MICROZONAZIONE SISMICA
Livello 3

Regione Emilia–Romagna
Comune di Camposanto

Relazione Illustrativa – Allegato 3
Verifica Potenziale di Liquefazione CPTU

Regione	Soggetto realizzatore	Data
Emilia–Romagna	Geotema S.r.l.	30/10/2018

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plot

CRR plot — CRR & CSR

FS Plot — Factor of safety

LPI — Liquefaction potential

Vertical settlements — Settlement (cm)

Lateral displacements — LDI

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m
Fines correction method:	B&I (2014)	Average results interval:	3
Points to test:	Based on Ic value	Ic cut-off value:	2.60
Earthquake magnitude Mw:	6.14	Unit weight calculation:	Based on SBT
Peak ground acceleration:	0.23	Use fill:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A

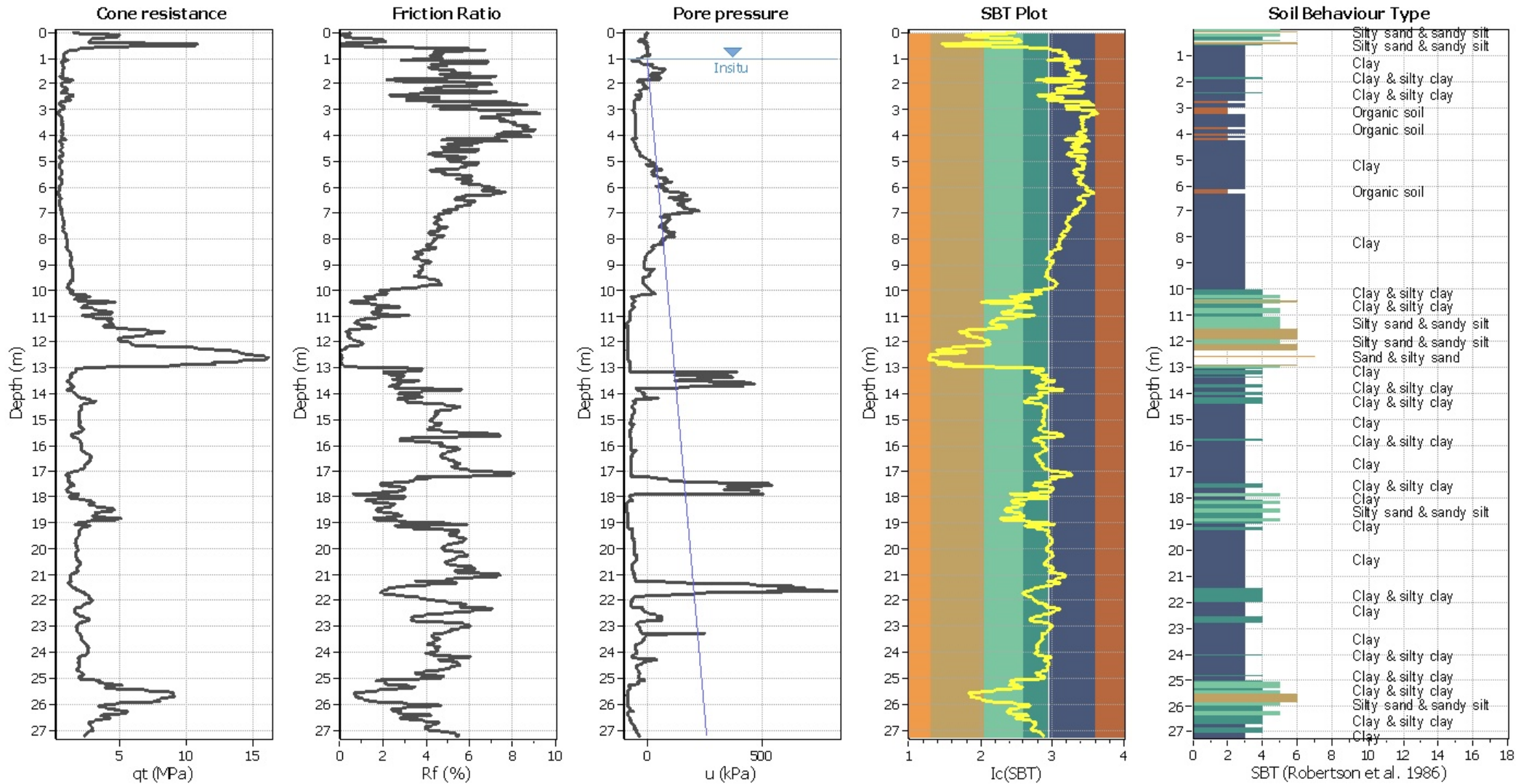|	
Fill weight:	N/A
Transition detect. applied:	No
Kσ applied:	Yes
Clay like behavior applied:	Sand & Clay
Limit depth applied:	No
Limit depth:	N/A

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
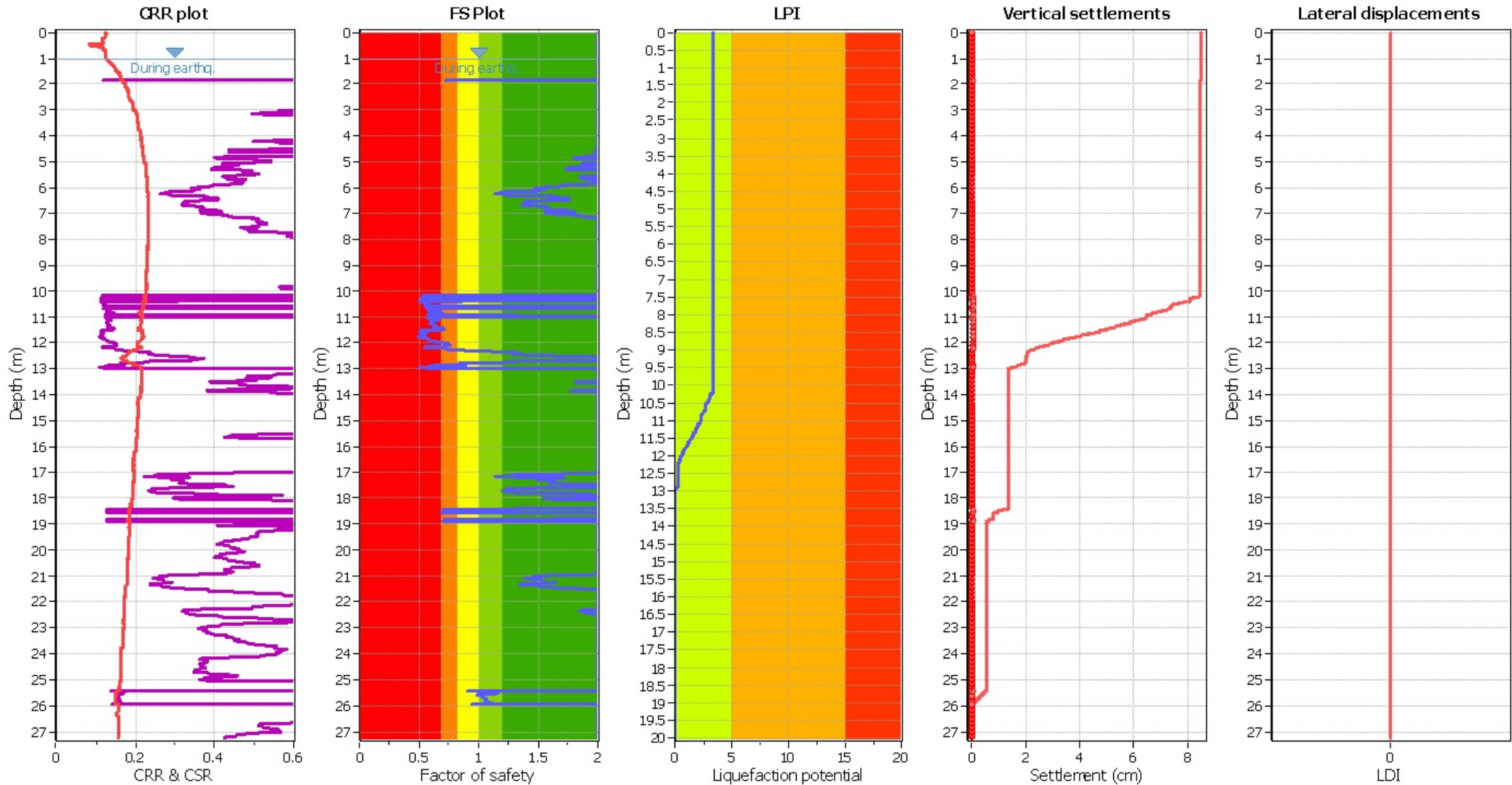- Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CLiq v.2.1.6.11 - CPT Liquefaction Assessment Software - Report created on: 18/01/2019, 09:48:21
Project file: \\LACIE-2BIG-NAS\Public\Lavori\Microzonazione Camposanto\Relazione\CPTU_Camposanto.clq

3

Liquefaction analysis overall plot

CRR plot | FS Plot | LPI | Vertical settlements | Lateral displacements

Input parameters and analysis data

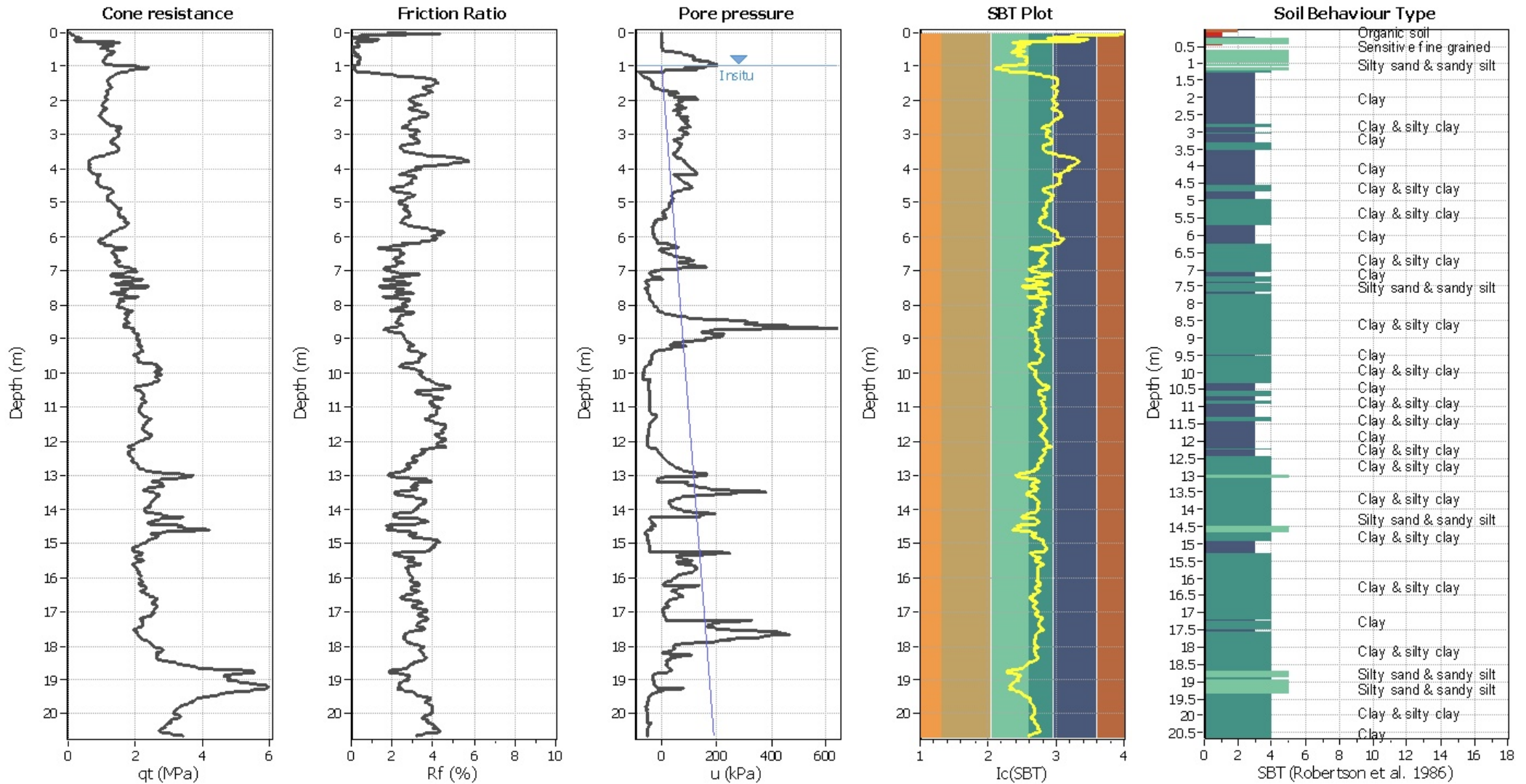|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
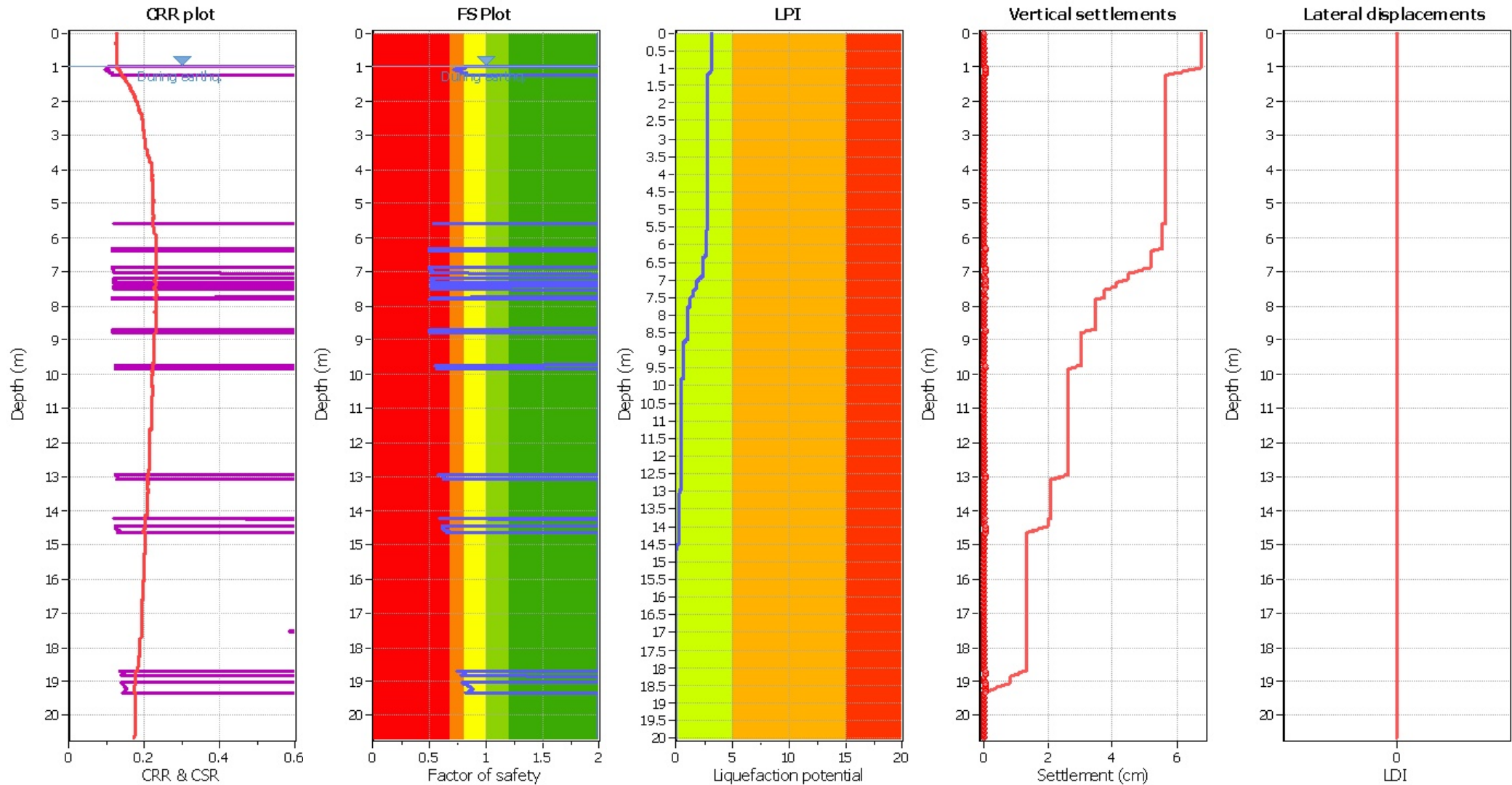- ■ Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CLiq v.2.1.6.11 - CPT Liquefaction Assessment Software - Report created on: 18/01/2019, 09:48:23
Project file: \\LACIE-2BIG-NAS\Public\Lavori\Microzonazione Camposanto\Relazione\CPTU_Camposanto.clq

5

Liquefaction analysis overall plot

Input parameters and analysis data

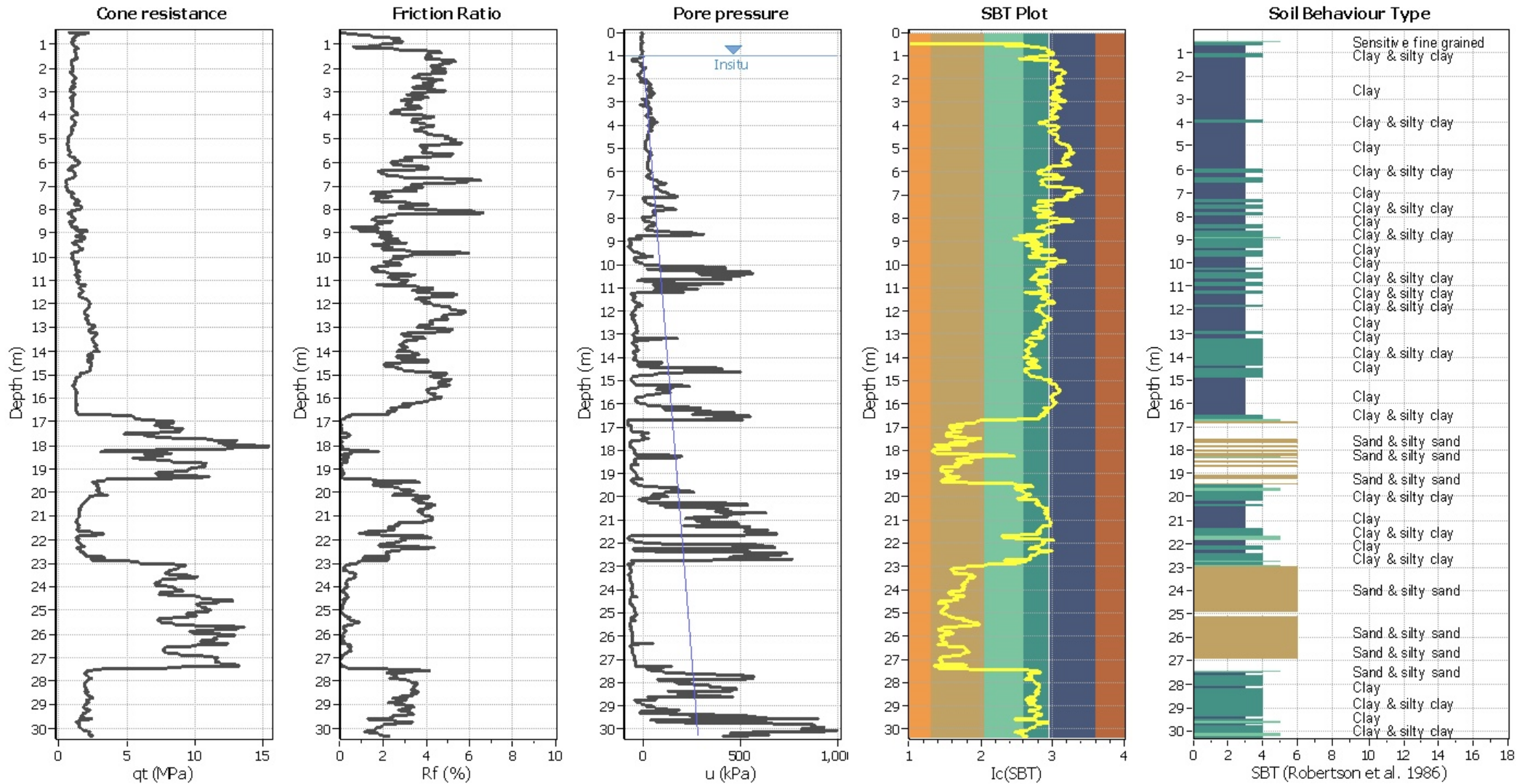|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K$_\sigma$ applied:	Yes
Earthquake magnitude M$_w$:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
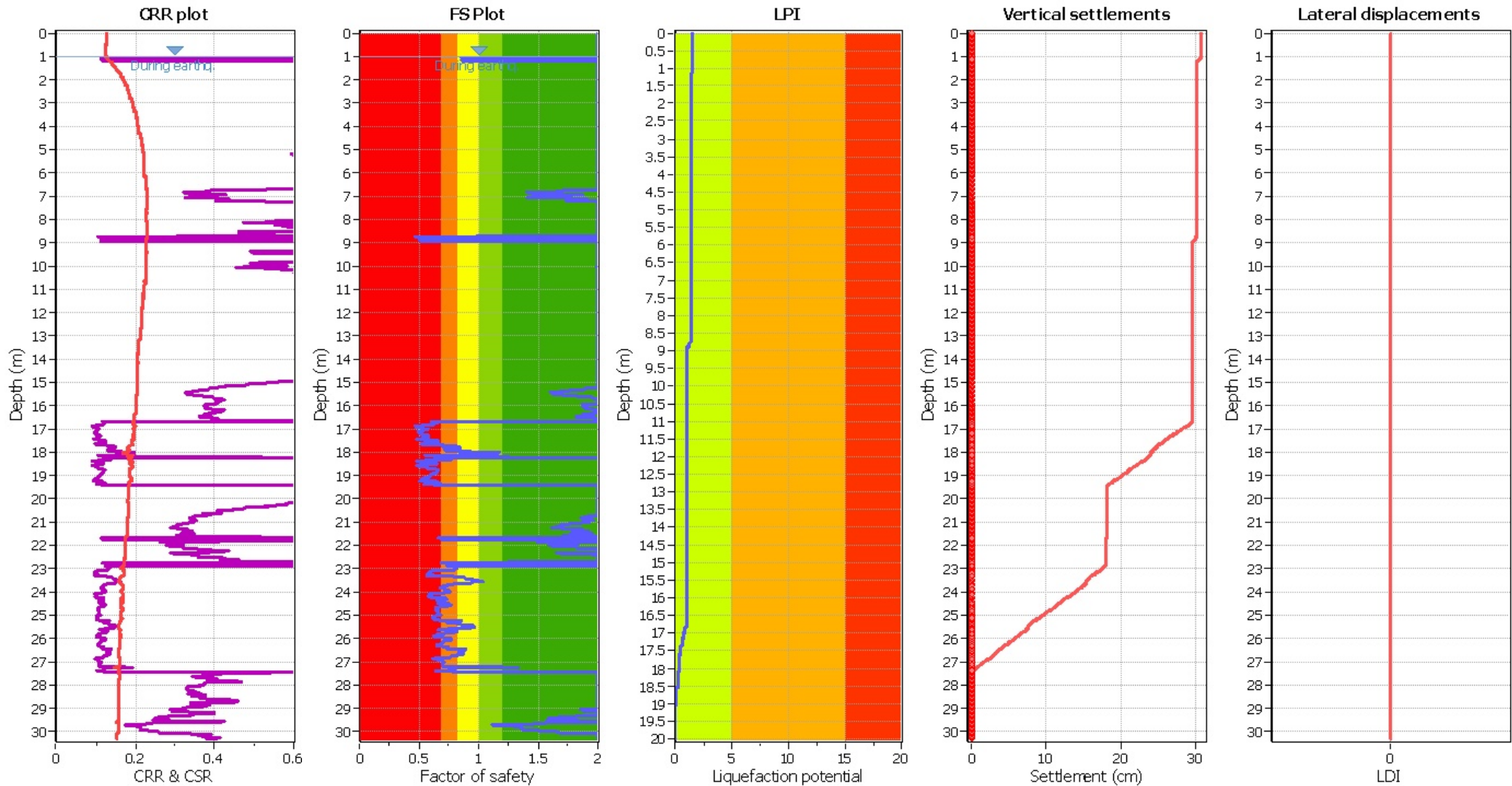- Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plot

CRR plot

FS Plot

LPI

Vertical settlements

Lateral displacements

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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

CLiq v.2.1.6.11 - CPT Liquefaction Assessment Software - Report created on: 18/01/2019, 09:48:26
Project file: \\LACIE-2BIG-NAS\Public\Lavori\Microzonazione Camposanto\Relazione\CPTU_Camposanto.clq

