or potentially contaminated sites with COCs exist within the AOC, no further inquiry is necessary.

## **12.2 VES Tier II**

### **12.2.1 Plume Test**

The Plume Test assesses whether or not a plume is close enough to the property to result in a VEC.

1. Critical Distance Determination – Determine distance from property to edge of plume in any direction (vertical, horizontal, lateral).
2. VEC exists if a plume of volatile organic compounds (VOCs), semi-volatile organic compounds (S-VOCs), or Volatile Inorganic compounds or free petroleum product accumulating above water table within 100-feet of the property or if a plume of dissolved volatile petroleum hydrocarbons within 30-feet of the property.

The Subject Property is considered an area of potential Vapor Encroachment based on the former nine USTs at the subject property that contained volatile compounds. In addition, 1,1,1-TCA was detected in two soil samples collected beneath the east ends of Tank Nos. 2 and 3 during the removal.

## **13.0 USER PROVIDED INFORMATION**

Specific information provided by the User is discussed below.

### **13.1 Title Records**

A chain-of-title report was provided to AEC for review.

### **13.2 Environmental Liens or Activity and Use Limitations**

No information pertaining to environmental liens or activity/use limitations filed against the Property was provided by the User or identified by AEC during this assessment.

### **13.3 Specialized Knowledge**

The User did not provide AEC with historical investigation reports pertaining to the Property and/or the area around the Property.

### **13.4 Valuation Reduction for Environmental Issues**

No information pertaining to Property valuation was provided by the User.

## 14.0 FINDINGS AND CONCLUSION

Advanced Environmental Concepts, Inc. (AEC) performed a Phase I Environmental Site Assessment (ESA) on two parcels totaling 2.95-acres having addresses of 110 and 132 East Crowther Avenue, Placentia, California on behalf of Mr. Erik Weeks of Integral Partners Funding, LLC (Integral). Also, this subject property is described by two Orange County Assessor's Parcel Numbers (APNs) of 339-091-08 (0.85-acres) and 339-091-09 (2.1-acres).

The larger of the two subject parcels is the western 2.1-acre property having an address of 110 E. Crowther Avenue and is currently occupied by Excalibur Extrusions; a plastic pipe, nipple, and coupling manufacturing facility. The owner of the subject business (Mr. Glenn Baldwin) stated that his company has been onsite since 1970 and that he purchased the site from a ceramics manufacturing company at that time. However, a review of the City Directory indicated that a ceramics company still occupied the site during 1972. In any event, following the ceramics company occupancy, the property has been used as a plastics manufacturing site for a minimum of 44 years. The property is improved with 17,892 square feet of building space in which it appears additions have been added over the years. The northeastern portion of the subject building is improved with asphalt-paved parking area that adjoins approximately 1,500 square feet of office space. The interior of the office space is improved with drop ceilings, linoleum flooring and HVAC system. The warehouse and manufacturing space are within approximate 14' to 18' high ceilings and sited on a slab-on-grade. The building is improved with loading bays along the west side and along the eastern exterior wall AEC observed a few air compressors and the cooling tower used to chill the water that cools the pipe following extrusion. AEC was informed by Mr. Baldwin that there used to be seven underground storage tanks (USTs) of varying capacities that formerly contained chemicals such as Methyl Ethyl Ketone (MEK) sited in the subsurface along the west side of the second loading dock. However, a review of the UST removal documents indicate there were nine USTs onsite having capacities of 5,000-gallons (5 tanks); 3,000-gallons (1 tank); 2,000-gallons (1 tank); and 1,000-gallons (2 tanks). Note that the tank capacities vary based on which document is reporting. The USTs were installed by the original property owner (ceramics manufacturing company) during the late 1960s and transferred to Excalibur during the property sale. The reports indicate gasoline was stored in the tanks, although this does not make complete sense in that the USTs were plumbed into the central manufacturing room and the product lines entered through a concrete wall. AEC was still able to observe the 2-inch diameter piping guides through the wall. The USTs were removed during 1992 under permit with the Orange County Health Care Agency (OCHCA) and soil samples collected beneath the east ends of Tank Nos. 2 and 3 indicated 400 ug/kg and 300 ug/kg of 1,1,1-Trichloroethane (TCA), respectively. Therefore, the OCHCA requested an additional investigation which consisted of drilling three soil borings to a maximum depth of 21' bgs. The analytical results indicated non-detectable TCA at 16' and 21' bgs, therefore, the OCHCA closed the site.

