Prepared by: Twain Cacek Office: POA Date: 8/22/2025
Checked by: Office: Date:
Calculation Title: Homer Harbor Navigation Improvements

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement
Boulanger et al. SPT-based Methodology

Earthquake

Maximum horizontal ground surface acceleration, a_{max}: 0.42 g
Earthquake moment magnitude, M_w: 7.5

Ground Water Conditions

Coincident water level (depth) at time of SPT, $h_{w,SPT}$: -35.8 ft
Coincident water level (depth) at time of earthquake, $h_{w,EQ}$: -35.8 ft
Note: Use a negative value for a water level above the ground surface and a positive value for ground water.

SPT Equipment

Equipment: Automatic-Trip Hammer ◄ Use drop-down list.

Energy ratio, ER: 75 percent
Borehole diameter: 4.000 in
Rod stickup: 41.0 ft (above the ground surface)

Sampler: Standard ◄ Use drop-down list.
Standard split-spoon sampler without room for liners (the inside diameter is a constant 1.375 inch)

Particle-Size Data

Predominant grain type: Quartz ◄ Use drop-down list.
Empirical constant, Q: 10

Ground Surface Geometry

Slope cotangent: H:1V
Slope angle, β: 0.0 deg
Note: Leave blank if level ground (β = 0°).

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement

▼ Use drop-down list.

z_{top} (ft)	z_{bot} (ft)	z_{avg} (ft)	N_m (bpf)	Soil Type: USCS Group Symbol	Soil Type: Flag	FC (%)	γ_{moist} (pcf)	γ_{sat} (pcf)	Time of SPT: σ_v (ksf)	Time of SPT: u (ksf)	Time of SPT: σ'_v (ksf)	N_{60} (bpf)	$N_{1,60}$ (bpf)	$N_{1,60cs}$ (bpf)	During Earthquake: σ_v (ksf)	During Earthquake: u (ksf)	During Earthquake: σ'_v (ksf)	During Earthquake: Flag	r_d	MSF	K_σ	K_o	K_α	CSR: M_w,σ'_v,α	CSR: M_w=7.5, σ'_v=1 atm, α=0	CRR: M_w,σ'_v,α	CRR: M_w=7.5, σ'_v=1 atm, α=0	FS_L	P_L	γ_{max}	ΔH (ft)	ΔLDI (ft)	ε_v	ΔS (ft)
0.0	15.0	7.5	0	CL	Clay	65.0	115.0	115.0	3.10	2.70	0.39	0.0	#N/A	#N/A	0.86	0.47	0.39		0.99	#N/A	#N/A		#N/A	0.590	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.00	-	#N/A	-
15.0	40.0	27.5	0	CL	Clay	65.0	115.0	115.0	5.40	3.95	1.45	0.0	#N/A	#N/A	3.16	1.72	1.45		0.92	#N/A	#N/A		#N/A	0.548	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	20.00	-	#N/A	-
40.0	44.0	42.0	10	CL	Clay	71.0	115.0	115.0	7.06	4.85	2.21	12.5	#N/A	#N/A	4.83	2.62	2.21		0.86	#N/A	#N/A		#N/A	0.510	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	14.50	-	#N/A	-
44.0	48.0	46.0	11	CL	Clay	71.0	115.0	115.0	7.52	5.10	2.42	13.8	#N/A	#N/A	5.29	2.87	2.42		0.84	#N/A	#N/A		#N/A	0.500	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.00	-	#N/A	-
48.0	54.0	51.0	14	CL	Clay	71.0	115.0	115.0	8.10	5.42	2.68	17.5	#N/A	#N/A	5.87	3.18	2.68		0.81	#N/A	#N/A		#N/A	0.486	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.00	-	#N/A	-
54.0	58.0	56.0	13	ML	Clay	57.0	120.0	120.0	8.69	5.73	2.96	16.3	#N/A	#N/A	6.45	3.49	2.96		0.79	#N/A	#N/A		#N/A	0.472	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.00	-	#N/A	-
58.0	61.0	59.5	17	ML	Clay	57.0	120.0	120.0	9.11	5.95	3.16	21.3	#N/A	#N/A	6.87	3.71	3.16		0.78	#N/A	#N/A		#N/A	0.461	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50	-	#N/A	-
61.0	71.0	66.0	18	ML	Clay	57.0	120.0	120.0	9.89	6.35	3.53	22.5	#N/A	#N/A	7.65	4.12	3.53		0.75	#N/A	#N/A		#N/A	0.443	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50	-	#N/A	-
71.0	80.0	75.5	7	SM		46.0	125.0	125.0	11.05	6.95	4.11	8.8	6.2	11.8	8.82	4.71	4.11		0.71	1.00	0.93		1.00	0.417	0.446	0.122	0.131	0.29	1.00E+00	0.388	9.50	3.689	0.034	0.321
80.0	90.0	85.0	24	SM		46.0	125.0	125.0	12.24	7.54	4.70	30.0	22.2	27.8	10.00	5.30	4.70		0.68	1.00	0.85		1.00	0.394	0.461	0.320	0.375	0.81	7.26E-01	0.052	9.50	0.493	0.011	0.106
90.0	94.0	92.0	35	SM		46.0	120.0	120.0	13.10	7.97	5.12	43.8	33.4	39.1	10.86	5.74	5.12		0.66	1.00	0.74		1.00	0.381	0.515	2.276	3.078	5.98	1.42E-49	0.000	7.00	0.000	0.000	0.000
94.0	100.0	97.0	55	SM		27.0	125.0	125.0	13.71	8.29	5.42	68.8	53.7	58.9	11.47	6.05	5.42		0.64	1.00	0.72		1.00	0.372	0.516	#####	#####	#####	0.00E+00	0.000	5.00	0.000	0.000	0.000
100.0	105.0	102.5	88	SM		27.0	125.0	125.0	14.40	8.63	5.77	110.0	84.5	89.7	12.16	6.40	5.77		0.63	1.00	0.70		1.00	0.364	0.517	#####	#####	#####	0.00E+00	0.000	5.50	0.000	0.000	0.000
105.0	111.0	108.0	100	SM		27.0	125.0	125.0	15.08	8.97	6.11	125.0	94.6	99.8	12.85	6.74	6.11		0.62	1.00	0.69		1.00	0.358	0.521	#####	#####	#####	0.00E+00	0.000	5.50	0.000	0.000	0.000

Notes: Depth, z, is between second and third SPT 6-inch intervals.
Use Shake2000 or Quake/W to compute τ_{max}/CSR to overcome uncertainty in r_d, especially at greater depth which is typical for a dam.