8

CPT basic interpretation plo

Input parameters and analysis data

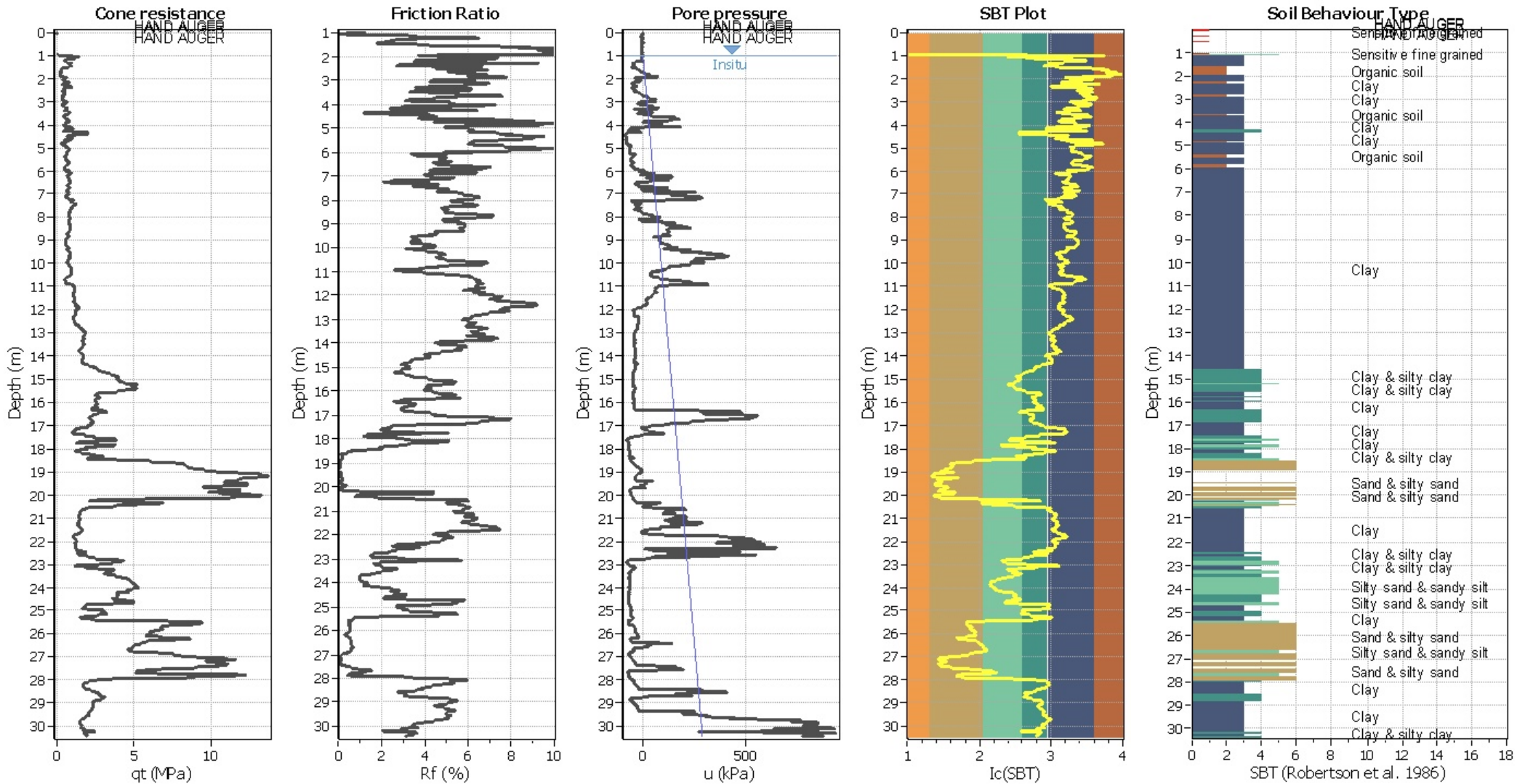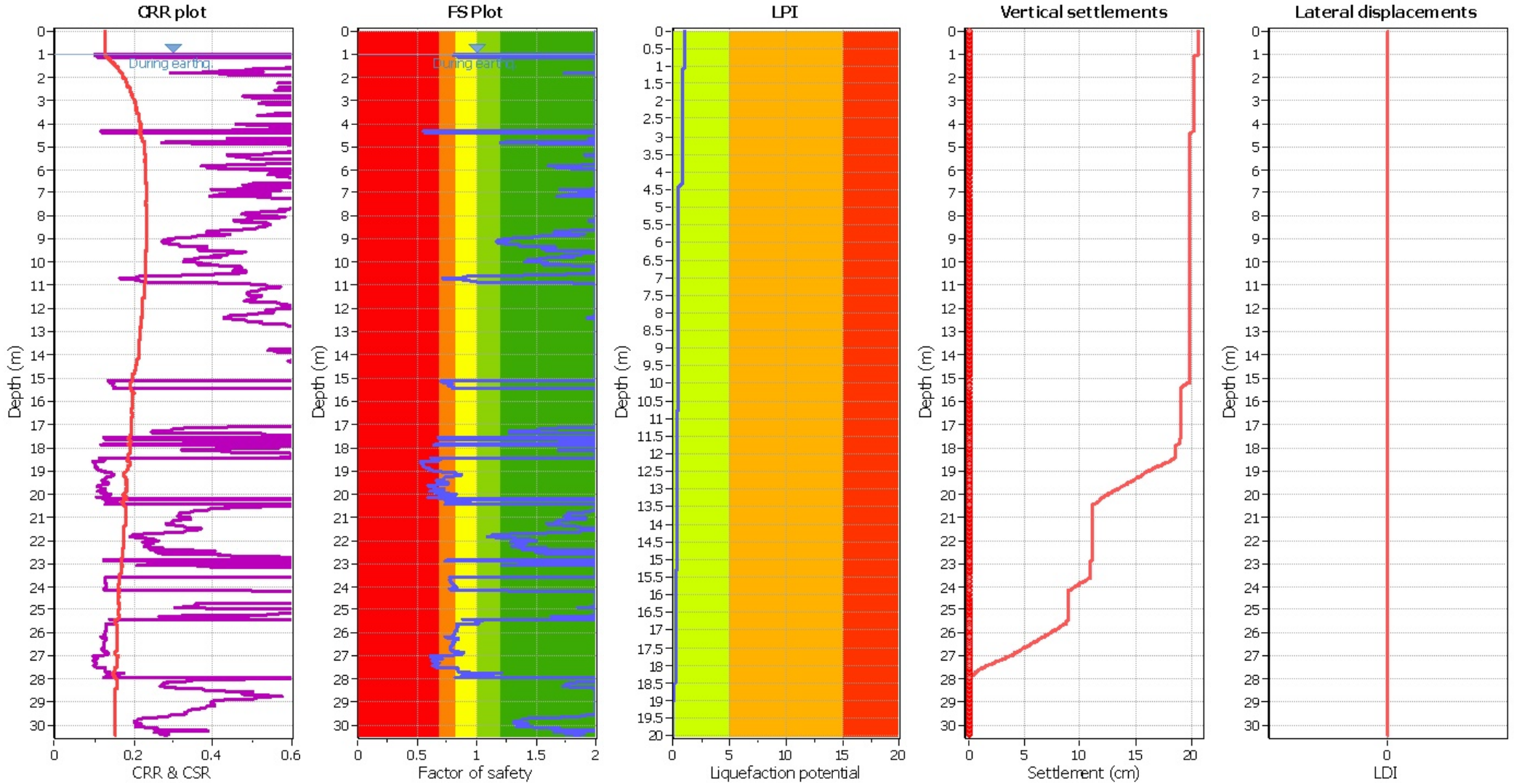|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K$_\sigma$ applied:	Yes
Earthquake magnitude M$_w$:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
■	3. Clay to silty clay	■	6. Clean sand to silty sand	■	9. Very stiff fine grained

CLiq v.2.1.6.11 - CPT Liquefaction Assessment Software - Report created on: 18/01/2019, 09:48:28
Project file: \\LACIE-2BIG-NAS\Public\Lavori\Microzonazione Camposanto\Relazione\CPTU_Camposanto.clq

9

Liquefaction analysis overall plot

CRR plot	FS Plot	LPI	Vertical settlements	Lateral displacements

Input parameters and analysis data

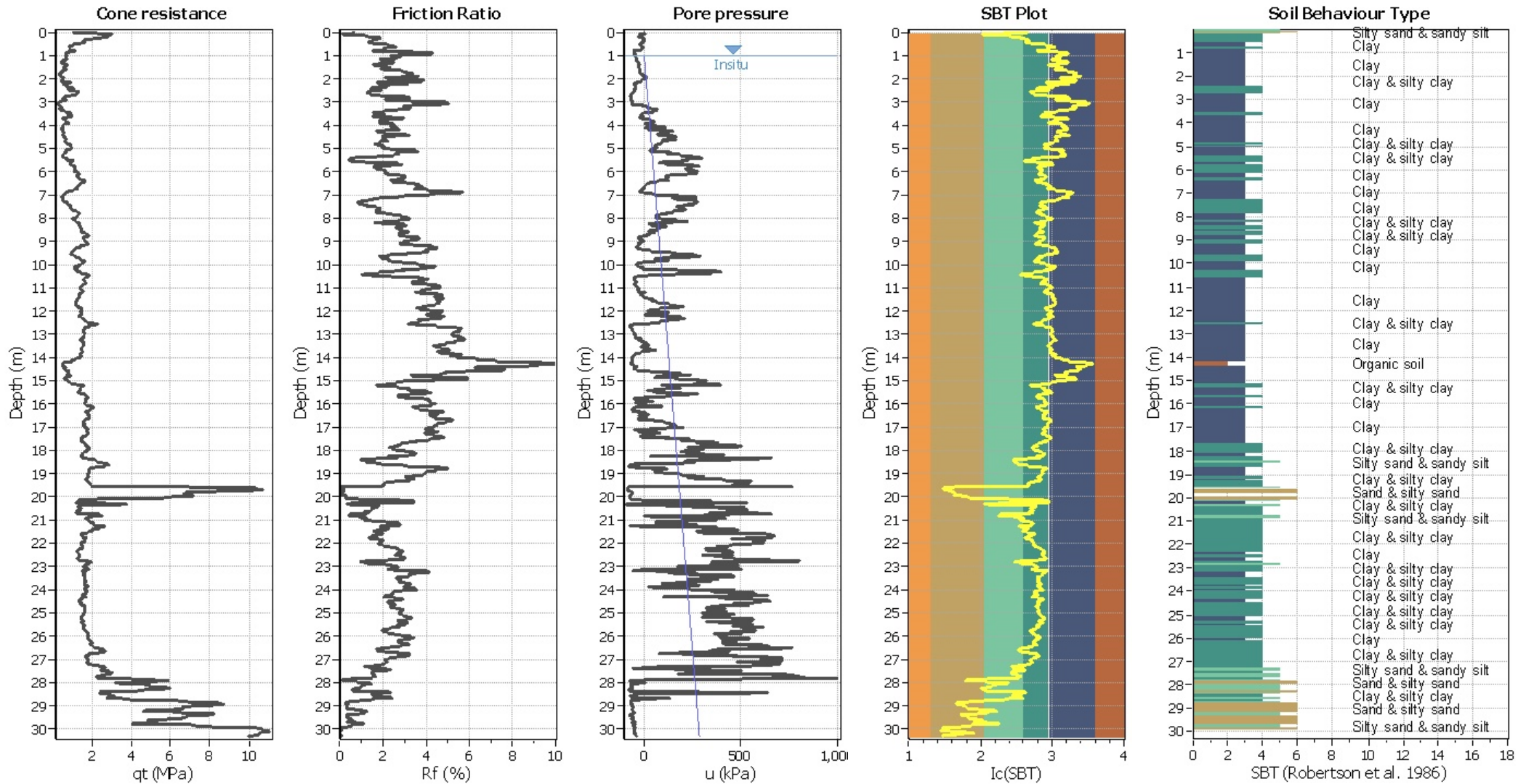|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K$_\sigma$ applied:	Yes
Earthquake magnitude M$_w$:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
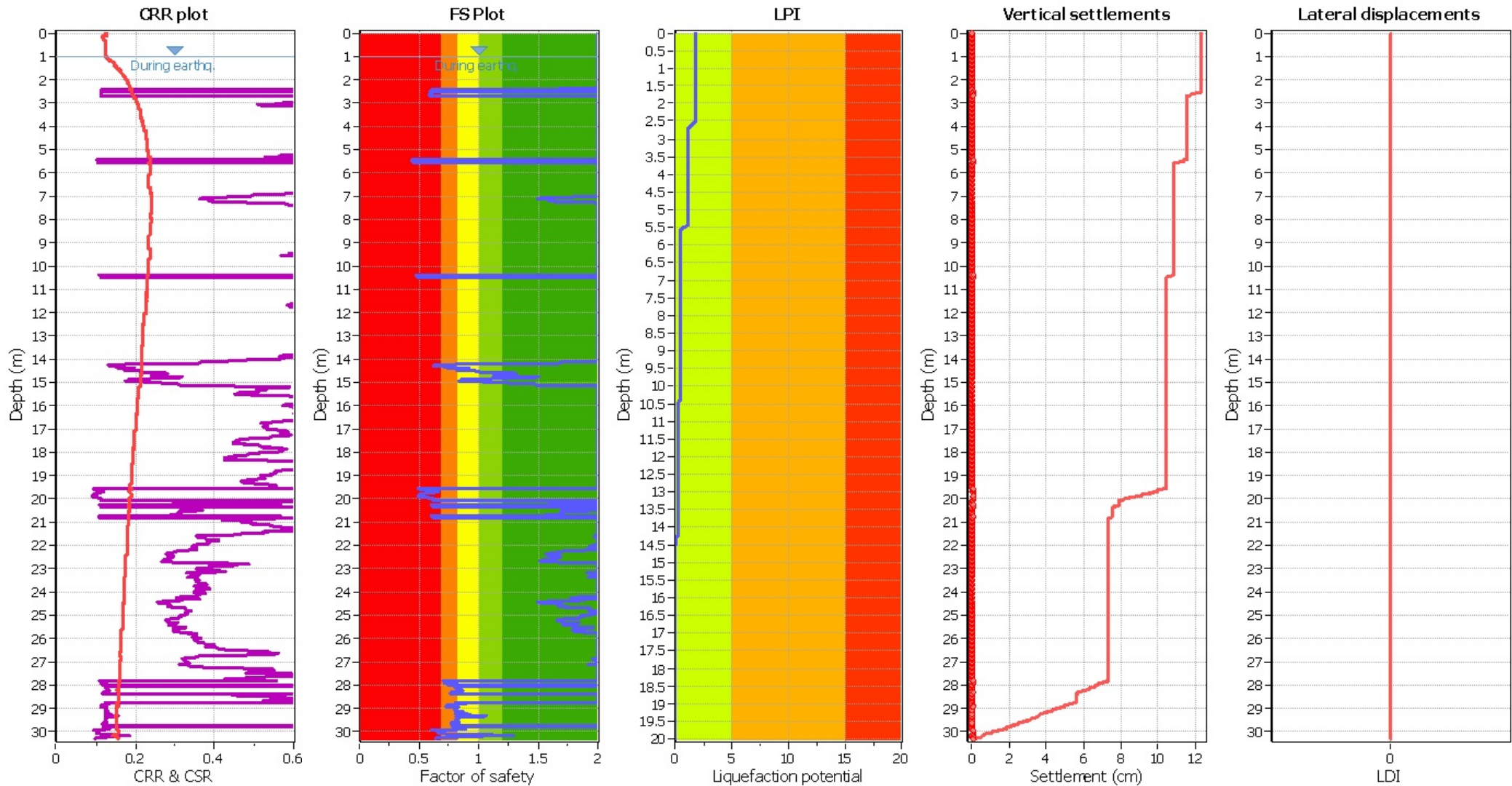- Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A	
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay	
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No	
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CLiq v.2.1.6.11 - CPT Liquefaction Assessment Software - Report created on: 18/01/2019, 09:48:32
Project file: \\LACIE-2BIG-NAS\Public\Lavori\Microzonazione Camposanto\Relazione\CPTU_Camposanto.clq

11

Liquefaction analysis overall plot

| | CRR plot | FS Plot | LPI | Vertical settlements | Lateral displacements |

Input parameters and analysis data

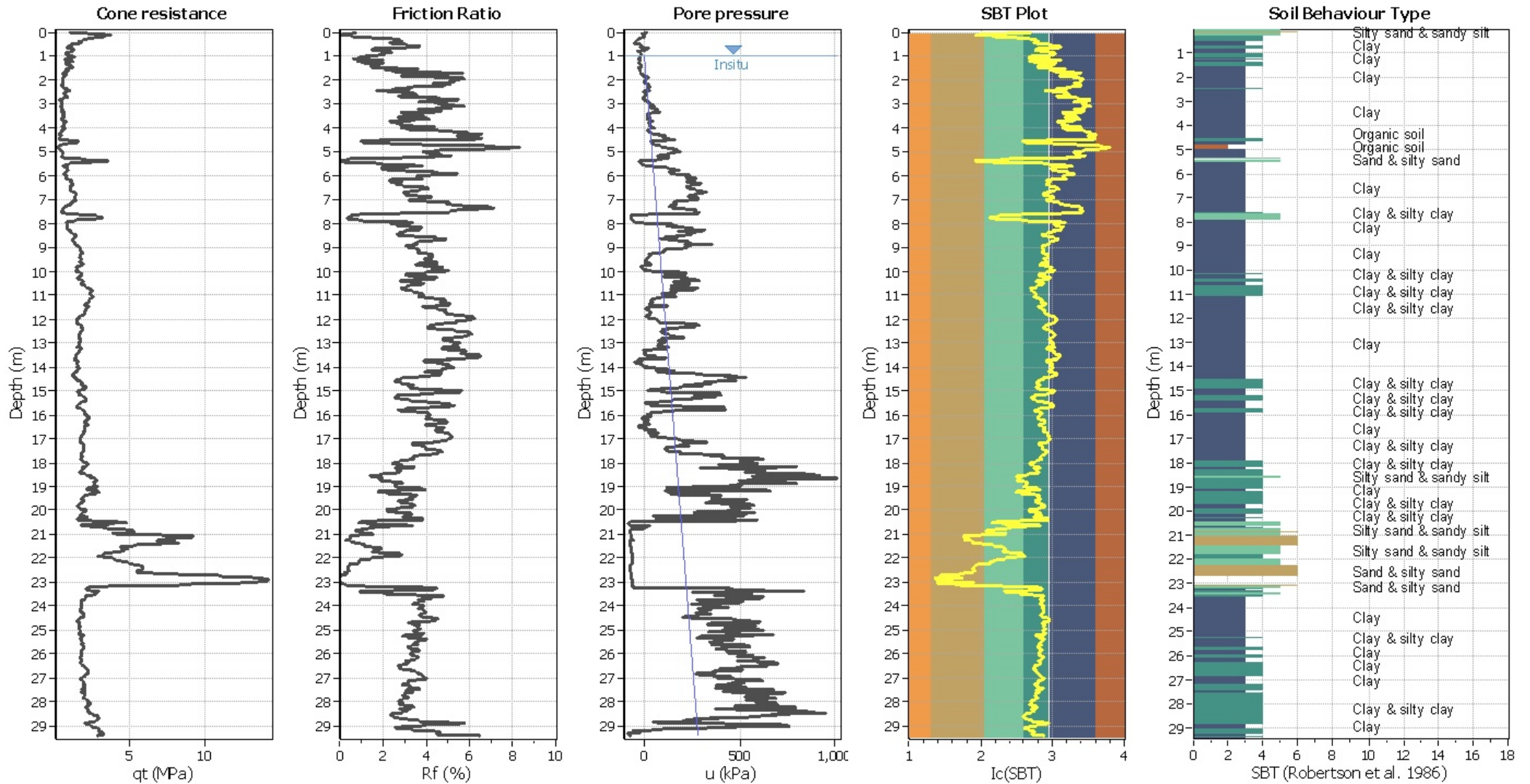|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
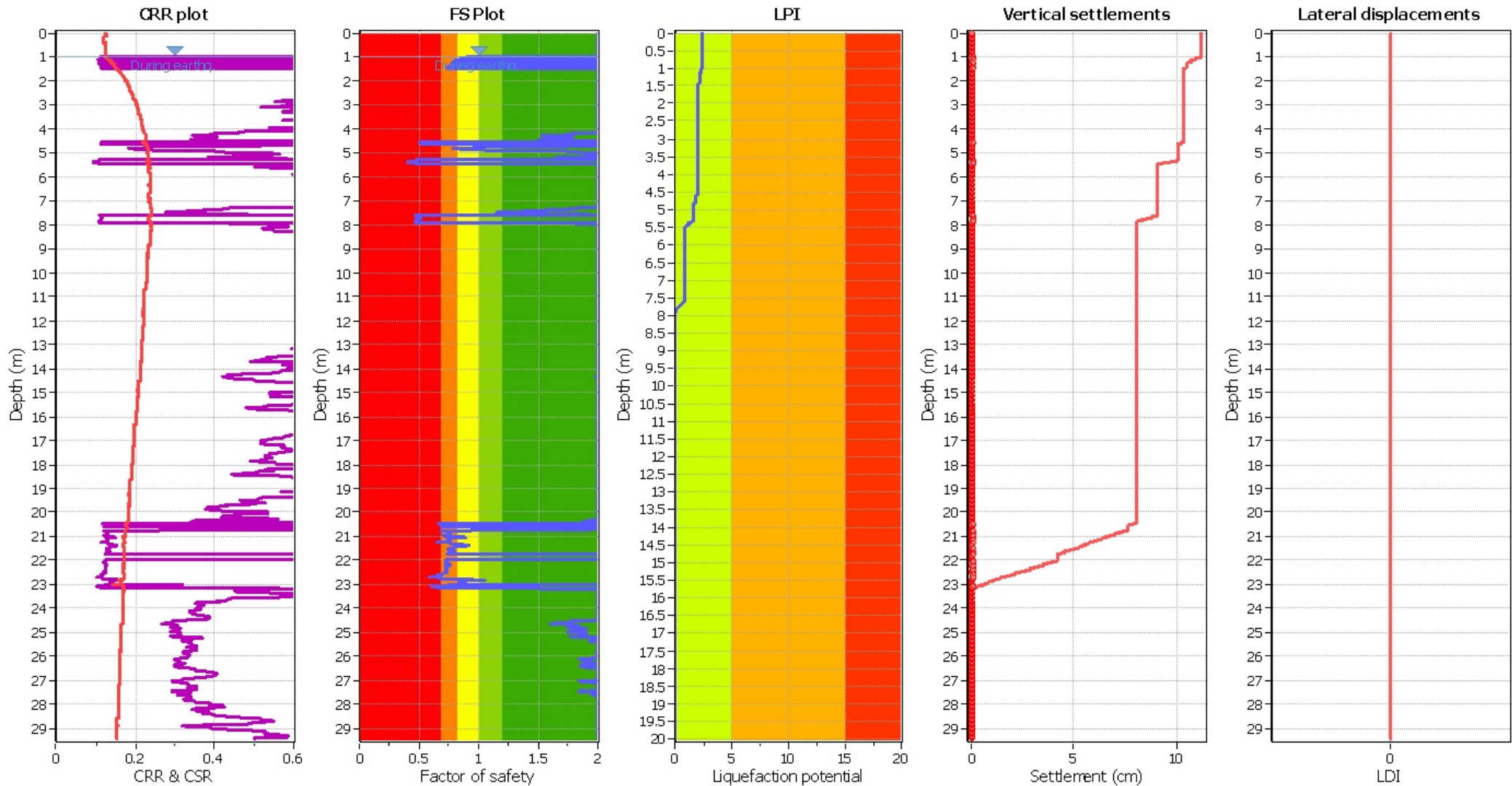- 🟨 Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

Liquefaction analysis overall plot

CRR plot	FS Plot	LPI	Vertical settlements	Lateral displacements

Input parameters and analysis data

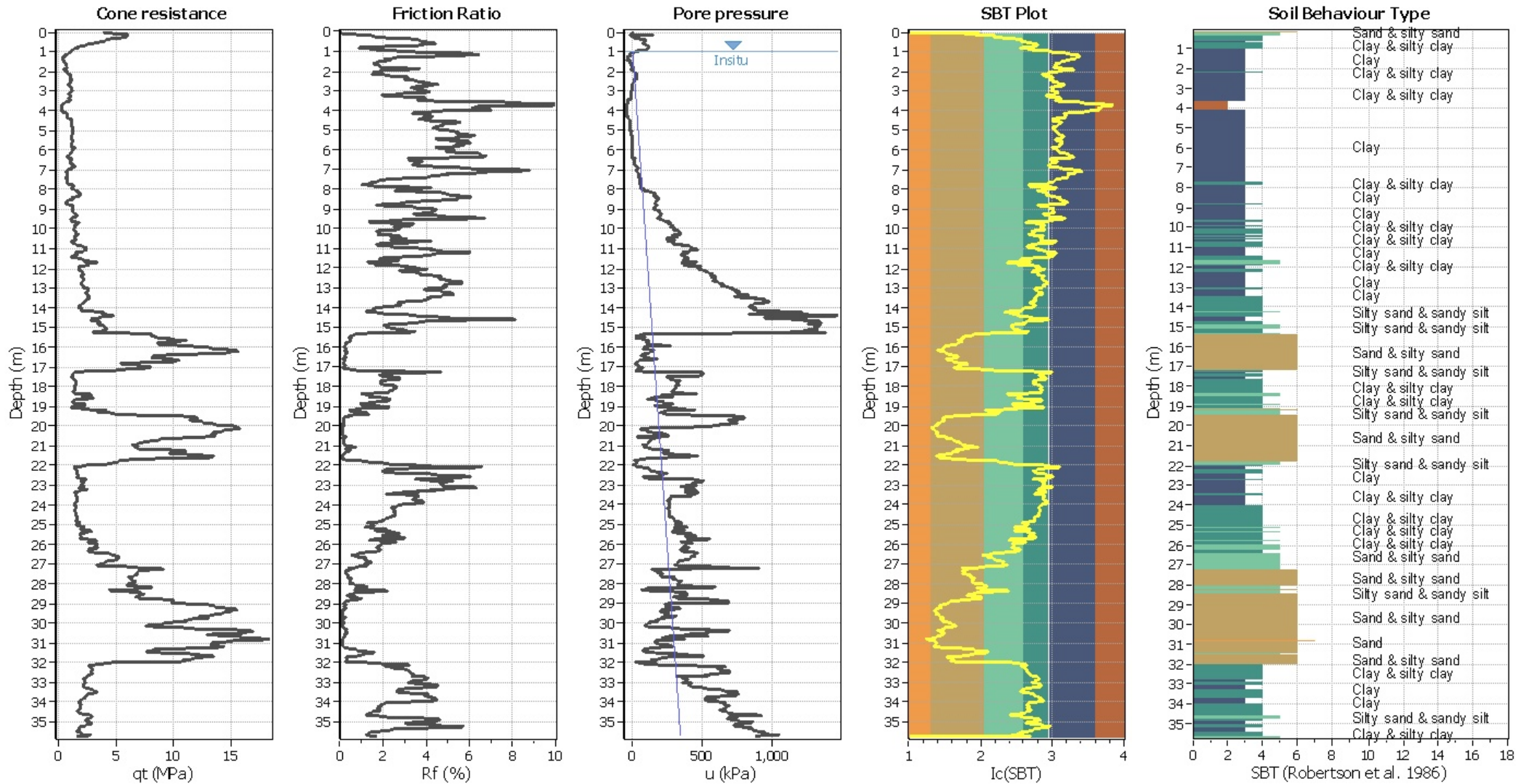|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
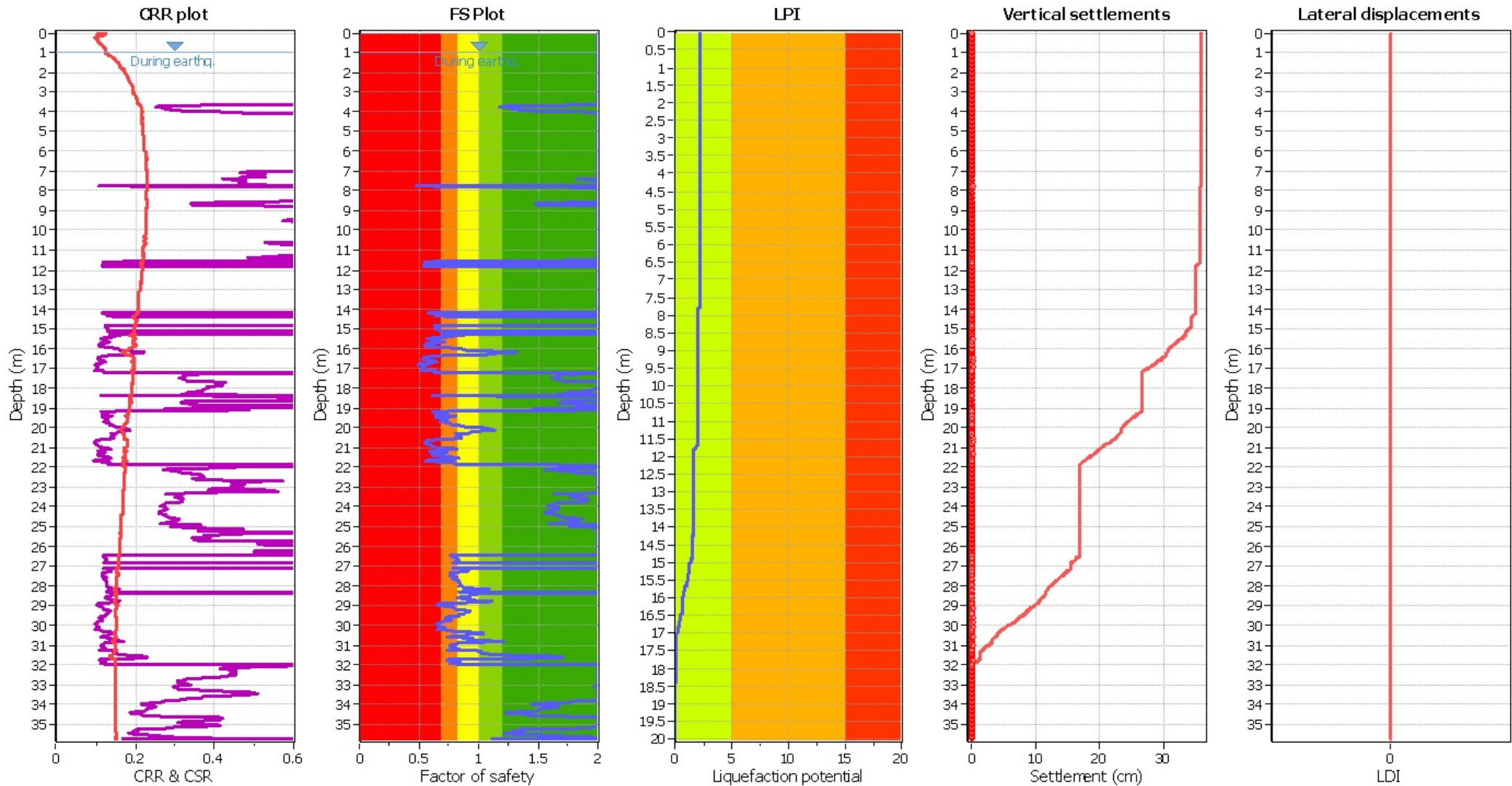- 🟨 Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

