

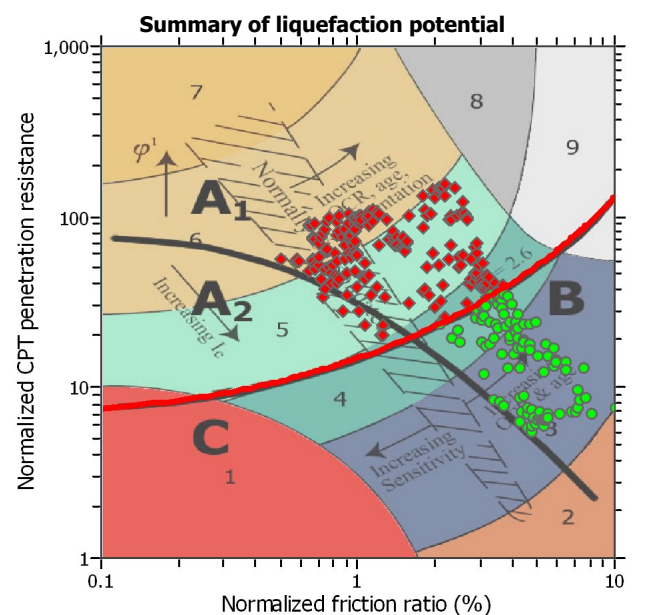
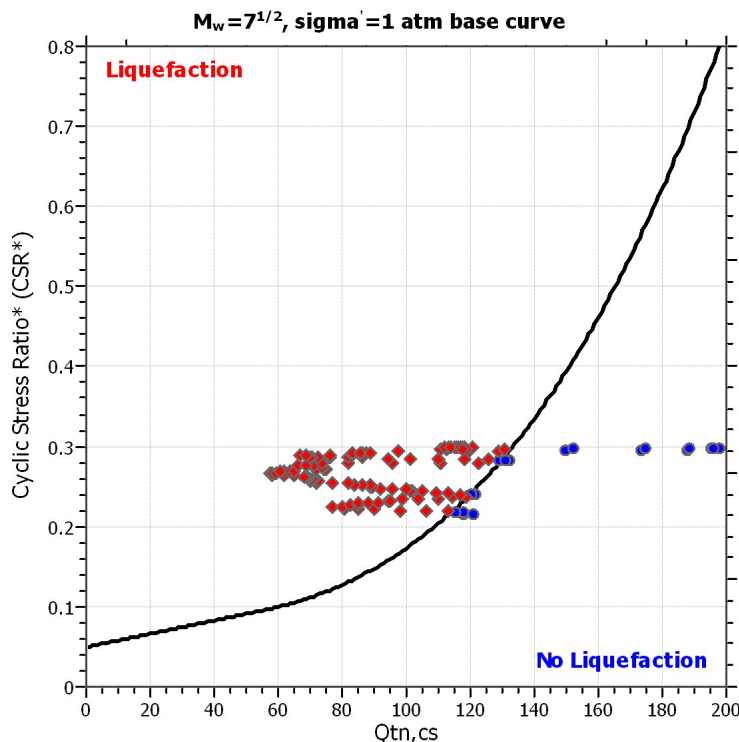
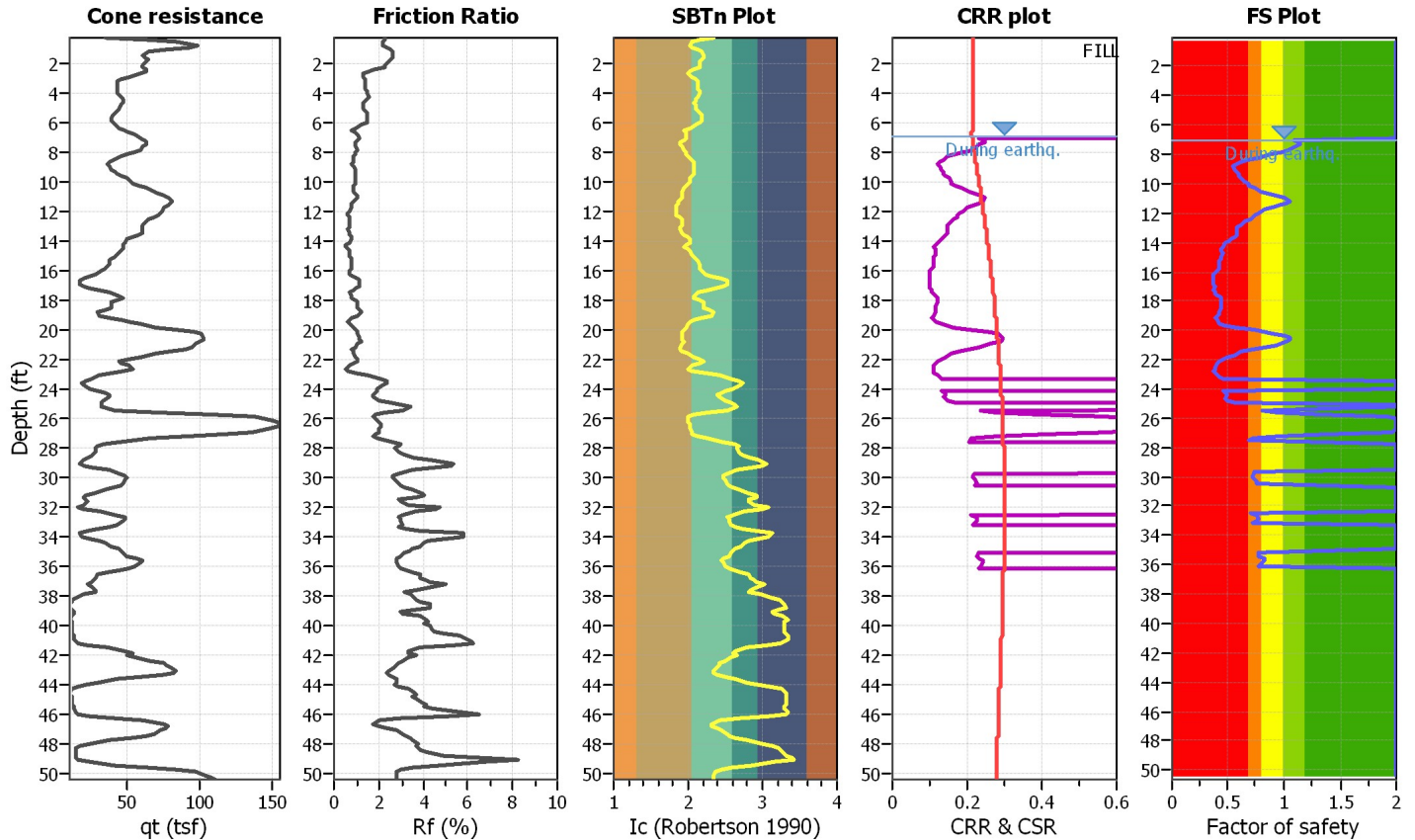
APPENDIX C
LIQUEFACTION ANALYSIS AND SEISMIC SETTLEMENT ANALYSIS

Summary of Seismic Settlement		
CPT No.	Estimated vertical settlement	Estimated differential settlement
1	5.90 inches	3.93 inches
2	4.06 inches	2.14 inches
3	1.95 inches	1.3 inches
4	2.25 inches	1.5 inches
5	3.46 inches	2.31 inches
6	3.44 inches	2.29 inches
7	1.0 inches	0.7 inches
8	1.29 inches	0.67 inches
9	0.74 inches	0.5 inches
10	1.02 inches	0.68 inches
11	1.28 inches	0.85 inches
12	1.33 inches	0.89 inches

LIQUEFACTION ANALYSIS REPORT

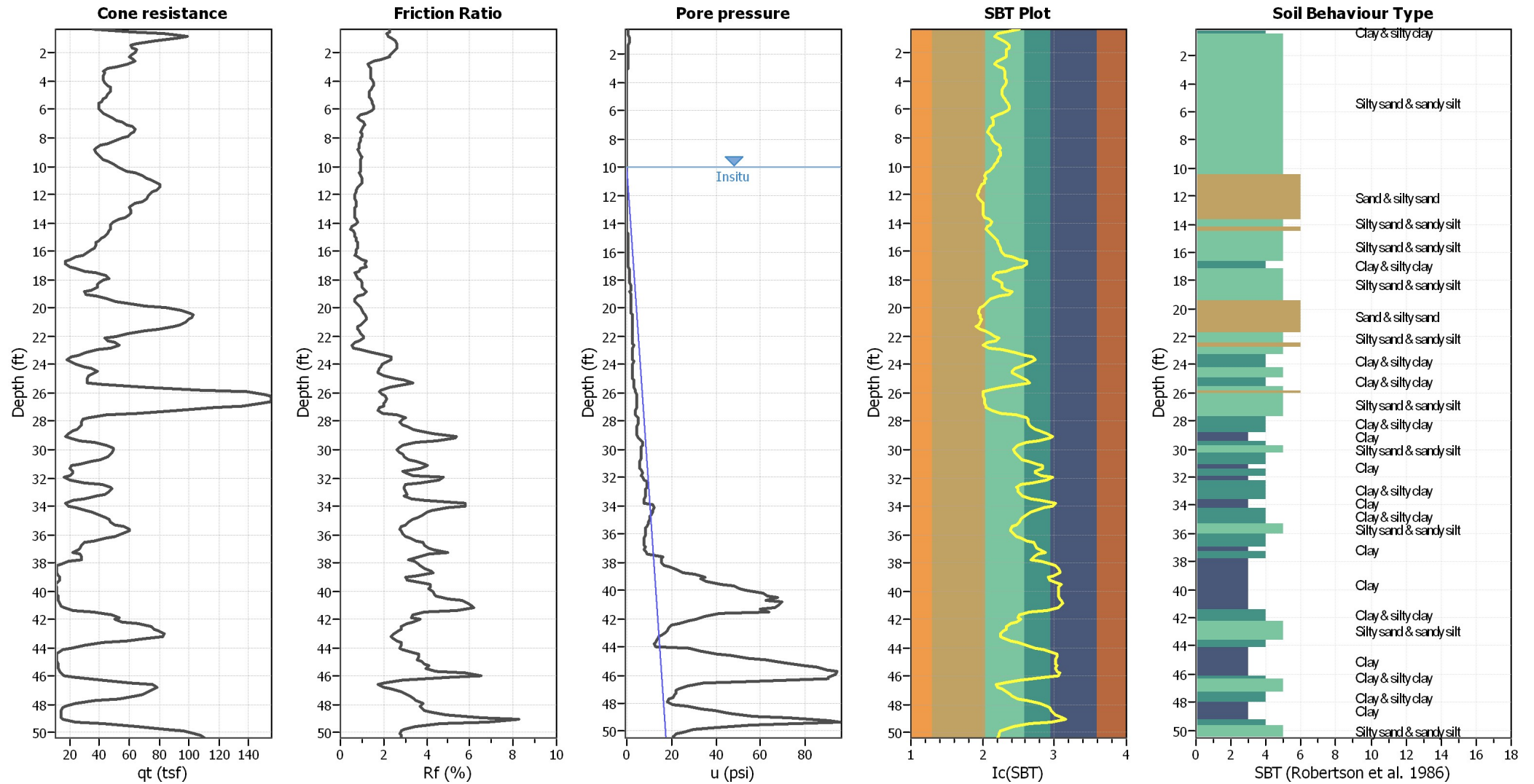
Project title : Zephyr Oceanside
Location : Hwy 76 & Foussat Road, Oceanside
CPT file : CPT-01
Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	17.00 ft	Fill height:	10.00 ft	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.72	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	50.00 ft
Peak ground acceleration:	0.45	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



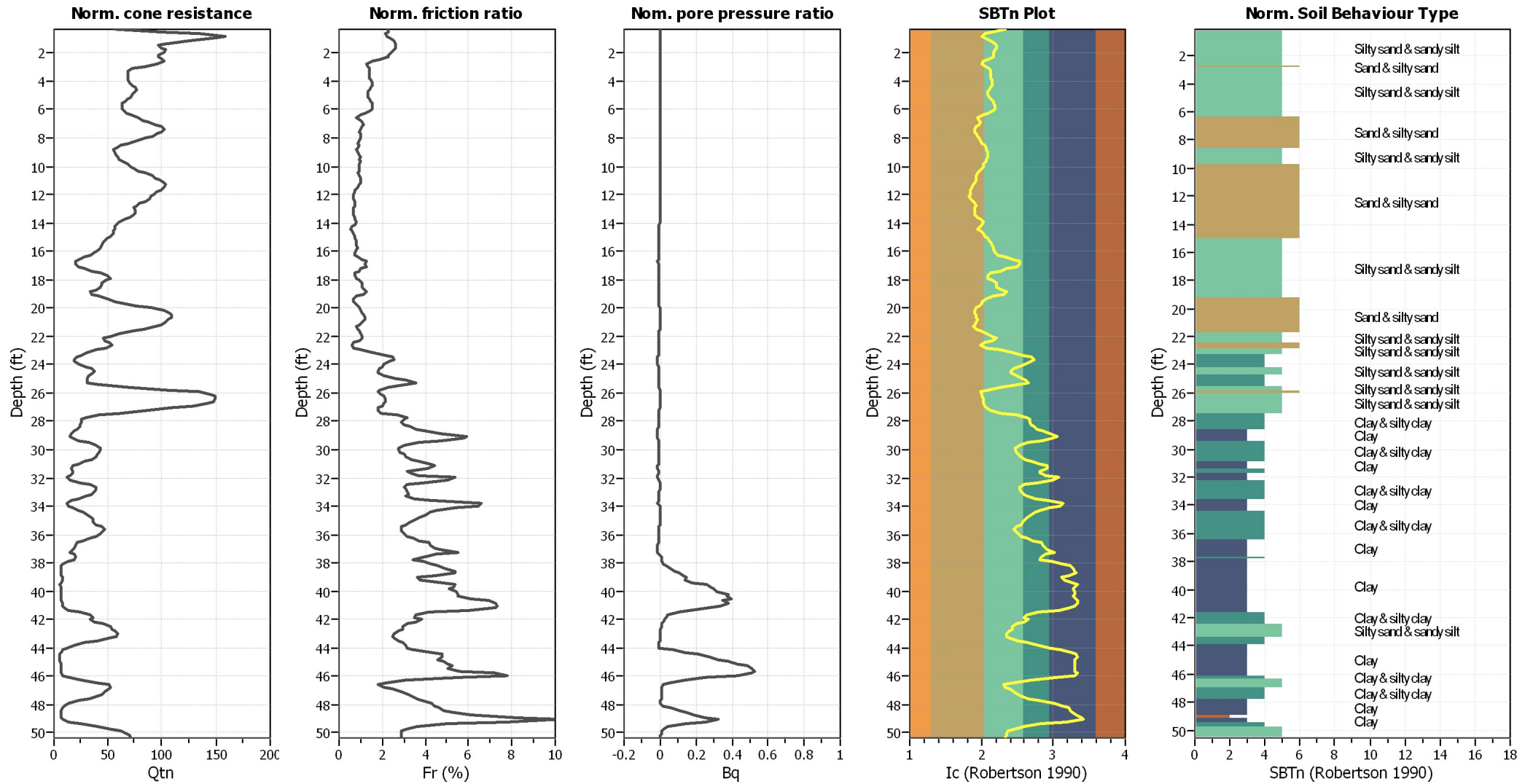
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	50.00 ft

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CPT basic interpretation plots (normalized)



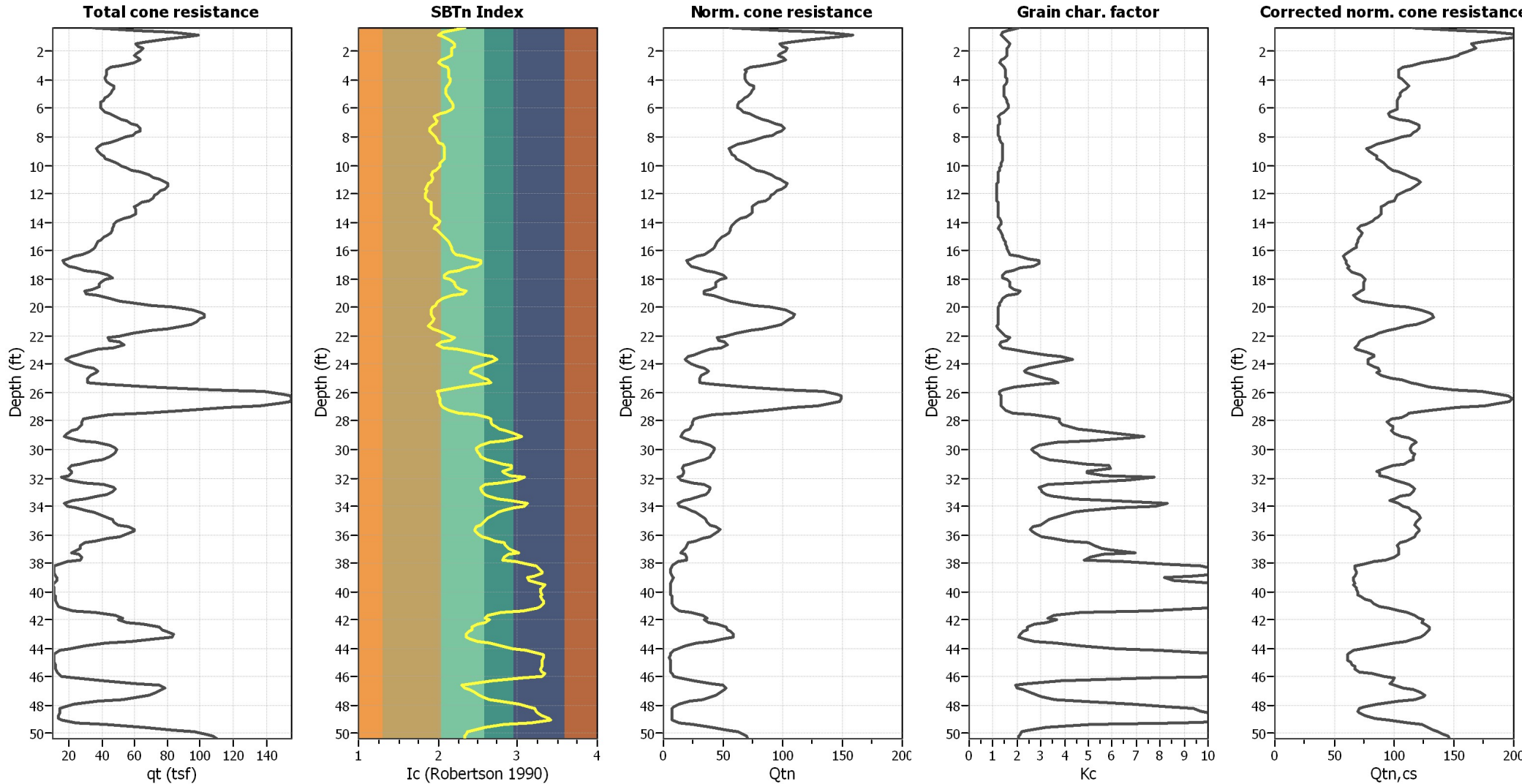
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	50.00 ft

SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

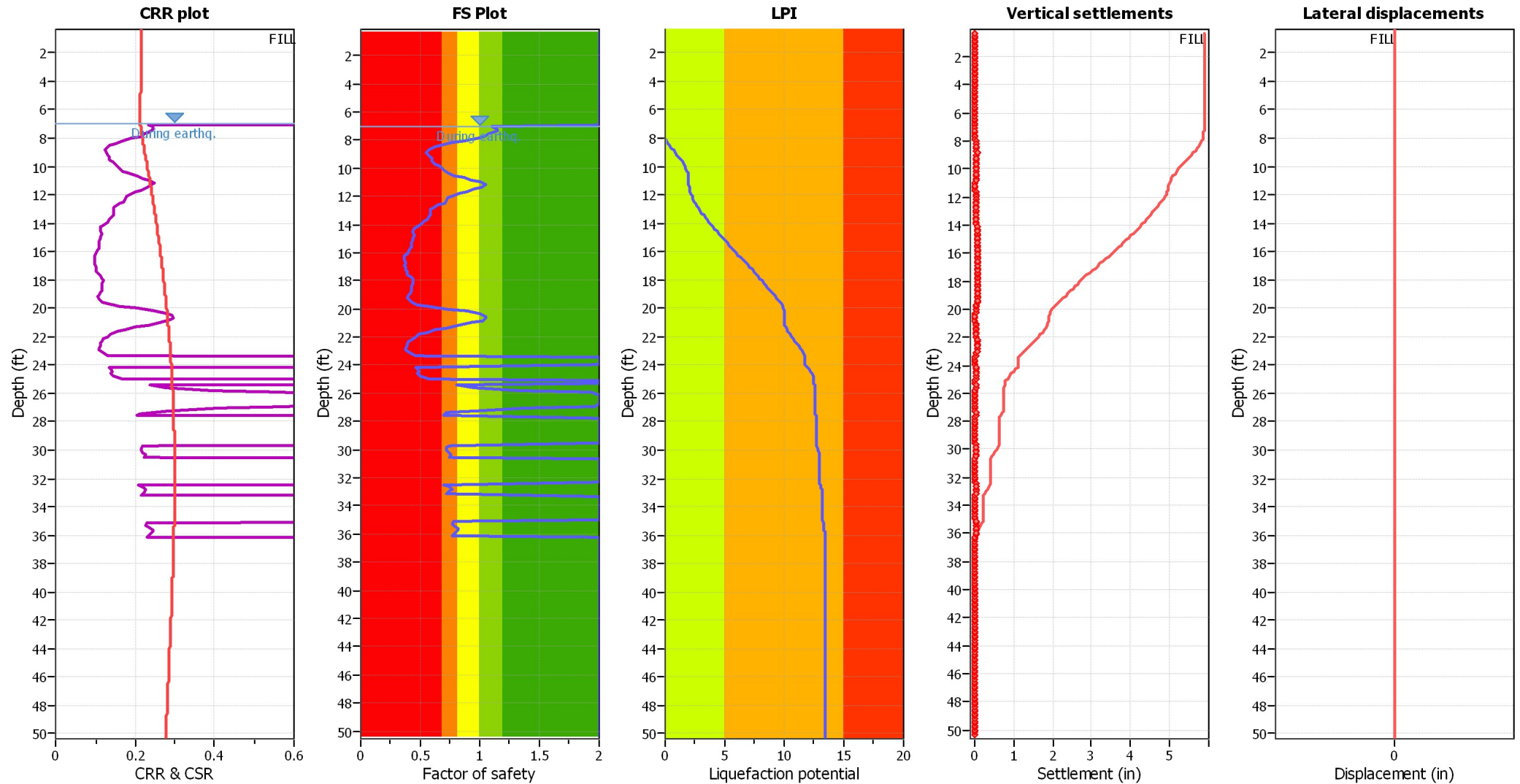
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _c applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	50.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	50.00 ft

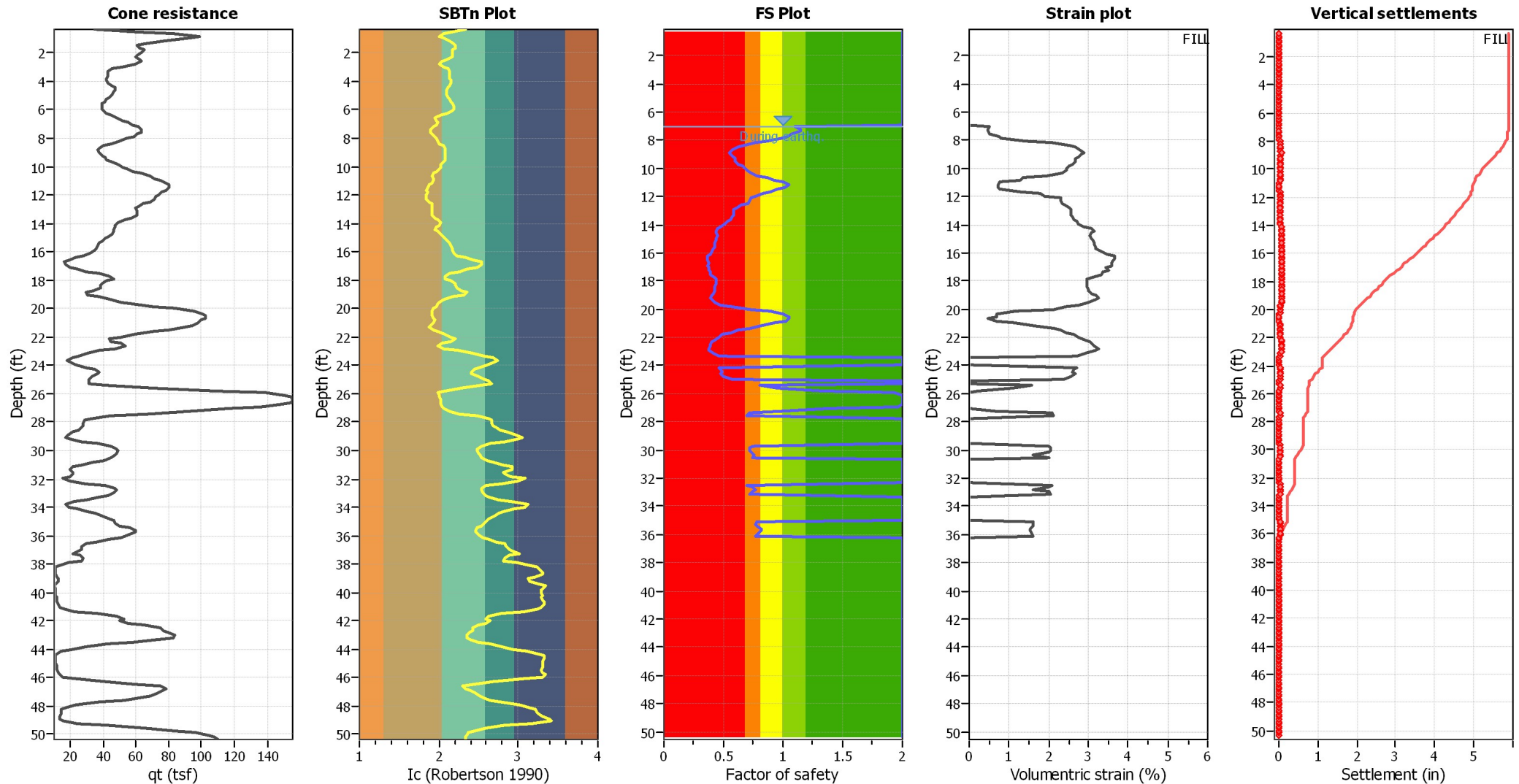
F.S. color scheme

Red	Almost certain it will liquefy
Orange	Very likely to liquefy
Yellow	Liquefaction and no liq. are equally likely
Light Green	Unlike to liquefy
Dark Green	Almost certain it will not liquefy

LPI color scheme

Red	Very high risk
Orange	High risk
Yellow	Low risk

Estimation of post-earthquake settlements



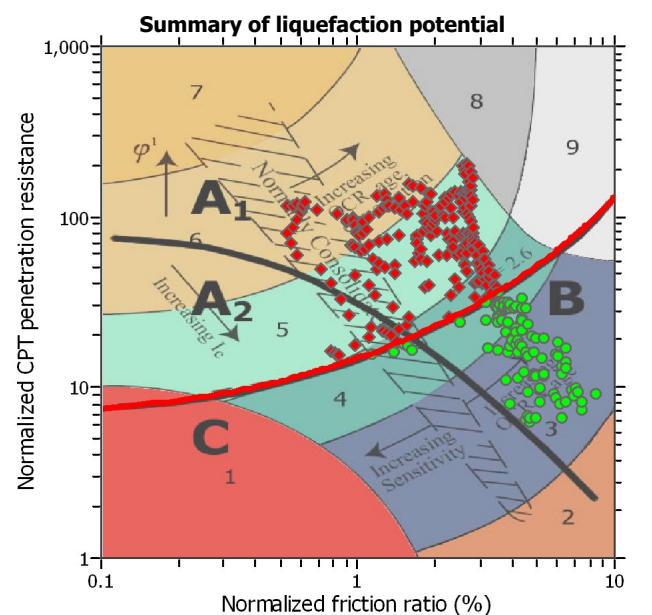
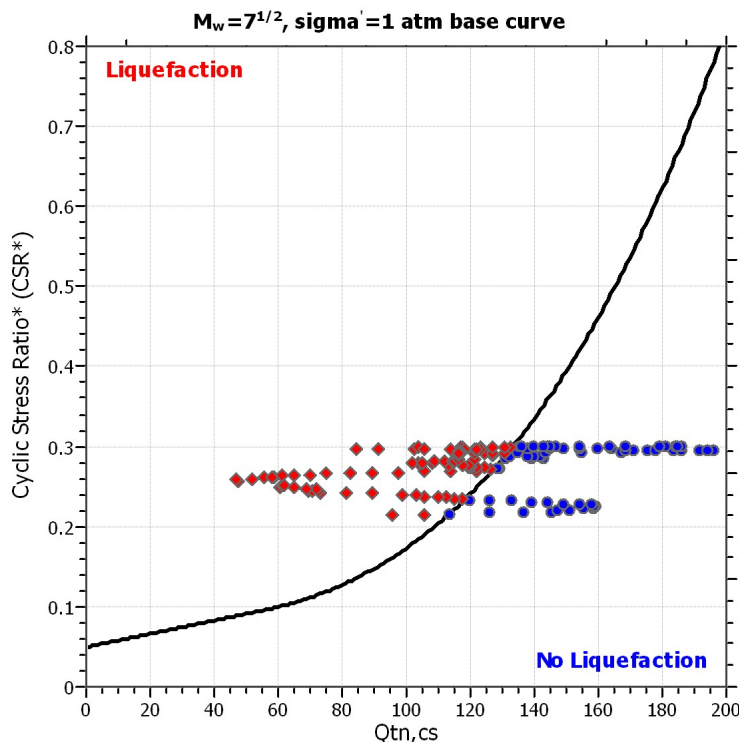
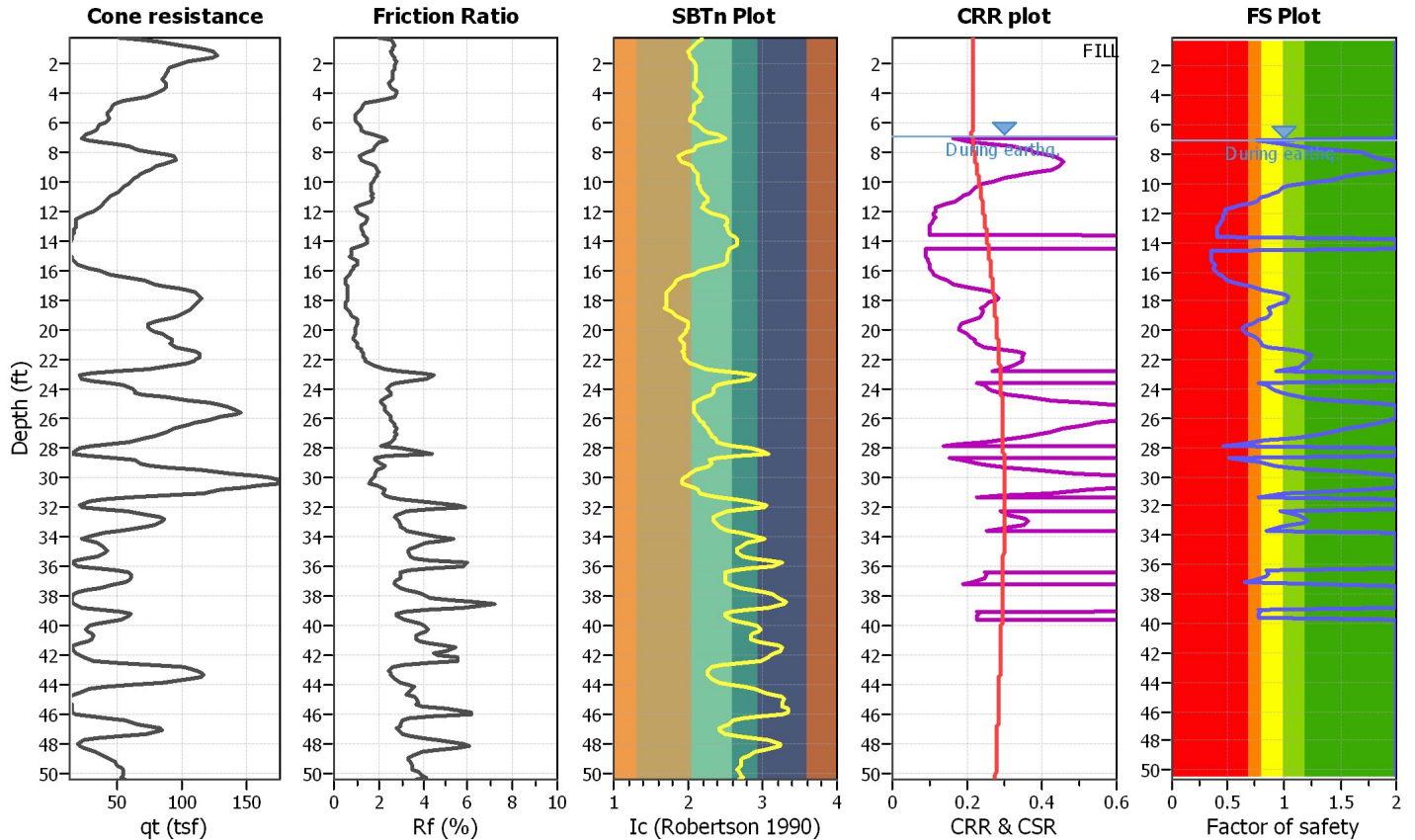
Abbreviations

q_c : Total cone resistance (cone resistance q_c corrected for pore water effects)
 I_c : Soil Behaviour Type Index
 FS: Calculated Factor of Safety against liquefaction
 Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

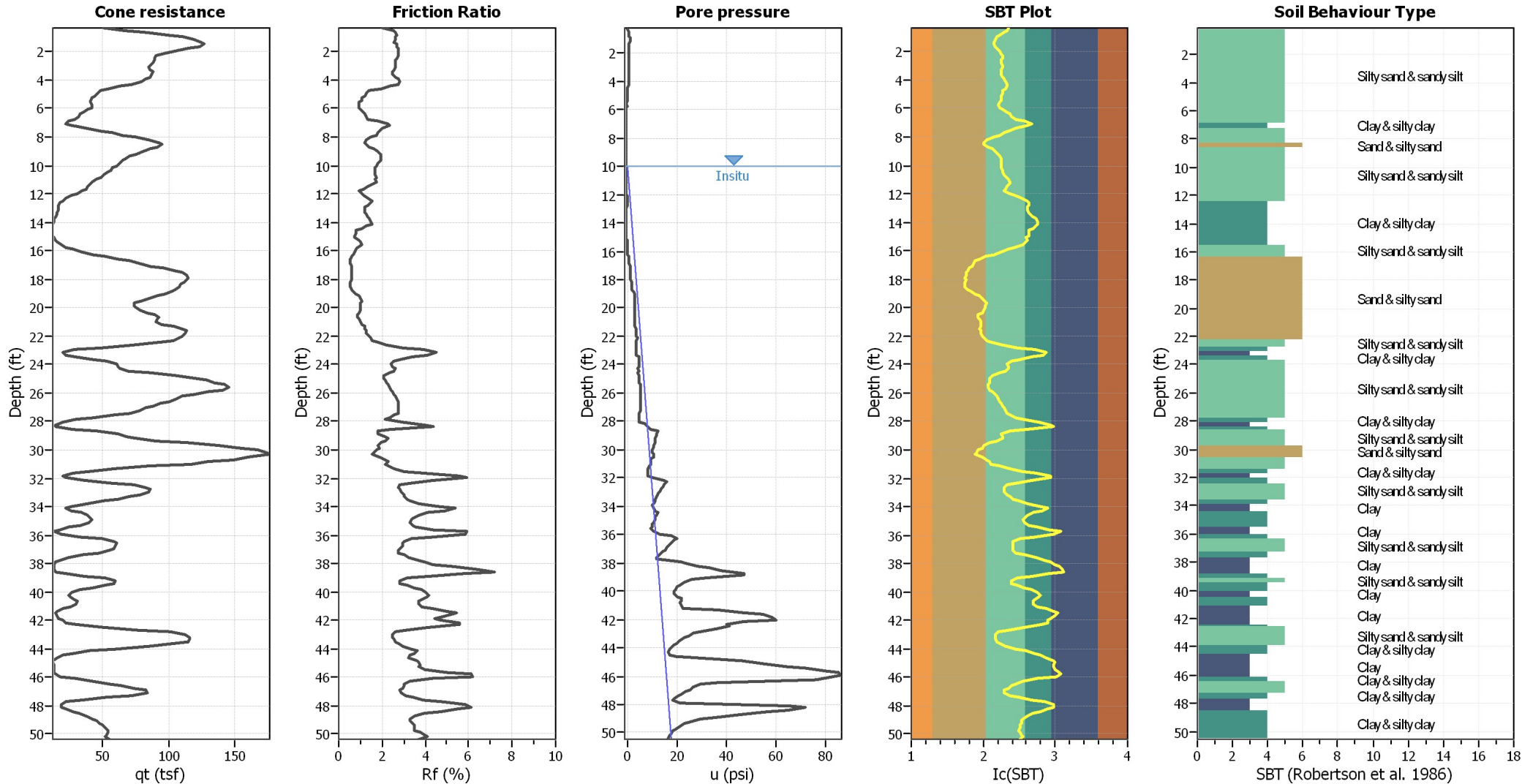
Project title : Zephyr Oceanside
Location : Hwy 76 & Foussat Road, Oceanside
CPT file : CPT-02
Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	17.00 ft	Fill height:	10.00 ft	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.72	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	50.00 ft
Peak ground acceleration:	0.45	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	50.00 ft