Lateral spreading displacement, LDI = Σ(ΔLDI): 4.182 ft
Post-liquefaction reconsolidation settlement, S = Σ(ΔS): 0.427 ft

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Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement
Boulanger et al. SPT-based Methodology

Earthquake

Maximum horizontal ground surface acceleration, a_{max}: 0.42 g
Earthquake moment magnitude, M_w: 7.5

Ground Water Conditions

Coincident water level (depth) at time of SPT, $h_{w,SPT}$: -10.4 ft
Coincident water level (depth) at time of earthquake, $h_{w,EQ}$: -10.4 ft
Note: Use a negative value for a water level above the ground surface and a positive value for ground water.

SPT Equipment

Equipment: Automatic-Trip Hammer ◄ Use drop-down list.

Energy ratio, ER: 75 percent
Borehole diameter: 4.000 in
Rod stickup: 16.0 ft (above the ground surface)

Sampler: Standard ◄ Use drop-down list.
Standard split-spoon sampler without room for liners (the inside diameter is a constant 1.375 inch)

Particle-Size Data

Predominant grain type: Quartz ◄ Use drop-down list.
Empirical constant, Q: 10

Ground Surface Geometry

Slope cotangent: H:1V
Slope angle, β: 0.0 deg
Note: Leave blank if level ground (β = 0°).

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement

▼ Use drop-down list.

z_{top} (ft)	z_{bot} (ft)	z_{avg} (ft)	N_m (bpf)	Soil Type USCS Group Symbol	Soil Type Flag	FC (%)	γ_{moist} (pcf)	γ_{sat} (pcf)	Time of SPT σ_v (ksf)	Time of SPT u (ksf)	Time of SPT σ'_v (ksf)	N_{60} (bpf)	$N_{1,60}$ (bpf)	$N_{1,60cs}$ (bpf)	During Earthquake σ_v (ksf)	During Earthquake u (ksf)	During Earthquake σ'_v (ksf)	During Earthquake Flag	r_d	MSF	K_σ	K_o	K_α	CSR M_w,σ'_v,α	CSR M_w=7.5, σ'_v=1 atm, α=0	CRR M_w,σ'_v,α	CRR M_w=7.5, σ'_v=1 atm, α=0	FS_L	P_L	γ_{max}	ΔH (ft)	ΔLDI (ft)	ε_v	ΔS (ft)
0.0	4.0	2.0	12	SP-SM		7.0	125.0	125.0	0.90	0.77	0.13	12.8	21.7	21.8	0.25	0.12	0.13		1.00	1.00	1.10		1.00	0.546	0.497	0.253	0.230	0.46	1.00E+00	0.129	1.50	0.194	0.021	0.032
4.0	8.0	6.0	23	SP-SM		7.0	125.0	125.0	1.40	1.02	0.38	27.3	43.9	44.0	0.75	0.37	0.38		0.99	1.00	1.10		1.00	0.541	0.492	#####	#####	39.89	1.05E-189	0.000	4.00	0.000	0.000	0.000
8.0	13.5	10.8	31	SP-SM		7.0	120.0	120.0	1.98	1.32	0.66	36.8	50.0	50.1	1.33	0.67	0.66		0.98	1.00	1.10		1.00	0.539	0.490	#####	#####	#####	0.00E+00	0.000	4.75	0.000	0.000	0.000
13.5	20.5	17.0	3	SM		45.0	125.0	125.0	2.75	1.71	1.04	3.8	5.5	11.1	2.10	1.06	1.04		0.96	1.00	1.07		1.00	0.530	0.496	0.134	0.126	0.25	1.00E+00	0.421	6.25	2.629	0.035	0.220
20.5	29.0	24.8	11	CL	Clay	72.0	115.0	115.0	3.68	2.19	1.48	13.8	#N/A	#N/A	3.03	1.54	1.48		0.93	#N/A	#N/A		#N/A	0.518	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.75	-	#N/A	-
29.0	35.0	32.0	2	CL	Clay	72.0	115.0	115.0	4.51	2.65	1.86	2.5	#N/A	#N/A	3.86	2.00	1.86		0.90	#N/A	#N/A		#N/A	0.509	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.25	-	#N/A	-
35.0	41.0	38.0	4	CL	Clay	85.0	115.0	115.0	5.20	3.02	2.18	5.0	#N/A	#N/A	4.55	2.37	2.18		0.87	#N/A	#N/A		#N/A	0.498	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00	-	#N/A	-
41.0	47.5	44.3	3	CL	Clay	85.0	115.0	115.0	5.92	3.41	2.51	3.8	#N/A	#N/A	5.27	2.76	2.51		0.85	#N/A	#N/A		#N/A	0.485	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.25	-	#N/A	-
47.5	55.0	51.3	10	ML	Clay	70.0	120.0	120.0	6.74	3.85	2.89	12.5	#N/A	#N/A	6.09	3.20	2.89		0.81	#N/A	#N/A		#N/A	0.467	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.00	-	#N/A	-
55.0	58.0	56.5	13	SM		46.0	125.0	125.0	7.38	4.17	3.21	16.3	13.5	19.1	6.74	3.53	3.21		0.79	1.00	0.95		1.00	0.452	0.478	0.185	0.195	0.41	1.00E+00	0.176	5.25	0.924	0.024	0.126
58.0	62.0	60.0	8	SM		46.0	125.0	125.0	7.82	4.39	3.43	10.0	7.8	13.5	7.17	3.74	3.43		0.77	1.00	0.95		1.00	0.442	0.466	0.136	0.144	0.31	1.00E+00	0.325	3.50	1.137	0.031	0.108
62.0	68.0	65.0	9	SM		46.0	125.0	125.0	8.45	4.70	3.74	11.3	8.5	14.1	7.80	4.06	3.74		0.75	1.00	0.94		1.00	0.428	0.456	0.140	0.149	0.33	1.00E+00	0.304	5.00	1.518	0.030	0.150
68.0	76.0	72.0	32	SM		46.0	125.0	125.0	9.32	5.14	4.18	40.0	32.4	38.0	8.67	4.49	4.18		0.72	1.00	0.80		1.00	0.410	0.513	1.810	2.264	4.41	1.07E-35	0.000	7.00	0.000	0.000	0.000
76.0	83.0	79.5	100	SM		22.0	125.0	125.0	10.26	5.61	4.65	125.0	101.6	106.4	9.61	4.96	4.65		0.70	1.00	0.77		1.00	0.393	0.512	#####	#####	#####	0.00E+00	0.000	7.50	0.000	0.000	0.000
83.0	92.0	87.5	76	SM		22.0	125.0	125.0	11.26	6.11	5.15	95.0	75.2	79.9	10.61	5.46	5.15		0.67	1.00	0.74		1.00	0.377	0.511	#####	#####	#####	0.00E+00	0.000	8.00	0.000	0.000	0.000
92.0	98.1	95.1	100	SM		22.0	125.0	125.0	12.20	6.58	5.62	125.0	96.7	101.4	11.55	5.93	5.62		0.65	1.00	0.71		1.00	0.364	0.512	#####	#####	#####	0.00E+00	0.000	7.55	0.000	0.000	0.000