Liquefaction analysis overall plot

CRR plot · FS Plot · LPI · Vertical settlements · Lateral displacements

Input parameters and analysis data

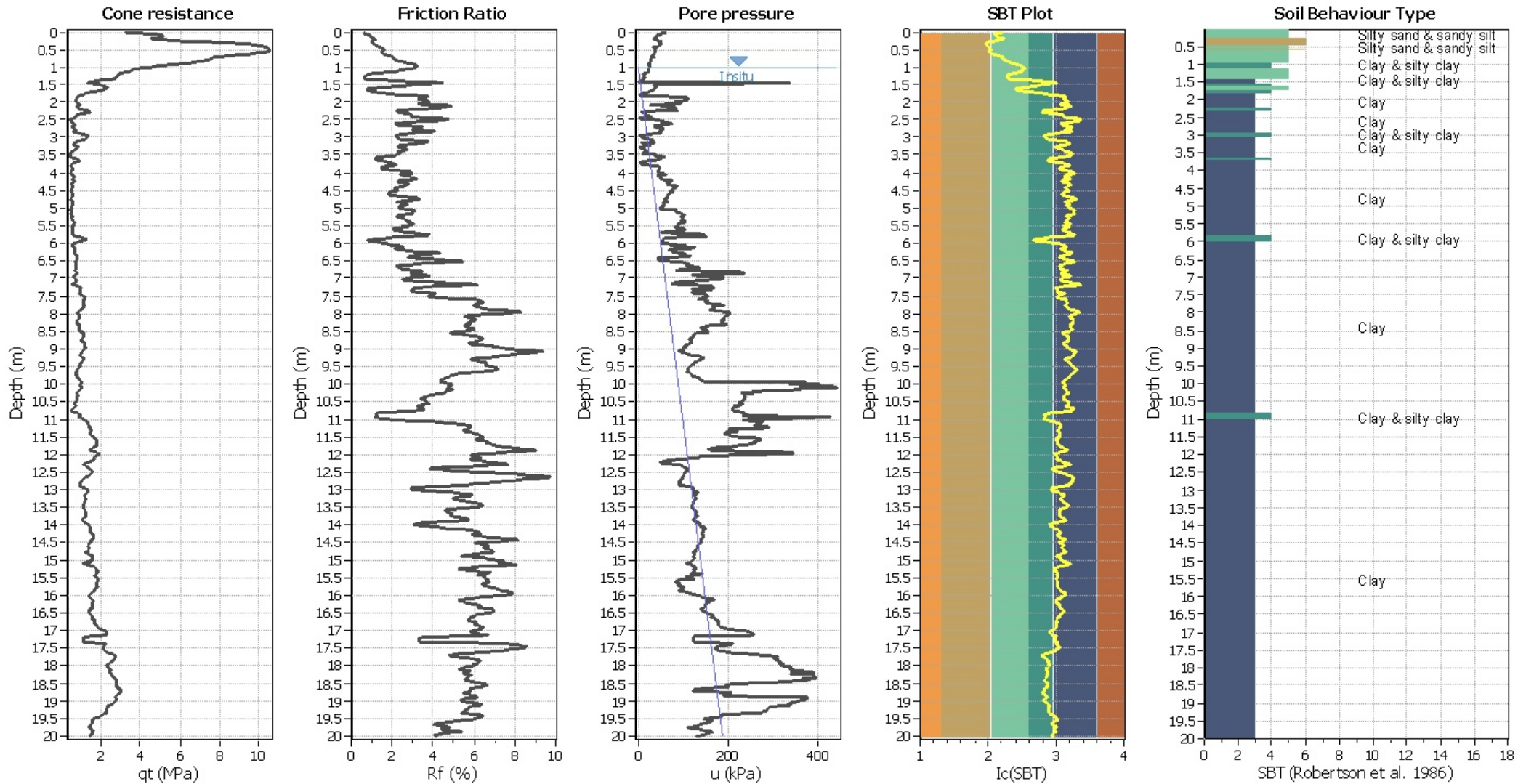|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
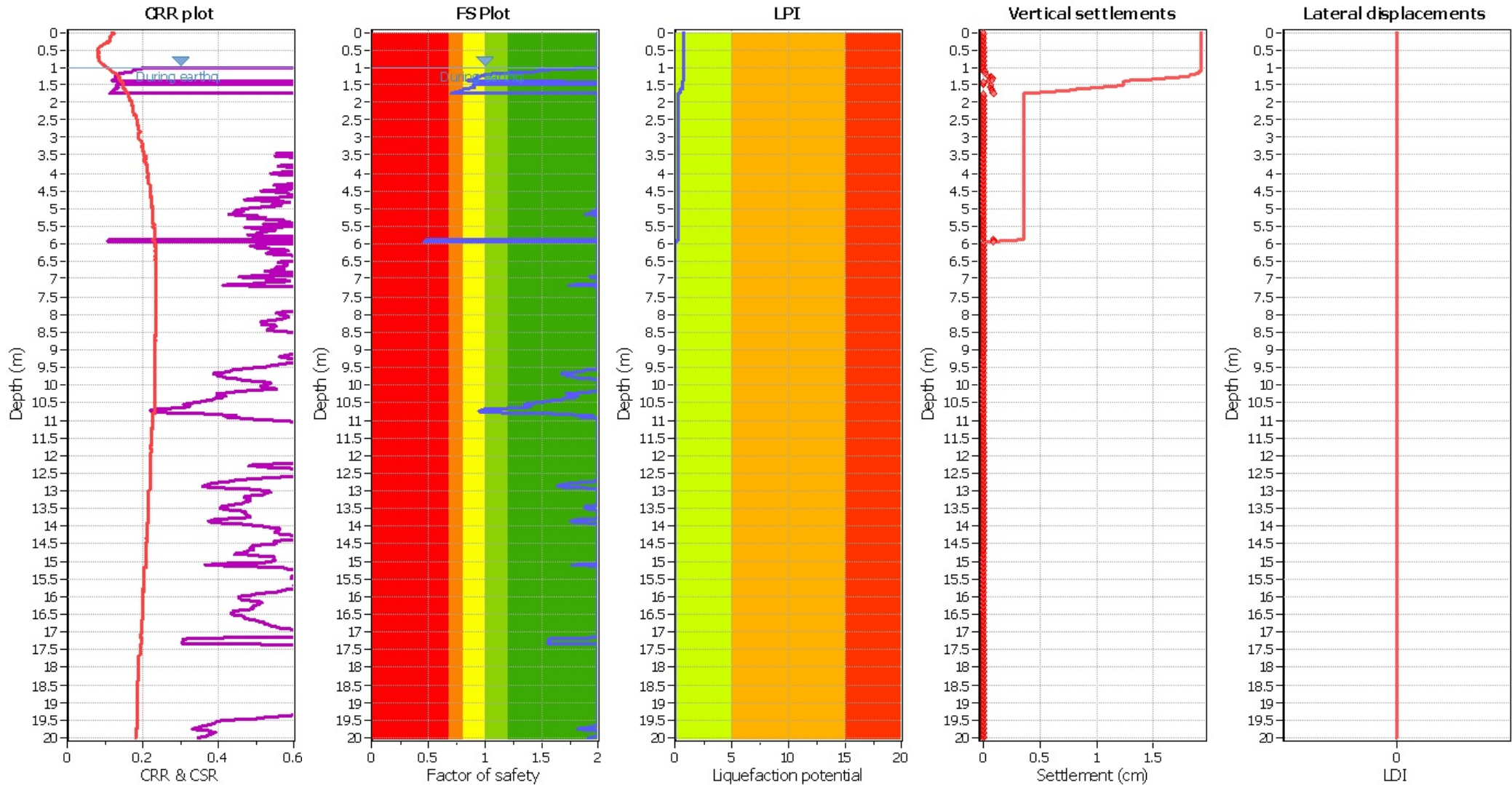- Low risk

CPT basic interpretation plo

Cone resistance	Friction Ratio	Pore pressure	SBT Plot	Soil Behaviour Type

Depth (m) axes from 0 to 20

Cone resistance: qt (MPa), axis 2 4 6 8 10

Friction Ratio: Rf (%), axis 0 2 4 6 8 10

Pore pressure: u (kPa), axis 0 200 400 — Insitu

SBT Plot: Ic(SBT), axis 1 2 3 4

Soil Behaviour Type: SBT (Robertson et al. 1986), axis 0 2 4 6 8 10 12 14 16 18

Soil Behaviour Type labels:
- Silty sand & sandy silt
- Silty sand & sandy silt
- Clay & silty clay
- Clay & silty clay
- Clay
- Clay
- Clay & silty clay
- Clay
- Clay & silty clay
- Clay
- Clay & silty clay
- Clay
- Clay

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

Liquefaction analysis overall plot

CRR plot | FS Plot | LPI | Vertical settlements | Lateral displacements

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m
Fines correction method:	B&I (2014)	Average results interval:	3
Points to test:	Based on Ic value	Ic cut-off value:	2.60
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT
Peak ground acceleration:	0.23	Use fill:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A

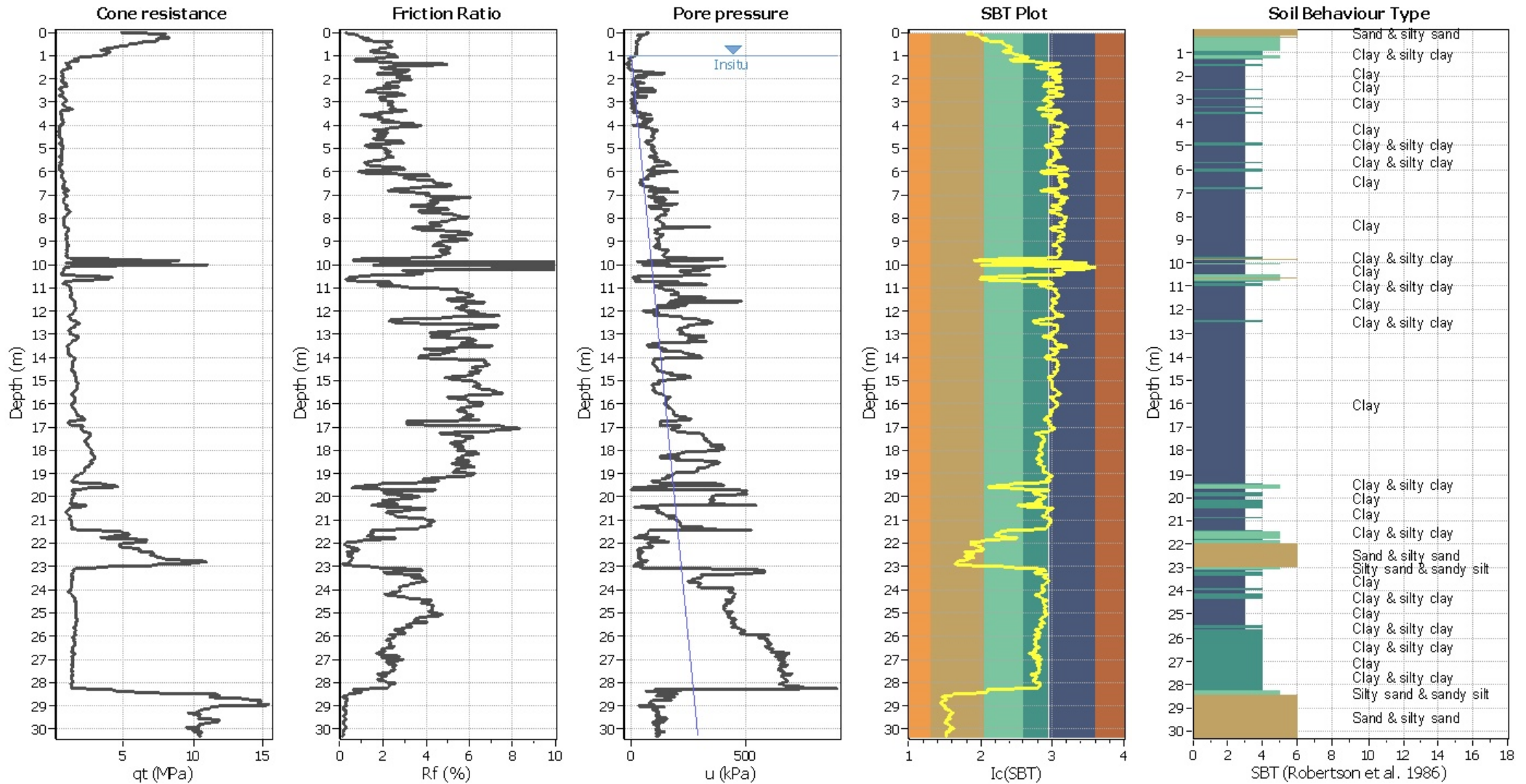|	
Fill weight:	N/A
Transition detect. applied:	No
K_σ applied:	Yes
Clay like behavior applied:	Sand & Clay
Limit depth applied:	No
Limit depth:	N/A

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
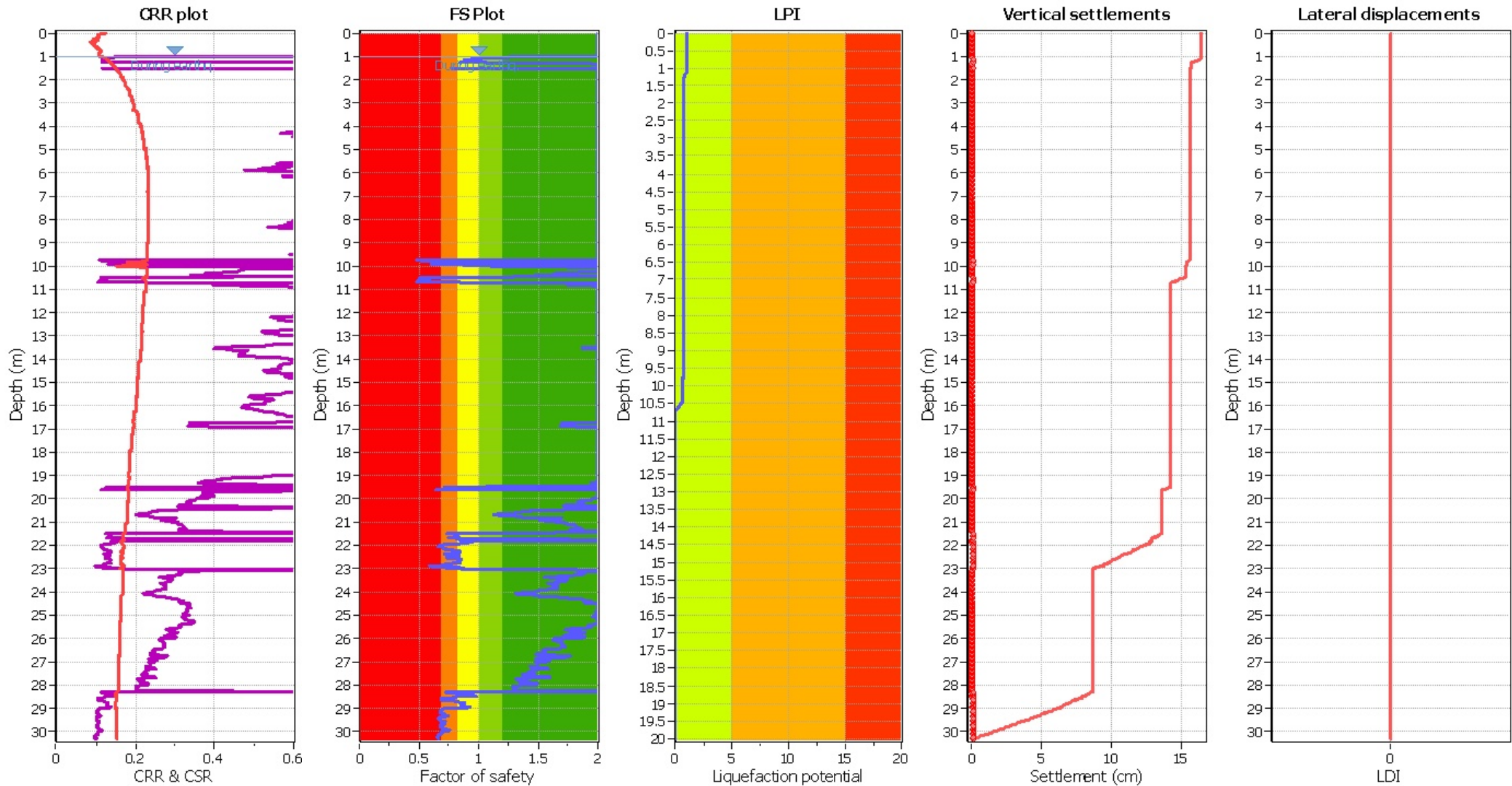- 🟨 Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K$_\sigma$ applied:	Yes
Earthquake magnitude M$_w$:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plot

| CRR plot | FS Plot | LPI | Vertical settlements | Lateral displacements |

Input parameters and analysis data

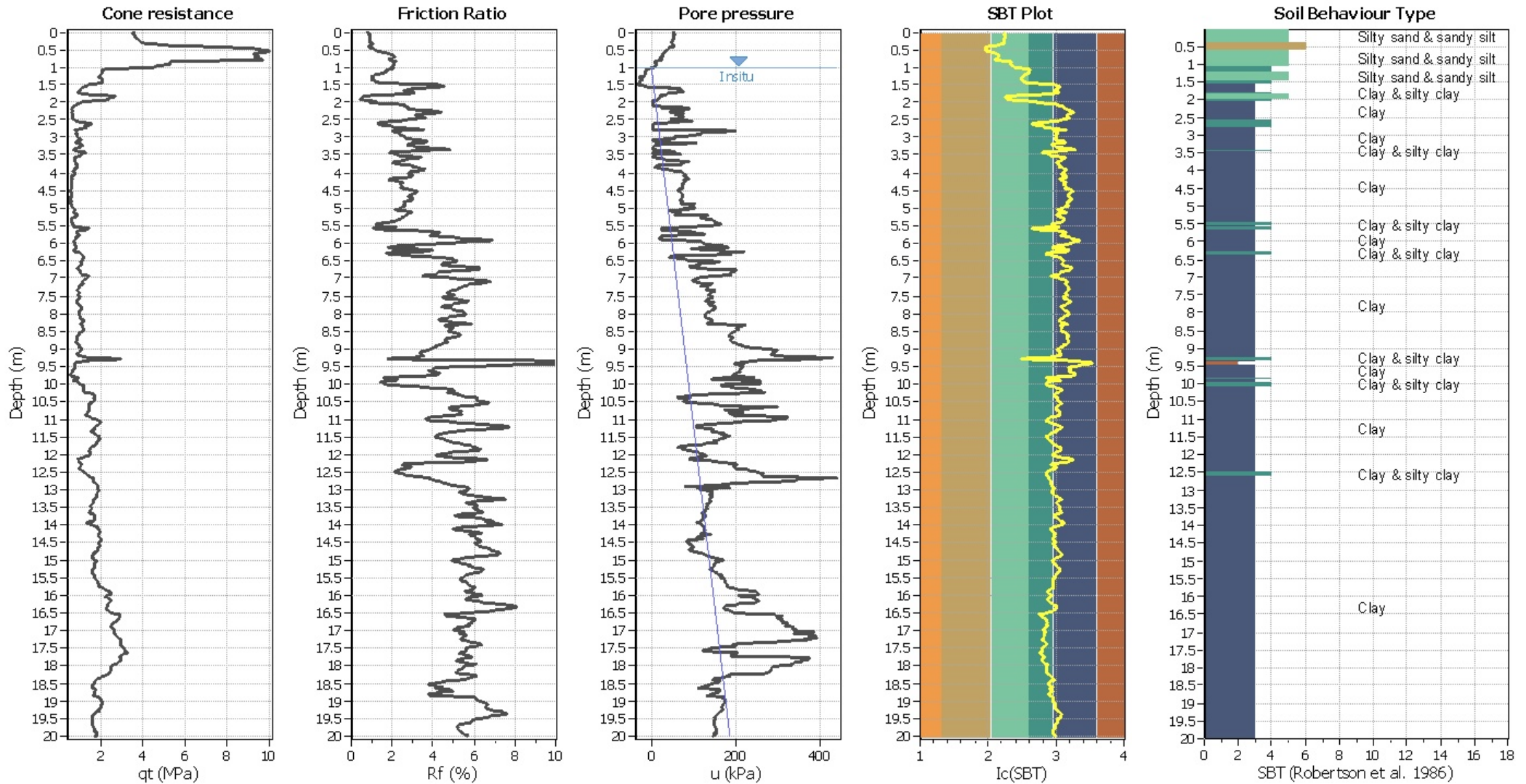|						
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A	
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No	
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes	
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay	
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No	
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A	

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
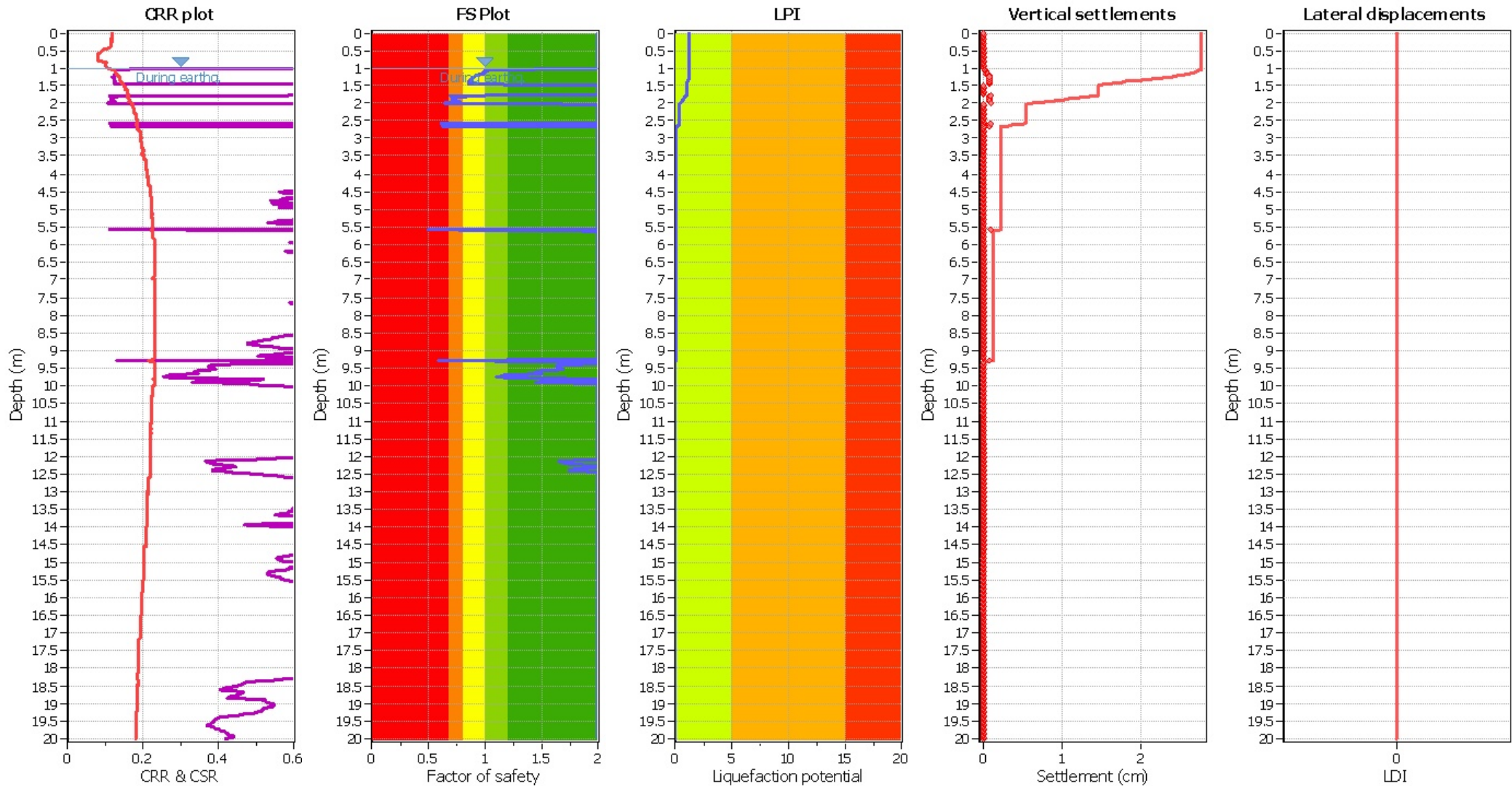- 🟨 Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	Kσ applied:	Yes
Earthquake magnitude Mw:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plot