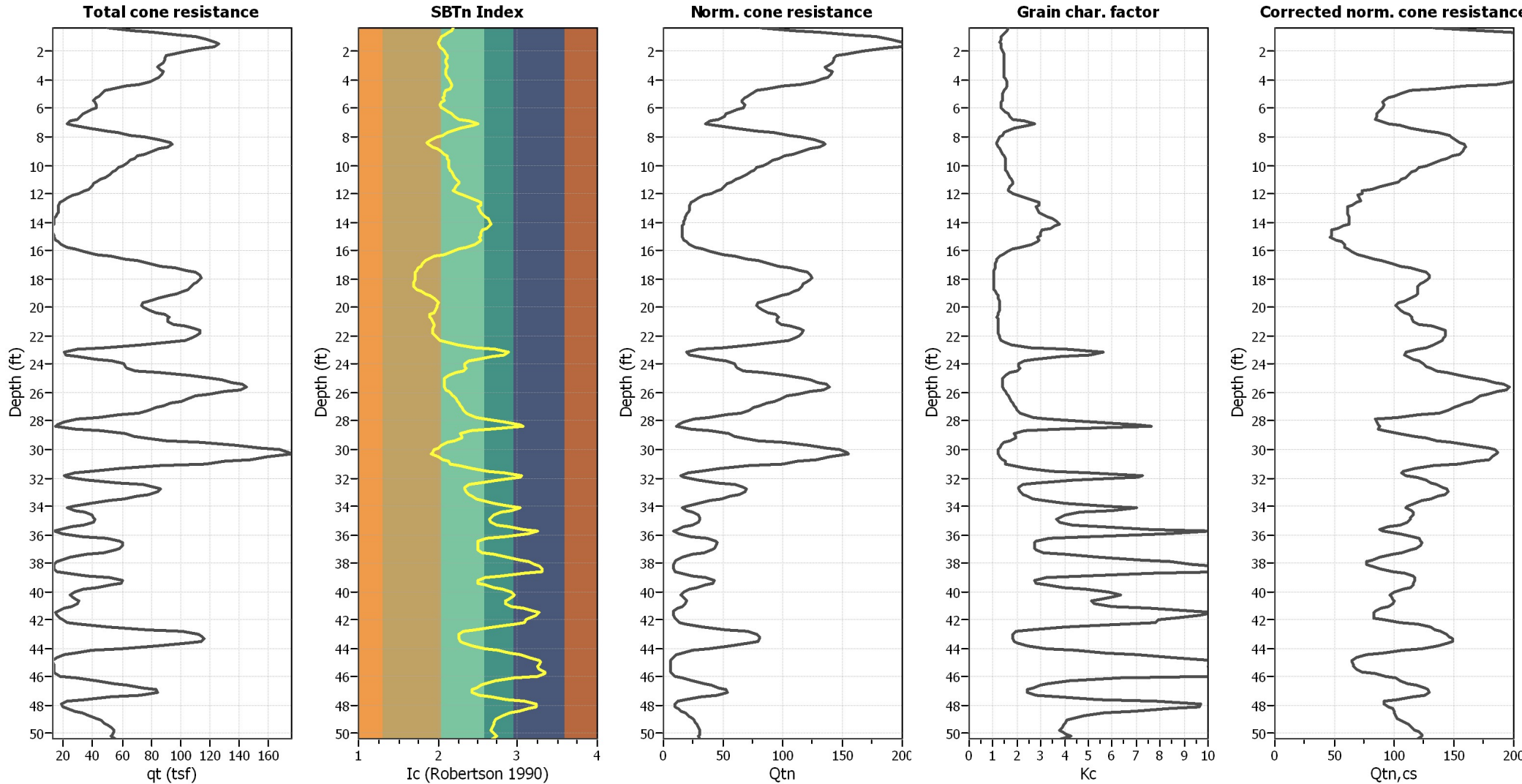
SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	50.00 ft

	1. Sensitive fine grained		4. Clayey silt to silty		7. Gravely sand to sand
	2. Organic material		5. Silty sand to sandy silt		8. Very stiff sand to
	3. Clay to silty clay		6. Clean sand to silty sand		9. Very stiff fine grained

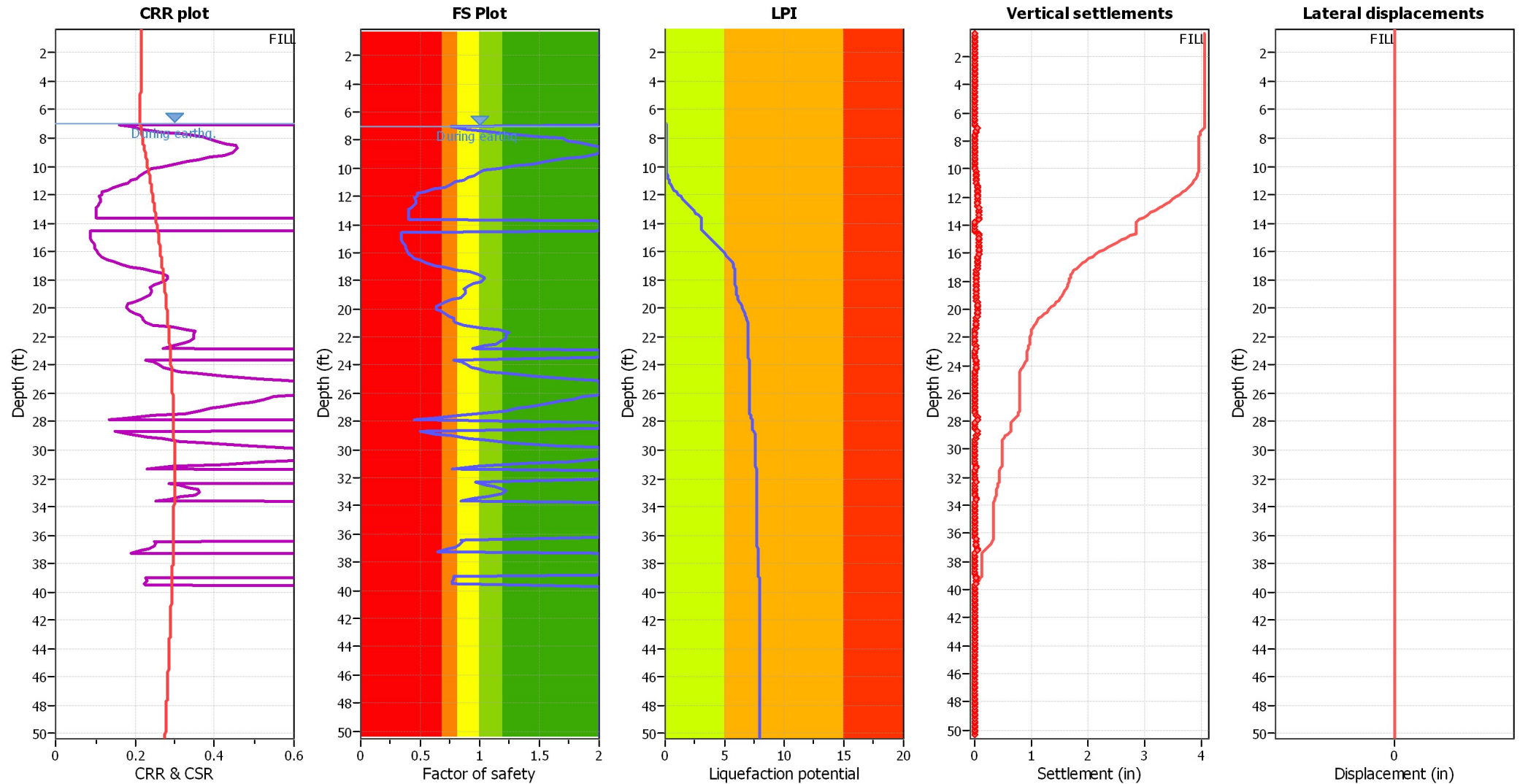
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _c applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	50.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	50.00 ft

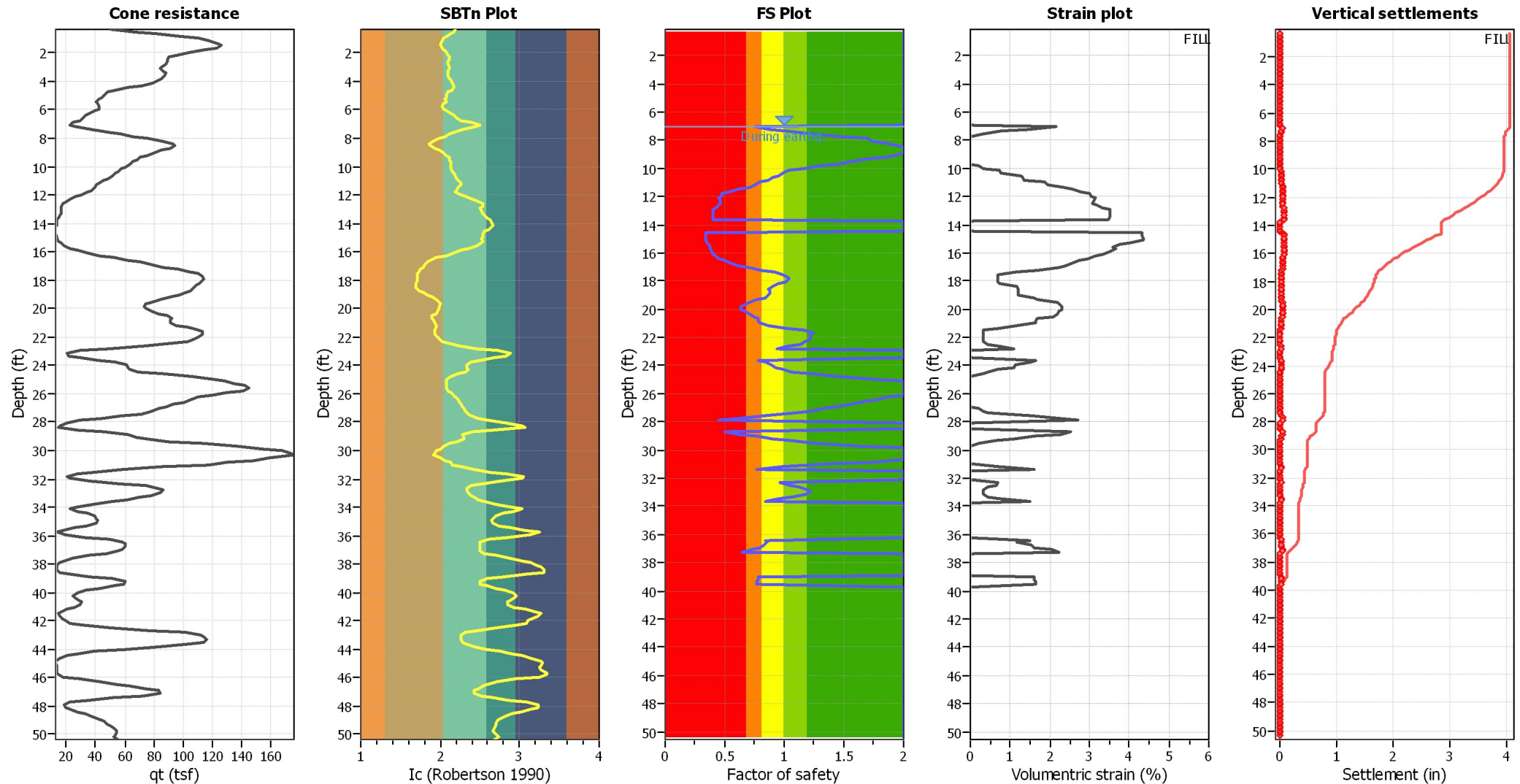
F.S. color scheme

■	Almost certain it will liquefy
■	Very likely to liquefy
■	Liquefaction and no liq. are equally likely
■	Unlike to liquefy
■	Almost certain it will not liquefy

LPI color scheme

■	Very high risk
■	High risk
■	Low risk

Estimation of post-earthquake settlements



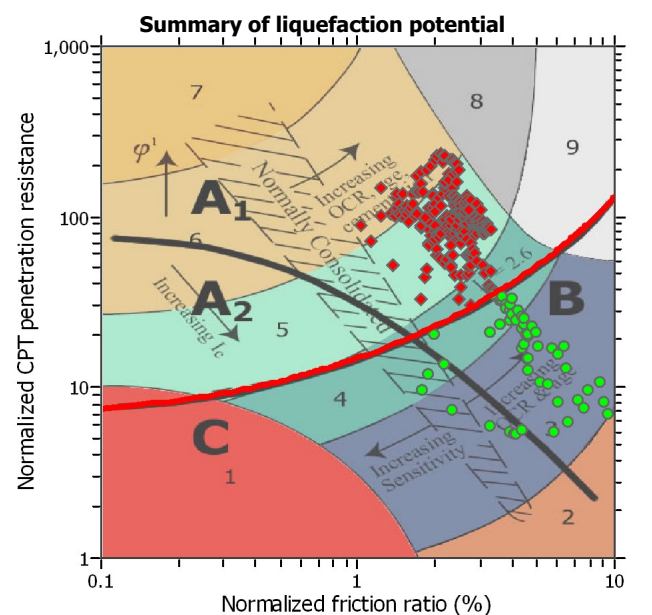
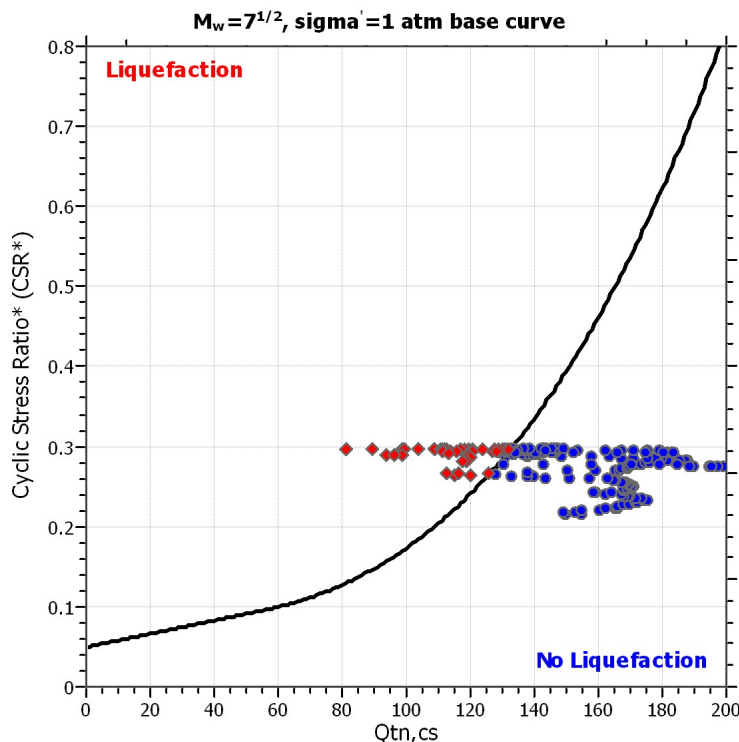
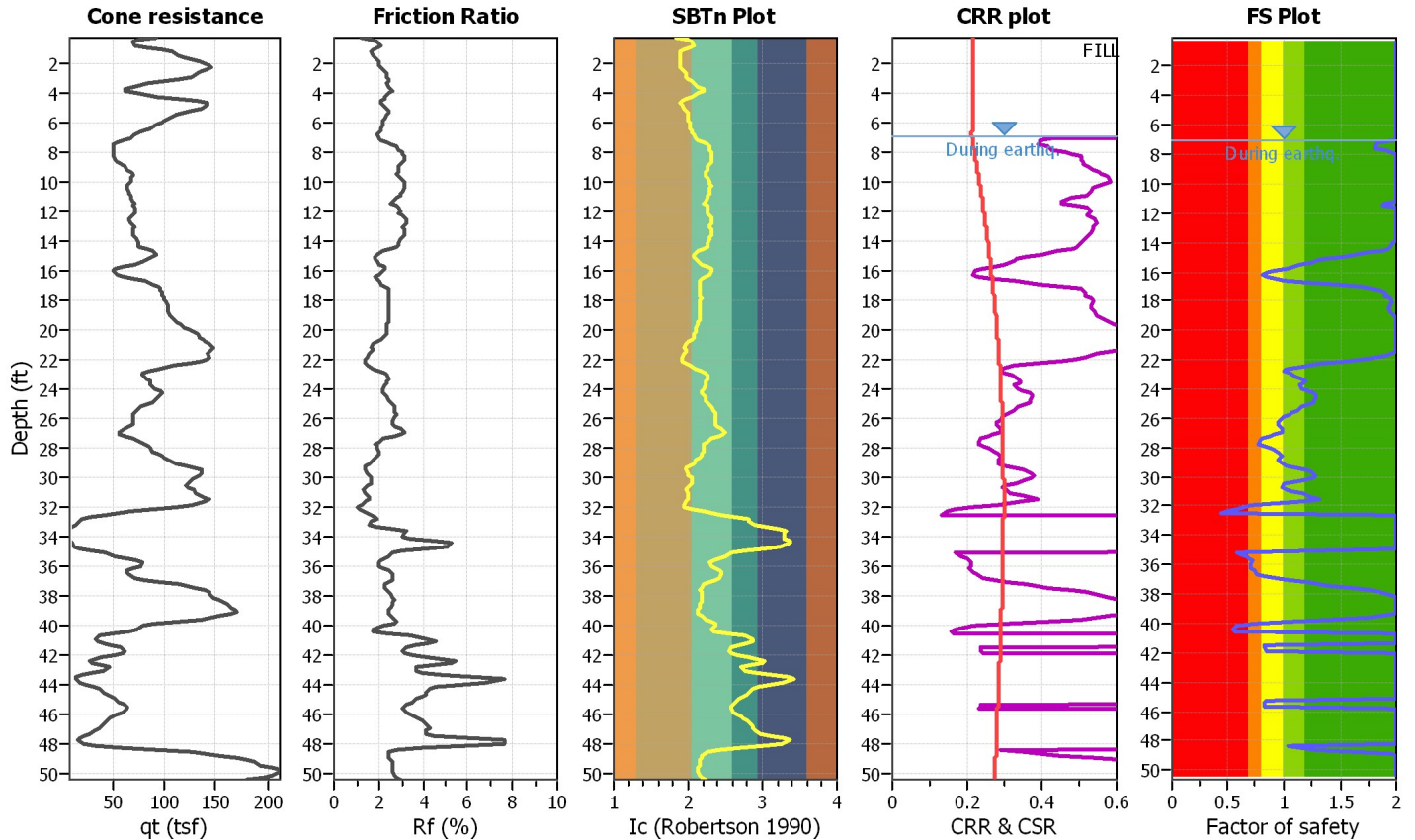
Abbreviations

q_c : Total cone resistance (cone resistance q_c corrected for pore water effects)
 I_c : Soil Behaviour Type Index
 FS: Calculated Factor of Safety against liquefaction
 Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