Notes: Depth, z, is between second and third SPT 6-inch intervals.
Use Shake2000 or Quake/W to compute τ_{max}/CSR to overcome uncertainty in r_d, especially at greater depth which is typical for a dam.

Lateral spreading displacement, LDI = Σ(ΔLDI): 6.402 ft
Post-liquefaction reconsolidation settlement, S = Σ(ΔS): 0.636 ft

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Earthquake

Maximum horizontal ground surface acceleration, a_{max}: 0.42 g
Earthquake moment magnitude, M_w: 7.5

Ground Water Conditions

Coincident water level (depth) at time of SPT, $h_{w,SPT}$: -16.0 ft
Coincident water level (depth) at time of earthquake, $h_{w,EQ}$: -16.0 ft
Note: Use a negative value for a water level above the ground surface and a positive value for ground water.

SPT Equipment

Equipment: Automatic-Trip Hammer ◄ Use drop-down list.

Energy ratio, ER: 75 percent
Borehole diameter: 4.000 in
Rod stickup: 21.0 ft (above the ground surface)

Sampler: Standard ◄ Use drop-down list.
Standard split-spoon sampler without room for liners (the inside diameter is a constant 1.375 inch)

Particle-Size Data

Predominant grain type: Quartz ◄ Use drop-down list.
Empirical constant, Q: 10

Ground Surface Geometry

Slope cotangent: H:1V
Slope angle, β: 0.0 deg
Note: Leave blank if level ground (β = 0°).

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement

▼ Use drop-down list.

z_{top} (ft)	z_{bot} (ft)	z_{avg} (ft)	N_m (bpf)	Soil Type USCS Group Symbol	Soil Type Flag	FC (%)	γ_{moist} (pcf)	γ_{sat} (pcf)	Time of SPT σ_v (ksf)	Time of SPT u (ksf)	Time of SPT σ'_v (ksf)	N_{60} (bpf)	$N_{1,60}$ (bpf)	$N_{1,60cs}$ (bpf)	During Earthquake σ_v (ksf)	During Earthquake u (ksf)	During Earthquake σ'_v (ksf)	During Earthquake Flag	r_d	MSF	K_σ	K_o	K_α	CSR M_w,σ'_v,α	CSR M_w=7.5, σ'_v=1 atm, α=0	CRR M_w,σ'_v,α	CRR M_w=7.5, σ'_v=1 atm, α=0	FS_L	P_L	γ_{max}	ΔH (ft)	ΔLDI (ft)	ε_v	ΔS (ft)
0.0	8.0	4.0	1	SC		27.0	125.0	125.0	1.50	1.25	0.25	1.2	2.0	7.2	0.50	0.25	0.25		1.00	1.00	1.10		1.00	0.544	0.494	0.110	0.100	0.20	1.00E+00	0.500	3.50	1.750	0.044	0.156
8.0	17.0	12.5	1	CL	Clay	86.0	115.0	115.0	2.52	1.78	0.74	1.3	#N/A	#N/A	1.52	0.78	0.74		0.97	#N/A	#N/A		#N/A	0.546	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	8.50	-	#N/A	-
17.0	25.0	21.0	3	CL	Clay	86.0	115.0	115.0	3.50	2.31	1.19	3.8	#N/A	#N/A	2.50	1.31	1.19		0.94	#N/A	#N/A		#N/A	0.542	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	8.50	-	#N/A	-
25.0	40.0	32.5	2	CL	Clay	86.0	115.0	115.0	4.82	3.03	1.79	2.5	#N/A	#N/A	3.82	2.03	1.79		0.90	#N/A	#N/A		#N/A	0.522	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	11.50	-	#N/A	-
40.0	45.0	42.5	7	CL	Clay	86.0	115.0	115.0	5.97	3.65	2.32	8.8	#N/A	#N/A	4.97	2.65	2.32		0.85	#N/A	#N/A		#N/A	0.499	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	10.00	-	#N/A	-
45.0	51.0	48.0	3	CL	Clay	76.0	115.0	115.0	6.60	3.99	2.61	3.8	#N/A	#N/A	5.60	3.00	2.61		0.83	#N/A	#N/A		#N/A	0.486	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50	-	#N/A	-
51.0	61.0	56.0	15	CL	Clay	76.0	115.0	115.0	7.52	4.49	3.03	18.8	#N/A	#N/A	6.52	3.49	3.03		0.79	#N/A	#N/A		#N/A	0.466	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	8.00	-	#N/A	-
61.0	72.0	66.5	25	ML	Clay	76.0	120.0	120.0	8.75	5.15	3.61	31.3	#N/A	#N/A	7.76	4.15	3.61		0.75	#N/A	#N/A		#N/A	0.438	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	10.50	-	#N/A	-
72.0	76.2	74.1	18	ML	Clay	59.0	120.0	120.0	9.67	5.62	4.04	22.5	#N/A	#N/A	8.67	4.62	4.04		0.72	#N/A	#N/A		#N/A	0.419	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.60	-	#N/A	-