Input parameters and analysis data

Analysis method:	B&I (2014)
Fines correction method:	B&I (2014)
Points to test:	Based on Ic value
Earthquake magnitude M_w:	6.14
Peak ground acceleration:	0.23
Depth to water table (insitu):	1.00 m

Depth to GWT (erthq.):	1.00 m
Average results interval:	3
Ic cut-off value:	2.60
Unit weight calculation:	Based on SBT
Use fill:	No
Fill height:	N/A

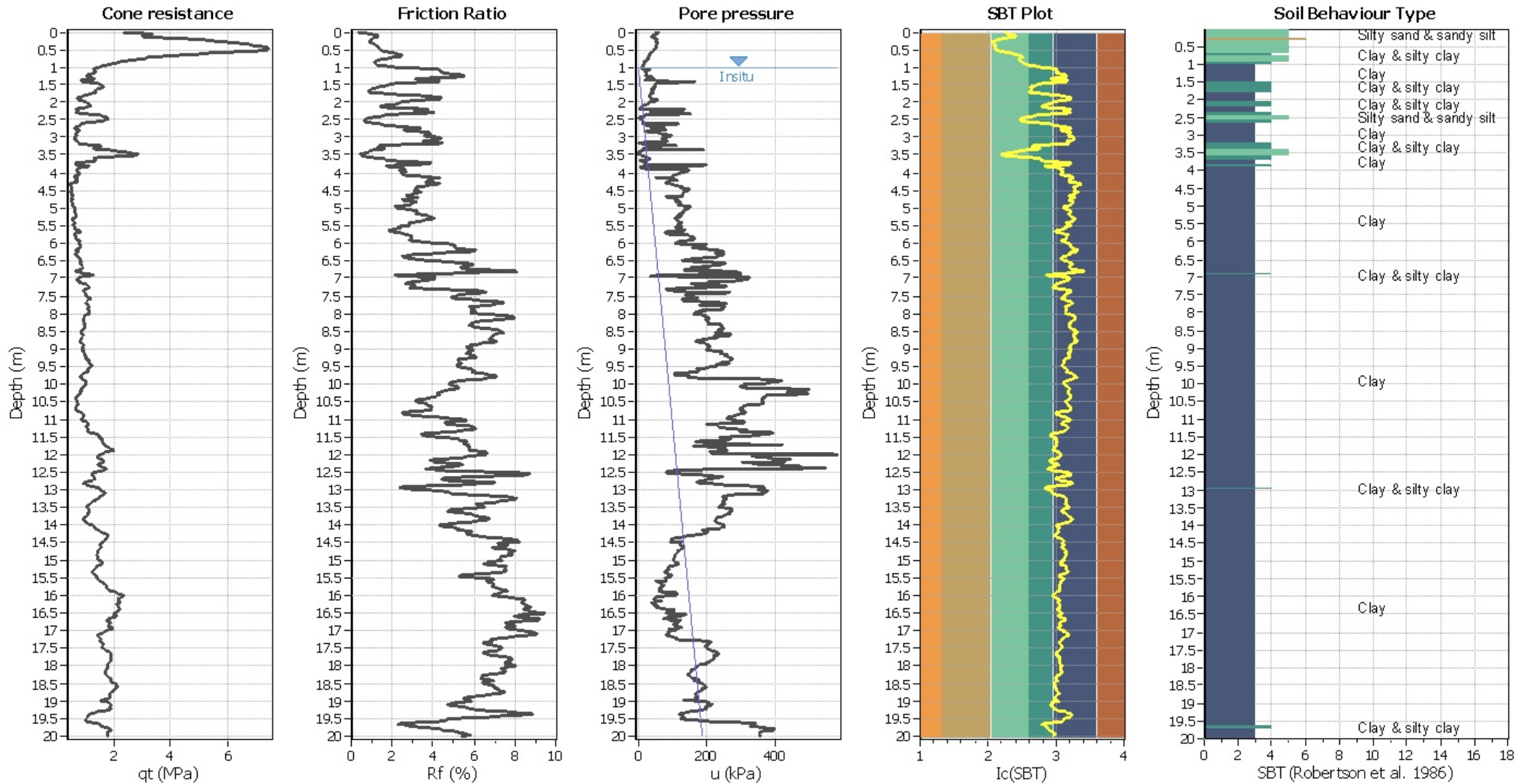|	
Fill weight:	N/A
Transition detect. applied:	No
K_σ applied:	Yes
Clay like behavior applied:	Sand & Clay
Limit depth applied:	No
Limit depth:	N/A

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
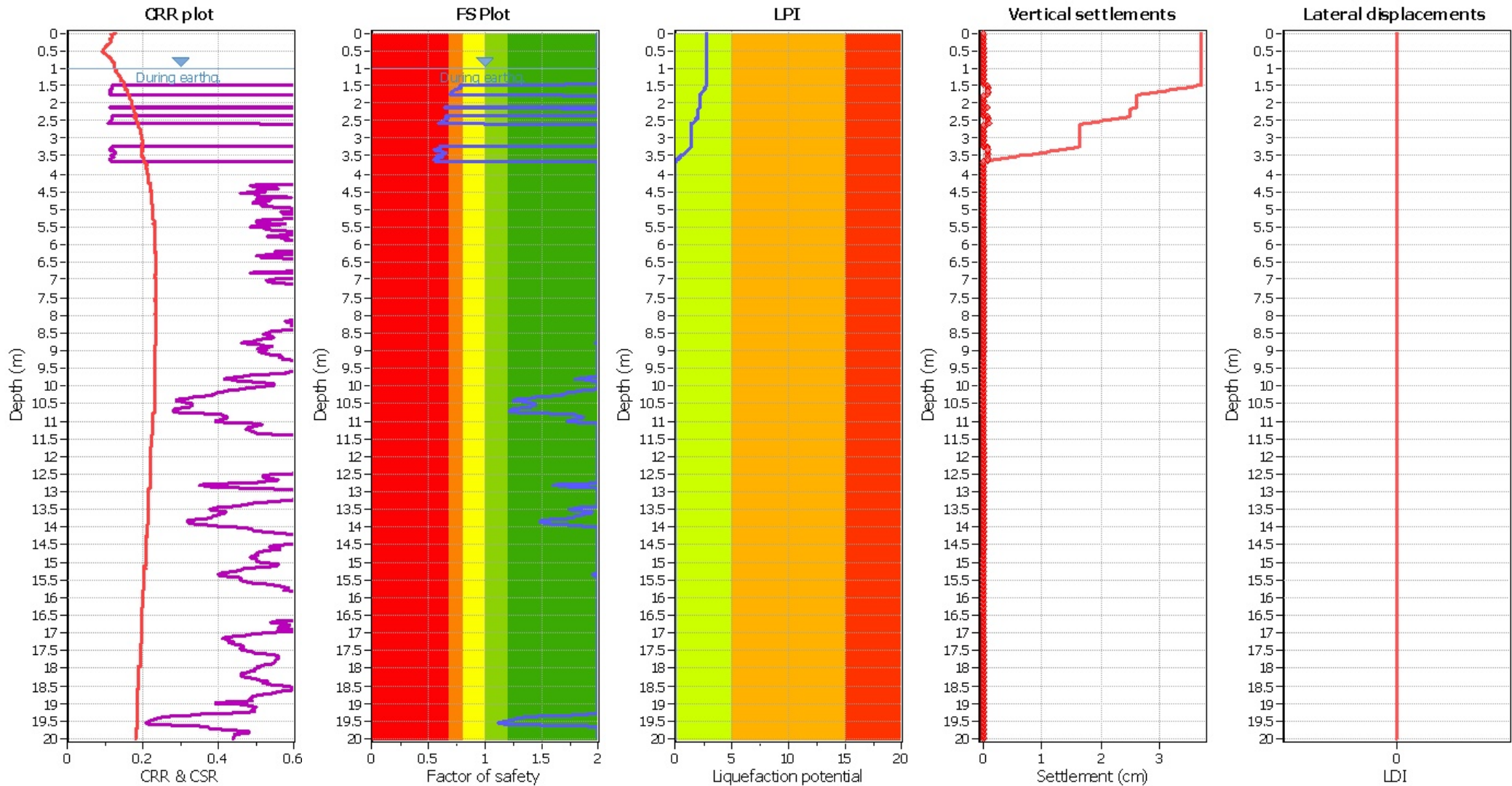- 🟩 Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K$_\sigma$ applied:	Yes
Earthquake magnitude M$_w$:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
■ 3. Clay to silty clay	■ 6. Clean sand to silty sand	□ 9. Very stiff fine grained

Liquefaction analysis overall plot

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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

CLiq v.2.1.6.11 - CPT Liquefaction Assessment Software - Report created on: 18/01/2019, 09:48:51
Project file: \\LACIE-2BIG-NAS\Public\Lavori\Microzonazione Camposanto\Relazione\CPTU_Camposanto.clq

24

CPT basic interpretation plo

Input parameters and analysis data

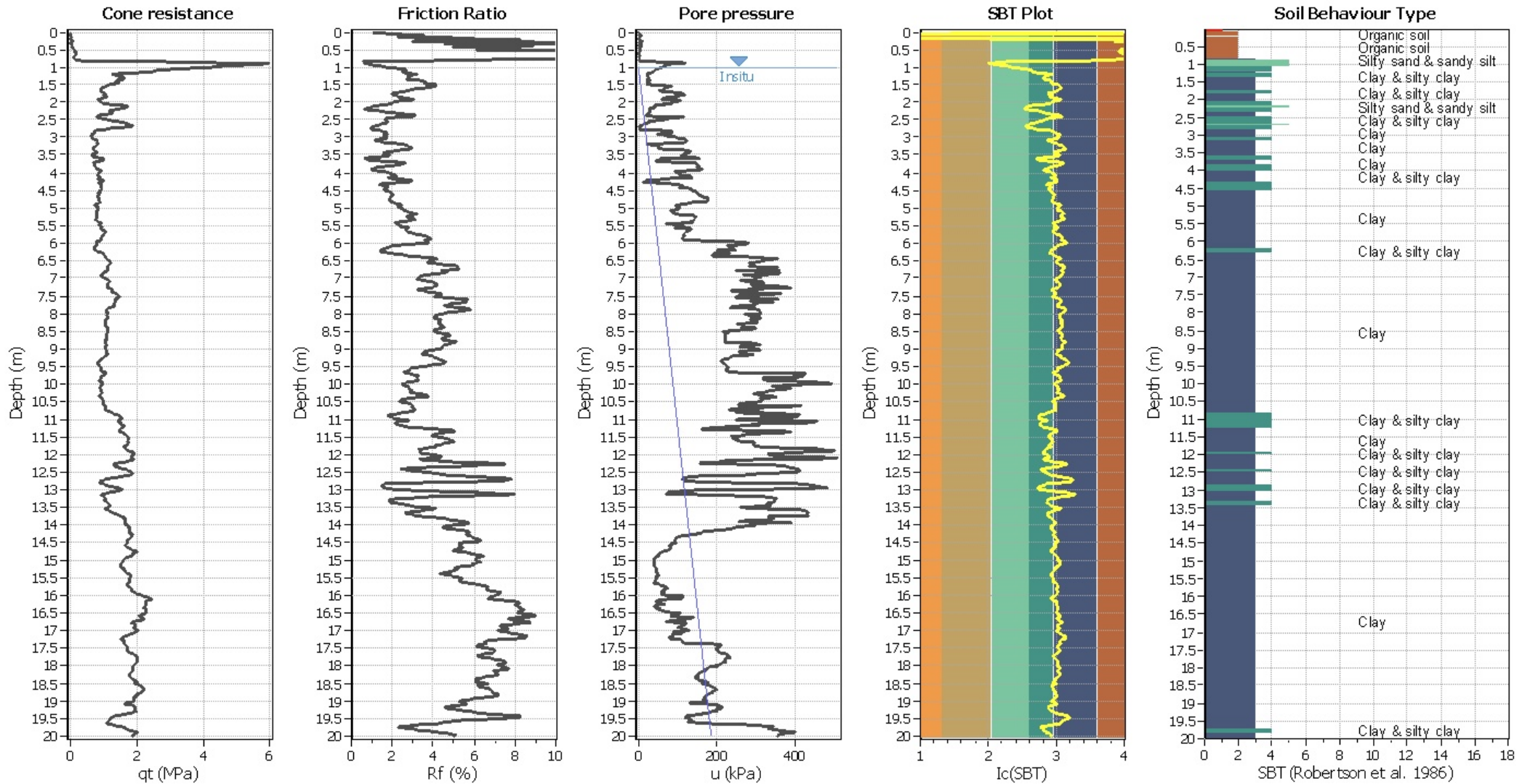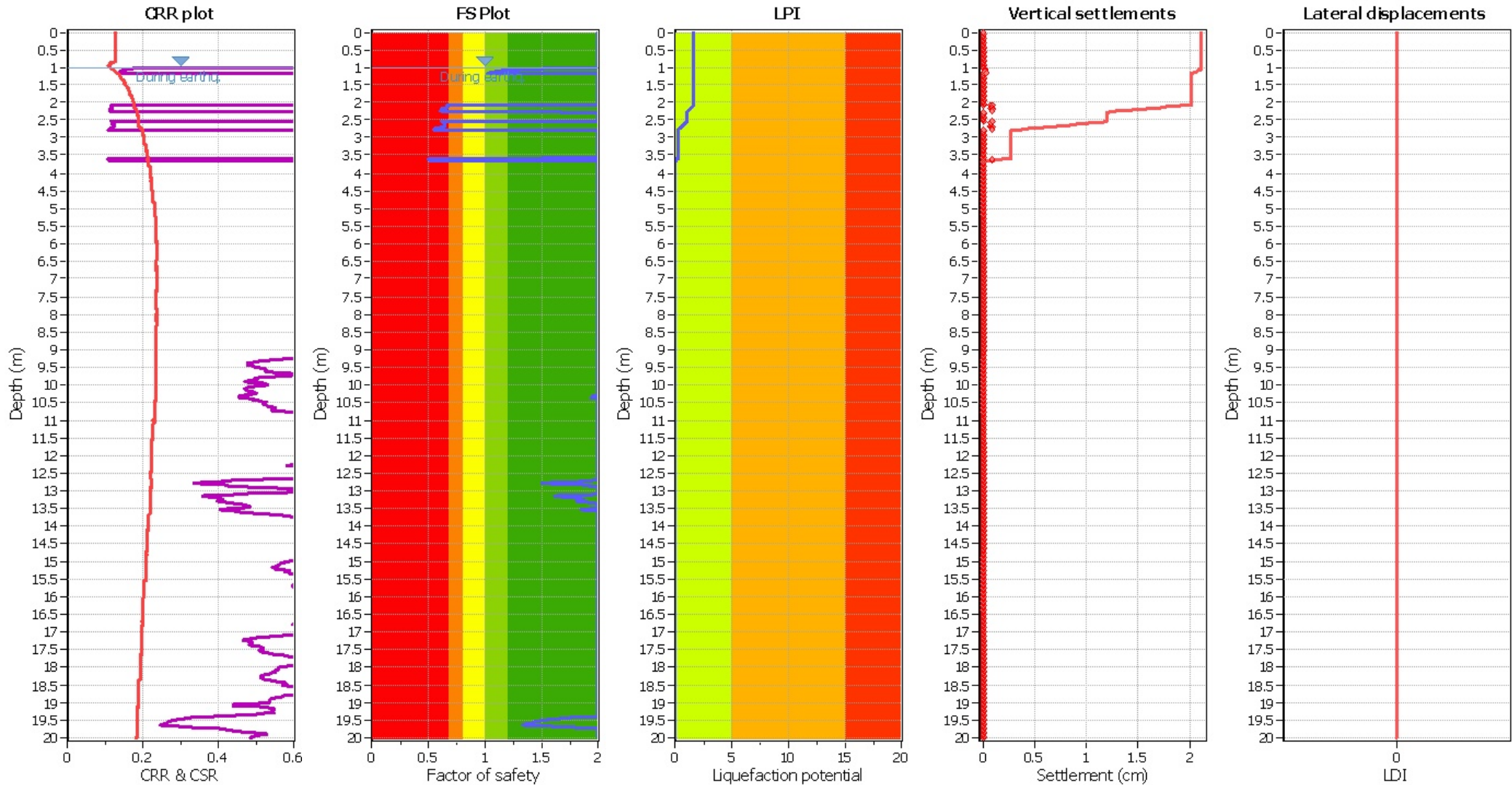|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plot

CRR plot	FS Plot	LPI	Vertical settlements	Lateral displacements

Input parameters and analysis data

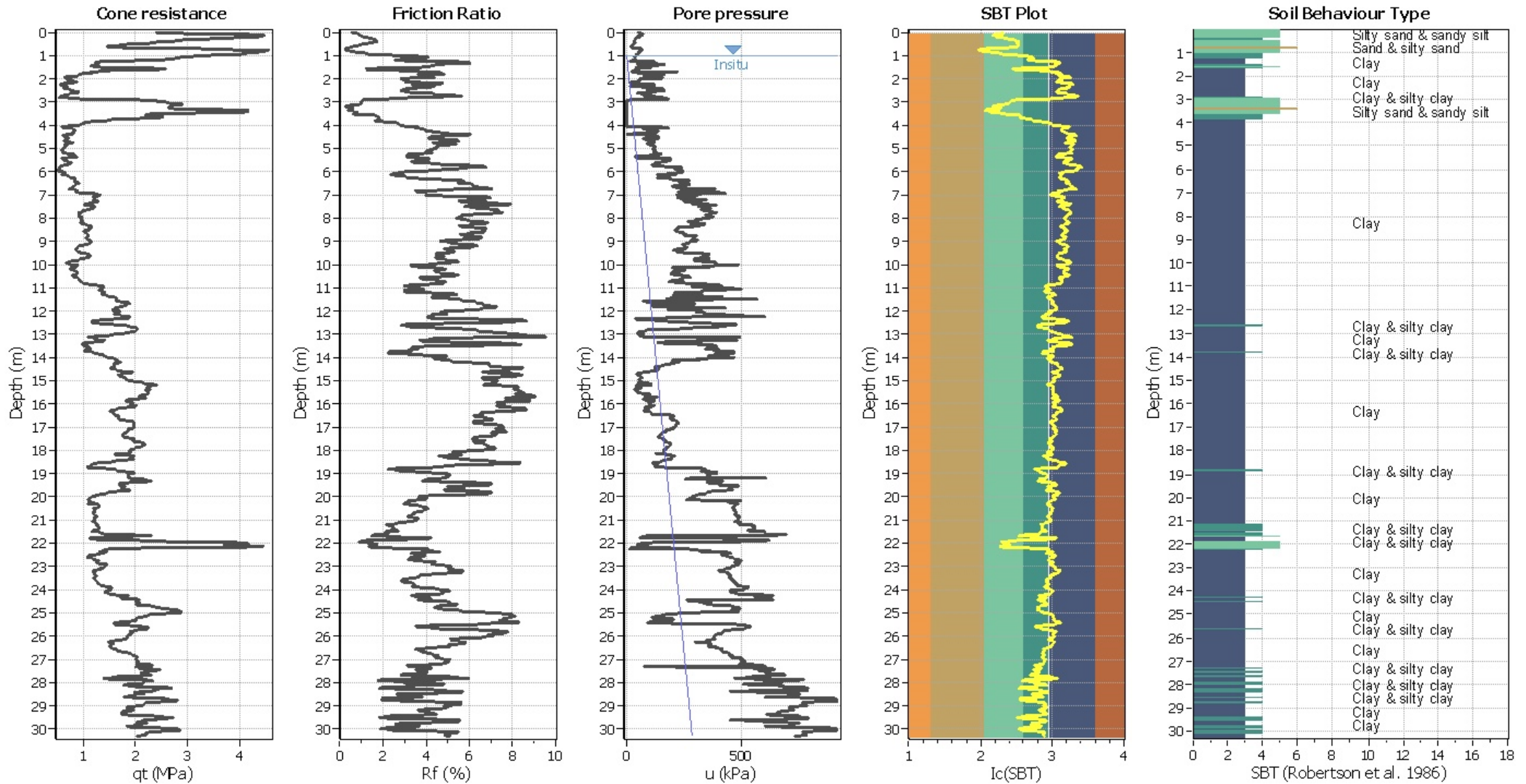|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
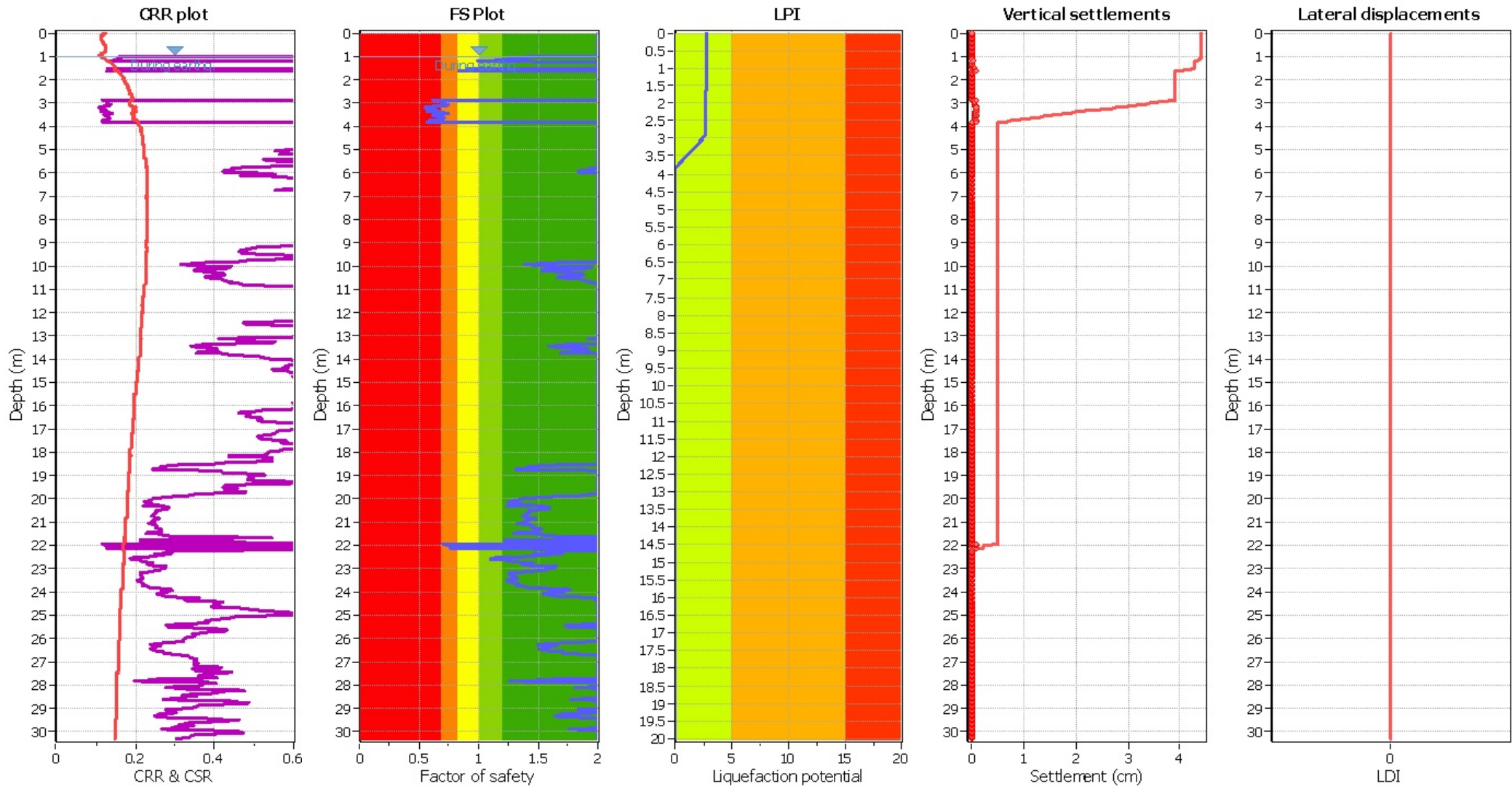- ■ Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plot