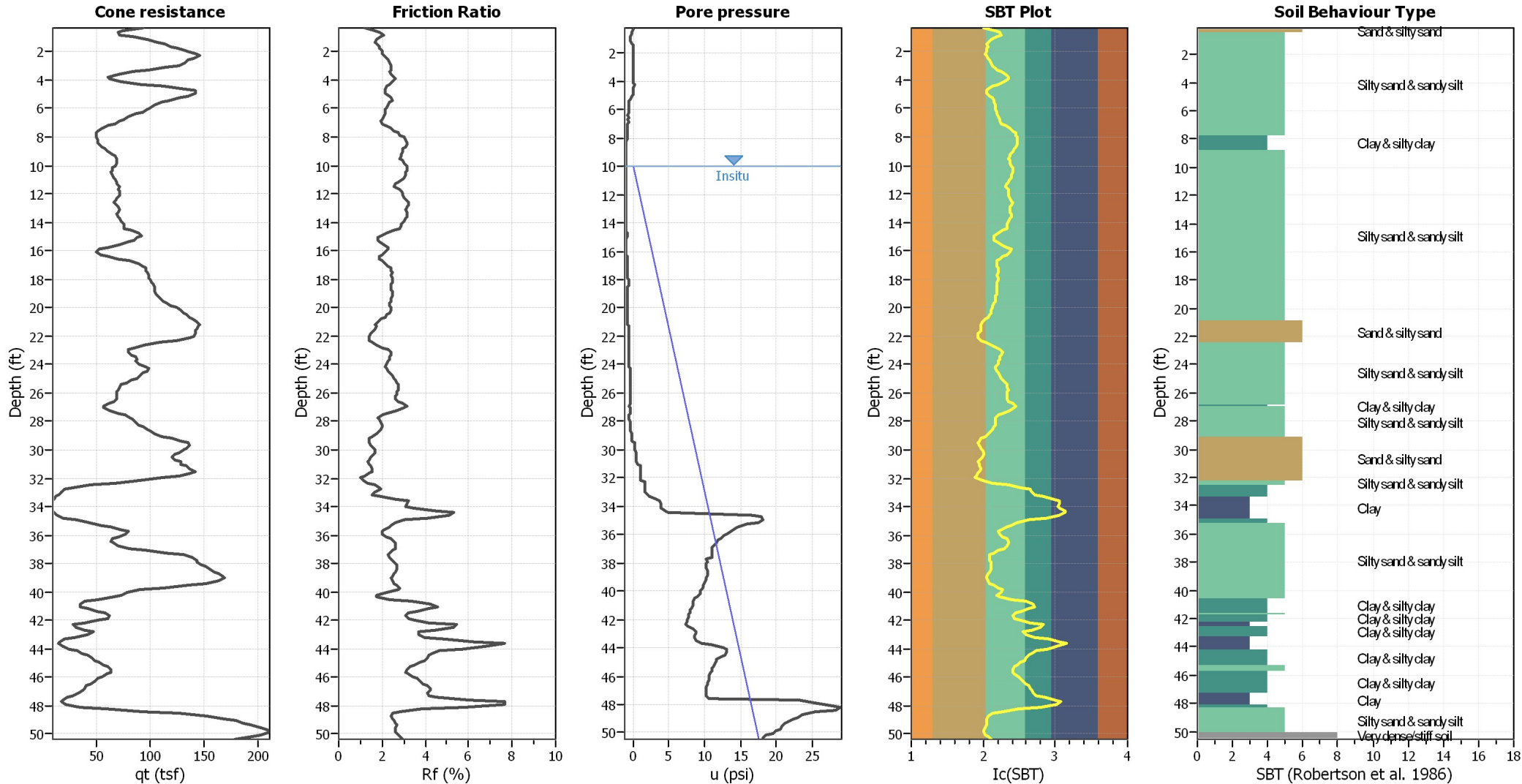
Project title : Zephyr Oceanside
Location : Hwy 76 & Foussat Road, Oceanside
CPT file : CPT-03
Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	17.00 ft	Fill height:	10.00 ft	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	No
Earthquake magnitude M_w :	6.72	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.45	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



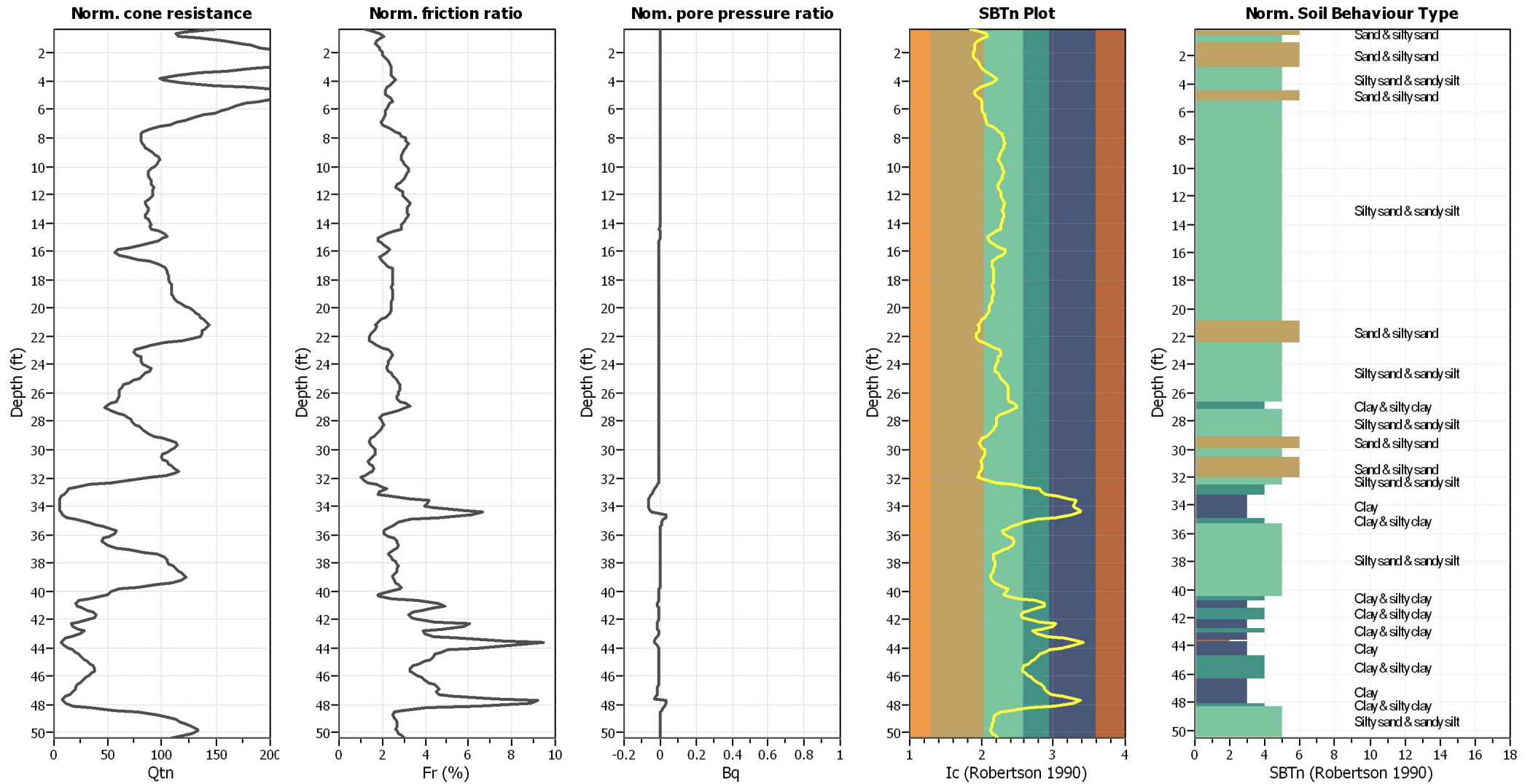
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

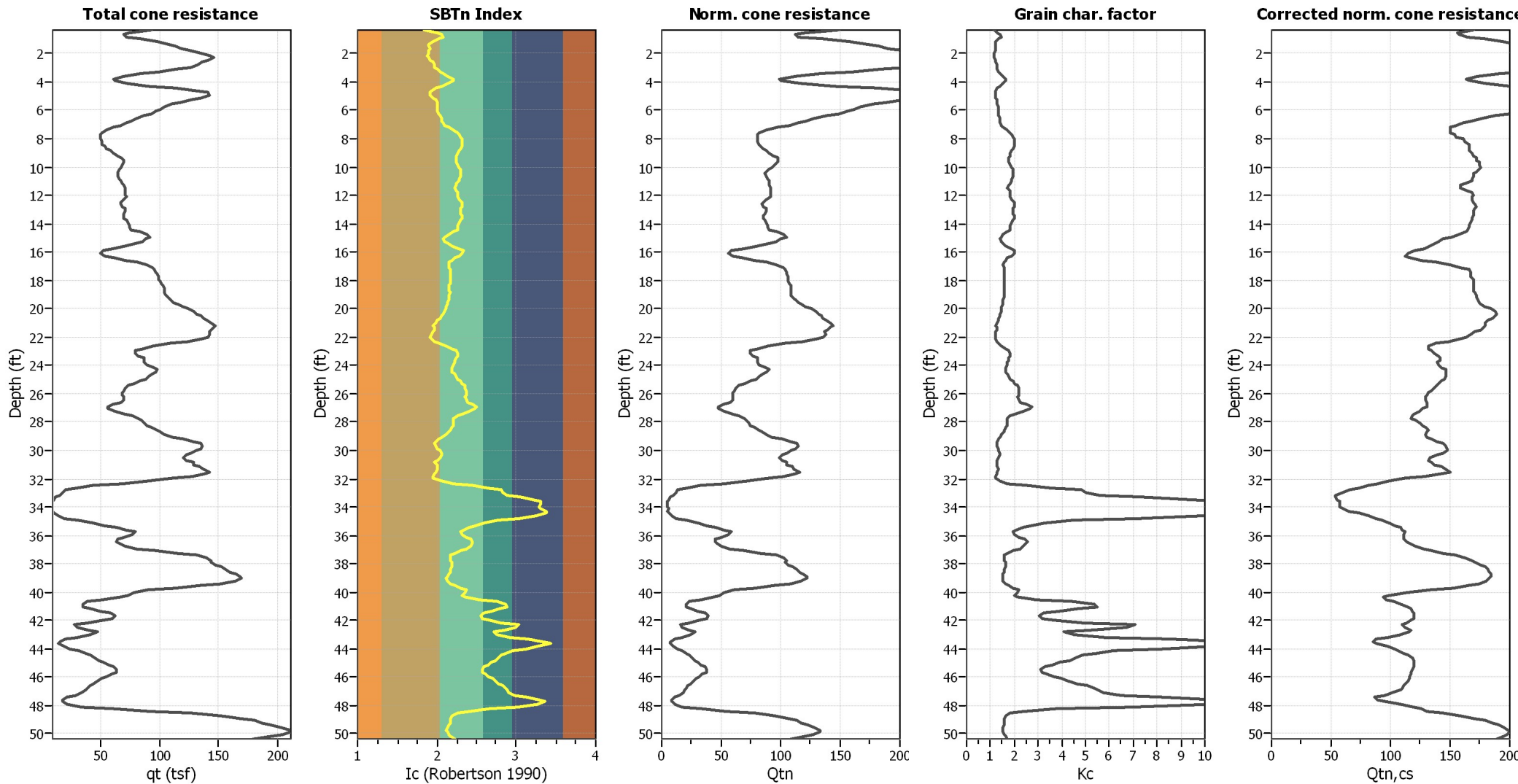
CPT basic interpretation plots (normalized)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

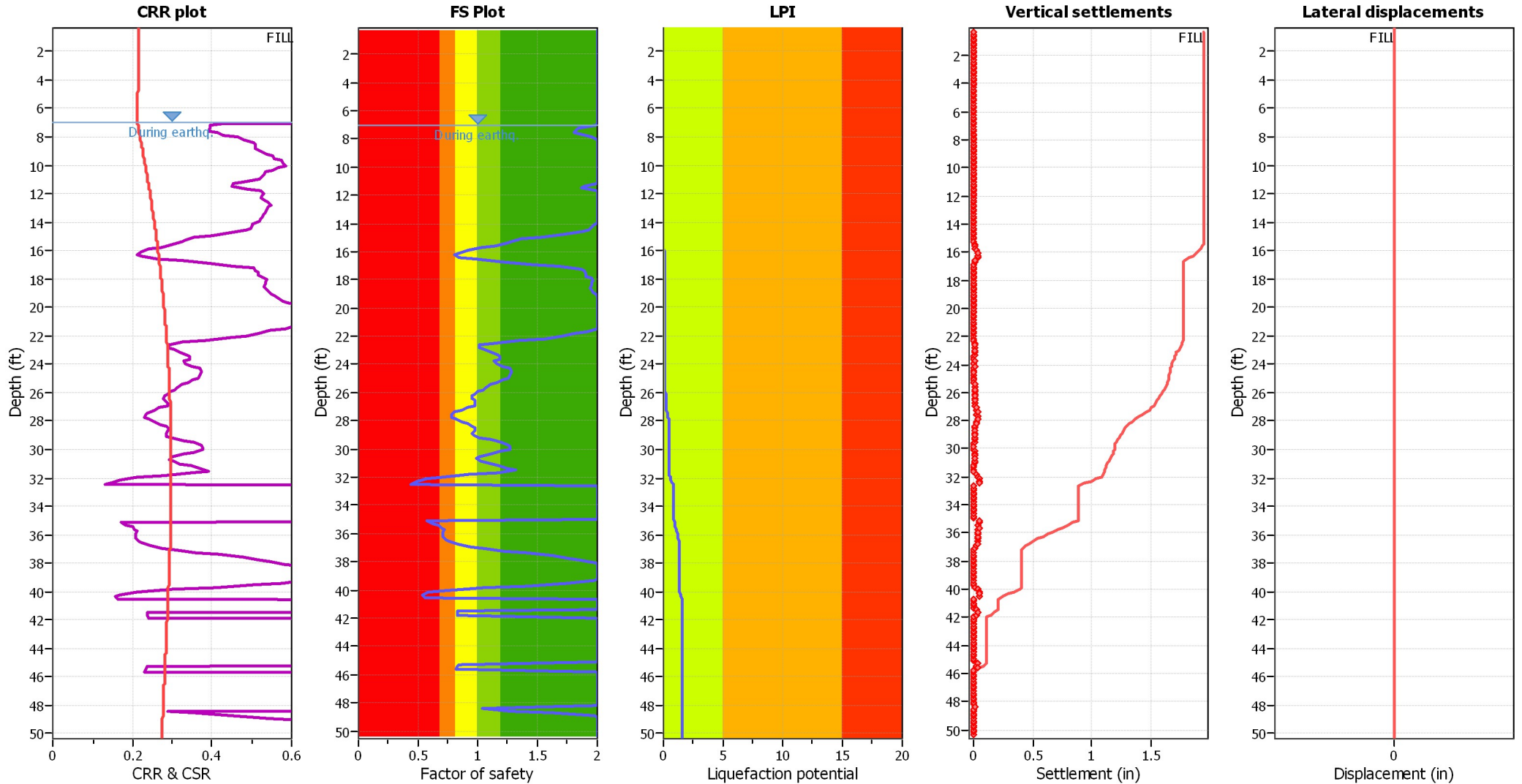
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _c applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

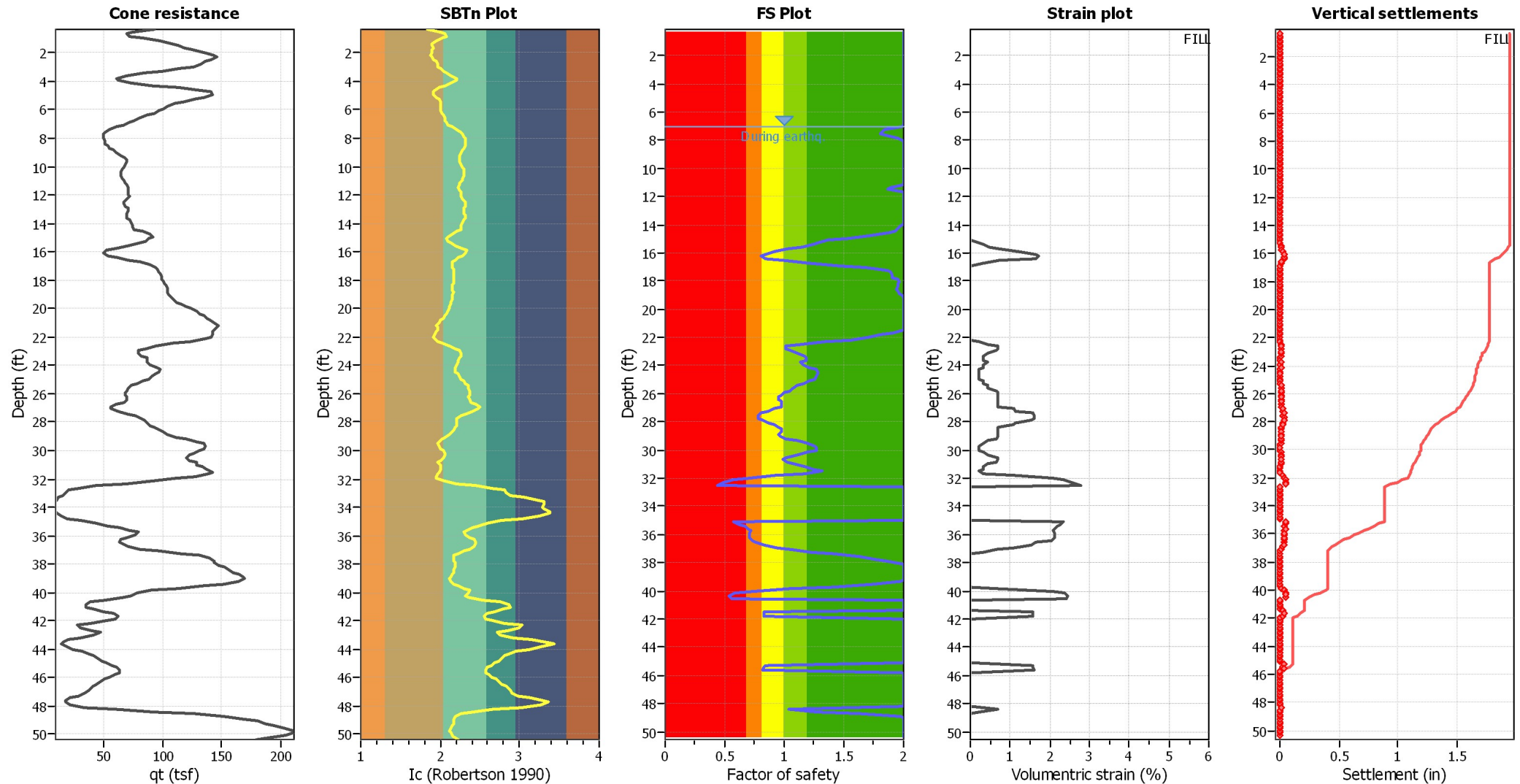
F.S. color scheme

Red	Almost certain it will liquefy
Orange	Very likely to liquefy
Yellow	Liquefaction and no liq. are equally likely
Light Green	Unlike to liquefy
Dark Green	Almost certain it will not liquefy