Notes: Depth, z, is between second and third SPT 6-inch intervals.
Use Shake2000 or Quake/W to compute τ_{max}/CSR to overcome uncertainty in r_d, especially at greater depth which is typical for a dam.

Lateral spreading displacement, LDI = Σ(ΔLDI): 1.750 ft
Post-liquefaction reconsolidation settlement, S = Σ(ΔS): 0.156 ft

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Earthquake

Maximum horizontal ground surface acceleration, a_{max}: 0.42 g
Earthquake moment magnitude, M_w: 7.5

Ground Water Conditions

Coincident water level (depth) at time of SPT, $h_{w,SPT}$: -10.4 ft
Coincident water level (depth) at time of earthquake, $h_{w,EQ}$: -10.4 ft
Note: Use a negative value for a water level above the ground surface and a positive value for ground water.

SPT Equipment

Equipment: Automatic-Trip Hammer ◄ Use drop-down list.

Energy ratio, ER: 75 percent
Borehole diameter: 4.000 in
Rod stickup: 5.0 ft (above the ground surface)

Sampler: Standard ◄ Use drop-down list.
Standard split-spoon sampler without room for liners (the inside diameter is a constant 1.375 inch)

Particle-Size Data

Predominant grain type: Quartz ◄ Use drop-down list.
Empirical constant, Q: 10

Ground Surface Geometry

Slope cotangent: H:1V
Slope angle, β: 0.0 deg
Note: Leave blank if level ground (β = 0°).

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement

▼ Use drop-down list.

z_{top} (ft)	z_{bot} (ft)	z_{avg} (ft)	N_m (bpf)	Soil Type: USCS Group Symbol	Soil Type: Flag	FC (%)	γ_{moist} (pcf)	γ_{sat} (pcf)	Time of SPT: σ_v (ksf)	Time of SPT: u (ksf)	Time of SPT: σ'_v (ksf)	N_{60} (bpf)	$N_{1,60}$ (bpf)	$N_{1,60cs}$ (bpf)	During Earthquake: σ_v (ksf)	During Earthquake: u (ksf)	During Earthquake: σ'_v (ksf)	During Earthquake: Flag	r_d	MSF	K_σ	K_o	K_α	CSR: M_w,σ'_v,α	CSR: M_w=7.5, σ'_v=1 atm, α=0	CRR: M_w,σ'_v,α	CRR: M_w=7.5, σ'_v=1 atm, α=0	FS_L	P_L	γ_{max}	ΔH (ft)	ΔLDI (ft)	ε_v	ΔS (ft)
0.0	35.0	17.5	0	CL	Clay	84.0	115.0	115.0	2.66	1.74	0.92	0.0	#N/A	#N/A	2.01	1.09	0.92		0.96	#N/A	#N/A		#N/A	0.571	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	17.00	-	#N/A	-
35.0	43.0	39.0	7	CL	Clay	79.0	115.0	115.0	5.13	3.08	2.05	8.8	#N/A	#N/A	4.49	2.43	2.05		0.87	#N/A	#N/A		#N/A	0.519	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	21.50	-	#N/A	-
43.0	54.0	48.5	8	CL	Clay	79.0	115.0	115.0	6.23	3.68	2.55	10.0	#N/A	#N/A	5.58	3.03	2.55		0.83	#N/A	#N/A		#N/A	0.493	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	9.50	-	#N/A	-
54.0	64.0	59.0	10	CL	Clay	79.0	115.0	115.0	7.43	4.33	3.10	12.5	#N/A	#N/A	6.79	3.68	3.10		0.78	#N/A	#N/A		#N/A	0.465	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	10.50	-	#N/A	-
64.0	77.0	70.5	13	ML	Clay	70.0	120.0	120.0	8.79	5.05	3.74	16.3	#N/A	#N/A	8.14	4.40	3.74		0.73	#N/A	#N/A		#N/A	0.434	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	11.50	-	#N/A	-
77.0	84.0	80.5	26	ML	Clay	70.0	120.0	120.0	9.99	5.67	4.31	32.5	#N/A	#N/A	9.34	5.02	4.31		0.69	#N/A	#N/A		#N/A	0.409	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	10.00	-	#N/A	-
84.0	93.0	88.5	26	SM		46.0	125.0	125.0	10.97	6.17	4.79	32.5	24.1	29.7	10.32	5.52	4.79		0.67	1.00	0.84		1.00	0.392	0.469	0.391	0.468	1.00	1.62E-01	0.035	8.00	0.281	0.007	0.056
93.0	99.0	96.0	100	SM		46.0	125.0	125.0	11.90	6.64	5.26	125.0	98.4	104.0	11.25	5.99	5.26		0.65	1.00	0.73		1.00	0.378	0.517	#####	#####	#####	0.00E+00	0.000	7.50	0.000	0.000	0.000
99.0	103.0	101.0	86	SM		46.0	125.0	125.0	12.53	6.95	5.58	107.5	83.3	88.9	11.88	6.30	5.58		0.64	1.00	0.71		1.00	0.370	0.518	#####	#####	#####	0.00E+00	0.000	5.00	0.000	0.000	0.000

Notes: Depth, z, is between second and third SPT 6-inch intervals.
Use Shake2000 or Quake/W to compute τ_{max}/CSR to overcome uncertainty in r_d, especially at greater depth which is typical for a dam.