CRR plot
FS Plot
LPI
Vertical settlements
Lateral displacements

Input parameters and analysis data

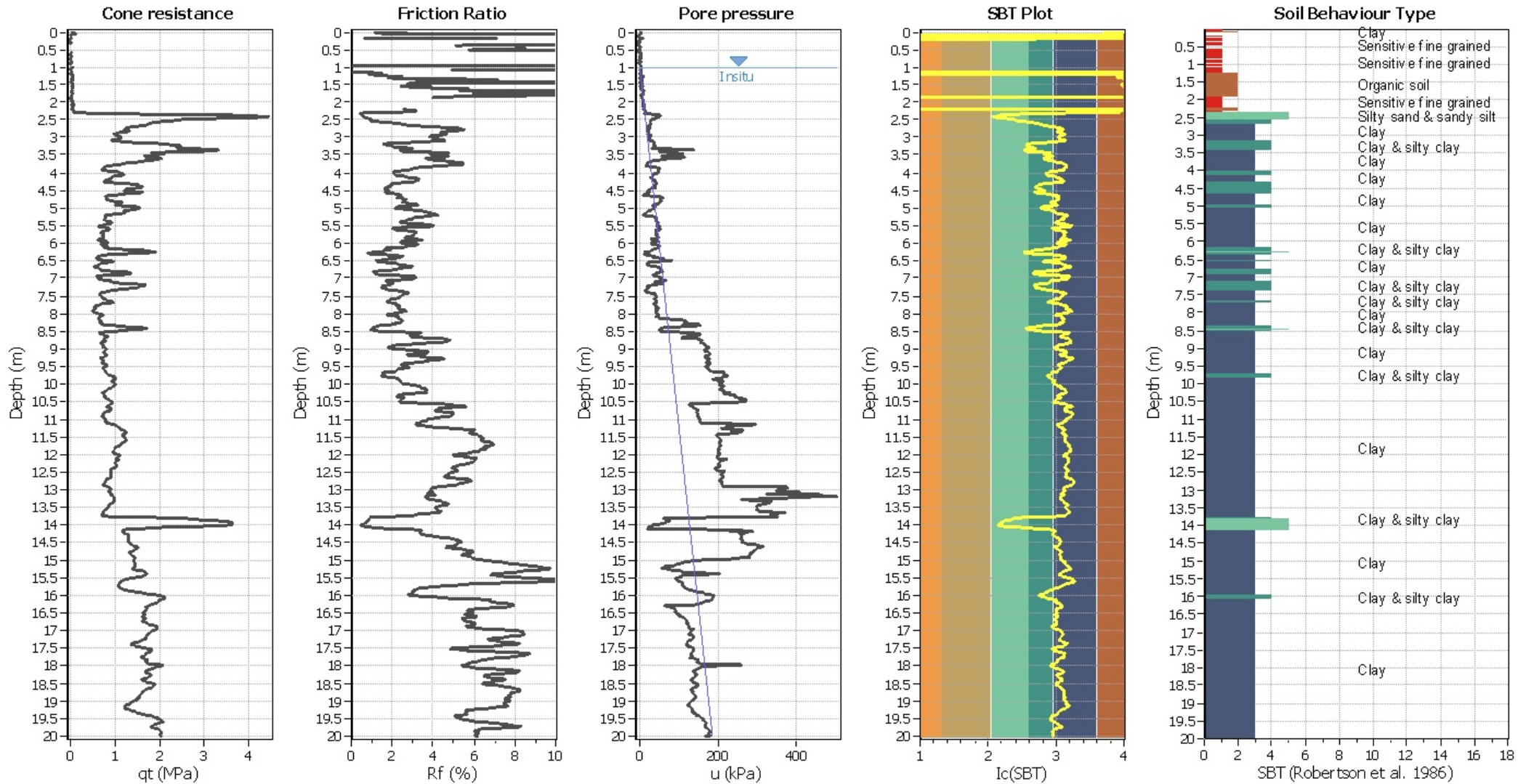|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
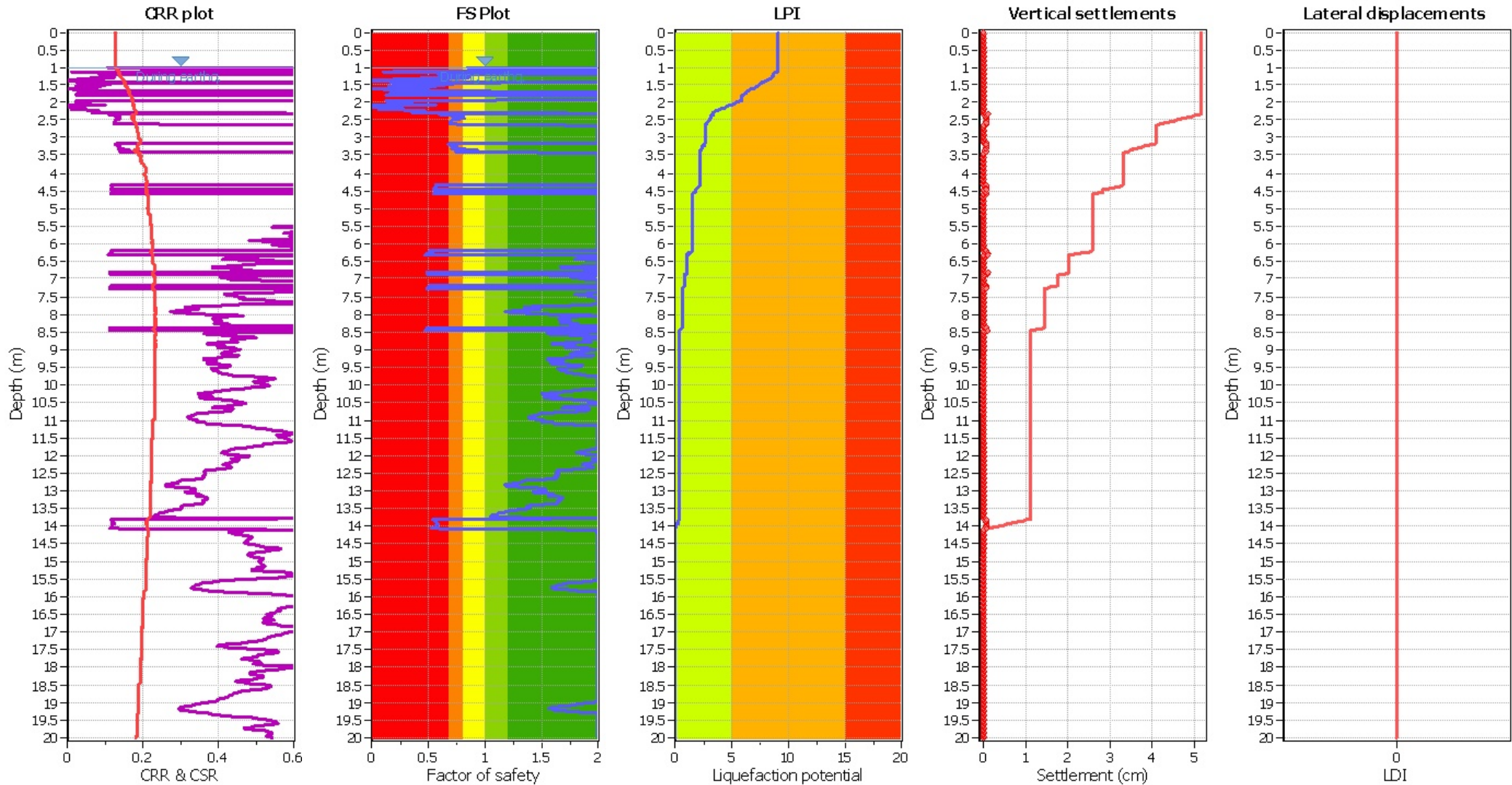- Low risk

CPT basic interpretation plo

Cone resistance — qt (MPa)

Friction Ratio — Rf (%)

Pore pressure — u (kPa)

SBT Plot — Ic(SBT)

Soil Behaviour Type — SBT (Robertson et al. 1986)

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A	
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay	
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No	
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A	

SBT legend

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

Liquefaction analysis overall plot

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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

CLiq v.2.1.6.11 - CPT Liquefaction Assessment Software - Report created on: 18/01/2019, 09:49:00
Project file: \\LACIE-2BIG-NAS\Public\Lavori\Microzonazione Camposanto\Relazione\CPTU_Camposanto.clq

30

CPT basic interpretation plo

Input parameters and analysis data

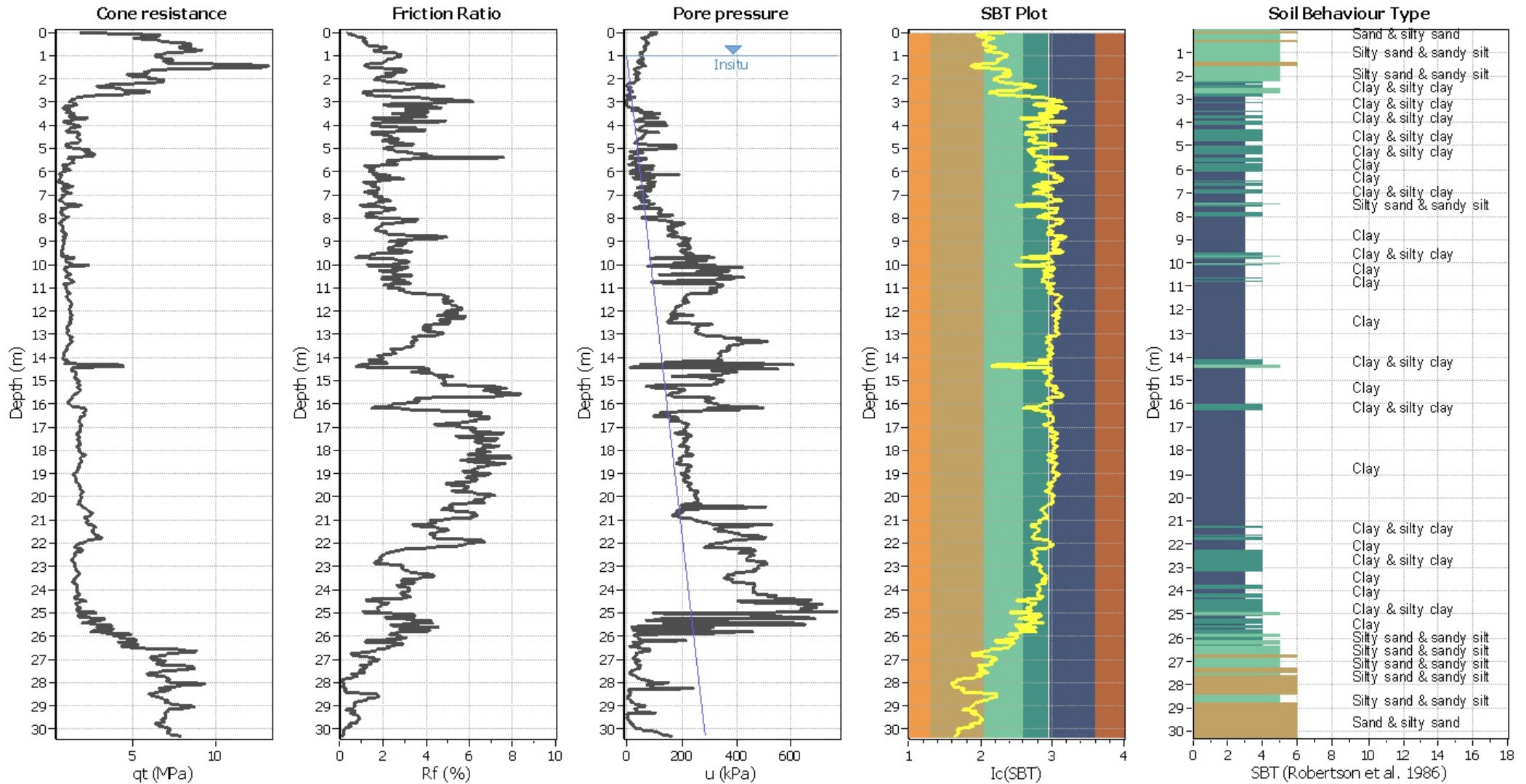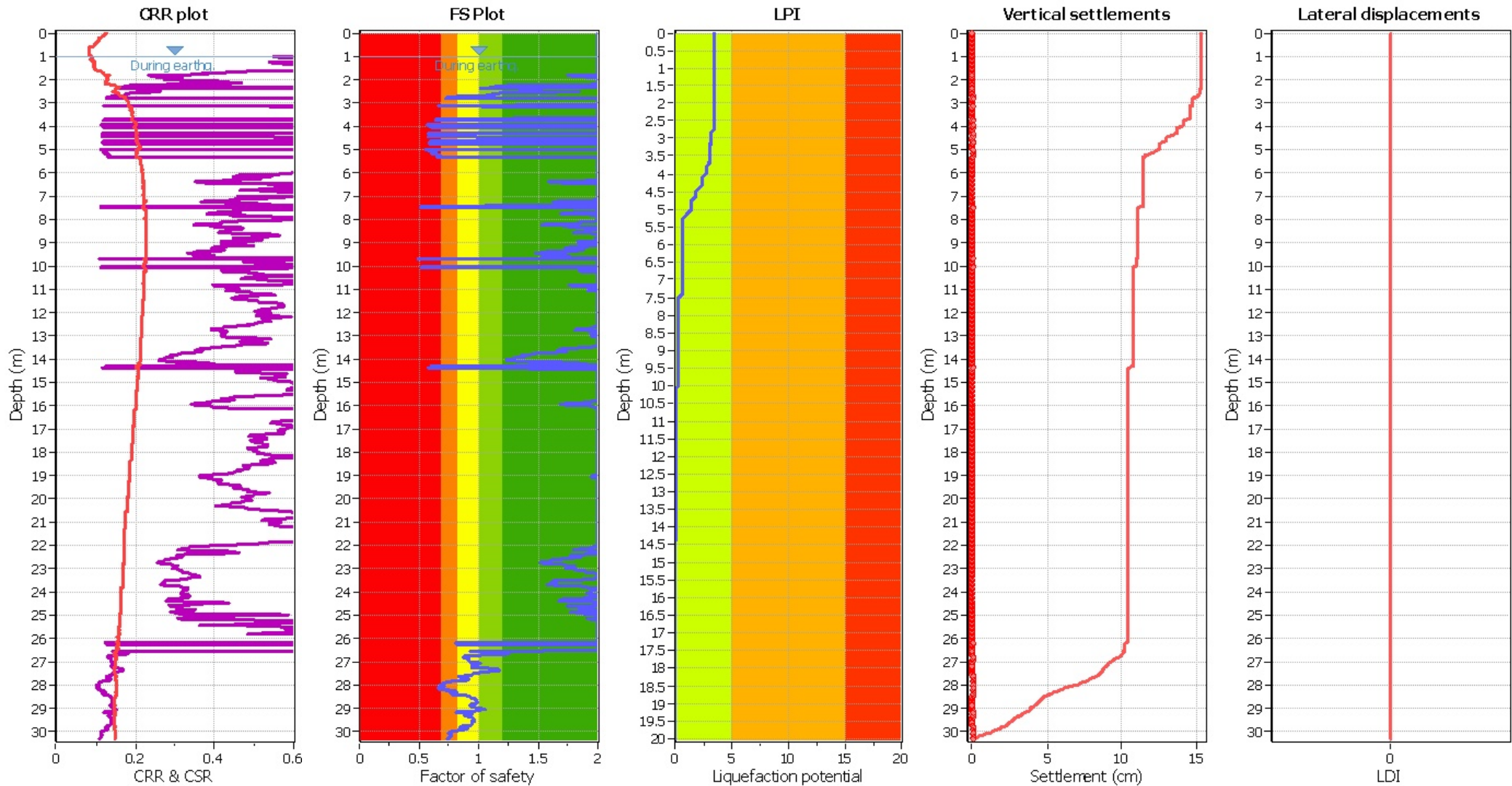|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
■ 3. Clay to silty clay	■ 6. Clean sand to silty sand	□ 9. Very stiff fine grained

Liquefaction analysis overall plot

CRR plot | FS Plot | LPI | Vertical settlements | Lateral displacements

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m
Fines correction method:	B&I (2014)	Average results interval:	3
Points to test:	Based on Ic value	Ic cut-off value:	2.60
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT
Peak ground acceleration:	0.23	Use fill:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A

Fill weight:	N/A
Transition detect. applied:	No
K_σ applied:	Yes
Clay like behavior applied:	Sand & Clay
Limit depth applied:	No
Limit depth:	N/A

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

CLiq v.2.1.6.11 - CPT Liquefaction Assessment Software - Report created on: 18/01/2019, 09:49:05
Project file: \\LACIE-2BIG-NAS\Public\Lavori\Microzonazione Camposanto\Relazione\CPTU_Camposanto.clq

32

CPT basic interpretation plo

Input parameters and analysis data

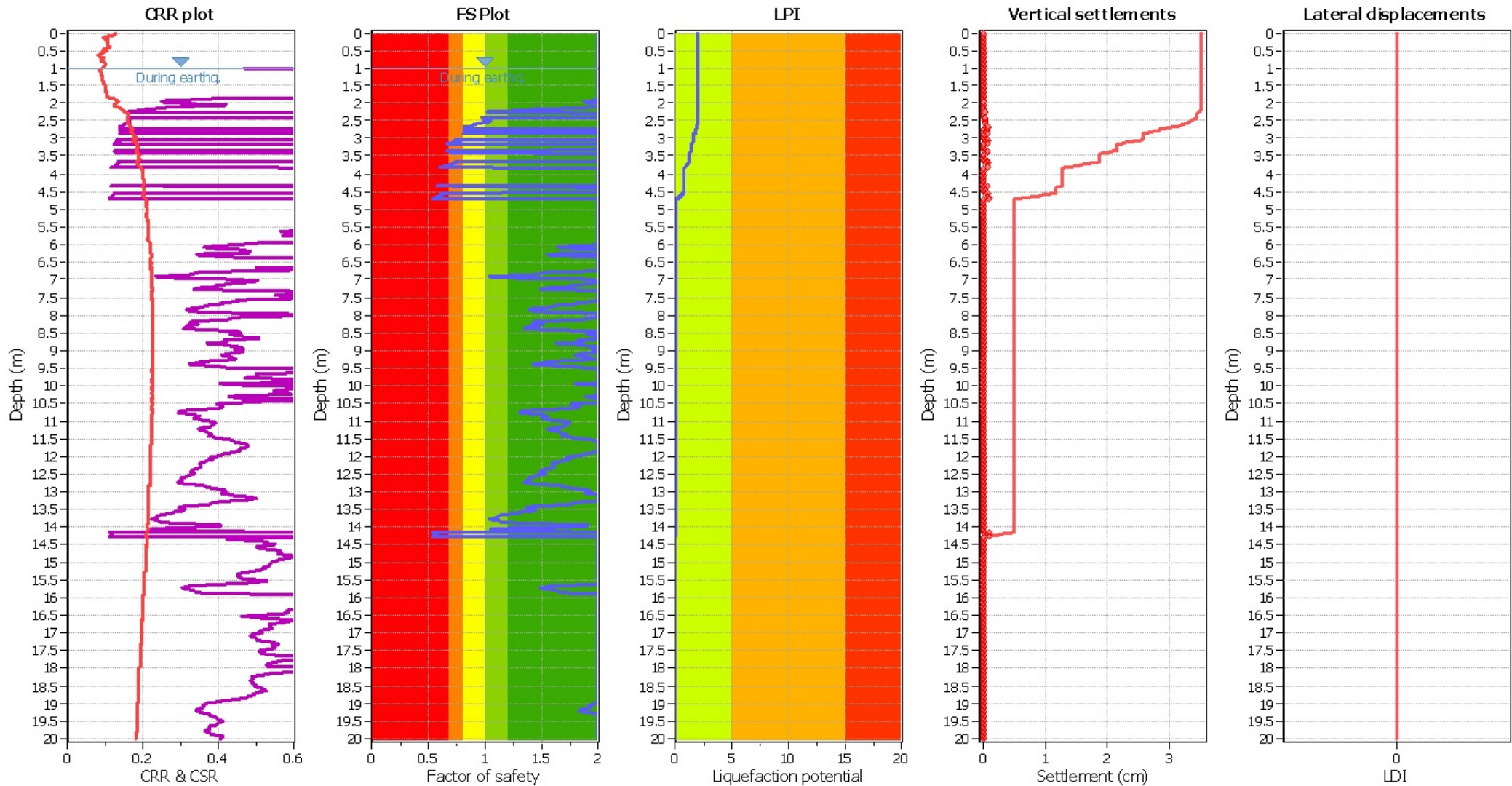|						
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A	
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No	
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K$_\sigma$ applied:	Yes	
Earthquake magnitude M$_w$:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay	
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No	
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plot

CRR plot

During earthq.

CRR & CSR

FS Plot

During earthq.

Factor of safety

LPI

Liquefaction potential

Vertical settlements

Settlement (cm)

Lateral displacements

LDI

Depth (m)

Input parameters and analysis data

Analysis method:	B&I (2014)
Fines correction method:	B&I (2014)
Points to test:	Based on Ic value
Earthquake magnitude M_w:	6.14
Peak ground acceleration:	0.23
Depth to water table (insitu):	1.00 m

Depth to GWT (erthq.):	1.00 m
Average results interval:	3
Ic cut-off value:	2.60
Unit weight calculation:	Based on SBT
Use fill:	No
Fill height:	N/A

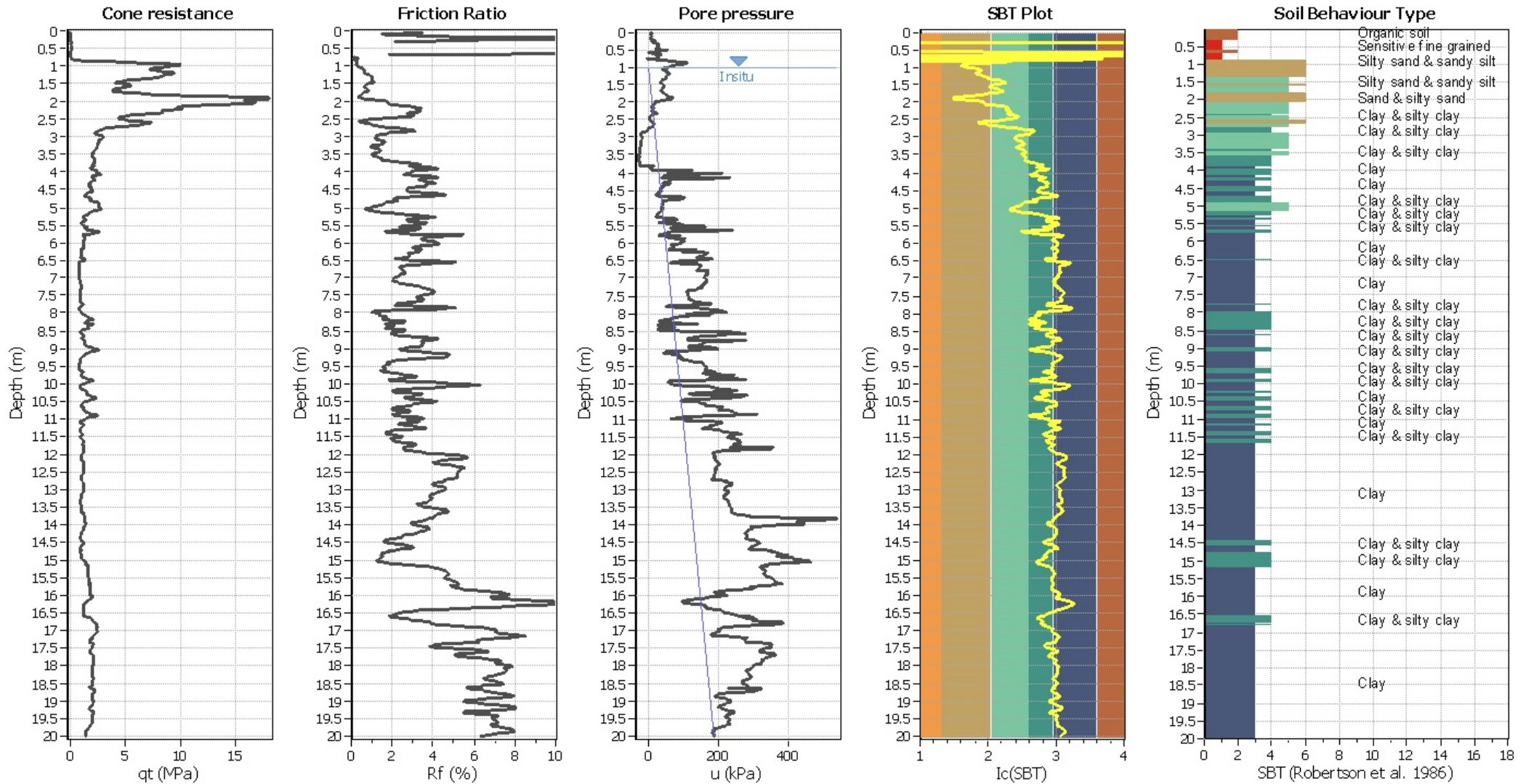|	
Fill weight:	N/A
Transition detect. applied:	No
K_σ applied:	Yes
Clay like behavior applied:	Sand & Clay
Limit depth applied:	No
Limit depth:	N/A

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
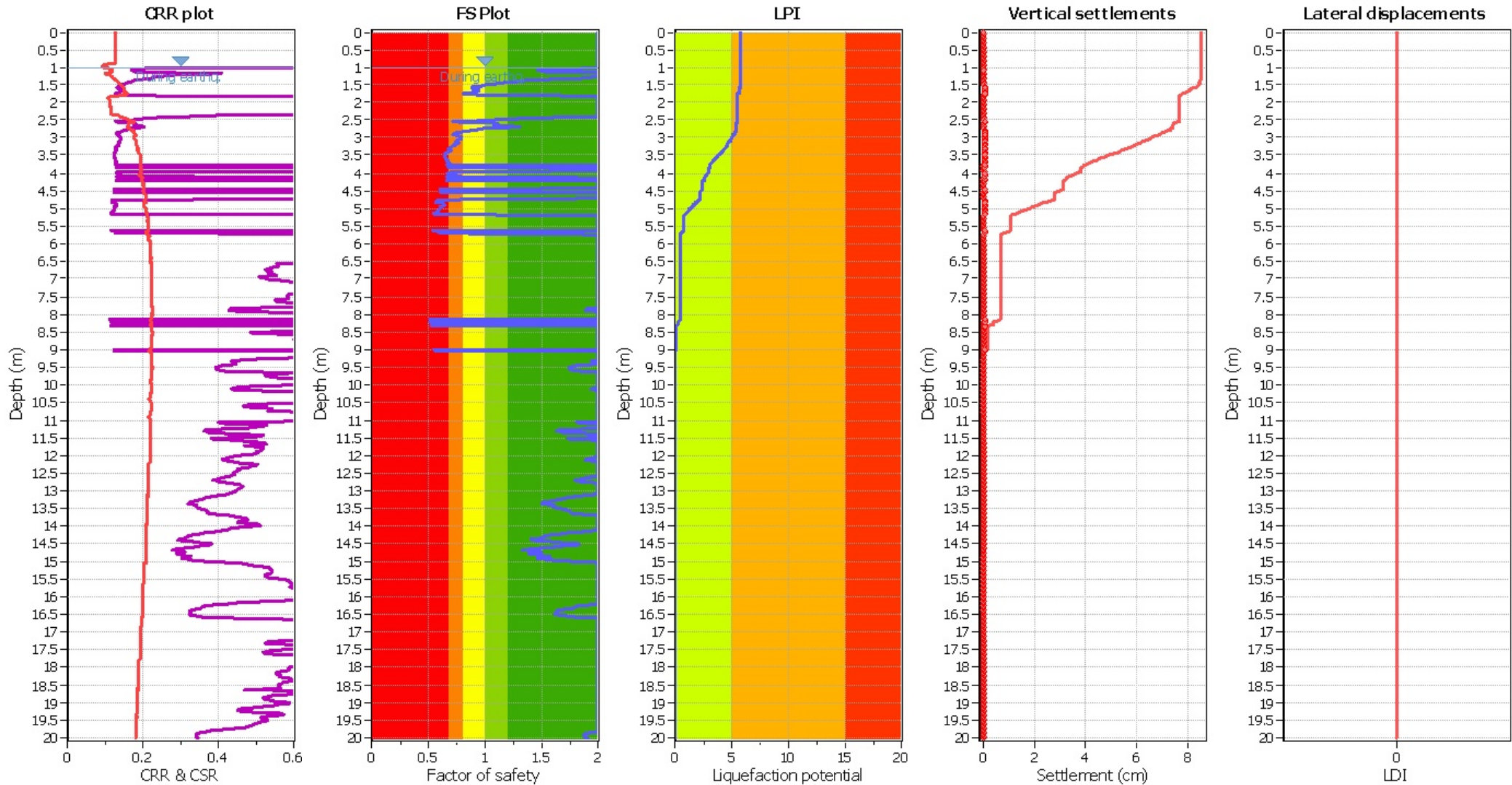- 🟨 Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand	
■ 3. Clay to silty clay	■ 6. Clean sand to silty sand	□ 9. Very stiff fine grained	