LPI color scheme

Red	Very high risk
Orange	High risk
Yellow	Low risk

Estimation of post-earthquake settlements



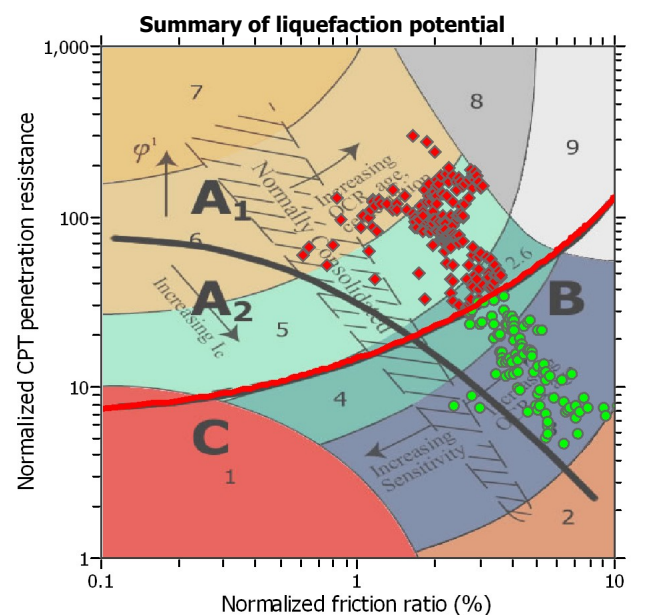
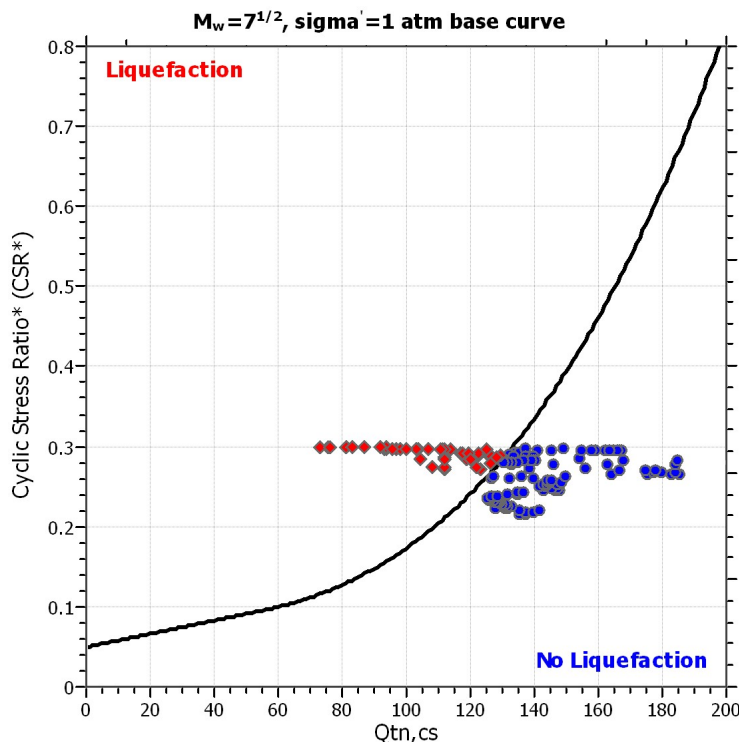
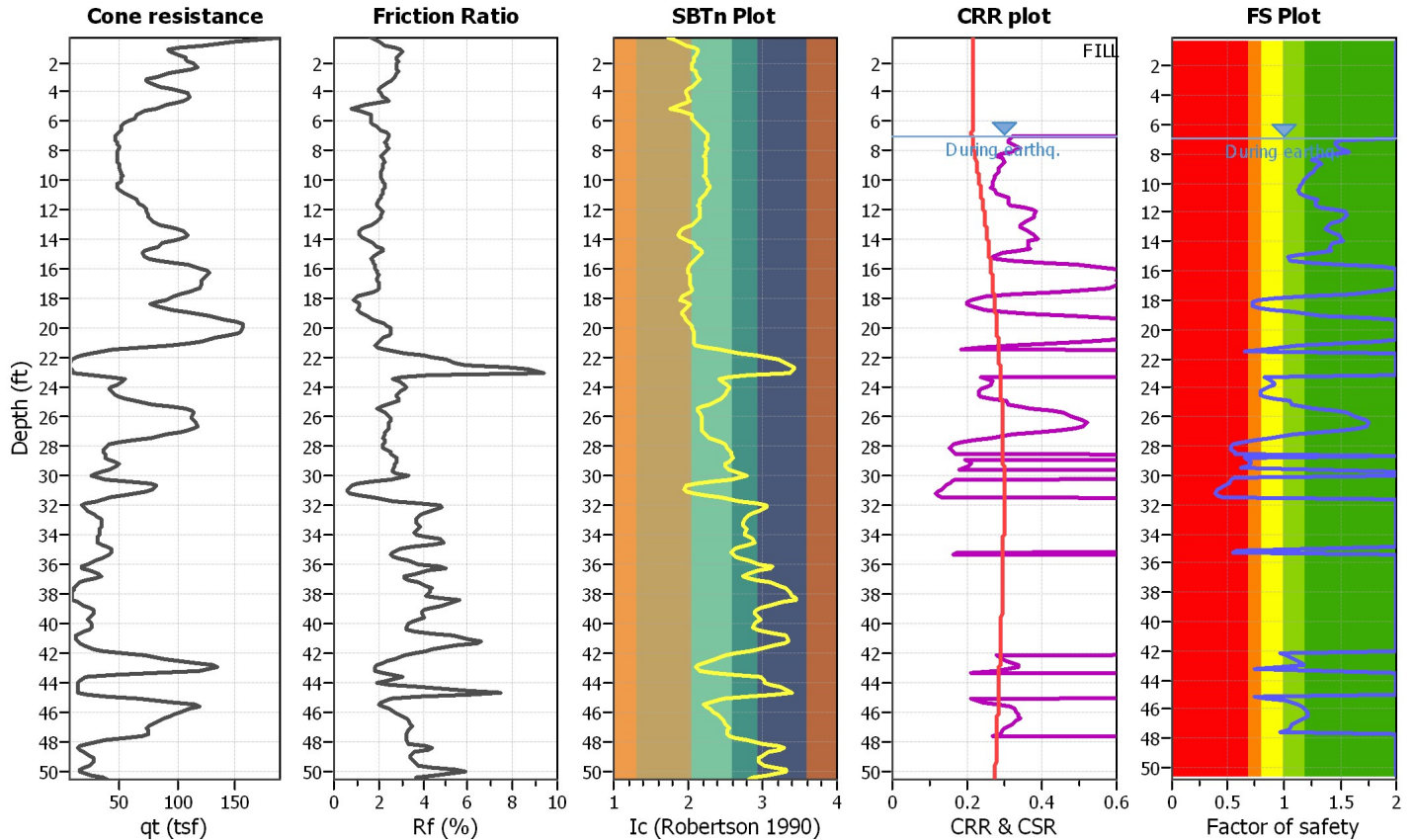
Abbreviations

q_c : Total cone resistance (cone resistance q_c corrected for pore water effects)
 I_c : Soil Behaviour Type Index
 FS: Calculated Factor of Safety against liquefaction
 Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

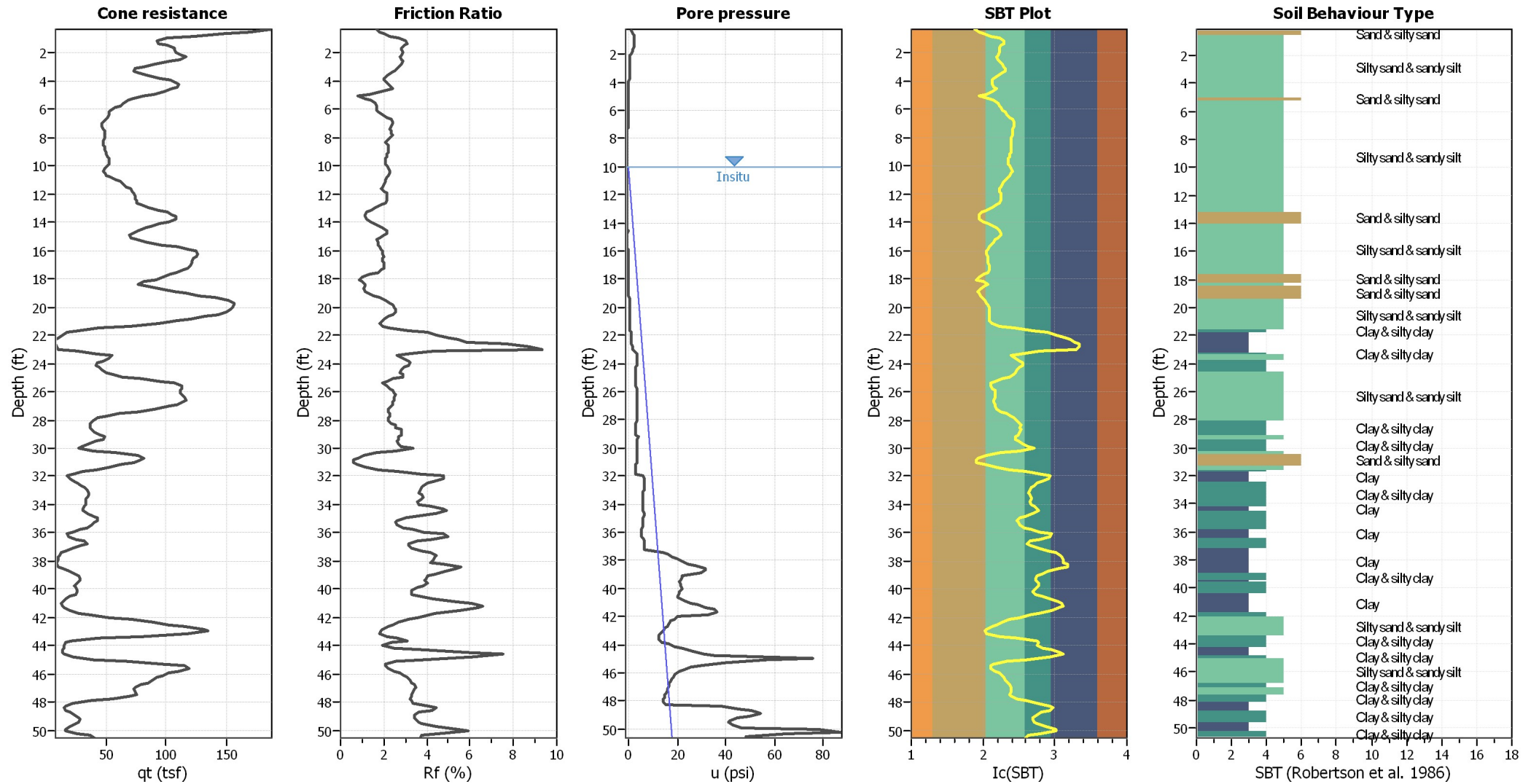
Project title : Zephyr Oceanside
Location : Hwy 76 & N Foussat Oceanside
CPT file : CPT-04
Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	17.00 ft	Fill height:	10.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth:	N/A
Earthquake magnitude M_w :	6.72	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.45	Unit weight calculation:	Based on SBT	K_0 applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



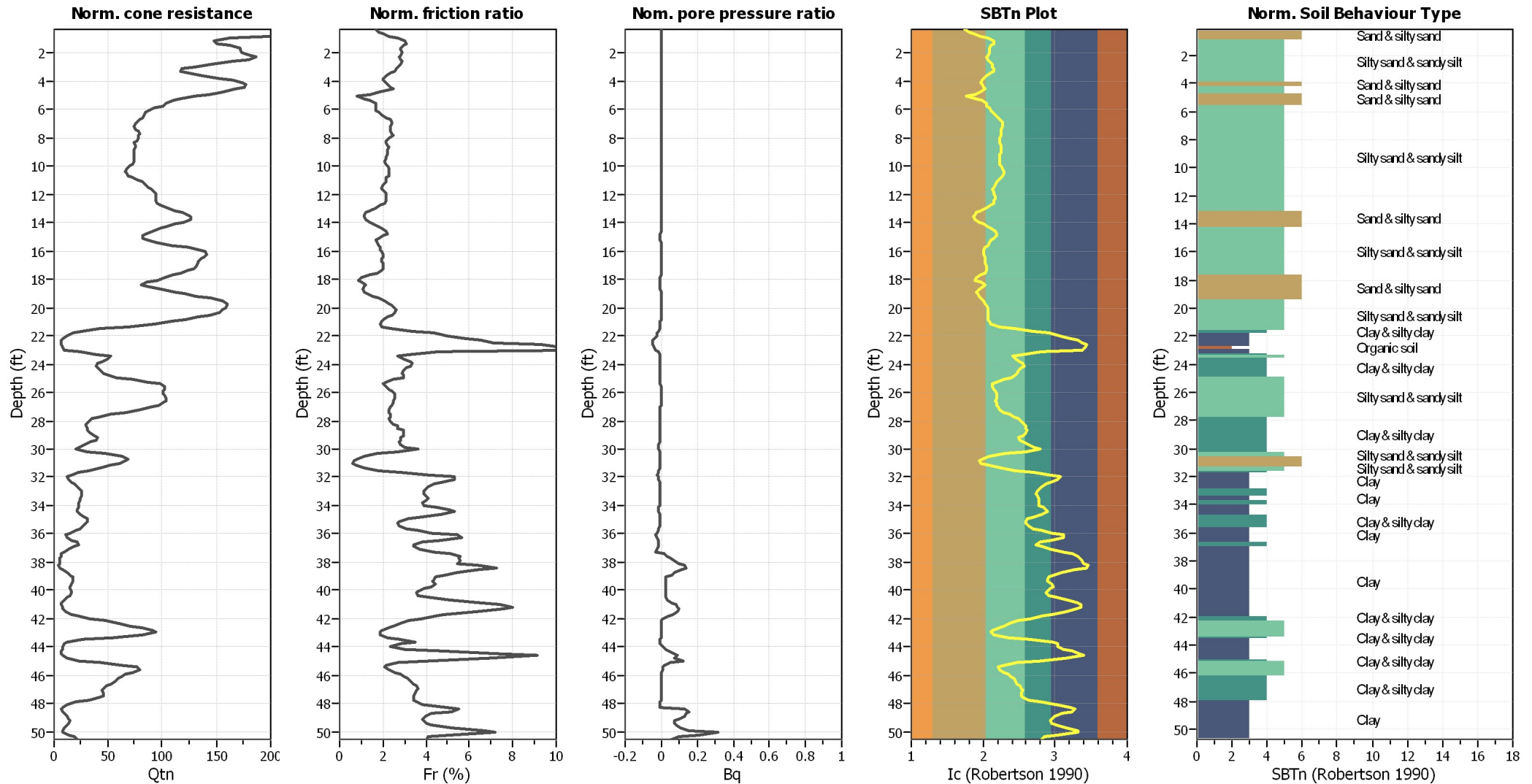
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_G applied:	Yes
Earthquake magnitude M_w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CPT basic interpretation plots (normalized)



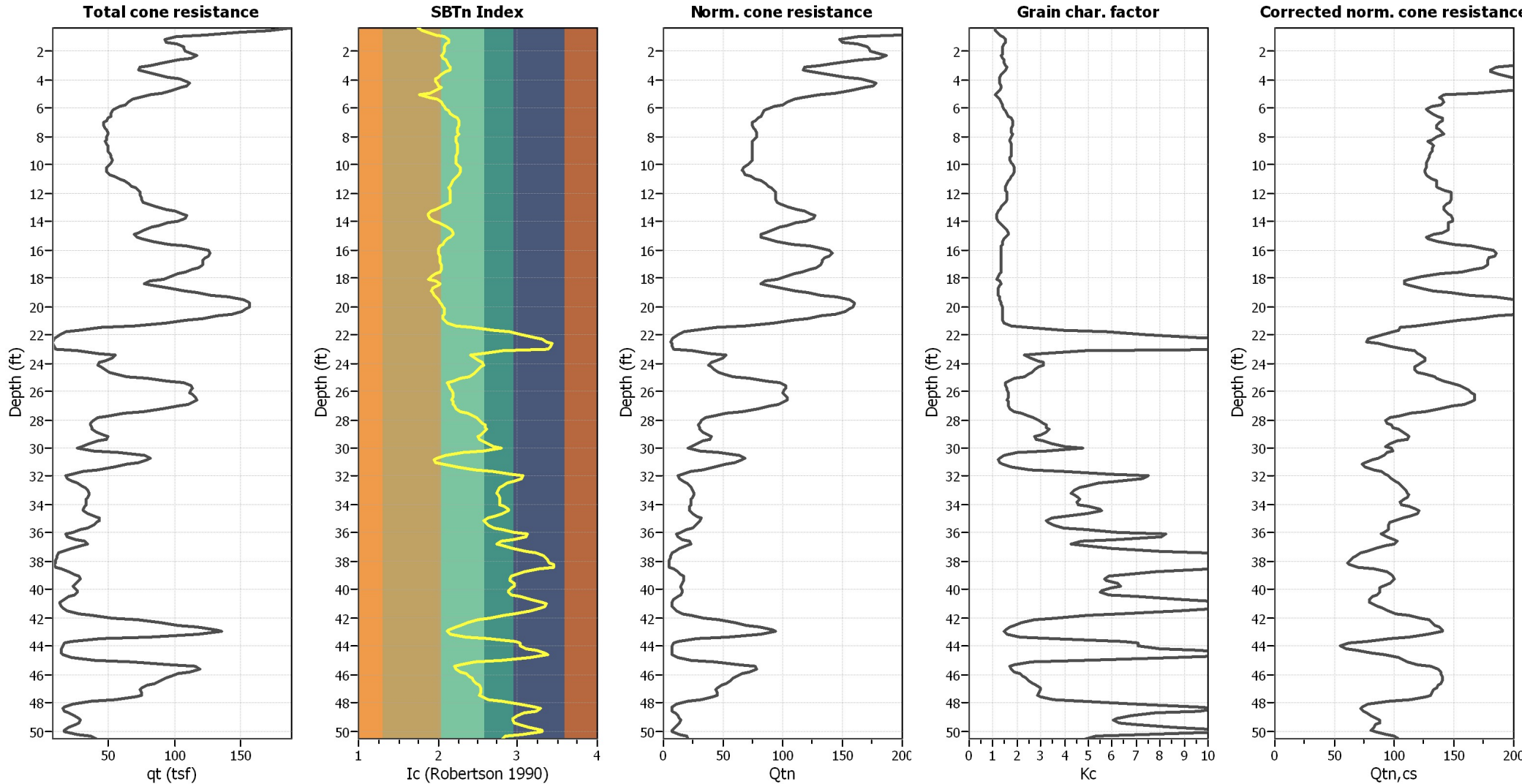
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