The western half of the subject site is basically an open yard used for storage of raw plastic pellets that are imported to the site to be melted and used in the manufacturing process, or storage for manufacturing "mistakes" that will either be re-used in the manufacturing process or disposed at an offsite recycling facility. AEC also observed a steel-constructed canopy in the northwest portion of the site that is used for covered storage of raw product and finished product.

The eastern portion of the subject property has an address of 132 E. Crowther Avenue and consists of an approximate 15,457 square foot building on an approximate 0.85-acre parcel. The elongated rectangular-shaped building borders the east boundary and there is an asphalt-paved parking lot within the northern portion adjoining E. Crowther Avenue. Also, there is a triangular-shaped open space area improved with grass and a cement slab-on-grade patio along the south end of the property. Currently, the masonry block and concrete tilt-up building is just a shell; the interior was gutted during the past year by the current owner (Mr. Brian Johnson) in preparation for re-development. The building has historically been occupied by the Boys & Girls Club of Placentia from at least 1972 to approximately 2013. During the Boys & Girls Club occupancy the interior was improved with offices, classrooms, bathrooms, an atrium, and indoor sporting facilities.

The ESA process under ASTM Standard 1527 was created to identify *recognized environmental conditions* (RECs) which present a material risk of harm to public health or the environment and generally be the subject of an enforcement action if brought to the attention of appropriate governmental agencies. The ESA process additionally identifies *controlled recognized environmental conditions*, which are specified under ASTM Standard 1527 as a REC resulting from a past release that has been addressed to the satisfaction of the applicable regulatory authority with hazardous substances allowed to remain in place subject to institutional controls; and/or *historical recognized environmental conditions*, i.e. conditions which may have presented a material risk to public health and/or the environment but have now been mitigated to the satisfaction of a regulatory agency at the Subject Property. The descriptive term "recognized environmental condition" means the presence, or likely presence, of any hazardous substances or petroleum products in, at, or on a property due to any release to the environment; under conditions that indicate an existing release, a past release, or a material threat of a release to the environment. In addition, AEC will identify non-ASTM conditions ("housekeeping conditions") which are considered de minimis and generally do not present a material risk of harm to public health or the environment and would not be the subject of an enforcement action if brought to the attention of an appropriate governmental agency.

The results of this investigation have identified no *housekeeping conditions*, no *controlled recognized environmental conditions*, no *recognized environmental conditions*, no *historical offsite recognized environmental conditions*, and one *onsite historical recognized environmental condition*.

#### Historical Recognized Environmental Condition

- The Excalibur Extrusion facility had nine underground storage tanks (USTs) of varying capacities that were reported to have contained gasoline installed at the subject property along the west side of the manufacturing building outside a loading bay. The USTs were removed under Orange County Health Care Agency (OCHCA) permit during June 1992 and soil samples collected beneath USTs identified as Nos. 2 and 3 exhibited elevated concentrations of 1,1,1-TCA, a chlorinated solvent (400 ug/kg and 330 ug/kg, respectively at a depth of 14' bgs). The OCHCA required a subsurface investigation to evaluate the vertical migration of the TCA, therefore, three soil borings were drilled to 21' bgs and soil samples were collected at 16' bgs and 21' bgs. The confirmation samples collected at 16' and 21' bgs indicated non-detectable concentrations of TCA, therefore, closure was issued by the OCHCA in a letter dated November 13, 1992.

*Since the property is scheduled for conversion from industrial-use to residential-use AEC recommends conducting a multi-depth soil gas investigation focused in the area of the former nine USTs, and also conduct a site-wide soil gas investigation at both 110 and 132 E. Crowther Avenue. The multi-depth soil gas investigation will evaluate the subject property for future vapor intrusion concerns.*

AEC has conducted this Phase I Environmental Site Assessment at 110 and 132 E. Crowther Avenue, Placentia, California (the Property) in conformance with the scope and limitations of ASTM Standard E1527-13. Any exceptions to, or deletions from this practice are described in Section 5.0 of this report. This assessment has revealed no evidence of recognized environmental conditions in connection with the Subject Property. Therefore, based on the results of our investigation, AEC recommends conducting a soil gas survey to identify if a potential vapor intrusion concern exists for residential development.