Lateral spreading displacement, LDI = Σ(ΔLDI): 0.281 ft
Post-liquefaction reconsolidation settlement, S = Σ(ΔS): 0.056 ft

Prepared by: Twain Cacek Office: POA Date: 4/11/2026
Checked by: Office: Date:
Calculation Title: Homer Harbor Navigation Improvements

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement
Boulanger et al. SPT-based Methodology

Earthquake

Maximum horizontal ground surface acceleration, a_{max}: 0.42 g
Earthquake moment magnitude, M_w: 7.5

Ground Water Conditions

Coincident water level (depth) at time of SPT, $h_{w,SPT}$: -7.4 ft
Coincident water level (depth) at time of earthquake, $h_{w,EQ}$: -7.4 ft
Note: Use a negative value for a water level above the ground surface and a positive value for ground water.

SPT Equipment

Equipment: Automatic-Trip Hammer ◄ Use drop-down list.

Energy ratio, ER: 75 percent
Borehole diameter: 4.000 in
Rod stickup: 5.0 ft (above the ground surface)

Sampler: Standard ◄ Use drop-down list.
Standard split-spoon sampler without room for liners (the inside diameter is a constant 1.375 inch)

Particle-Size Data

Predominant grain type: Quartz ◄ Use drop-down list.
Empirical constant, Q: 10

Ground Surface Geometry

Slope cotangent: H:1V
Slope angle, β: 0.0 deg
Note: Leave blank if level ground (β = 0°).

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement

▼ Use drop-down list.

z_{top} (ft)	z_{bot} (ft)	z_{avg} (ft)	N_m (bpf)	Soil Type: USCS Group Symbol	Soil Type: Flag	FC (%)	γ_{moist} (pcf)	γ_{sat} (pcf)	Time of SPT: σ_v (ksf)	Time of SPT: u (ksf)	Time of SPT: σ'_v (ksf)	N_{60} (bpf)	$N_{1,60}$ (bpf)	$N_{1,60cs}$ (bpf)	During Earthquake: σ_v (ksf)	During Earthquake: u (ksf)	During Earthquake: σ'_v (ksf)	During Earthquake: Flag	r_d	MSF	K_σ	K_o	K_α	CSR: M_w,σ'_v,α	CSR: M_w=7.5, σ'_v=1 atm, α=0	CRR: M_w,σ'_v,α	CRR: M_w=7.5, σ'_v=1 atm, α=0	FS_L	P_L	γ_{max}	ΔH (ft)	ΔLDI (ft)	ε_v	ΔS (ft)
0.0	13.0	6.5	0	CL	Clay	70.0	115.0	115.0	1.21	0.87	0.34	0.0	#N/A	#N/A	0.75	0.41	0.34		0.99	#N/A	#N/A		#N/A	0.592	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00	-	#N/A	-
13.0	28.5	20.8	0	CL	Clay	75.0	115.0	115.0	2.85	1.76	1.09	0.0	#N/A	#N/A	2.39	1.29	1.09		0.95	#N/A	#N/A		#N/A	0.564	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	14.25	-	#N/A	-
28.5	57.0	42.8	1	CL	Clay	72.0	115.0	115.0	5.38	3.13	2.25	1.3	#N/A	#N/A	4.92	2.67	2.25		0.85	#N/A	#N/A		#N/A	0.508	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	22.00	-	#N/A	-
57.0	78.5	67.8	3	CL	Clay	80.0	115.0	115.0	8.25	4.69	3.56	3.8	#N/A	#N/A	7.79	4.23	3.56		0.74	#N/A	#N/A		#N/A	0.442	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	25.00	-	#N/A	-
78.5	82.0	80.3	6	ML	Clay	67.0	120.0	120.0	9.72	5.47	4.25	7.5	#N/A	#N/A	9.26	5.01	4.25		0.69	#N/A	#N/A		#N/A	0.412	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	12.50	-	#N/A	-

Notes: Depth, z, is between second and third SPT 6-inch intervals.
Use Shake2000 or Quake/W to compute τ_{max}/CSR to overcome uncertainty in r_d, especially at greater depth which is typical for a dam.

Lateral spreading displacement, LDI = Σ(ΔLDI): 0.000 ft
Post-liquefaction reconsolidation settlement, S = Σ(ΔS): 0.000 ft

Prepared by: Twain Cacek Office: POA Date: 4/11/2026
Checked by: Office: Date:
Calculation Title: Homer Harbor Navigation Improvements

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement
Boulanger et al. SPT-based Methodology

Earthquake

Maximum horizontal ground surface acceleration, a_{max}: 0.42 g
Earthquake moment magnitude, M_w: 7.5

Ground Water Conditions

Coincident water level (depth) at time of SPT, $h_{w,SPT}$: -9.5 ft
Coincident water level (depth) at time of earthquake, $h_{w,EQ}$: -9.5 ft
Note: Use a negative value for a water level above the ground surface and a positive value for ground water.

SPT Equipment

Equipment: Automatic-Trip Hammer ◄ Use drop-down list.

Energy ratio, ER: 75 percent
Borehole diameter: 4.000 in
Rod stickup: 5.0 ft (above the ground surface)

Sampler: Standard ◄ Use drop-down list.
Standard split-spoon sampler without room for liners (the inside diameter is a constant 1.375 inch)

Particle-Size Data

Predominant grain type: Quartz ◄ Use drop-down list.
Empirical constant, Q: 10

Ground Surface Geometry

Slope cotangent: H:1V
Slope angle, β: 0.0 deg
Note: Leave blank if level ground (β = 0°).