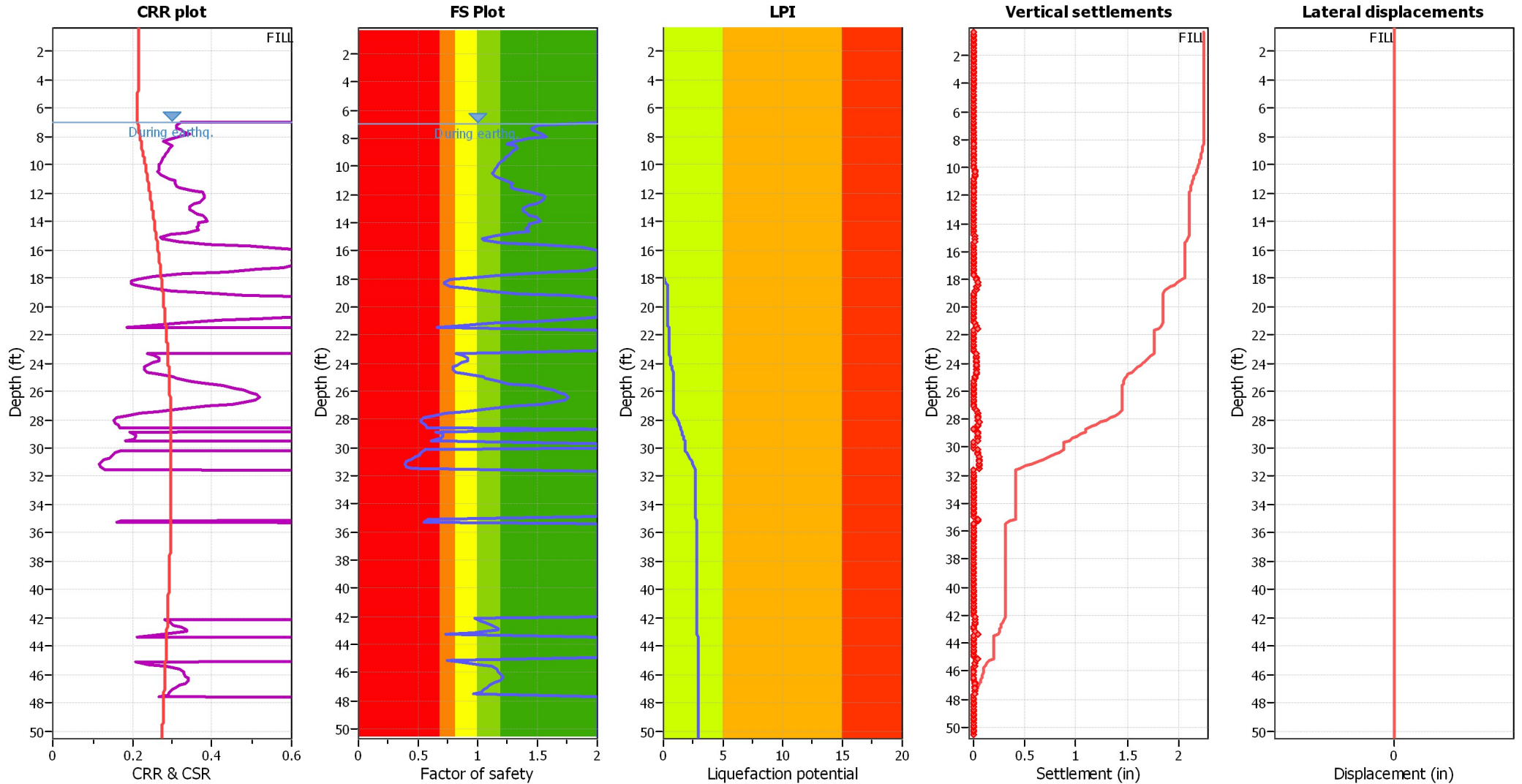
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _c applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (earthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	N/A

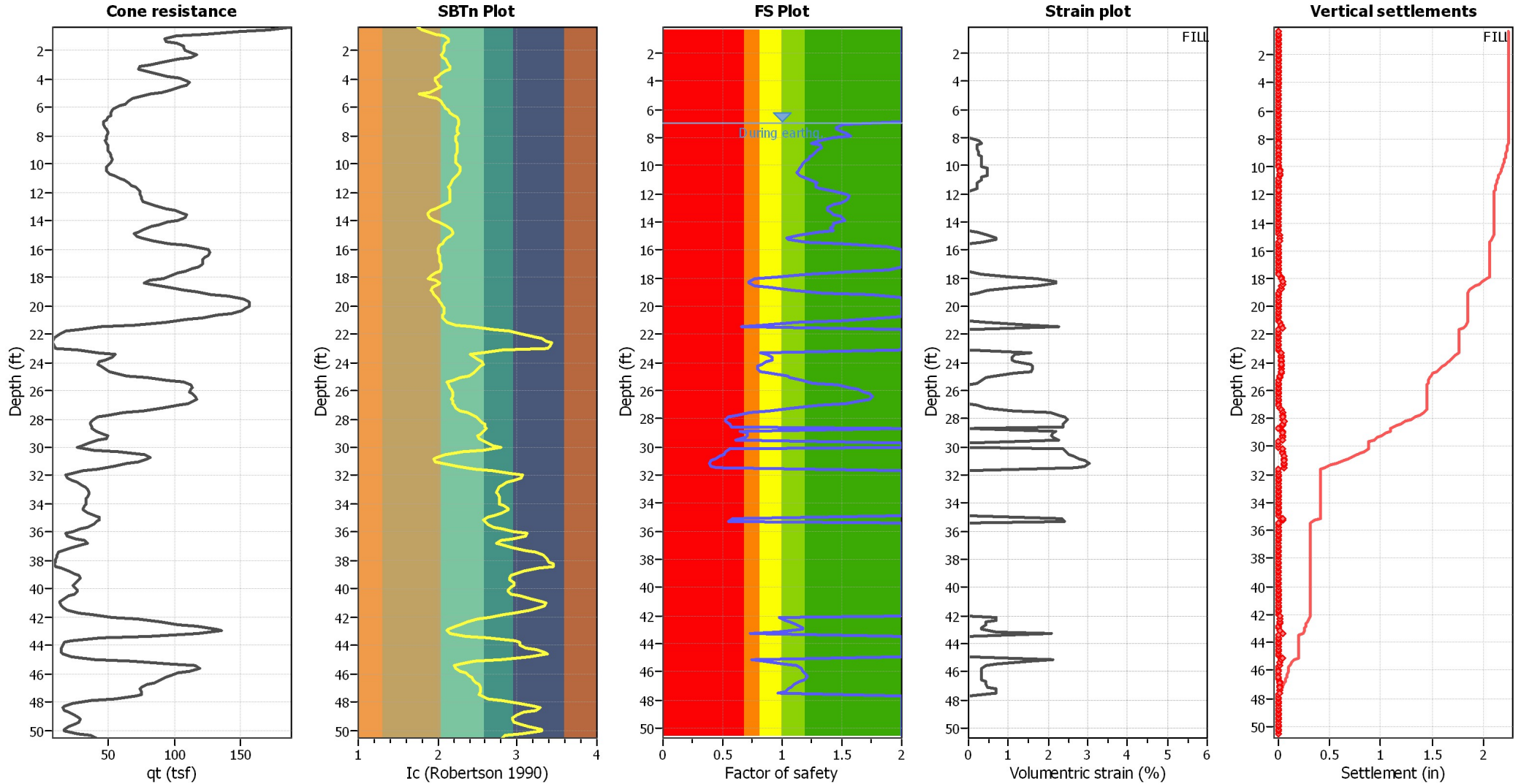
F.S. color scheme

Red	Almost certain it will liquefy
Orange	Very likely to liquefy
Yellow	Liquefaction and no liq. are equally likely
Green	Unlike to liquefy
Dark Green	Almost certain it will not liquefy

LPI color scheme

Red	Very high risk
Orange	High risk
Yellow	Low risk

Estimation of post-earthquake settlements



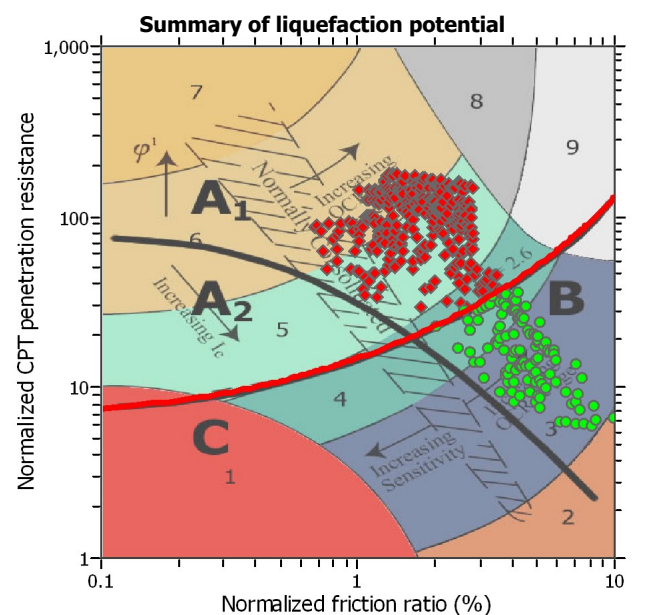
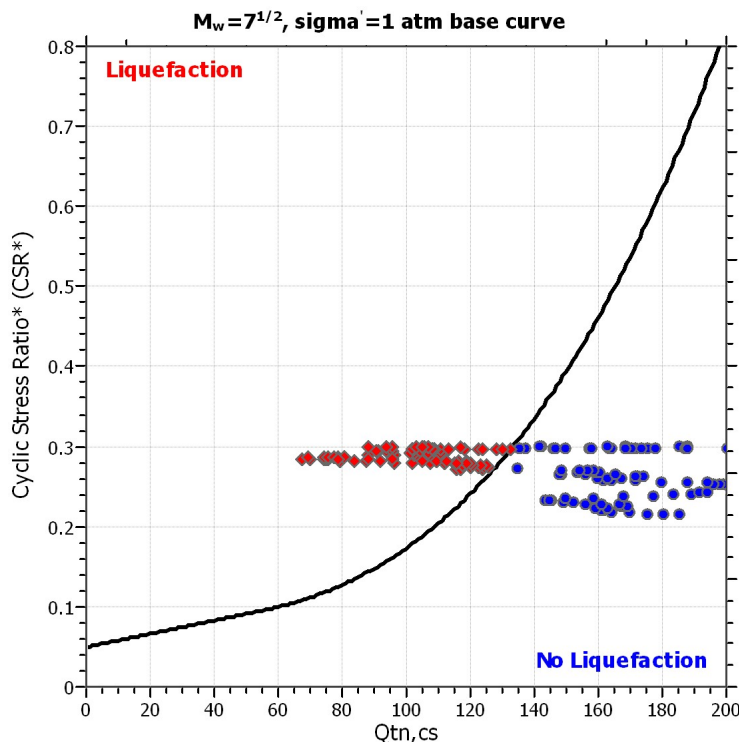
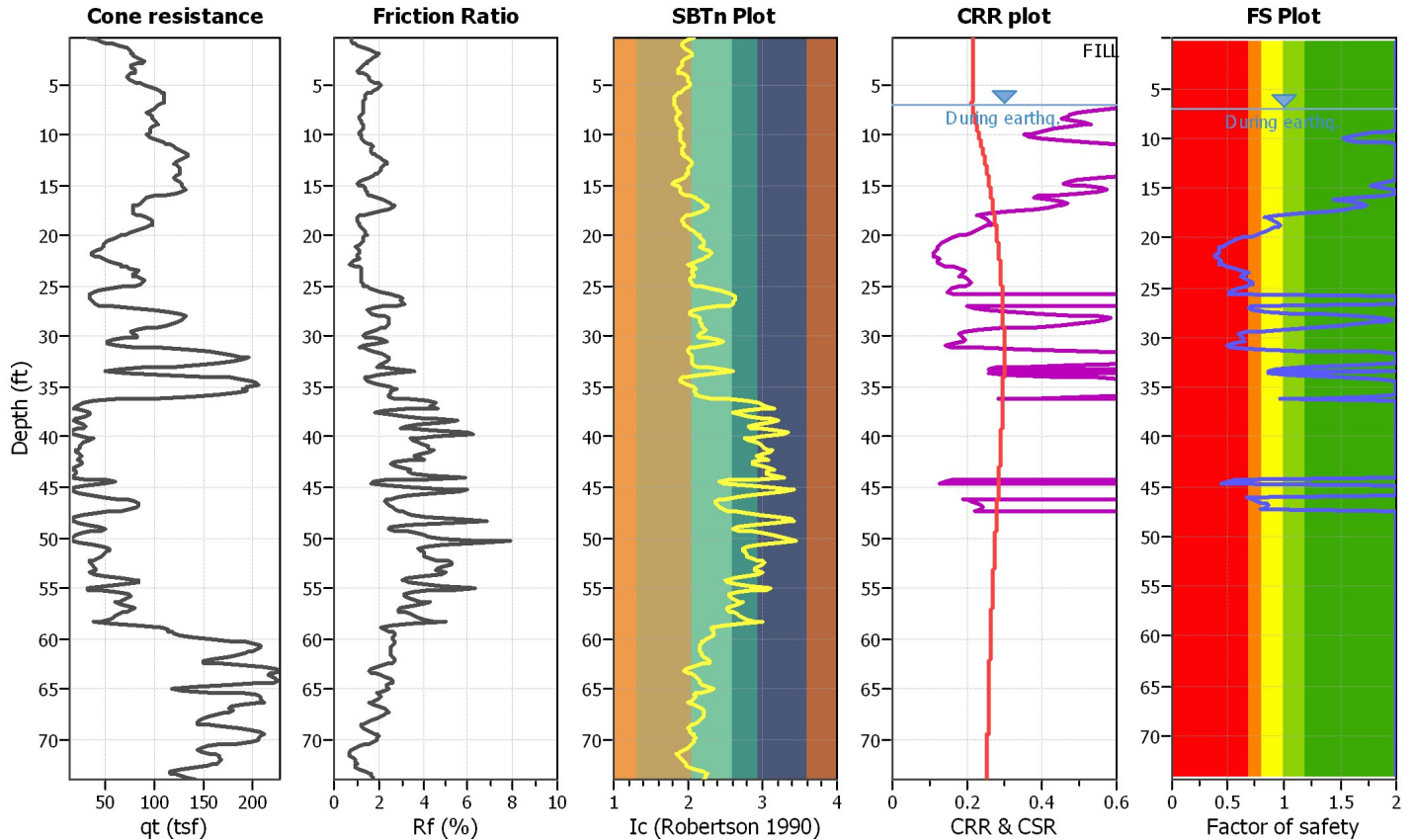
Abbreviations

- qc: Total cone resistance (cone resistance q_c corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

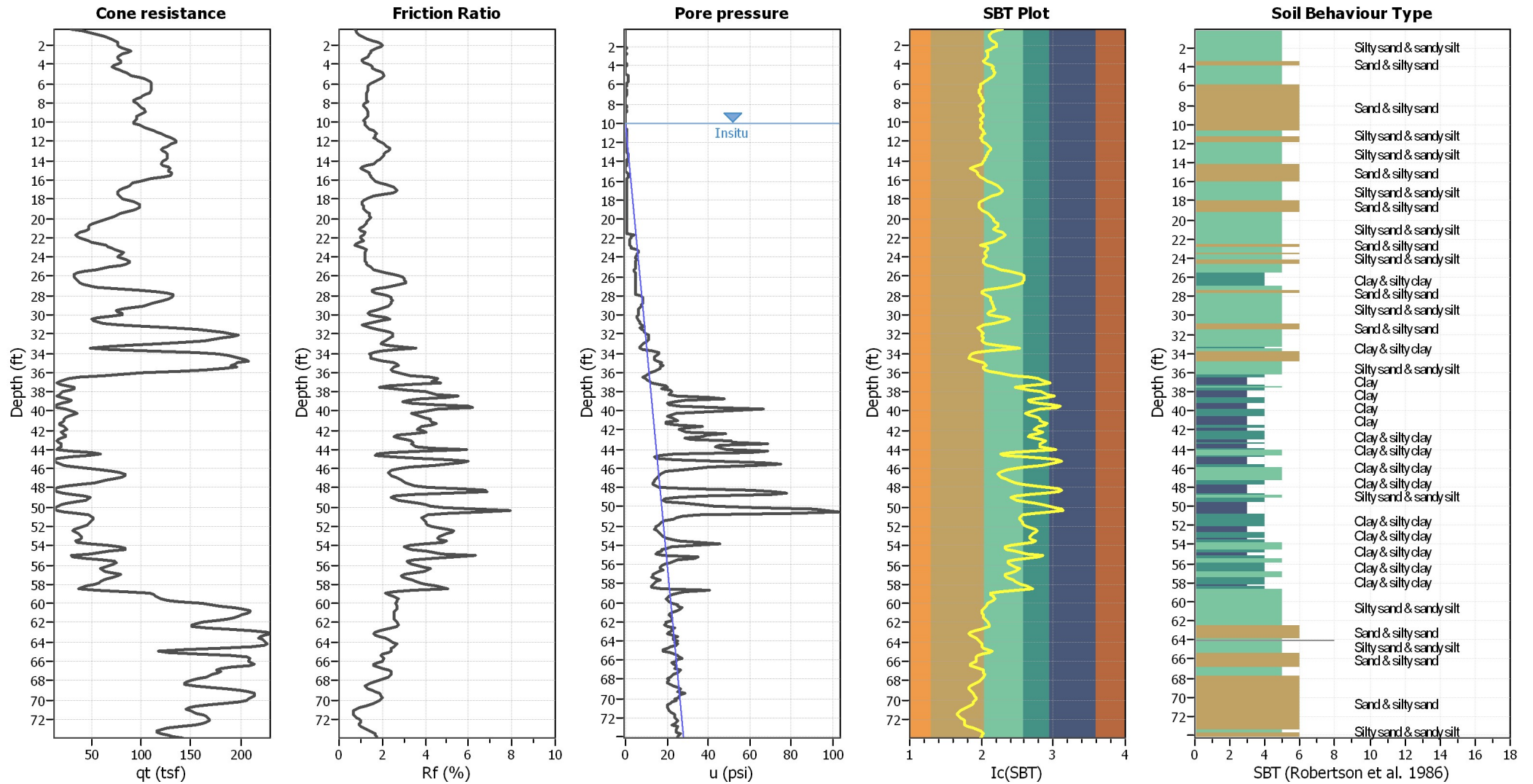
Project title : Zephyr Oceanside
Location : Hwy 76 and Foussat Rd., Oceanside, Ca.
CPT file : CPT-05
Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	17.00 ft	Fill height:	10.00 ft	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.72	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	60.00 ft
Peak ground acceleration:	0.45	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_a applied:	Yes
Earthquake magnitude M_w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	60.00 ft