Liquefaction analysis overall plot

CRR plot | FS Plot | LPI | Vertical settlements | Lateral displacements

Input parameters and analysis data

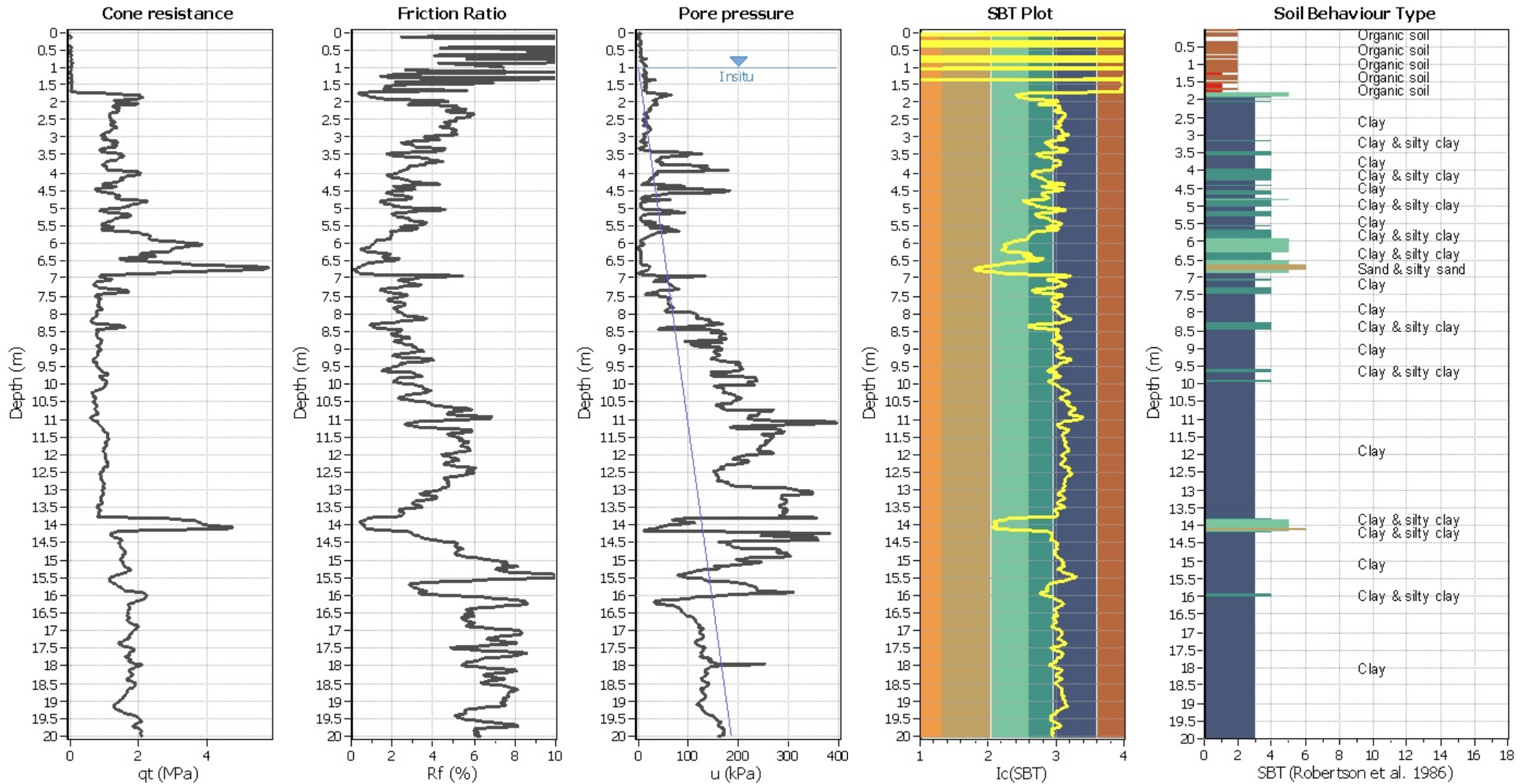|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
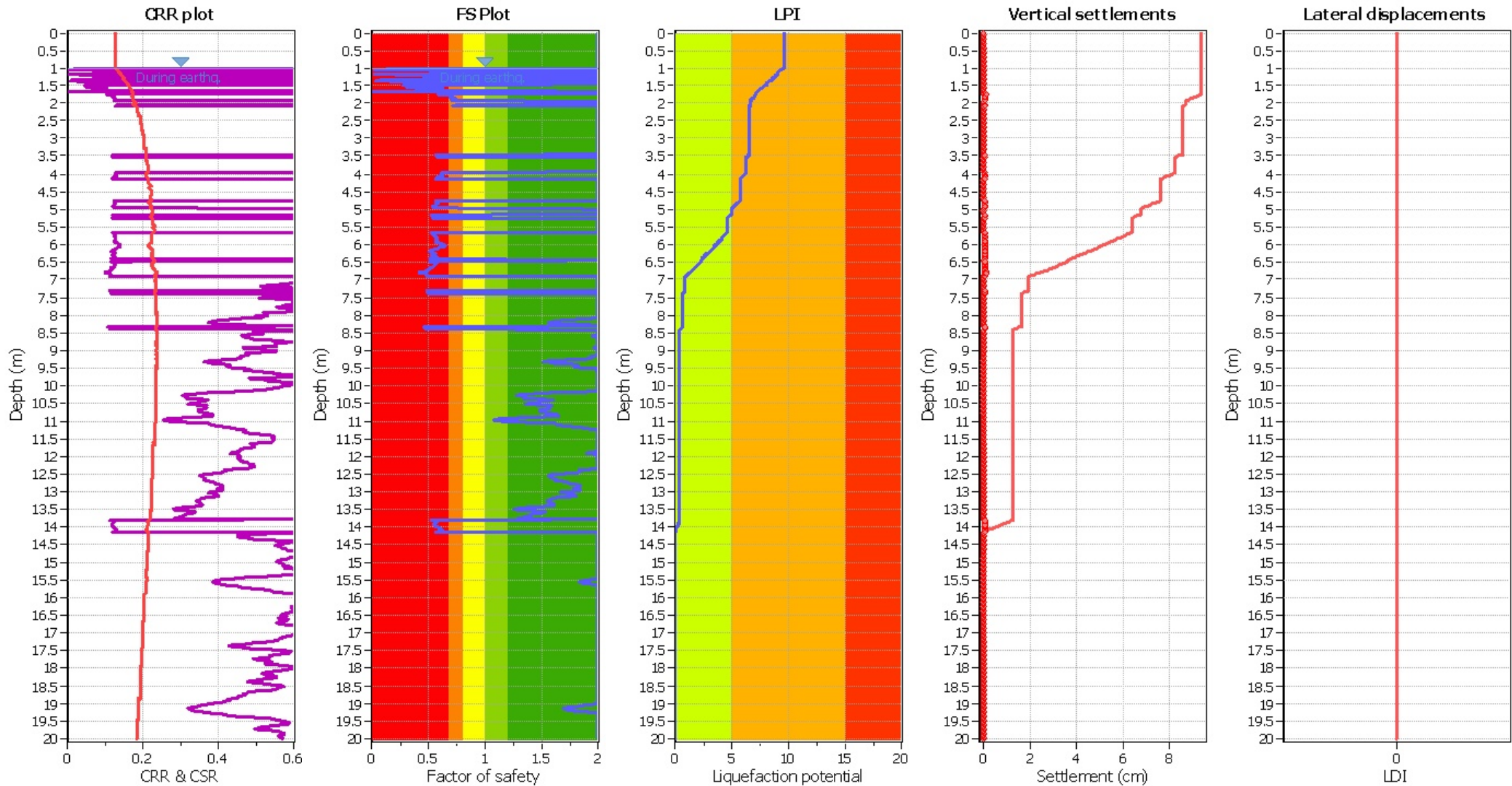- 🟩 Low risk

CPT basic interpretation plo

Cone resistance
Depth (m) vs qt (MPa)

Friction Ratio
Depth (m) vs Rf (%)

Pore pressure
Depth (m) vs u (kPa)
Insitu

SBT Plot
Depth (m) vs Ic(SBT)

Soil Behaviour Type
Depth (m) vs SBT (Robertson et al. 1986)

Organic soil
Organic soil
Organic soil
Organic soil
Organic soil

Clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
Clay
Clay & silty clay
Clay & silty clay
Sand & silty sand
Clay

Clay
Clay & silty clay

Clay
Clay & silty clay

Clay

Clay

Clay & silty clay
Clay & silty clay

Clay

Clay & silty clay

Clay

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CLiq v.2.1.6.11 - CPT Liquefaction Assessment Software - Report created on: 18/01/2019, 09:49:23
Project file: \\LACIE-2BIG-NAS\Public\Lavori\Microzonazione Camposanto\Relazione\CPTU_Camposanto.clq

37

Liquefaction analysis overall plot

CRR plot — CRR & CSR

FS Plot — Factor of safety

LPI — Liquefaction potential

Vertical settlements — Settlement (cm)

Lateral displacements — LDI

Input parameters and analysis data

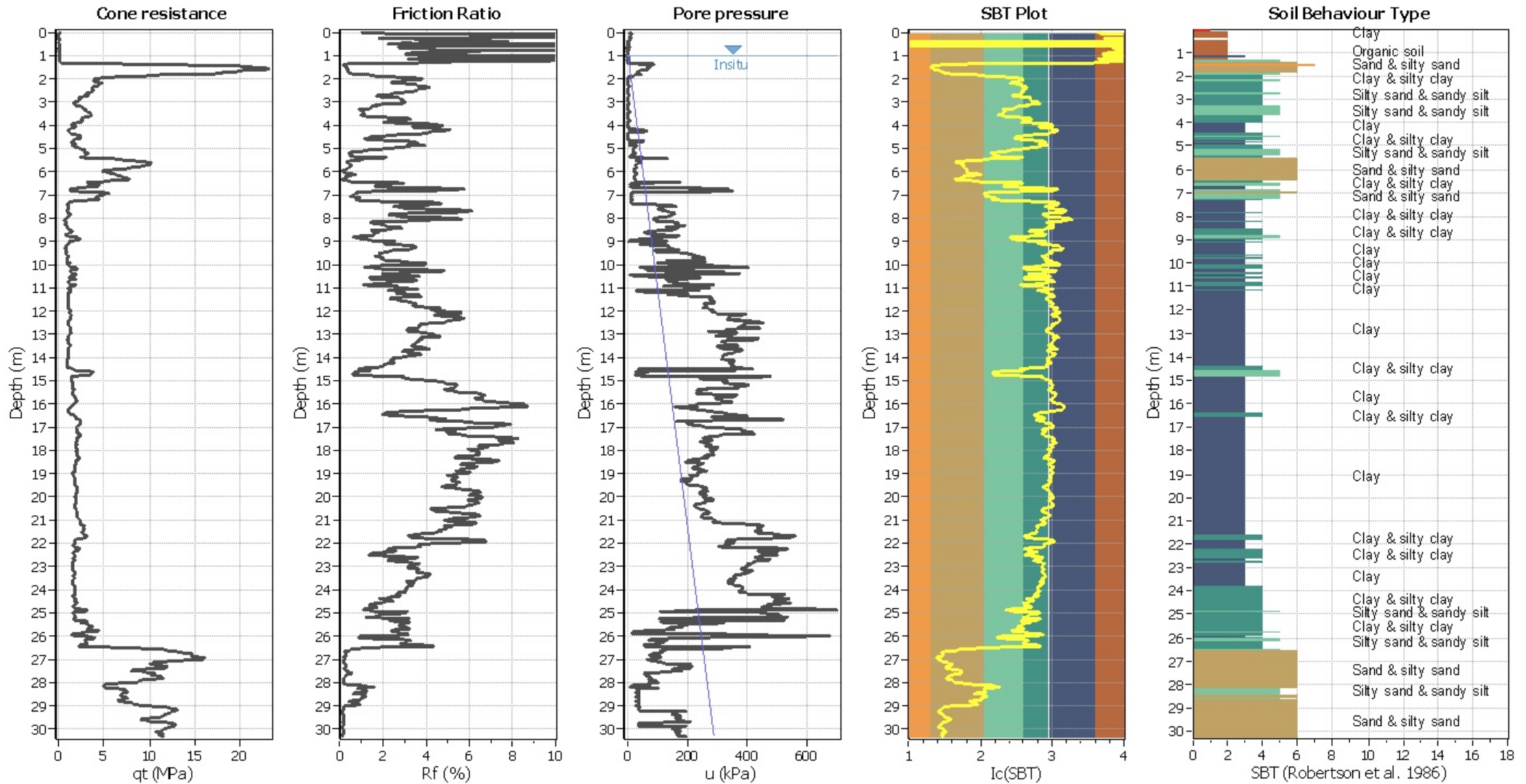|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
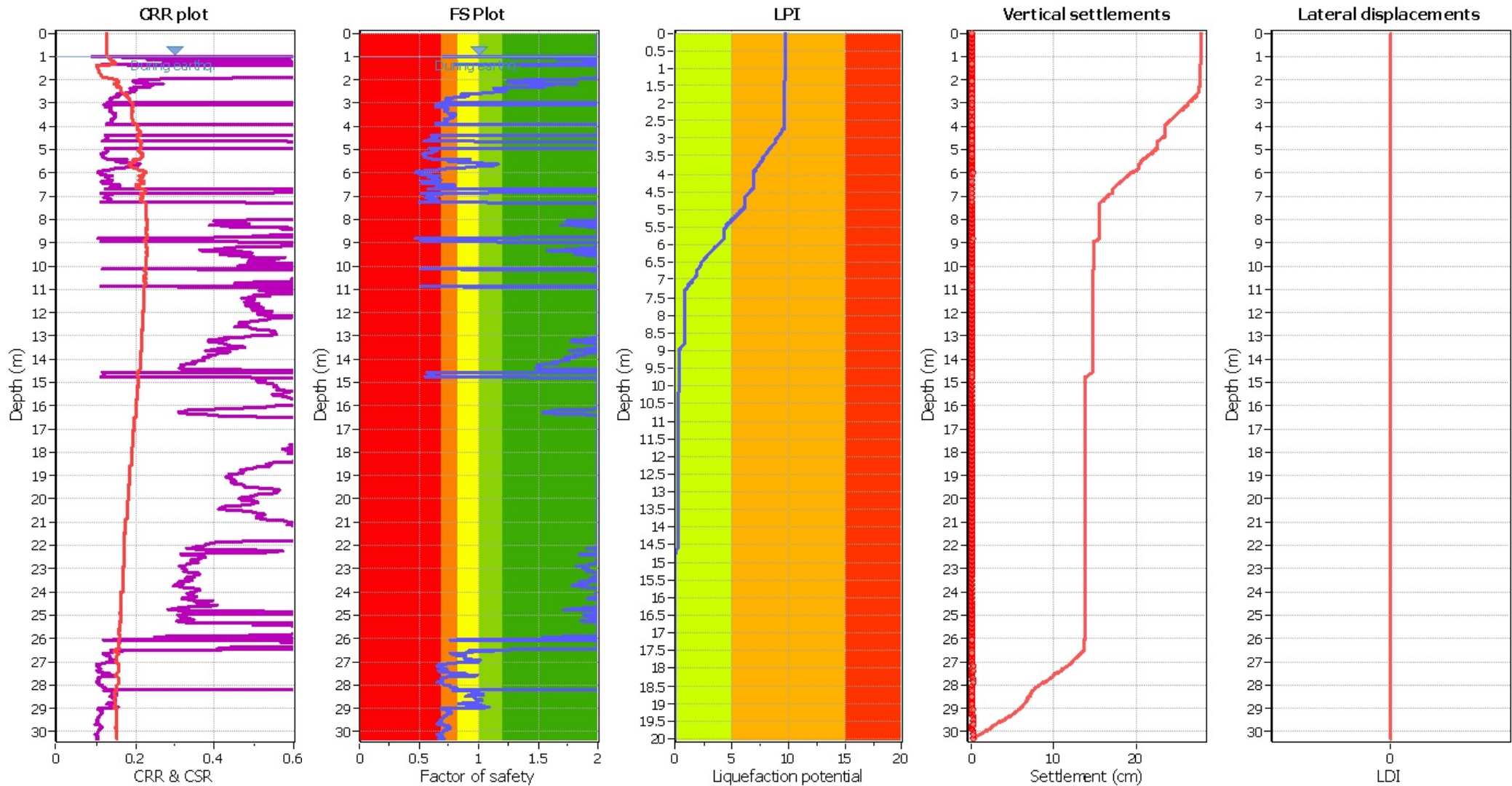- Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A	
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay	
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No	
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plot

CRR plot
FS Plot
LPI
Vertical settlements
Lateral displacements

Input parameters and analysis data

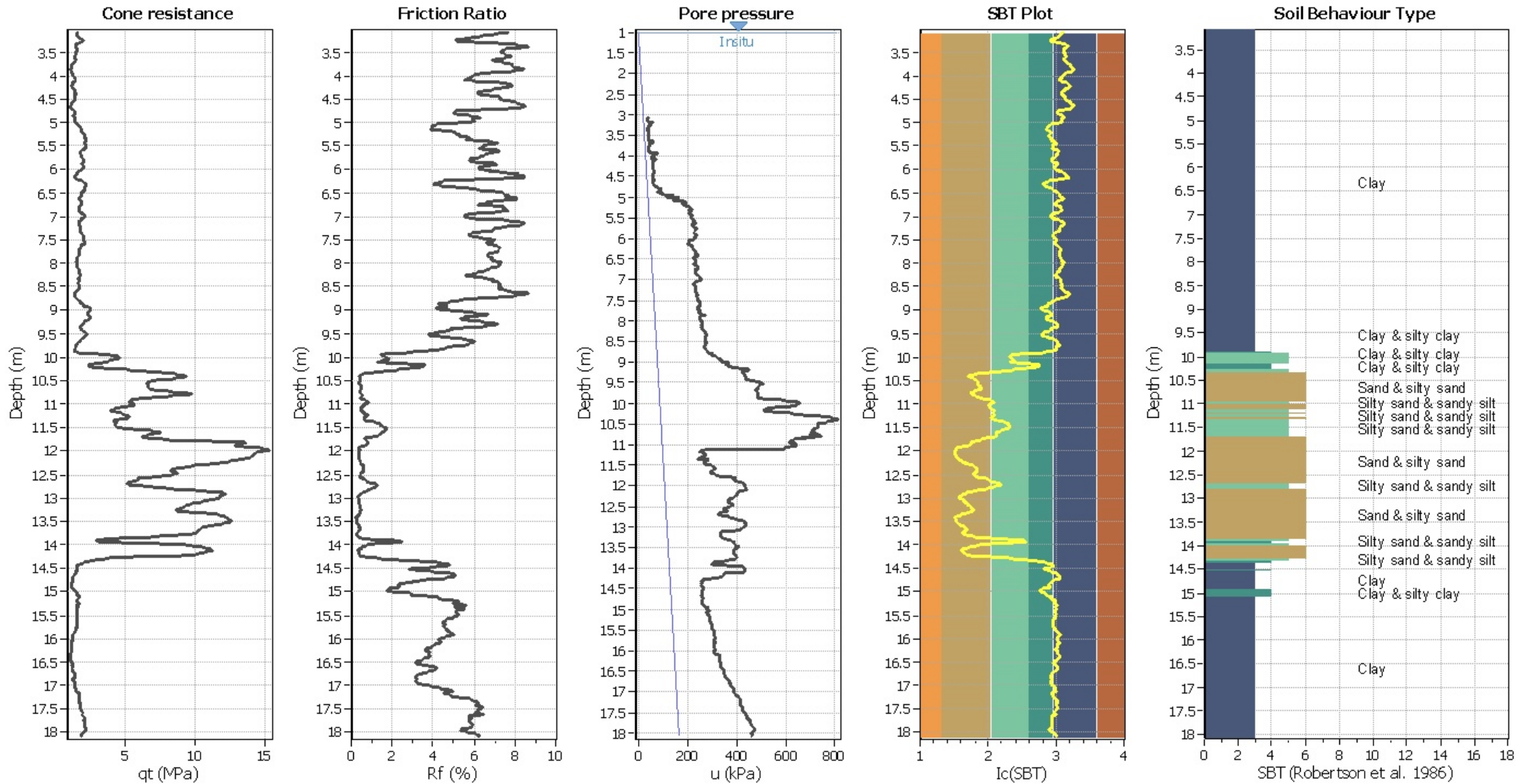|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
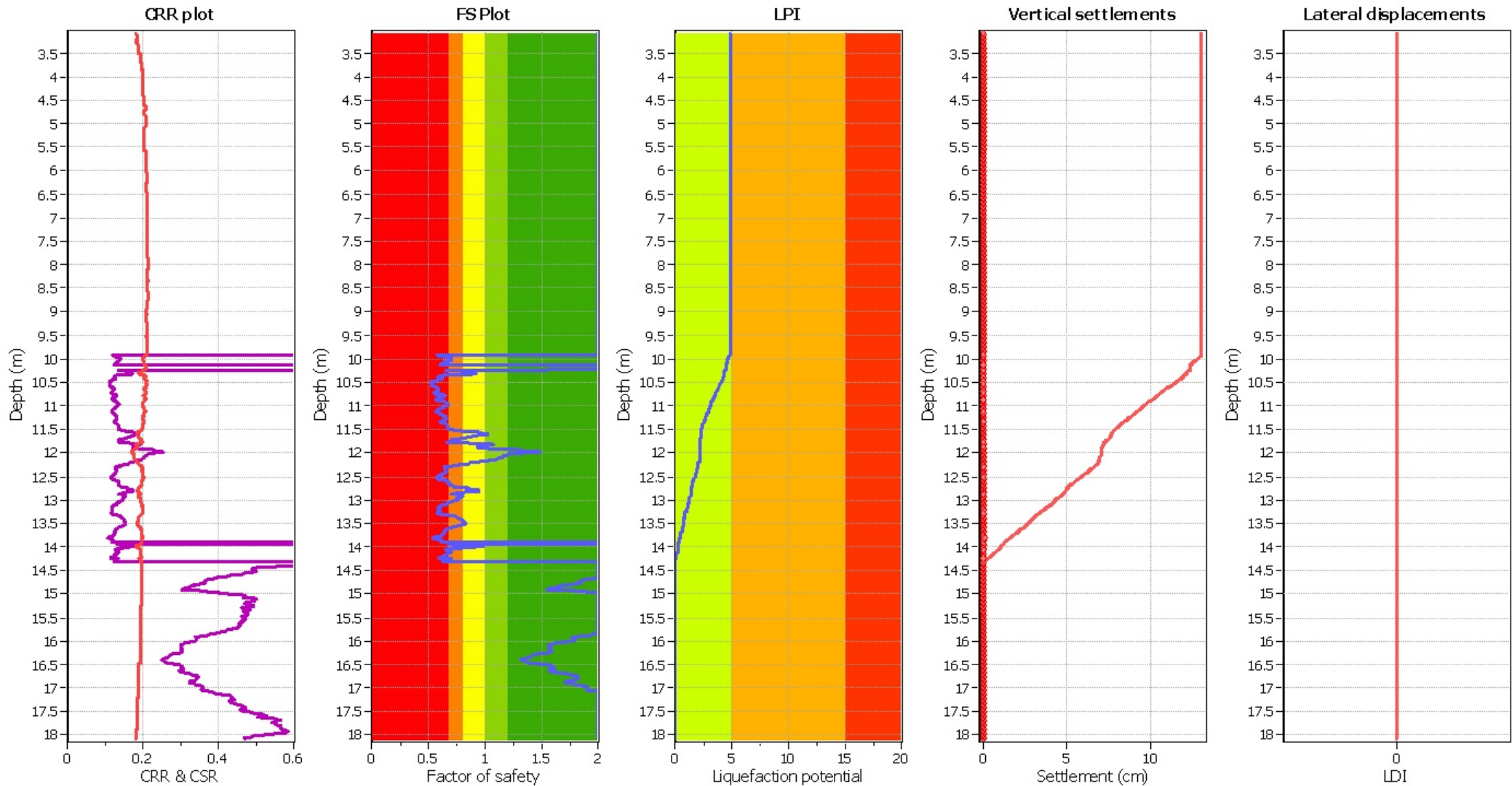- Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plot

CRR plot | **FS Plot** | **LPI** | **Vertical settlements** | **Lateral displacements**

(CRR plot: y-axis Depth (m); x-axis CRR & CSR, 0 to 0.6)

(FS Plot: y-axis Depth (m); x-axis Factor of safety, 0 to 2)

(LPI: y-axis Depth (m); x-axis Liquefaction potential, 0 to 20)

(Vertical settlements: y-axis Depth (m); x-axis Settlement (cm), 0 to 10+)

(Lateral displacements: y-axis Depth (m); x-axis LDI)