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement

▼ Use drop-down list.

z_{top} (ft)	z_{bot} (ft)	z_{avg} (ft)	N_m (bpf)	Soil Type: USCS Group Symbol	Soil Type: Flag	FC (%)	γ_{moist} (pcf)	γ_{sat} (pcf)	Time of SPT: σ_v (ksf)	Time of SPT: u (ksf)	Time of SPT: σ'_v (ksf)	N_{60} (bpf)	$N_{1,60}$ (bpf)	$N_{1,60cs}$ (bpf)	During Earthquake: σ_v (ksf)	During Earthquake: u (ksf)	During Earthquake: σ'_v (ksf)	During Earthquake: Flag	r_d	MSF	K_σ	K_o	K_α	CSR: M_w,σ'_v,α	CSR: M_w=7.5, σ'_v=1 atm, α=0	CRR: M_w,σ'_v,α	CRR: M_w=7.5, σ'_v=1 atm, α=0	FS_L	P_L	γ_{max}	ΔH (ft)	ΔLDI (ft)	ε_v	ΔS (ft)
0.0	18.0	9.0	0	CL	Clay	51.0	115.0	115.0	1.63	1.15	0.47	0.0	#N/A	#N/A	1.04	0.56	0.47		0.98	#N/A	#N/A		#N/A	0.588	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	8.50	-	#N/A	-
18.0	42.0	30.0	2	CL	Clay	79.0	115.0	115.0	4.04	2.46	1.58	2.5	#N/A	#N/A	3.45	1.87	1.58		0.91	#N/A	#N/A		#N/A	0.542	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	21.00	-	#N/A	-
42.0	69.0	55.5	4	ML	Clay	58.0	120.0	115.0	6.98	4.06	2.92	5.0	#N/A	#N/A	6.38	3.46	2.92		0.79	#N/A	#N/A		#N/A	0.474	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	25.50	-	#N/A	-
69.0	81.0	75.0	7	CL	Clay	80.0	115.0	115.0	9.22	5.27	3.95	8.8	#N/A	#N/A	8.63	4.68	3.95		0.71	#N/A	#N/A		#N/A	0.425	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	19.50	-	#N/A	-

Notes: Depth, z, is between second and third SPT 6-inch intervals.
Use Shake2000 or Quake/W to compute τ_{max}/CSR to overcome uncertainty in r_d, especially at greater depth which is typical for a dam.

Lateral spreading displacement, LDI = Σ(ΔLDI): 0.000 ft
Post-liquefaction reconsolidation settlement, S = Σ(ΔS): 0.000 ft

Prepared by: Twain Cacek Office: POA Date: 4/11/2026
Checked by: Office: Date:
Calculation Title: Homer Harbor Navigation Improvements

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement
Boulanger et al. SPT-based Methodology

Earthquake

Maximum horizontal ground surface acceleration, a_{max}: 0.42 g
Earthquake moment magnitude, M_w: 7.5

Ground Water Conditions

Coincident water level (depth) at time of SPT, $h_{w,SPT}$: -10.8 ft
Coincident water level (depth) at time of earthquake, $h_{w,EQ}$: -10.8 ft
Note: Use a negative value for a water level above the ground surface and a positive value for ground water.

SPT Equipment

Equipment: Automatic-Trip Hammer ◄ Use drop-down list.

Energy ratio, ER: 75 percent
Borehole diameter: 4.000 in
Rod stickup: 5.0 ft (above the ground surface)

Sampler: Standard ◄ Use drop-down list.
Standard split-spoon sampler without room for liners (the inside diameter is a constant 1.375 inch)

Particle-Size Data

Predominant grain type: Quartz ◄ Use drop-down list.
Empirical constant, Q: 10

Ground Surface Geometry

Slope cotangent: H:1V
Slope angle, β: 0.0 deg
Note: Leave blank if level ground (β = 0°).

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement

▼ Use drop-down list.

z_{top} (ft)	z_{bot} (ft)	z_{avg} (ft)	N_m (bpf)	Soil Type: USCS Group Symbol	Soil Type: Flag	FC (%)	γ_{moist} (pcf)	γ_{sat} (pcf)	Time of SPT: σ_v (ksf)	Time of SPT: u (ksf)	Time of SPT: σ'_v (ksf)	N_{60} (bpf)	$N_{1,60}$ (bpf)	$N_{1,60cs}$ (bpf)	During Earthquake: σ_v (ksf)	During Earthquake: u (ksf)	During Earthquake: σ'_v (ksf)	During Earthquake: Flag	r_d	MSF	K_σ	K_o	K_α	CSR: M_w,σ'_v,α	CSR: M_w=7.5, σ'_v=1 atm, α=0	CRR: M_w,σ'_v,α	CRR: M_w=7.5, σ'_v=1 atm, α=0	FS_L	P_L	γ_{max}	ΔH (ft)	ΔLDI (ft)	ε_v	ΔS (ft)
0.0	10.5	5.3	0	SP-SM		6.0	120.0	110.0	1.25	1.00	0.25	0.0	#####	#N/A	0.58	0.33	0.25		0.99	#N/A	#N/A		1.00	0.627	#N/A	0.000	#N/A	0.00	#VALUE!	#N/A	4.75	-	#N/A	-
10.5	60.0	35.3	1	CL	Clay	84.0	115.0	115.0	4.63	2.87	1.75	1.3	#N/A	#N/A	3.95	2.20	1.75		0.89	#N/A	#N/A		#N/A	0.545	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	30.00	-	#N/A	-
60.0	76.0	68.0	2	ML	Clay	75.0	120.0	115.0	8.39	4.92	3.48	2.5	#N/A	#N/A	7.72	4.24	3.48		0.74	#N/A	#N/A		#N/A	0.449	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	32.75	-	#N/A	-
76.0	80.0	78.0	7	SM		25.0	120.0	115.0	9.54	5.54	4.00	8.8	6.3	11.3	8.87	4.87	4.00		0.70	1.00	0.94		1.00	0.425	0.453	0.120	0.128	0.28	1.00E+00	0.409	10.00	4.089	0.035	0.346

Notes: Depth, z, is between second and third SPT 6-inch intervals.
Use Shake2000 or Quake/W to compute τ_{max}/CSR to overcome uncertainty in r_d, especially at greater depth which is typical for a dam.