**15.0 REFERENCES**

- 1) Orange County Assessor's Office; Civic Center Plaza, Building 11, 625 N. Ross Street, Room 142, Santa Ana, CA 92701; (714) 834-2727.
- 2) Geologic Map of California; State of California Resources Agency, Department of Conservation, Division of Mines and Geology.
- 3) United States Geological Survey - 7.5 and 15 Minute Series Topographic Quadrangle Map Publications (Orange, Yorba Linda, Anaheim, & La Habra Quadrangles, 7.5 and 15 Minute Series).
- 4) Southern California Edison; P. O. Box 410; Long Beach, California 90802; (310) 491-2391.
- 5) Wetlands Law Tests Government Plan; Gregor I. McGregor, Esq.; Environmental Protection Volume 3, Number 9 - November 1992; Stevens Publishing Corporation; 225 North New Road; Waco, Texas 76710; (817) 776-9000
- 6) California Statewide Radon Survey Screening Results; State of California Department of Health Services; 601 North 7th Street; Sacramento, California 95814; (916) 322-2040.
- 7) United States Department of Housing and Urban Development (HUD); 1615 West Olympic Boulevard; Los Angeles, California; (213)-251-7001.
- 8) Environmental Data Resources, Inc. (EDR); 6 Armstrong Road, Shelton, Connecticut 06484; (203) 783-0300.
- 9) City of Placentia Building Division (City Clerk's Office); 401 E. Chapman Avenue, Placentia, California 92870; (714) 993-8231.
- 10) Orange County Agricultural Commission; 1750 S. Douglass Road, Building D; Anaheim, California 92806-6050; (714) 447-7100.
- 11) Orange County Health Care Agency; 1241 E. Dyer Road, Suite 120; Santa Ana, California 92705; (714) 433-6000.
- 12) Orange County Fire Authority; 1 Fire Authority Road; Irvine, California; (714) 573-6000.
- 13) South Coast Air Quality Management District; 21865 Copley Drive, Diamond Bar, CA 91765 (909)396-2000.
- 14) State of California Department of Conservation - Division of Oil & Gas; 4800 Stockdale Highway; Bakersfield, California 93309; (661) 322-4031.
- 15) Santa Ana Regional Water Quality Control Board; 3737 Main Street, Suite 500; Riverside, California 92501-3348; (951) 782-3252
- 16) Office of the State Fire Marshal Pipeline Safety Division; P.O. Box 944246 Sacramento, California 94244-2460; (916) 445-8477

## 16.0 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

Advanced Environmental Concepts, Inc. appreciates the opportunity to provide our professional assistance to Mr. Erik Weeks and Integral Funding Partners, LLC on this project. If you have any questions regarding this assessment or if AEC can be of further service, please call us at (661) 395-1646.

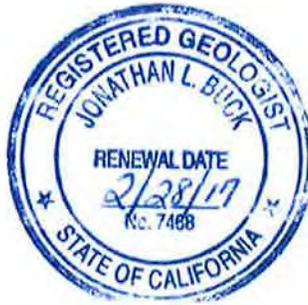
In addition, I declare to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in Section 312.10 of 40 Code of Federal Regulations (CFR) 312. I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject site. I have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR 312.

Sincerely,

**Advanced Environmental Concepts, Inc.**

This report has been prepared by:

  
\_\_\_\_\_  
Jonathan L. Buck  
Principal Geologist



110 & 132 E. Crowther, Placentia

## 17.0 QUALIFICATIONS OF ENVIRONMENTAL PROFESSIONALS

AEC staff is composed of two primary environmental professionals that perform Phase I Environmental Site Assessments on a routine basis. Qualifications profiles for these individuals are provided in the following section.

### Jonathan L. Buck

Mr. Buck received a Bachelor of Science degree in Geology from the University of California, Santa Barbara, in 1981 and was professionally engaged in the petroleum industry in various capacities through 1985. Mr. Buck joined the environmental industry in 1985 and formed **Advanced Environmental Concepts Inc.** in 1989. Since its inception, **AEC** has been a full service environmental consulting firm specializing in Phase I Site Assessments, UST programs, and soil and groundwater assessment and cleanup programs. Mr. Buck is a State of California Registered Geologist (#7468) and has performed numerous ESAs on diverse properties throughout California, Arizona, Oregon, and Washington.