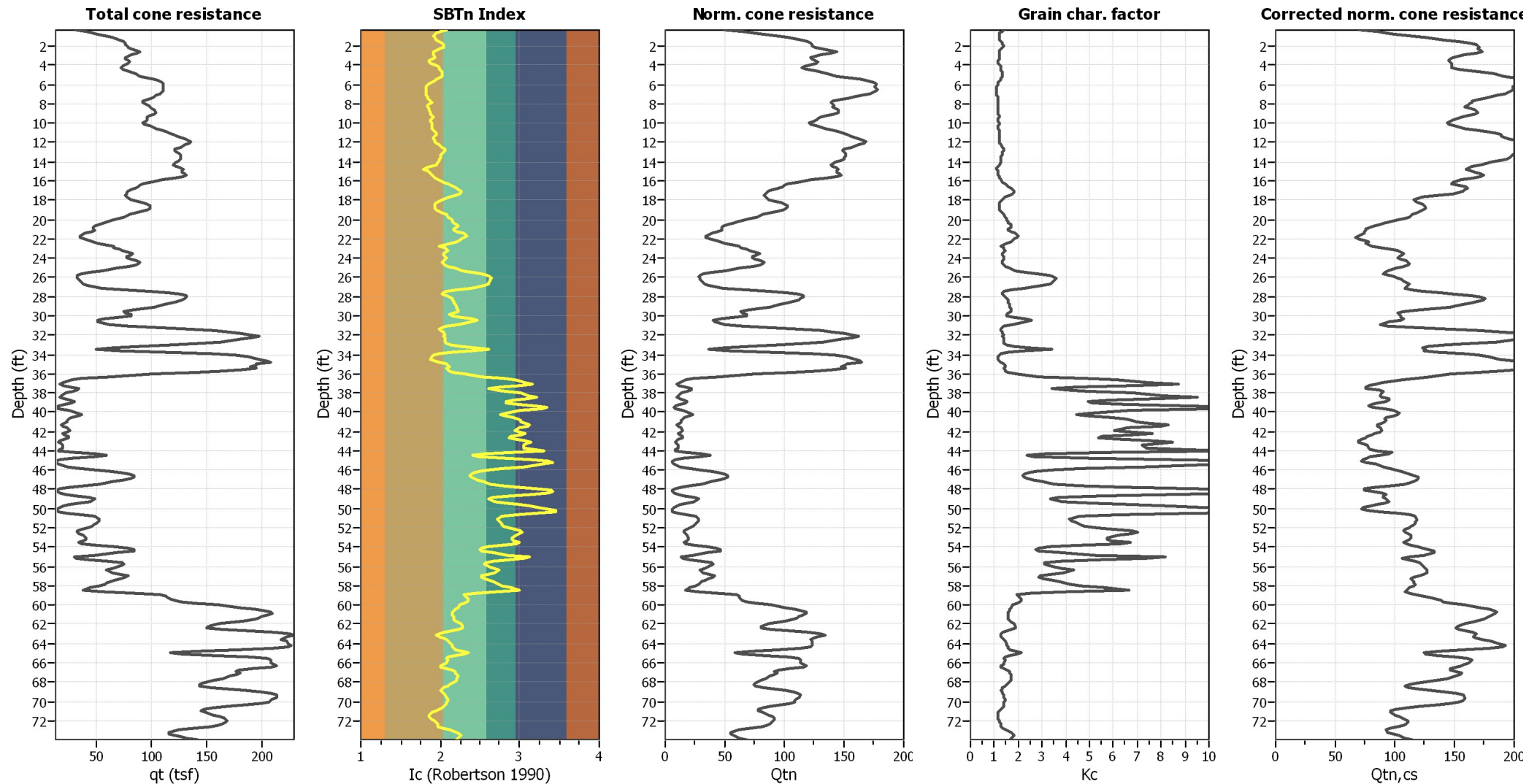
SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	60.00 ft

	1. Sensitive fine grained		4. Clayey silt to silty		7. Gravely sand to sand
	2. Organic material		5. Silty sand to sandy silt		8. Very stiff sand to
	3. Clay to silty clay		6. Clean sand to silty sand		9. Very stiff fine grained

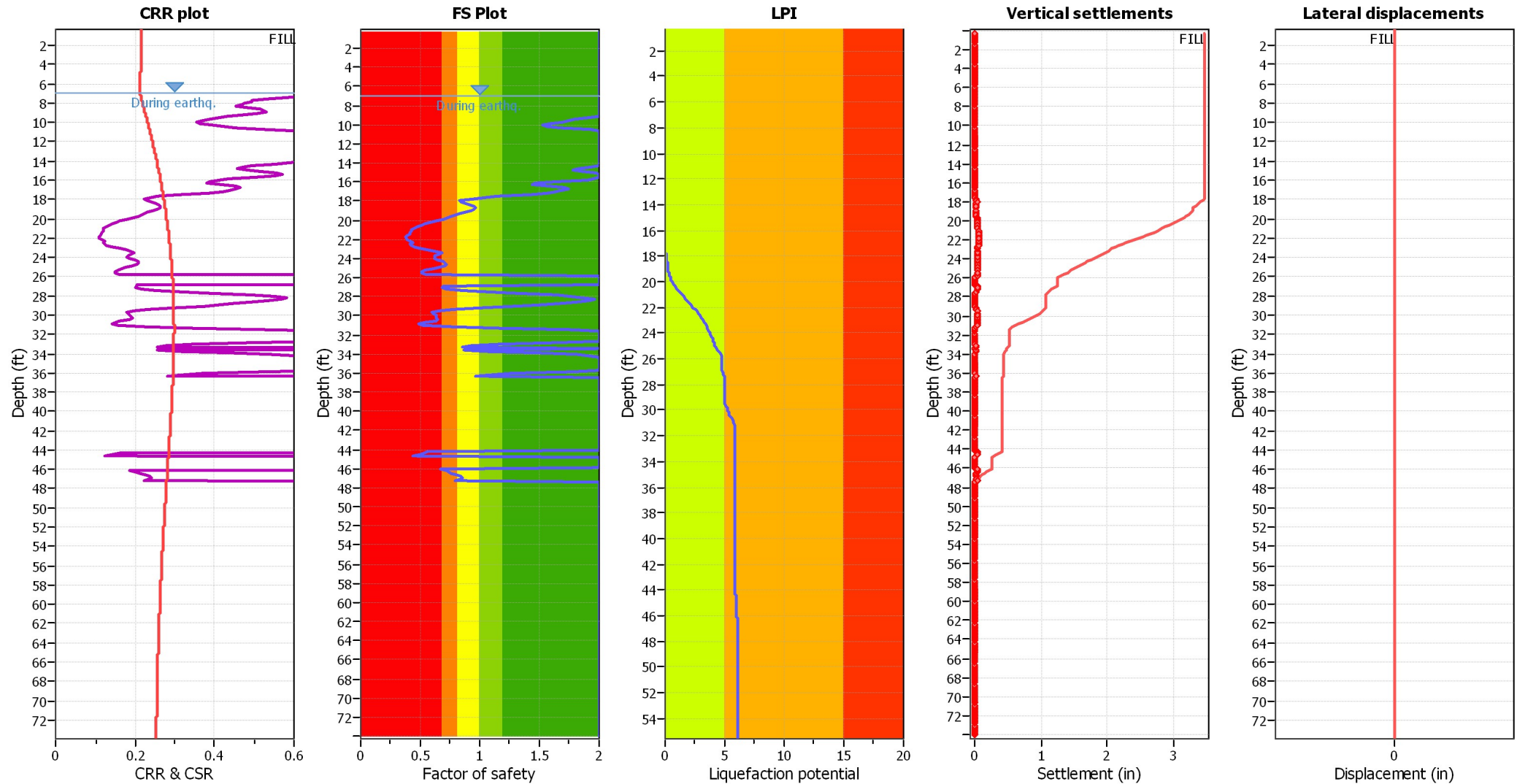
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	60.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	60.00 ft

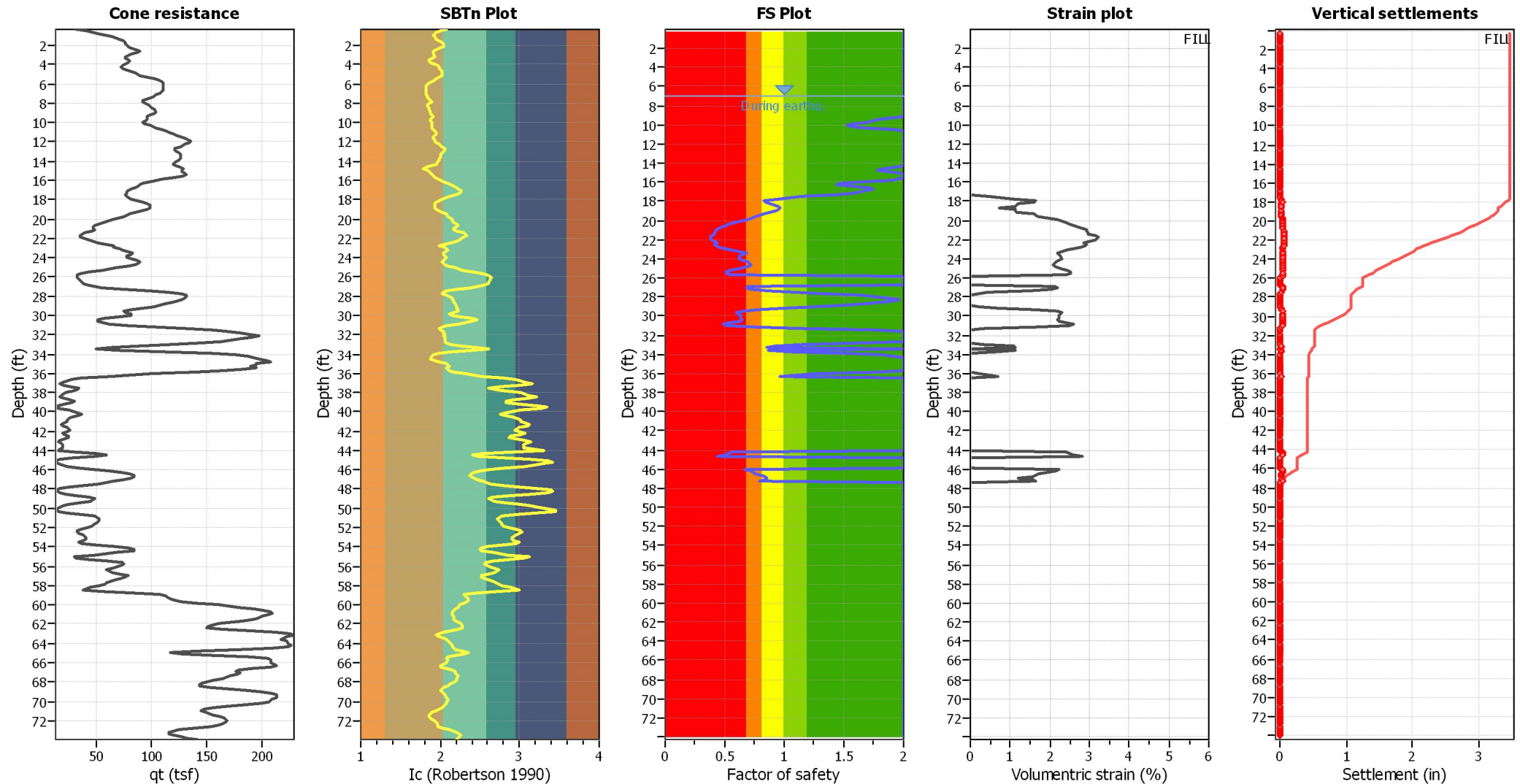
F.S. color scheme

Red	Almost certain it will liquefy
Orange	Very likely to liquefy
Yellow	Liquefaction and no liq. are equally likely
Light Green	Unlike to liquefy
Dark Green	Almost certain it will not liquefy

LPI color scheme

Red	Very high risk
Orange	High risk
Yellow	Low risk

Estimation of post-earthquake settlements



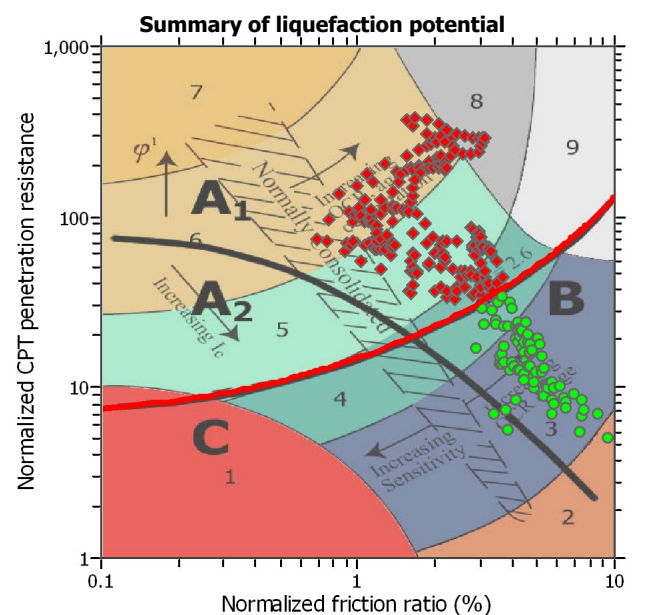
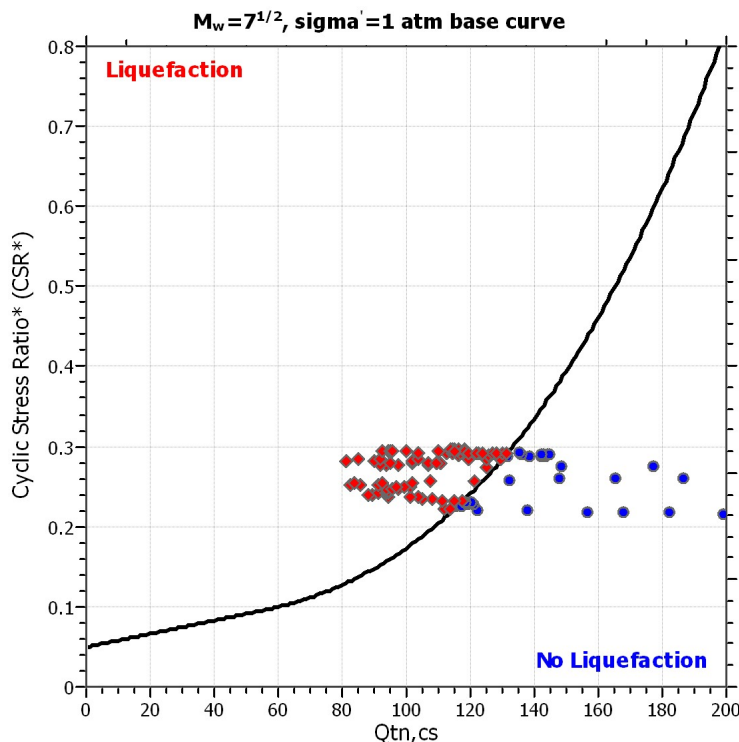
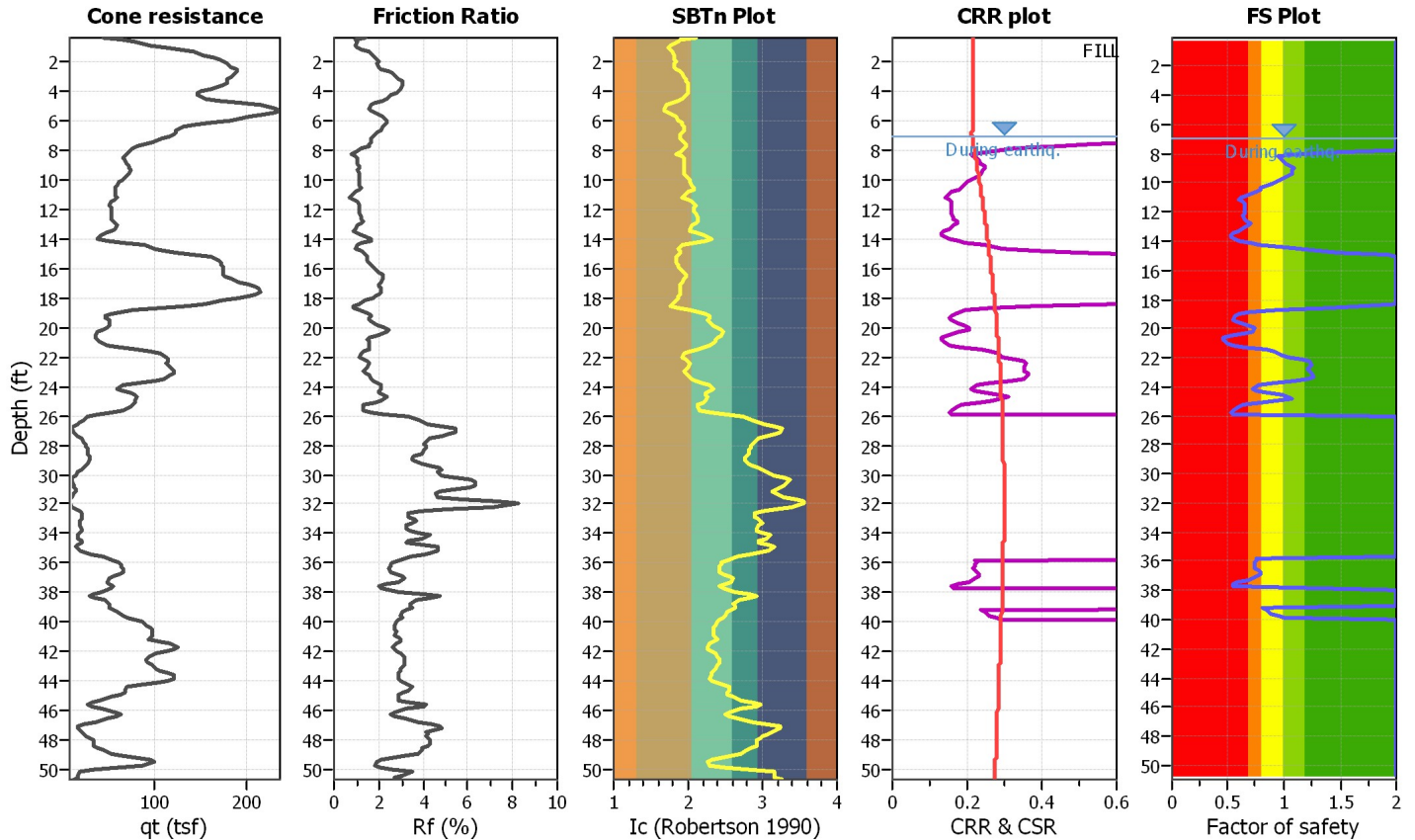
Abbreviations

q_c : Total cone resistance (cone resistance q_c corrected for pore water effects)
 I_c : Soil Behaviour Type Index
 FS: Calculated Factor of Safety against liquefaction
 Volumetric strain: Post-liquefaction volumetric strain