Lateral spreading displacement, LDI = Σ(ΔLDI): 4.089 ft
Post-liquefaction reconsolidation settlement, S = Σ(ΔS): 0.346 ft

Prepared by: Twain Cacek Office: POA Date: 4/11/2026
Checked by: Office: Date:
Calculation Title: Homer Harbor Navigation Improvements

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement
Boulanger et al. SPT-based Methodology

Earthquake

Maximum horizontal ground surface acceleration, a_{max}: 0.42 g
Earthquake moment magnitude, M_w: 7.5

Ground Water Conditions

Coincident water level (depth) at time of SPT, $h_{w,SPT}$: -17.3 ft
Coincident water level (depth) at time of earthquake, $h_{w,EQ}$: -17.3 ft
Note: Use a negative value for a water level above the ground surface and a positive value for ground water.

SPT Equipment

Equipment: Automatic-Trip Hammer ◄ Use drop-down list.

Energy ratio, ER: 75 percent
Borehole diameter: 4.000 in
Rod stickup: 5.0 ft (above the ground surface)

Sampler: Standard ◄ Use drop-down list.
Standard split-spoon sampler without room for liners (the inside diameter is a constant 1.375 inch)

Particle-Size Data

Predominant grain type: Quartz ◄ Use drop-down list.
Empirical constant, Q: 10

Ground Surface Geometry

Slope cotangent: H:1V
Slope angle, β: 0.0 deg
Note: Leave blank if level ground (β = 0°).

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement

▼ Use drop-down list.

z_{top} (ft)	z_{bot} (ft)	z_{avg} (ft)	N_m (bpf)	Soil Type: USCS Group Symbol	Soil Type: Flag	FC (%)	γ_{moist} (pcf)	γ_{sat} (pcf)	Time of SPT: σ_v (ksf)	Time of SPT: u (ksf)	Time of SPT: σ'_v (ksf)	N_{60} (bpf)	$N_{1,60}$ (bpf)	$N_{1,60cs}$ (bpf)	During Earthquake: σ_v (ksf)	During Earthquake: u (ksf)	During Earthquake: σ'_v (ksf)	During Earthquake: Flag	r_d	MSF	K_σ	K_o	K_α	CSR: M_w,σ'_v,α	CSR: M_w=7.5, σ'_v=1 atm, α=0	CRR: M_w,σ'_v,α	CRR: M_w=7.5, σ'_v=1 atm, α=0	FS_L	P_L	γ_{max}	ΔH (ft)	ΔLDI (ft)	ε_v	ΔS (ft)
0.0	25.0	12.5	1	ML	Clay	84.0	120.0	115.0	2.52	1.86	0.66	1.1	#N/A	#N/A	1.44	0.78	0.66		0.97	#N/A	#N/A		#N/A	0.581	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	12.00	-	#N/A	-
25.0	47.0	36.0	2	CL	Clay	74.0	115.0	115.0	5.22	3.33	1.89	2.5	#N/A	#N/A	4.14	2.25	1.89		0.88	#N/A	#N/A		#N/A	0.527	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	23.50	-	#N/A	-
47.0	66.0	56.5	7	CL	Clay	66.0	115.0	115.0	7.58	4.61	2.97	8.8	#N/A	#N/A	6.50	3.53	2.97		0.79	#N/A	#N/A		#N/A	0.471	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	20.50	-	#N/A	-
66.0	78.0	72.0	10	CL	Clay	80.0	115.0	115.0	9.36	5.57	3.79	12.5	#N/A	#N/A	8.28	4.49	3.79		0.72	#N/A	#N/A		#N/A	0.432	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	15.50	-	#N/A	-
64.0	78.0	71.0	10	ML	Clay	70.0	120.0	120.0	9.24	5.51	3.73	12.5	#N/A	#N/A	8.16	4.43	3.73		0.73	#N/A	#N/A		#N/A	0.435	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-1.00	-	#N/A	-
78.0	81.5	79.8	13	SM		25.0	120.0	120.0	10.29	6.06	4.24	16.3	11.7	16.8	9.21	4.98	4.24		0.70	1.00	0.92		1.00	0.413	0.450	0.158	0.172	0.38	1.00E+00	0.226	8.75	1.980	0.026	0.231

Notes: Depth, z, is between second and third SPT 6-inch intervals.
Use Shake2000 or Quake/W to compute τ_{max}/CSR to overcome uncertainty in r_d, especially at greater depth which is typical for a dam.

Lateral spreading displacement, LDI = Σ(ΔLDI): 1.980 ft
Post-liquefaction reconsolidation settlement, S = Σ(ΔS): 0.231 ft

Prepared by: Twain Cacek Office: POA Date: 4/11/2026
Checked by: Office: Date:
Calculation Title: Homer Harbor Navigation Improvements

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement
Boulanger et al. SPT-based Methodology

Earthquake

Maximum horizontal ground surface acceleration, a_{max}: 0.42 g
Earthquake moment magnitude, M_w: 7.5

Ground Water Conditions

Coincident water level (depth) at time of SPT, $h_{w,SPT}$: -15.6 ft
Coincident water level (depth) at time of earthquake, $h_{w,EQ}$: -15.6 ft
Note: Use a negative value for a water level above the ground surface and a positive value for ground water.

SPT Equipment

Equipment: Automatic-Trip Hammer ◄ Use drop-down list.

Energy ratio, ER: 75 percent
Borehole diameter: 4.000 in
Rod stickup: 5.0 ft (above the ground surface)

Sampler: Standard ◄ Use drop-down list.
Standard split-spoon sampler without room for liners (the inside diameter is a constant 1.375 inch)

Particle-Size Data

Predominant grain type: Quartz ◄ Use drop-down list.
Empirical constant, Q: 10

Ground Surface Geometry

Slope cotangent: H:1V
Slope angle, β: 0.0 deg
Note: Leave blank if level ground (β = 0°).