Input parameters and analysis data

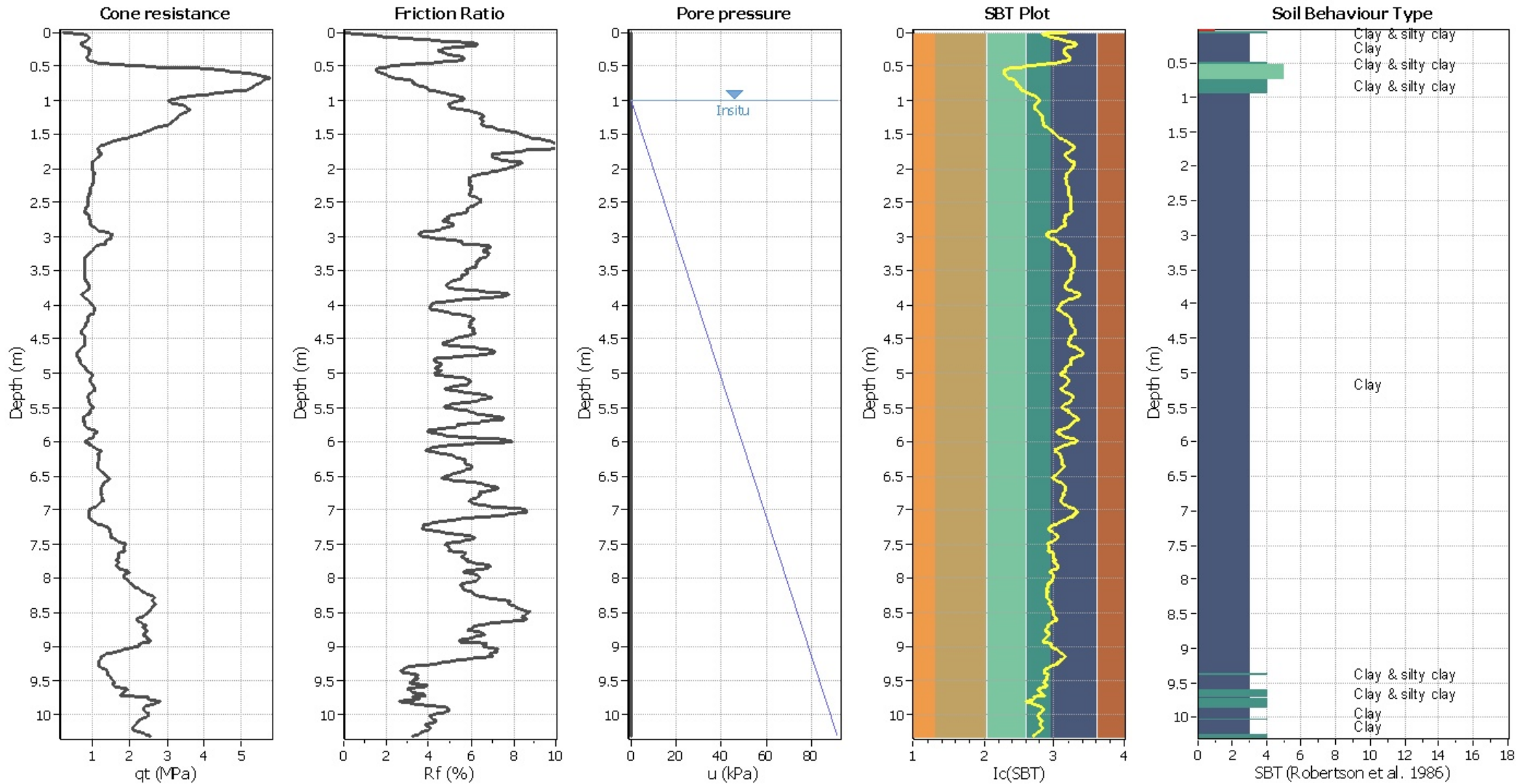|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
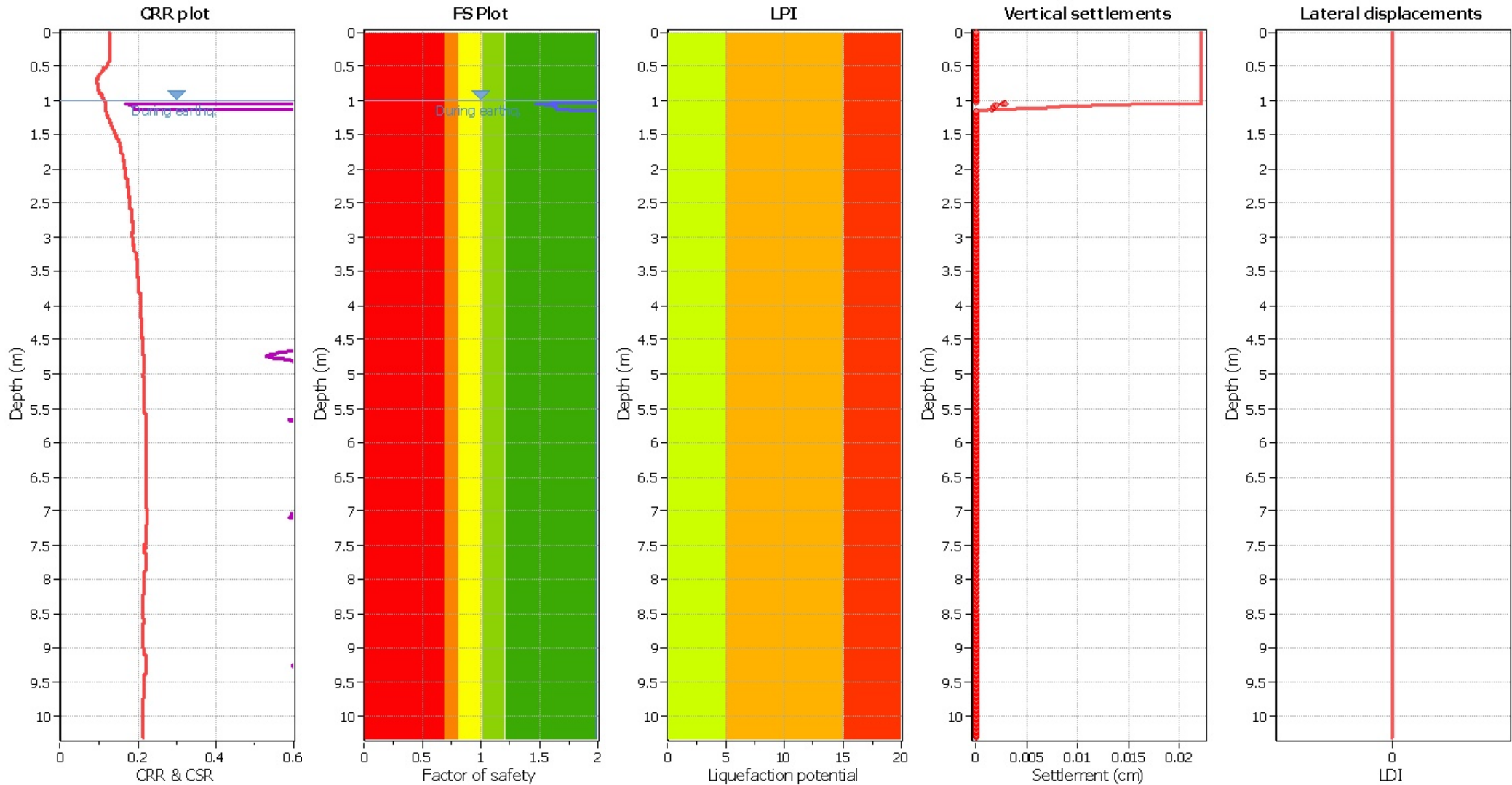- Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plot

Input parameters and analysis data

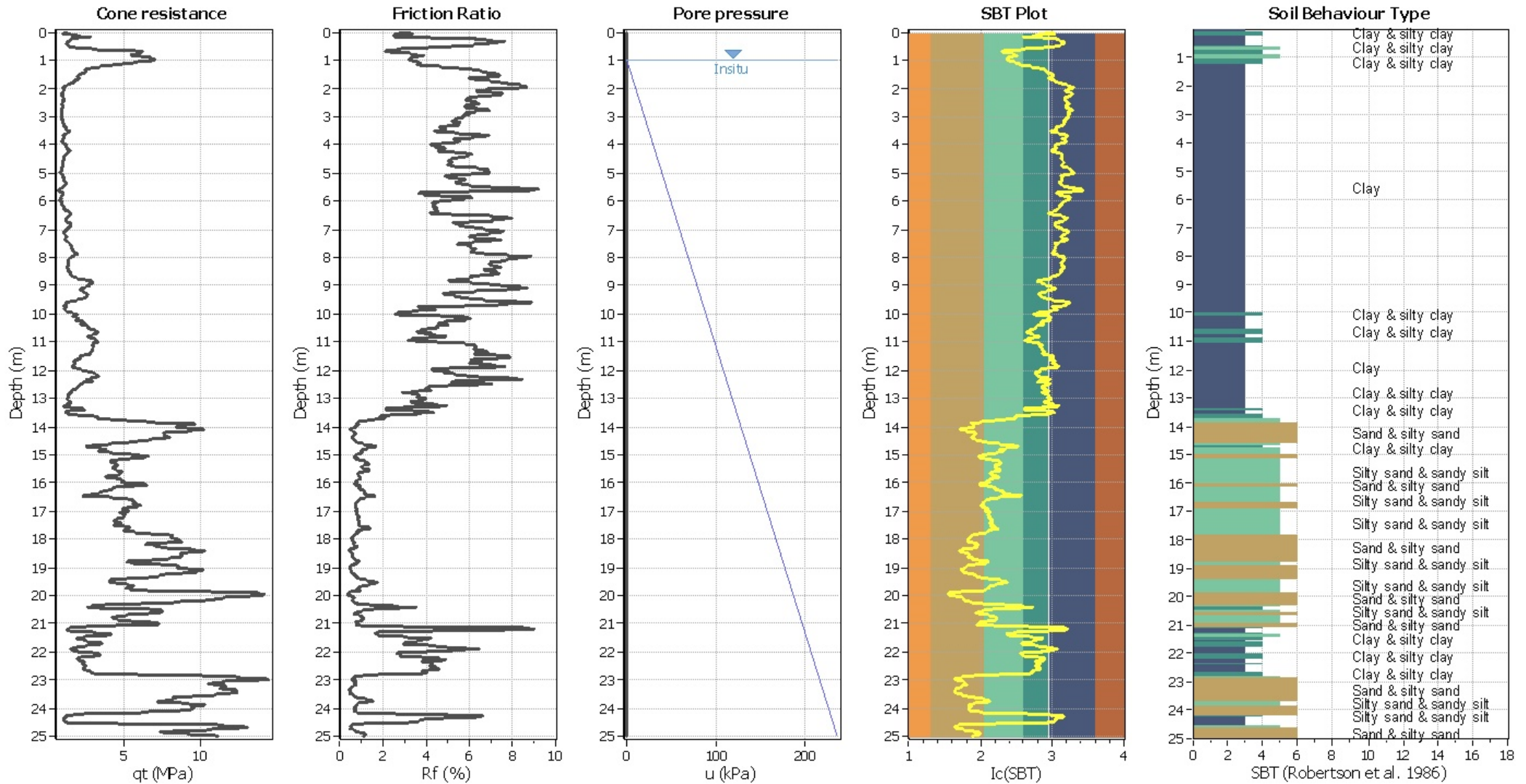|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
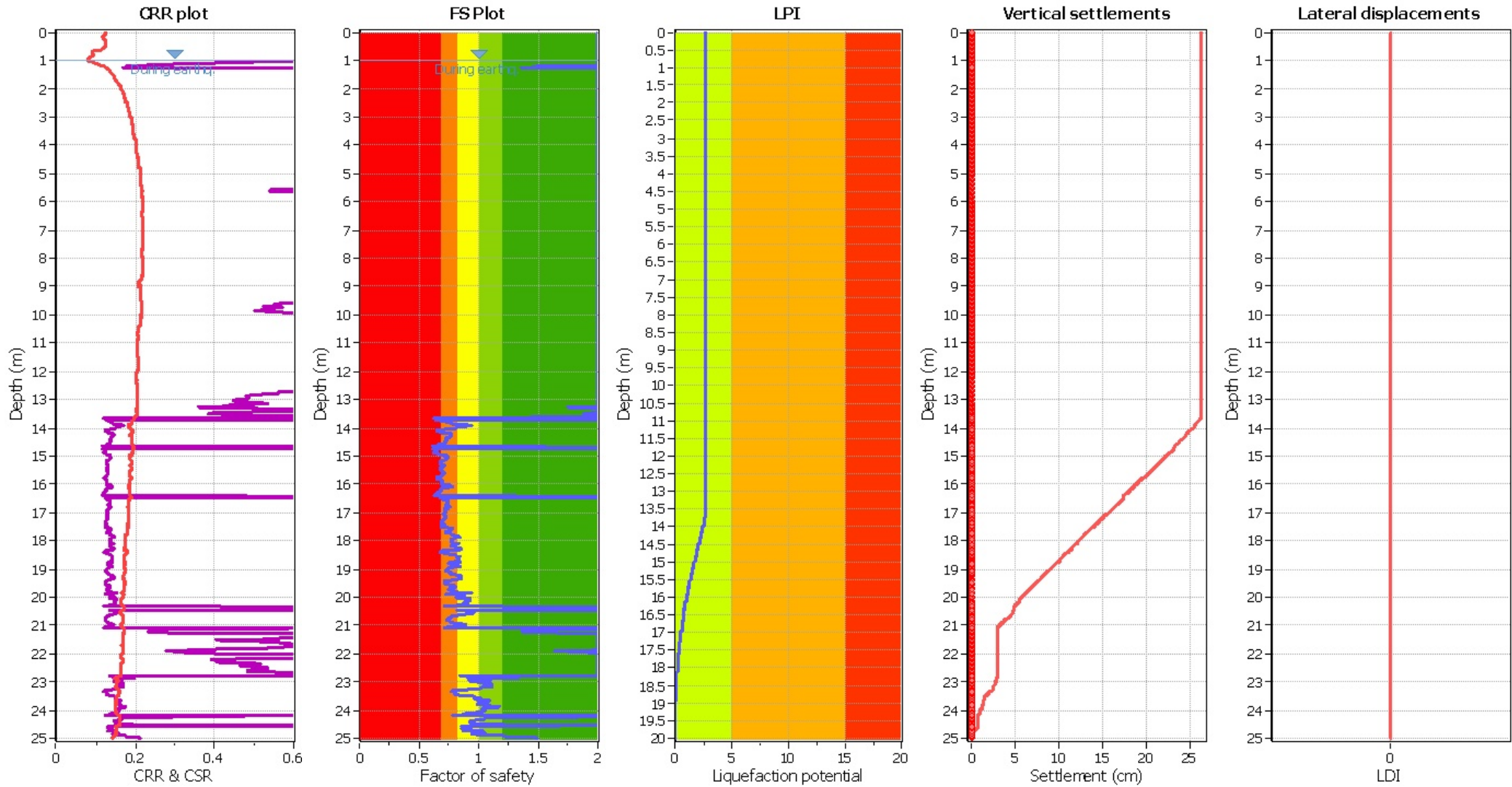- 🟩 Low risk

CPT basic interpretation plo

Cone resistance — Depth (m) vs qt (MPa)

Friction Ratio — Depth (m) vs Rf (%)

Pore pressure — Depth (m) vs u (kPa); Insitu

SBT Plot — Depth (m) vs Ic(SBT)

Soil Behaviour Type — Depth (m) vs SBT (Robertson et al. 1986)

Soil Behaviour Type labels:
- Clay & silty clay
- Clay & silty clay
- Clay & silty clay
- Clay
- Clay & silty clay
- Clay & silty clay
- Clay
- Clay & silty clay
- Clay & silty clay
- Sand & silty sand
- Clay & silty clay
- Silty sand & sandy silt
- Sand & silty sand
- Silty sand & sandy silt
- Silty sand & sandy silt
- Sand & silty sand
- Silty sand & sandy silt
- Silty sand & sandy silt
- Sand & silty sand
- Silty sand & sandy silt
- Sand & silty sand
- Clay & silty clay
- Clay & silty clay
- Clay & silty clay
- Sand & silty sand
- Silty sand & sandy silt
- Silty sand & sandy silt
- Sand & silty sand

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CLiq v.2.1.6.11 - CPT Liquefaction Assessment Software - Report created on: 18/01/2019, 09:49:52
Project file: \\LACIE-2BIG-NAS\Public\Lavori\Microzonazione Camposanto\Relazione\CPTU_Camposanto.clq

45

Liquefaction analysis overall plot

CRR plot	FS Plot	LPI	Vertical settlements	Lateral displacements

Input parameters and analysis data

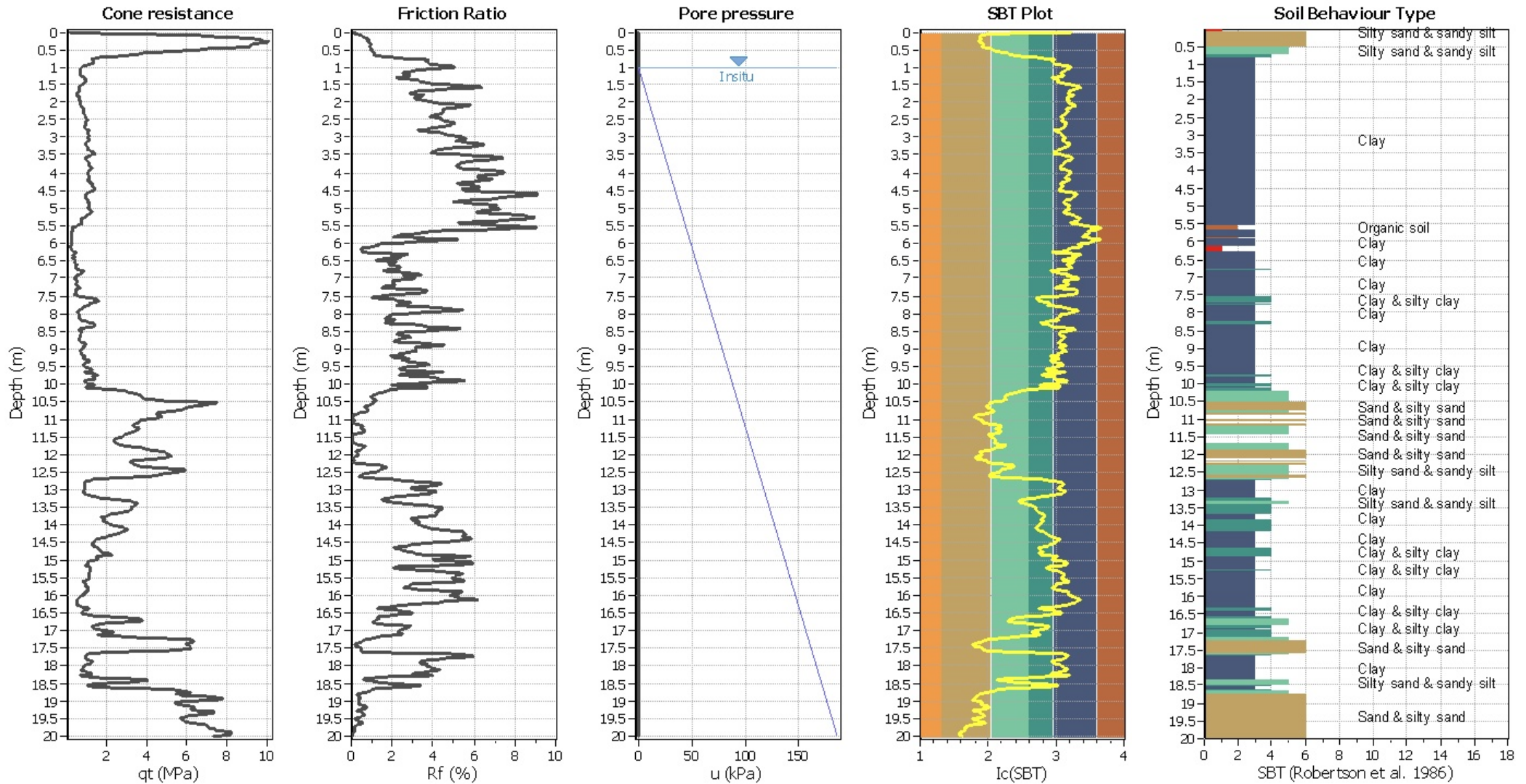|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
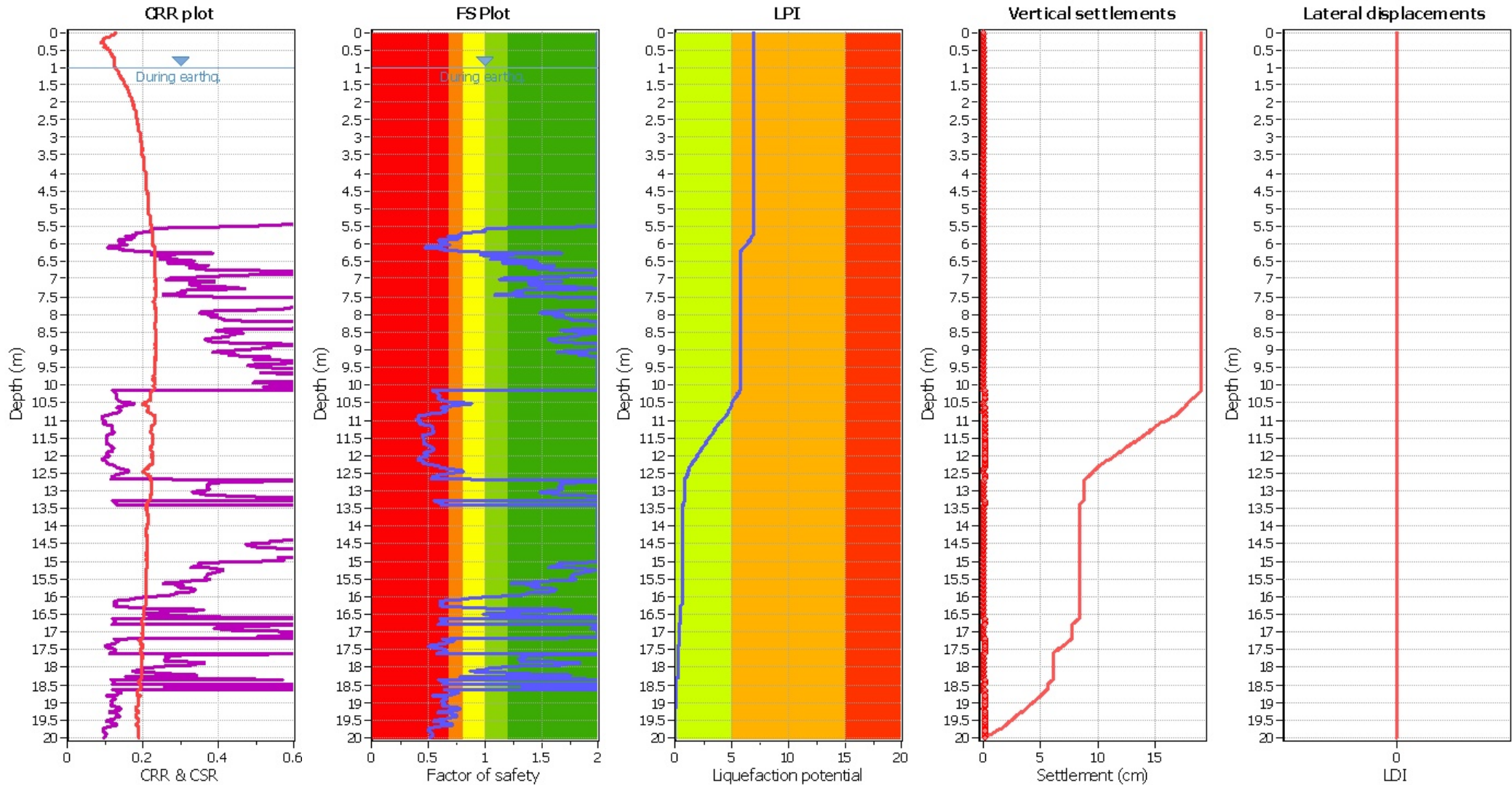- 🟧 High risk
- 🟨 Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

Liquefaction analysis overall plot

CRR plot — CRR & CSR

FS Plot — Factor of safety

LPI — Liquefaction potential

Vertical settlements — Settlement (cm)

Lateral displacements — LDI

Input parameters and analysis data

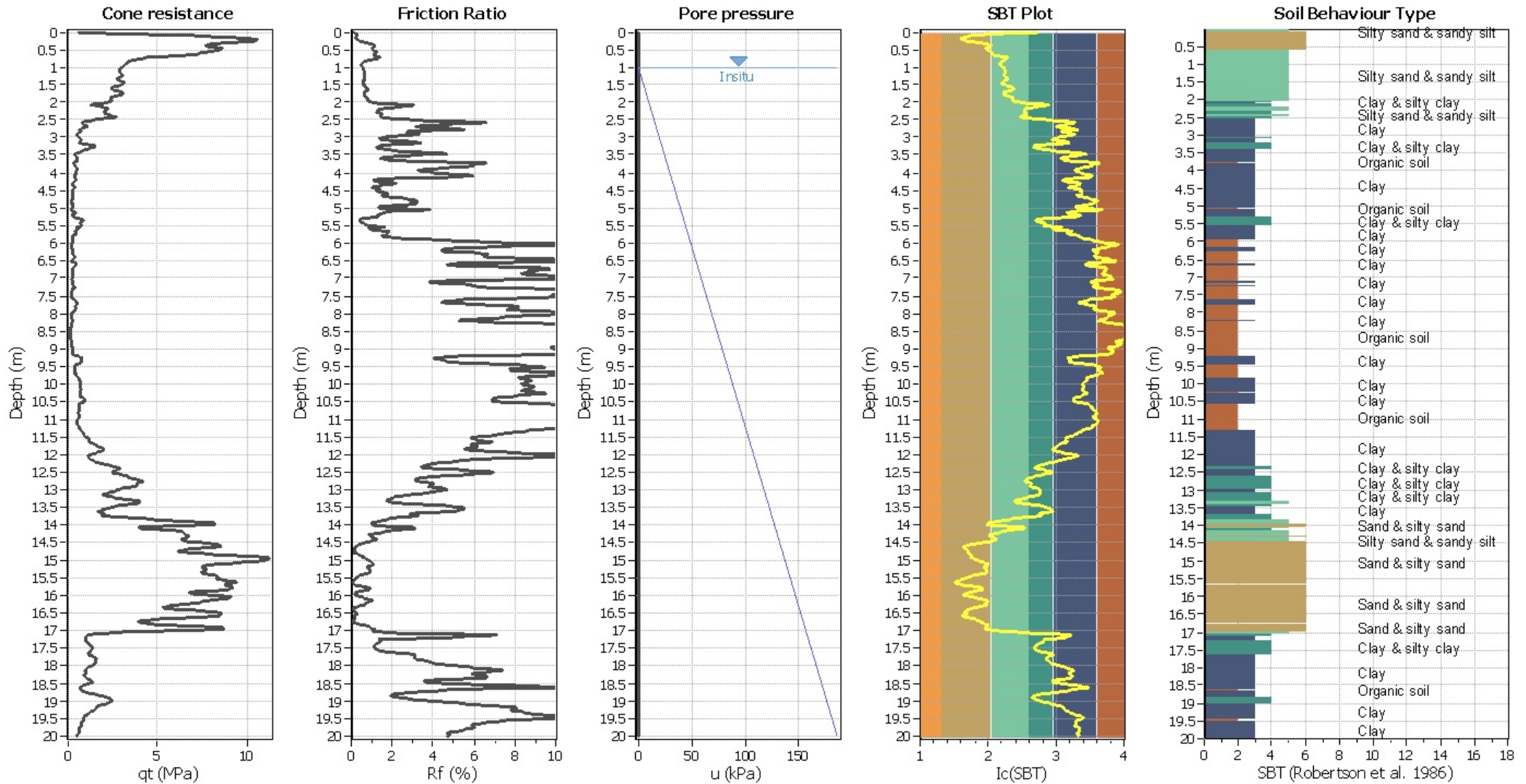|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K$_\sigma$ applied:	Yes
Earthquake magnitude M$_w$:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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