LIQUEFACTION ANALYSIS REPORT

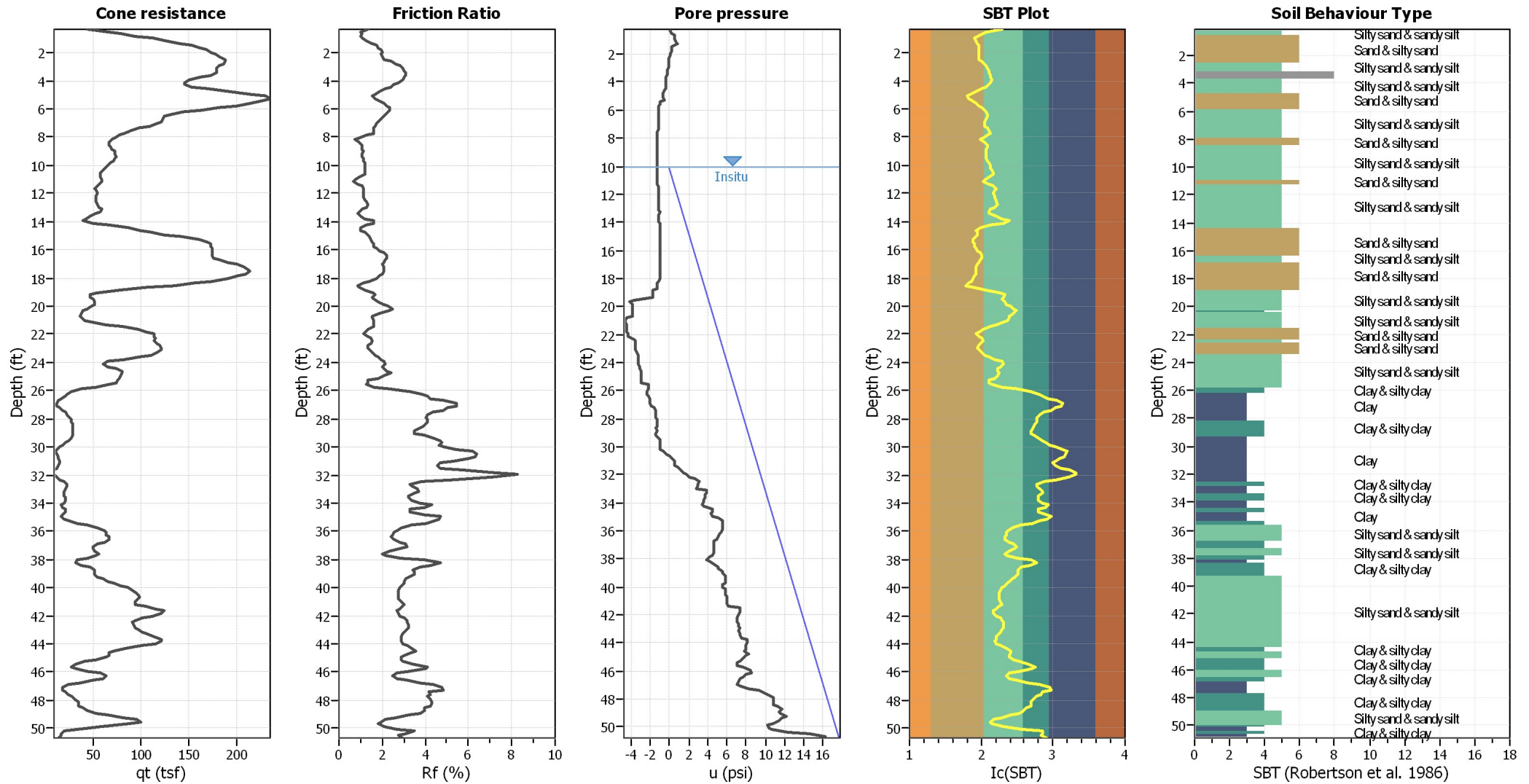
Project title : Zephyr Oceanside
Location : Hwy 76 & N Foussat Oceanside
CPT file : CPT-06
Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	17.00 ft	Fill height:	10.00 ft	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.72	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	50.00 ft
Peak ground acceleration:	0.45	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



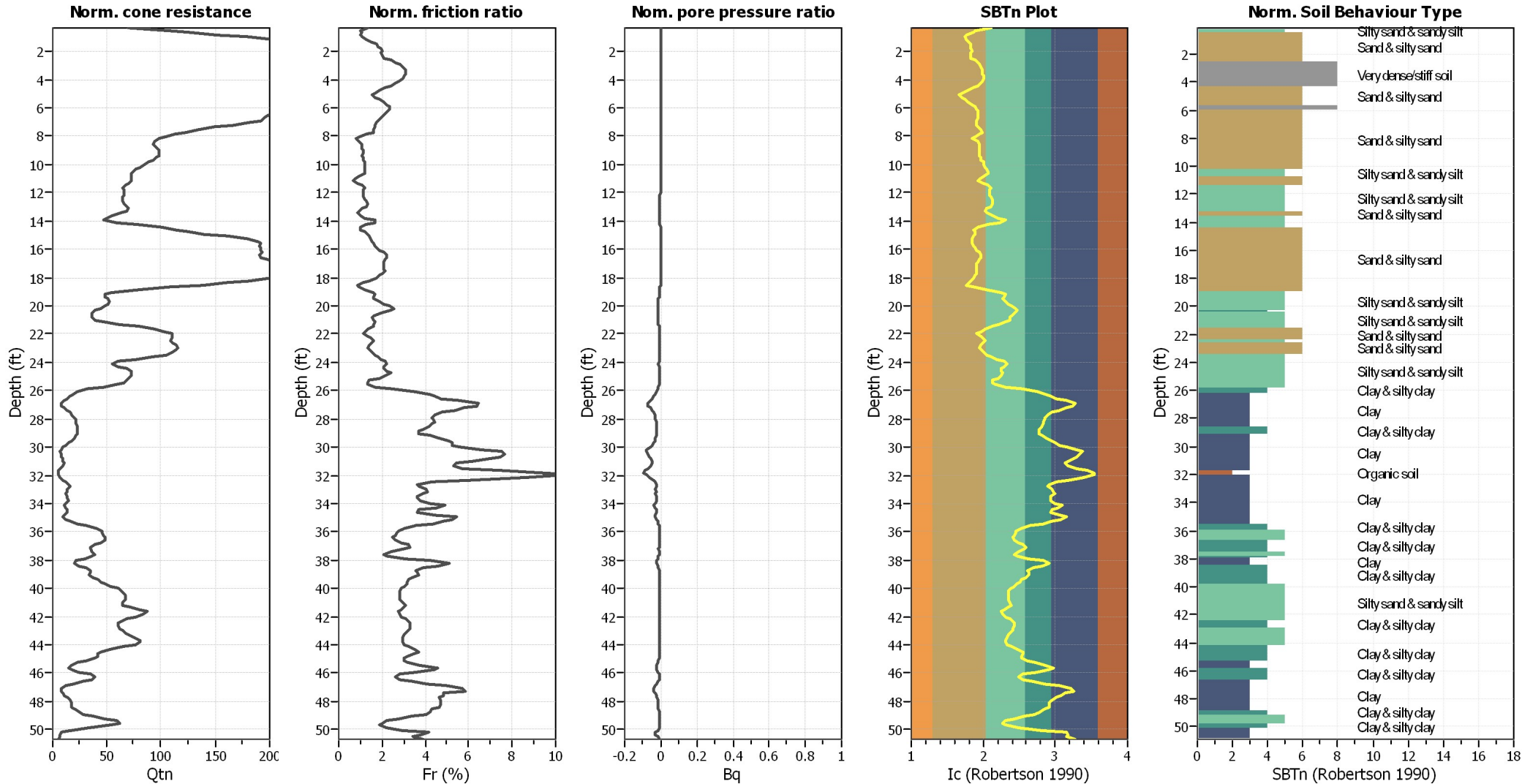
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_G applied:	Yes
Earthquake magnitude M_w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	50.00 ft

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CPT basic interpretation plots (normalized)



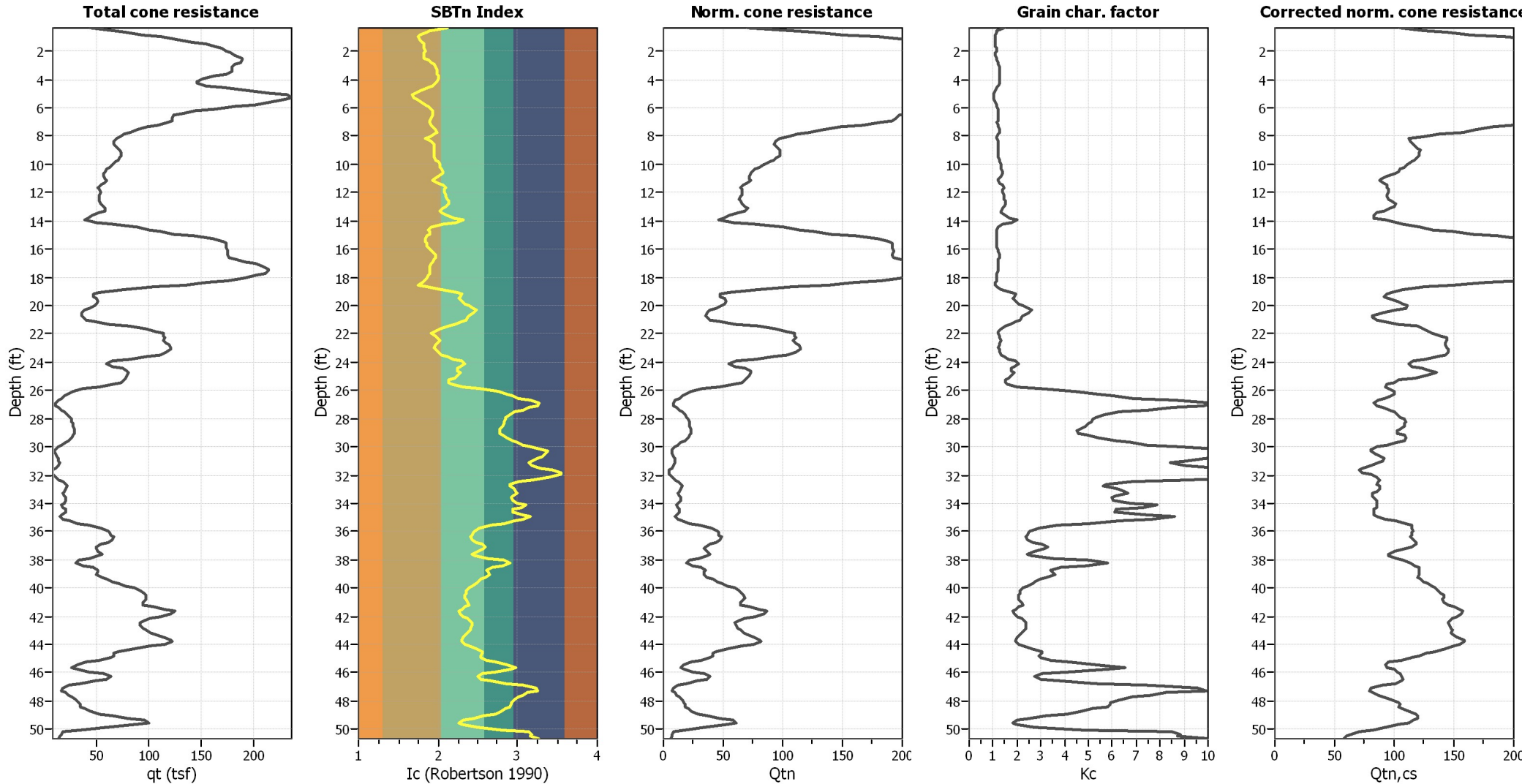
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _G applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	50.00 ft

SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

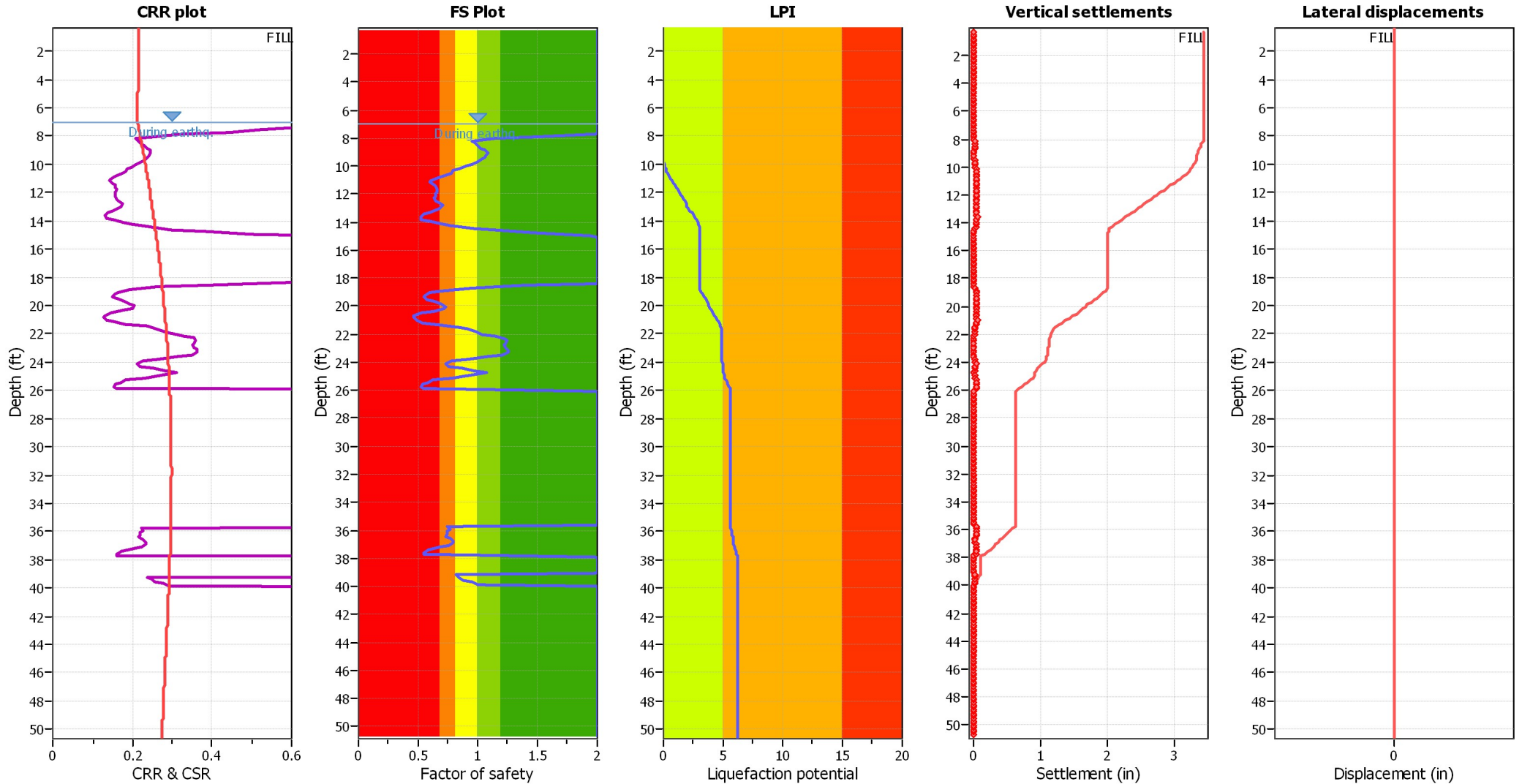
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _c applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	50.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	17.00 ft	Fill weight:	120.00 lb/ft ³
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	6.72	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.45	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	10.00 ft	Limit depth:	50.00 ft

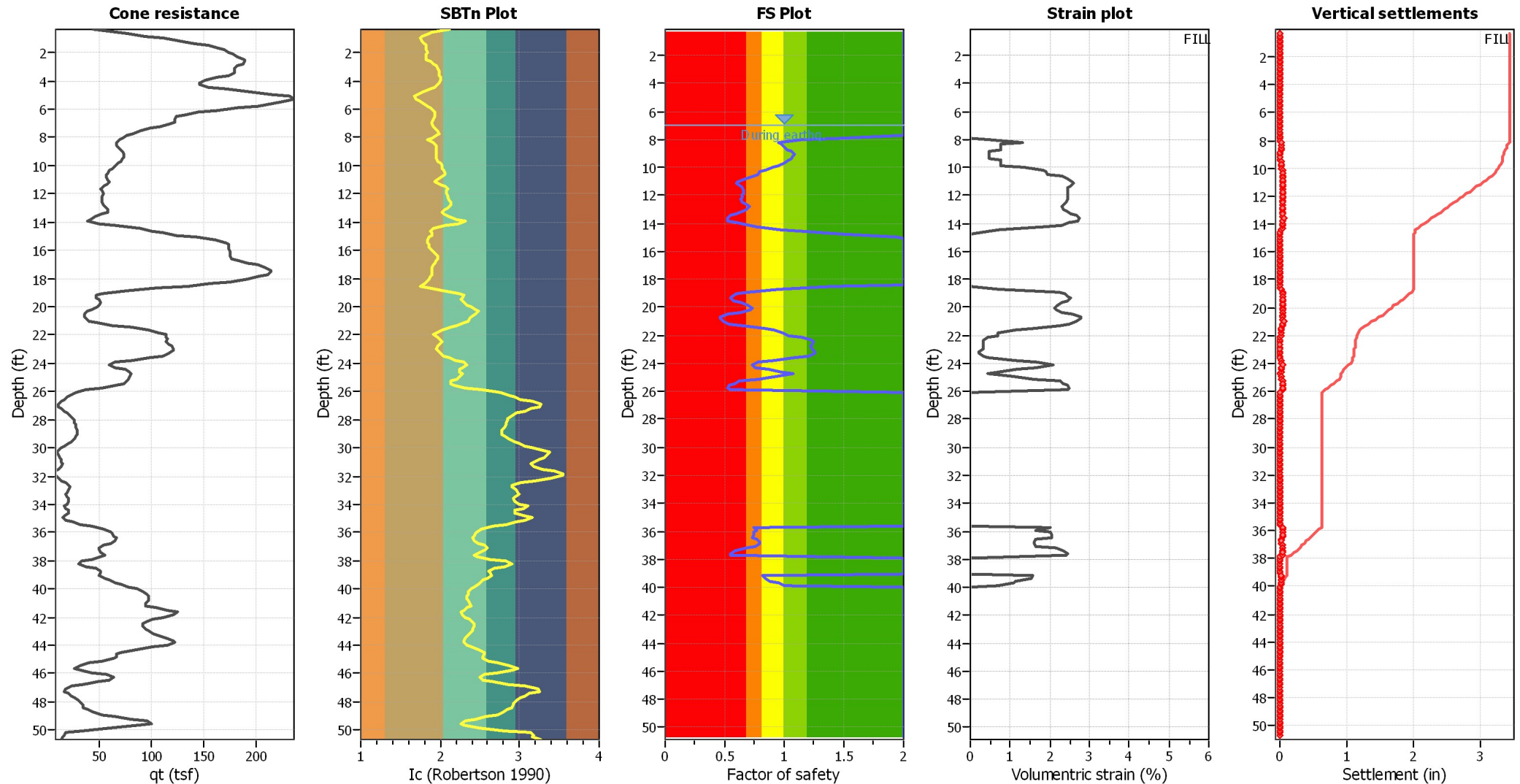
F.S. color scheme

Red	Almost certain it will liquefy
Orange	Very likely to liquefy
Yellow	Liquefaction and no liq. are equally likely
Light Green	Unlike to liquefy
Dark Green	Almost certain it will not liquefy

LPI color scheme

Red	Very high risk
Orange	High risk
Yellow	Low risk

Estimation of post-earthquake settlements



Abbreviations

q_c : Total cone resistance (cone resistance q_c corrected for pore water effects)
 I_c : Soil Behaviour Type Index
 FS: Calculated Factor of Safety against liquefaction
 Volumetric strain: Post-liquefaction volumetric strain