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement

▼ Use drop-down list.

z_{top} (ft)	z_{bot} (ft)	z_{avg} (ft)	N_m (bpf)	Soil Type: USCS Group Symbol	Soil Type: Flag	FC (%)	γ_{moist} (pcf)	γ_{sat} (pcf)	Time of SPT: σ_v (ksf)	Time of SPT: u (ksf)	Time of SPT: σ'_v (ksf)	N_{60} (bpf)	$N_{1,60}$ (bpf)	$N_{1,60cs}$ (bpf)	During Earthquake: σ_v (ksf)	During Earthquake: u (ksf)	During Earthquake: σ'_v (ksf)	During Earthquake: Flag	r_d	MSF	K_σ	K_o	K_α	CSR: M_w,σ'_v,α	CSR: M_w=7.5, σ'_v=1 atm, α=0	CRR: M_w,σ'_v,α	CRR: M_w=7.5, σ'_v=1 atm, α=0	FS_L	P_L	γ_{max}	ΔH (ft)	ΔLDI (ft)	ε_v	ΔS (ft)
0.0	18.0	9.0	0	ML	Clay	86.0	120.0	115.0	2.01	1.54	0.47	0.0	#N/A	#N/A	1.04	0.56	0.47		0.98	#N/A	#N/A		#N/A	0.588	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	8.50	-	#N/A	-
18.0	58.0	38.0	1	CL	Clay	75.0	115.0	115.0	5.34	3.34	2.00	1.3	#N/A	#N/A	4.37	2.37	2.00		0.87	#N/A	#N/A		#N/A	0.521	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	29.00	-	#N/A	-
58.0	78.0	68.0	4	ML	Clay	75.0	120.0	115.0	8.79	5.22	3.58	5.0	#N/A	#N/A	7.82	4.24	3.58		0.74	#N/A	#N/A		#N/A	0.442	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	30.00	-	#N/A	-
78.0	81.5	79.8	1	ML	Clay	54.0	120.0	115.0	10.14	5.95	4.19	1.3	#N/A	#N/A	9.17	4.98	4.19		0.70	#N/A	#N/A		#N/A	0.415	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	11.75	-	#N/A	-

Notes: Depth, z, is between second and third SPT 6-inch intervals.
Use Shake2000 or Quake/W to compute τ_{max}/CSR to overcome uncertainty in r_d, especially at greater depth which is typical for a dam.

Lateral spreading displacement, LDI = Σ(ΔLDI): 0.000 ft
Post-liquefaction reconsolidation settlement, S = Σ(ΔS): 0.000 ft

Prepared by: Twain Cacek Office: POA Date: 4/11/2026
Checked by: Office: Date:
Calculation Title: Homer Harbor Navigation Improvements

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement
Boulanger et al. SPT-based Methodology

Earthquake

Maximum horizontal ground surface acceleration, a_{max}: 0.42 g
Earthquake moment magnitude, M_w: 7.5

Ground Water Conditions

Coincident water level (depth) at time of SPT, $h_{w,SPT}$: -11.2 ft
Coincident water level (depth) at time of earthquake, $h_{w,EQ}$: -11.2 ft
Note: Use a negative value for a water level above the ground surface and a positive value for ground water.

SPT Equipment

Equipment: Automatic-Trip Hammer ◄ Use drop-down list.

Energy ratio, ER: 75 percent
Borehole diameter: 4.000 in
Rod stickup: 5.0 ft (above the ground surface)

Sampler: Standard ◄ Use drop-down list.
Standard split-spoon sampler without room for liners (the inside diameter is a constant 1.375 inch)

Particle-Size Data

Predominant grain type: Quartz ◄ Use drop-down list.
Empirical constant, Q: 10

Ground Surface Geometry

Slope cotangent: H:1V
Slope angle, β: 0.0 deg
Note: Leave blank if level ground (β = 0°).

Liquefaction Triggering, Lateral Spreading Deformation, and Post-Liquefaction Reconsolidation Settlement

▼ Use drop-down list.

z_{top} (ft)	z_{bot} (ft)	z_{avg} (ft)	N_m (bpf)	Soil Type: USCS Group Symbol	Soil Type: Flag	FC (%)	γ_{moist} (pcf)	γ_{sat} (pcf)	Time of SPT: σ_v (ksf)	Time of SPT: u (ksf)	Time of SPT: σ'_v (ksf)	N_{60} (bpf)	$N_{1,60}$ (bpf)	$N_{1,60cs}$ (bpf)	During Earthquake: σ_v (ksf)	During Earthquake: u (ksf)	During Earthquake: σ'_v (ksf)	During Earthquake: Flag	r_d	MSF	K_σ	K_o	K_α	CSR: M_w,σ'_v,α	CSR: M_w=7.5, σ'_v=1 atm, α=0	CRR: M_w,σ'_v,α	CRR: M_w=7.5, σ'_v=1 atm, α=0	FS_L	P_L	γ_{max}	ΔH (ft)	ΔLDI (ft)	ε_v	ΔS (ft)
0.0	18.0	9.0	0	ML	Clay	62.0	120.0	115.0	1.73	1.26	0.47	0.0	#N/A	#N/A	1.04	0.56	0.47		0.98	#N/A	#N/A		#N/A	0.588	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	8.50	-	#N/A	-
18.0	42.0	30.0	1	CL	Clay	88.0	115.0	115.0	4.15	2.57	1.58	1.3	#N/A	#N/A	3.45	1.87	1.58		0.91	#N/A	#N/A		#N/A	0.542	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	21.00	-	#N/A	-
42.0	82.0	62.0	3	ML	Clay	79.0	120.0	115.0	7.83	4.57	3.26	3.8	#N/A	#N/A	7.13	3.87	3.26		0.77	#N/A	#N/A		#N/A	0.457	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	32.00	-	#N/A	-

Notes: Depth, z, is between second and third SPT 6-inch intervals.
Use Shake2000 or Quake/W to compute τ_{max}/CSR to overcome uncertainty in r_d, especially at greater depth which is typical for a dam.

Lateral spreading displacement, LDI = Σ(ΔLDI): 0.000 ft
Post-liquefaction reconsolidation settlement, S = Σ(ΔS): 0.000 ft