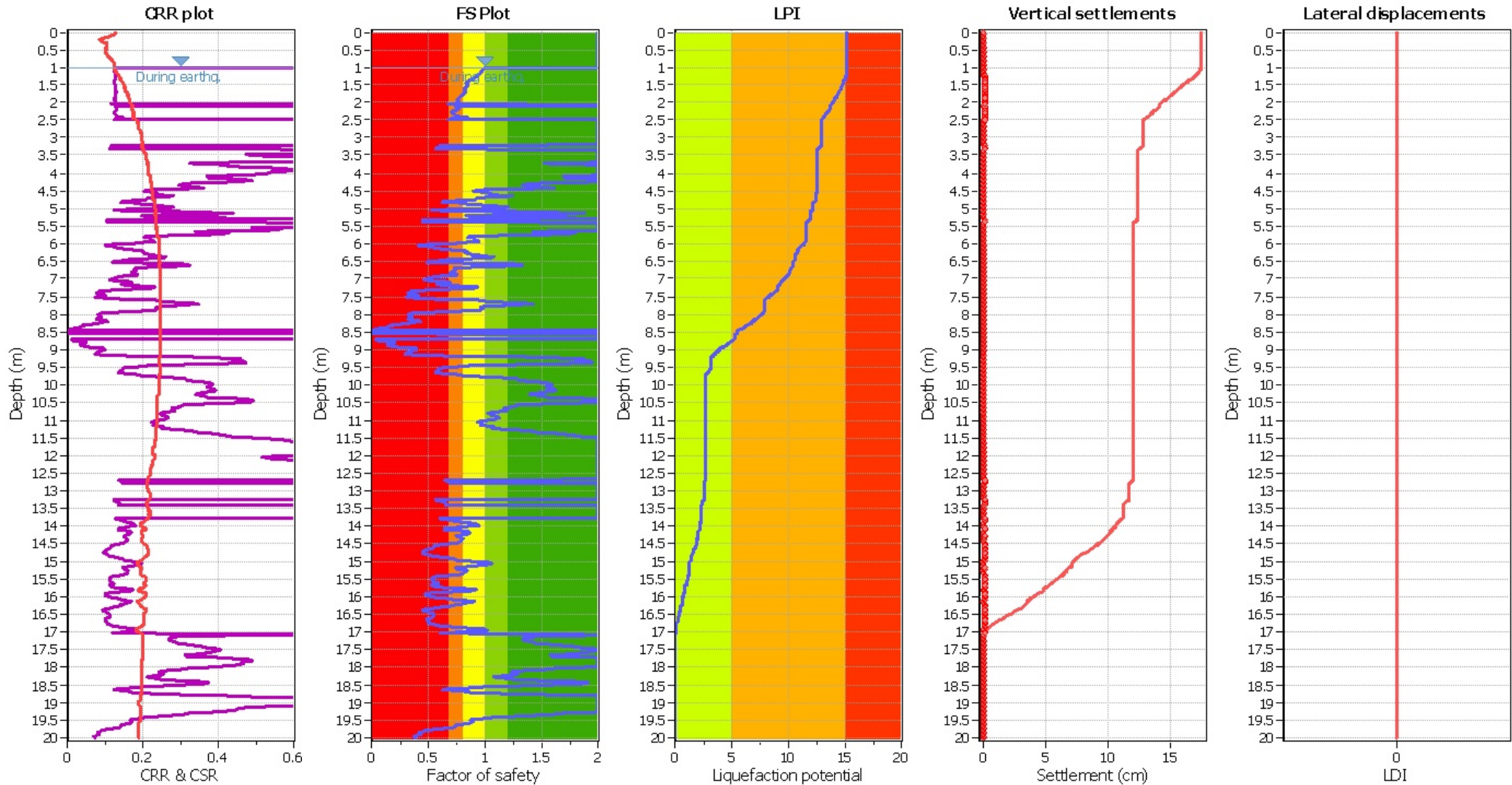**LPI color scheme**
- Very high risk
- High risk
- Low risk

CLiq v.2.1.6.11 - CPT Liquefaction Assessment Software - Report created on: 18/01/2019, 09:49:55
Project file: \\LACIE-2BIG-NAS\Public\Lavori\Microzonazione Camposanto\Relazione\CPTU_Camposanto.clq

48

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay

4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand

7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Liquefaction analysis overall plot

CRR plot — FS Plot — LPI — Vertical settlements — Lateral displacements

Input parameters and analysis data

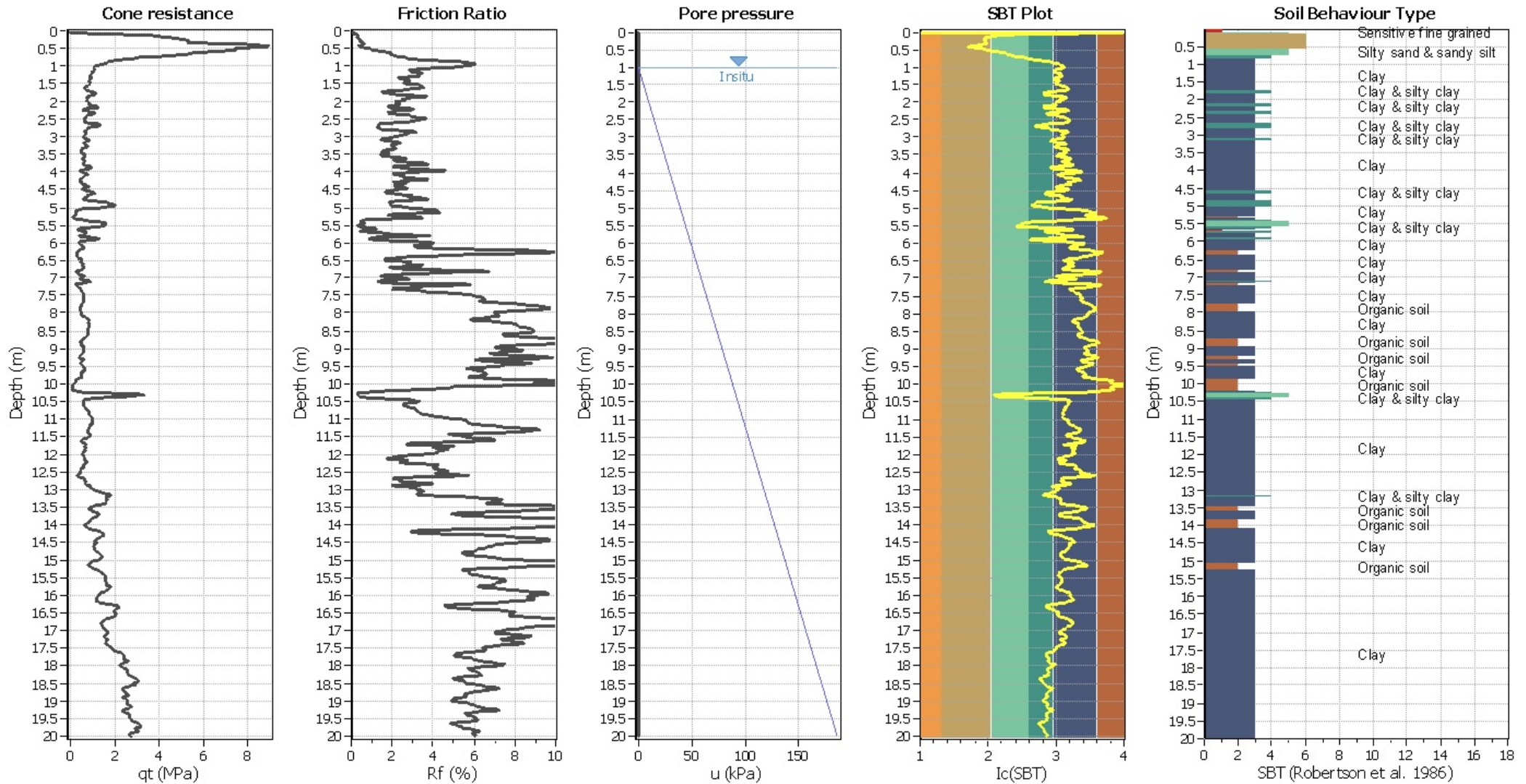|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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

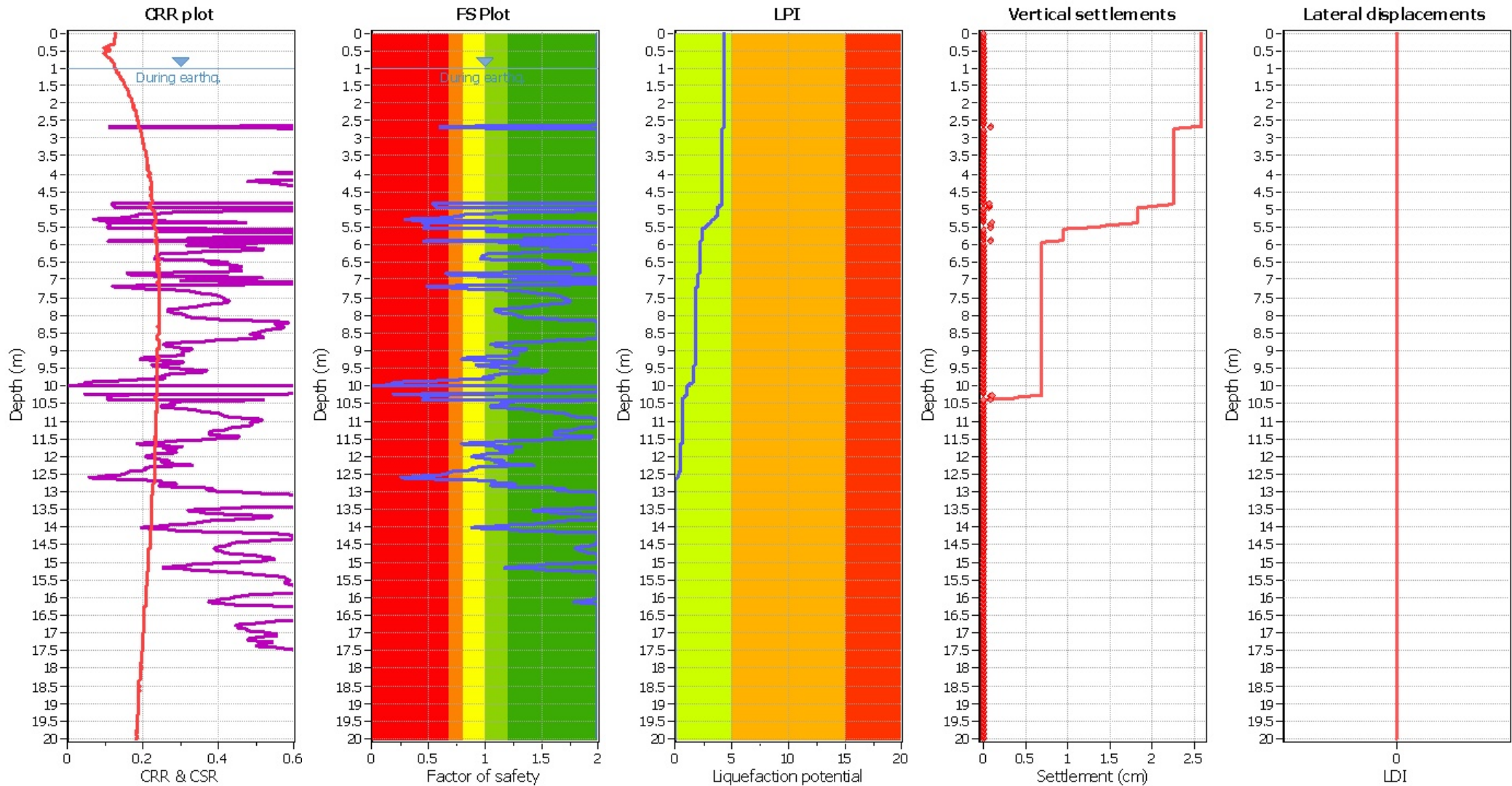CLiq v.2.1.6.11 - CPT Liquefaction Assessment Software - Report created on: 18/01/2019, 09:49:59
Project file: \\LACIE-2BIG-NAS\Public\Lavori\Microzonazione Camposanto\Relazione\CPTU_Camposanto.clq

50

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plot

CRR plot | **FS Plot** | **LPI** | **Vertical settlements** | **Lateral displacements**

Input parameters and analysis data

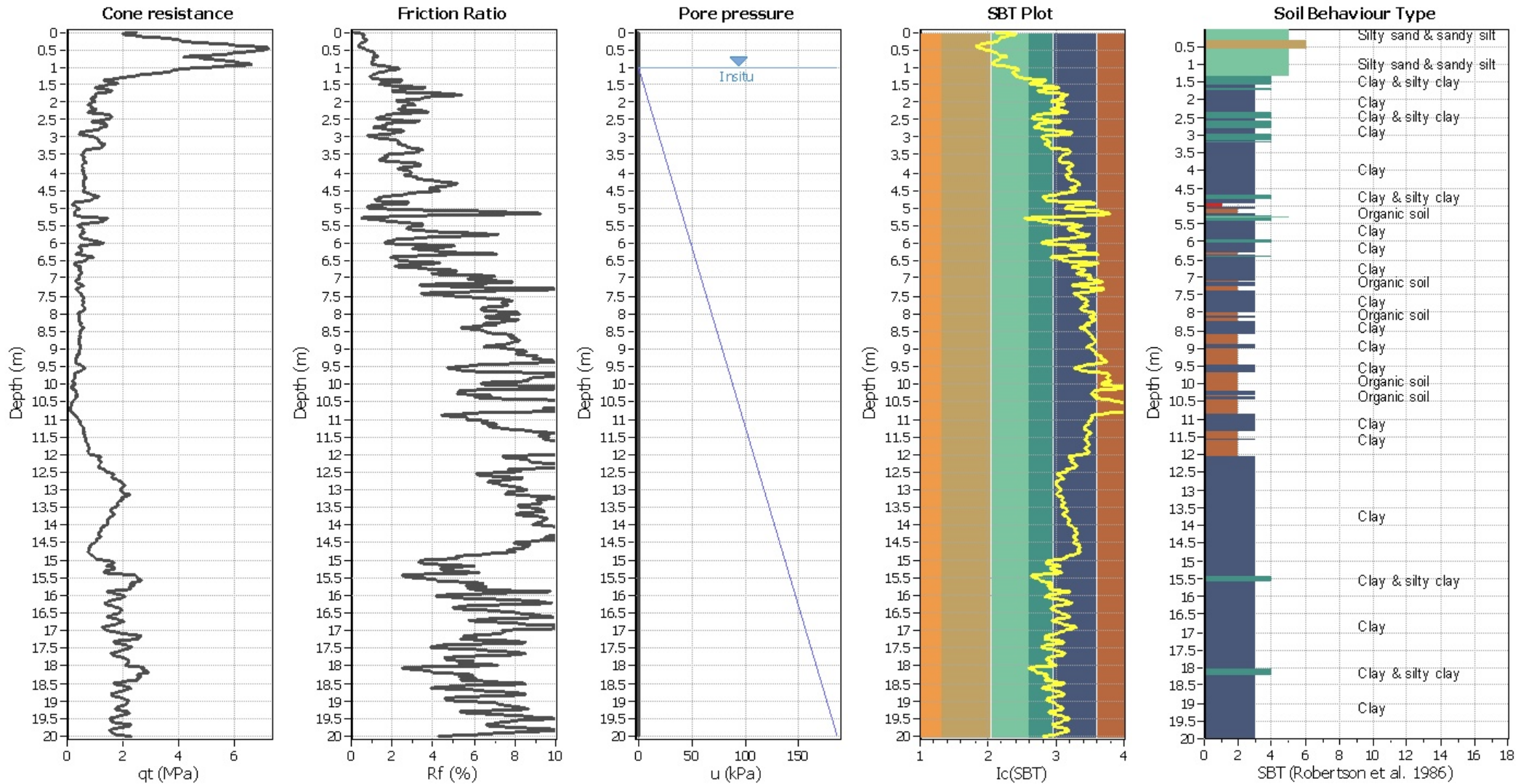|						
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A	
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No	
Points to test:	Based on Ic value	Ic cut-off value:	2.60	Kσ applied:	Yes	
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay	
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No	
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A	

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
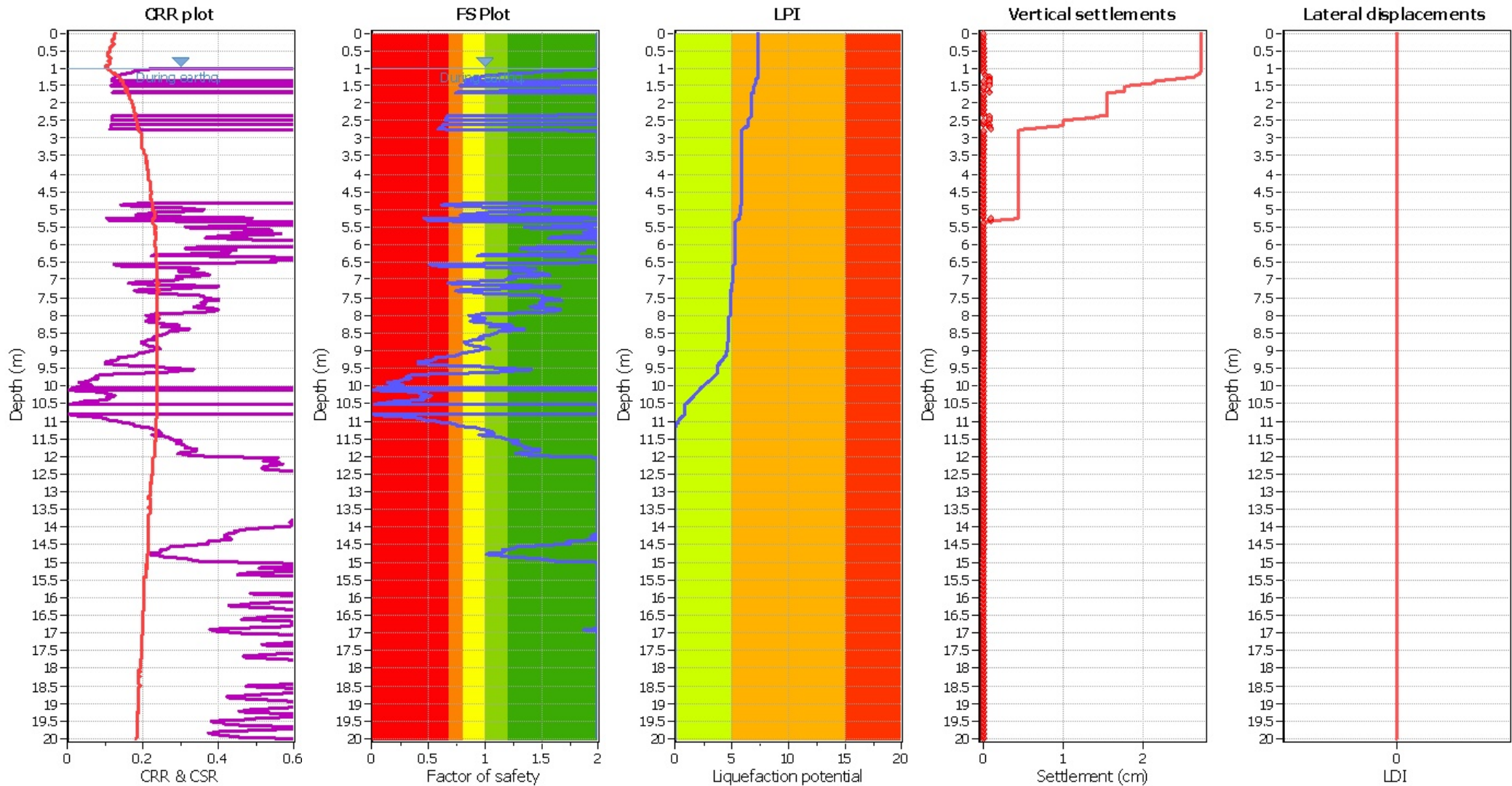- 🟧 High risk
- 🟨 Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plot

CRR plot — FS Plot — LPI — Vertical settlements — Lateral displacements

Input parameters and analysis data

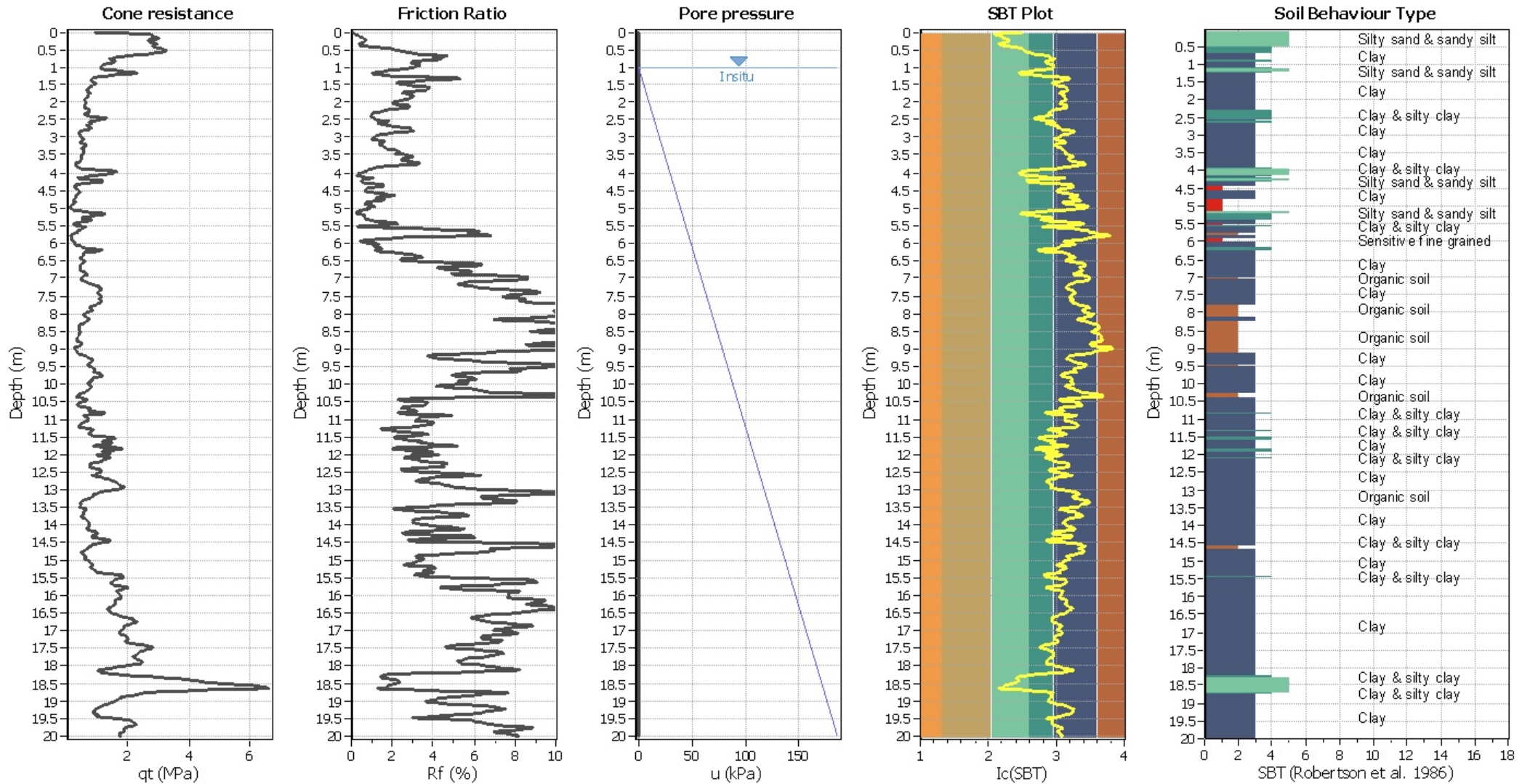|					
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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
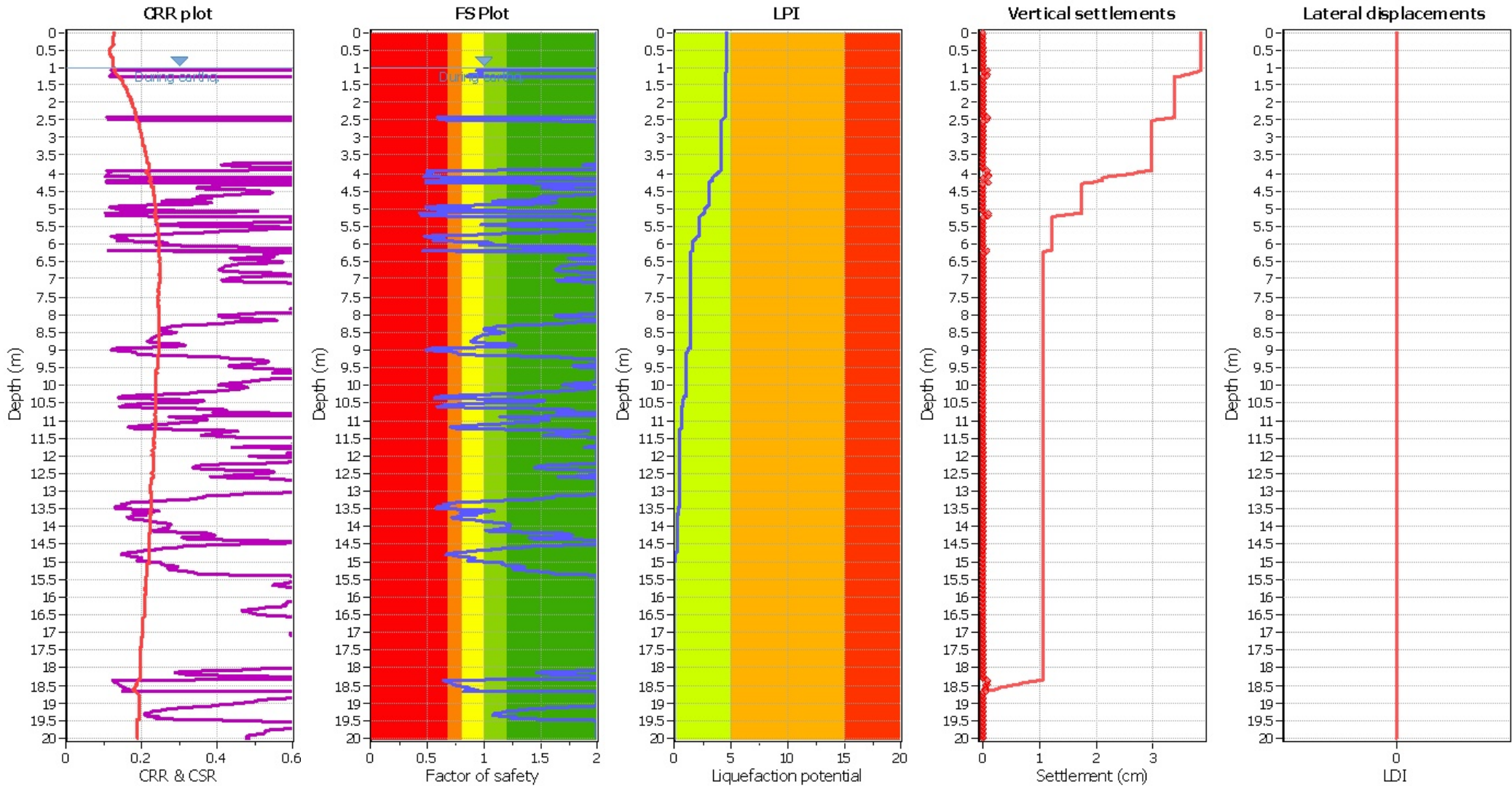- 🟨 Low risk

CPT basic interpretation plo

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	Kσ applied:	Yes
Earthquake magnitude Mw:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	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 clayey sand
■ 3. Clay to silty clay	■ 6. Clean sand to silty sand	■ 9. Very stiff fine grained

Liquefaction analysis overall plot

| CRR plot | FS Plot | LPI | Vertical settlements | Lateral displacements |

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	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:	6.14	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.23	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.00 m	Fill height:	N/A	Limit depth:	N/A

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