

ALLEGATO N. 5

VERIFICHE DI LIQUEFAZIONE

LIQUEFACTION ANALYSIS REPORT

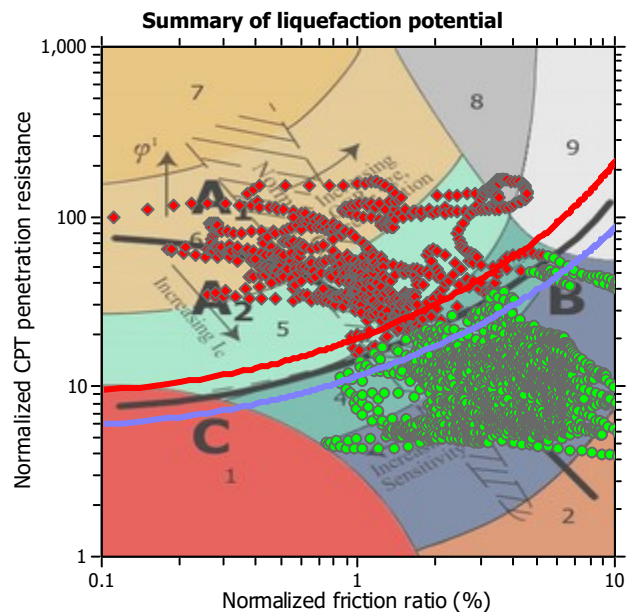
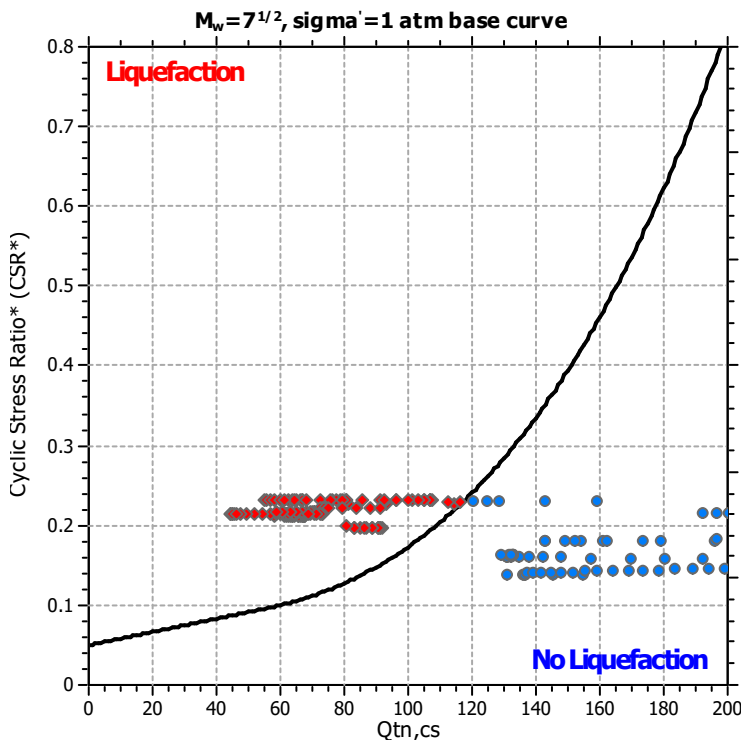
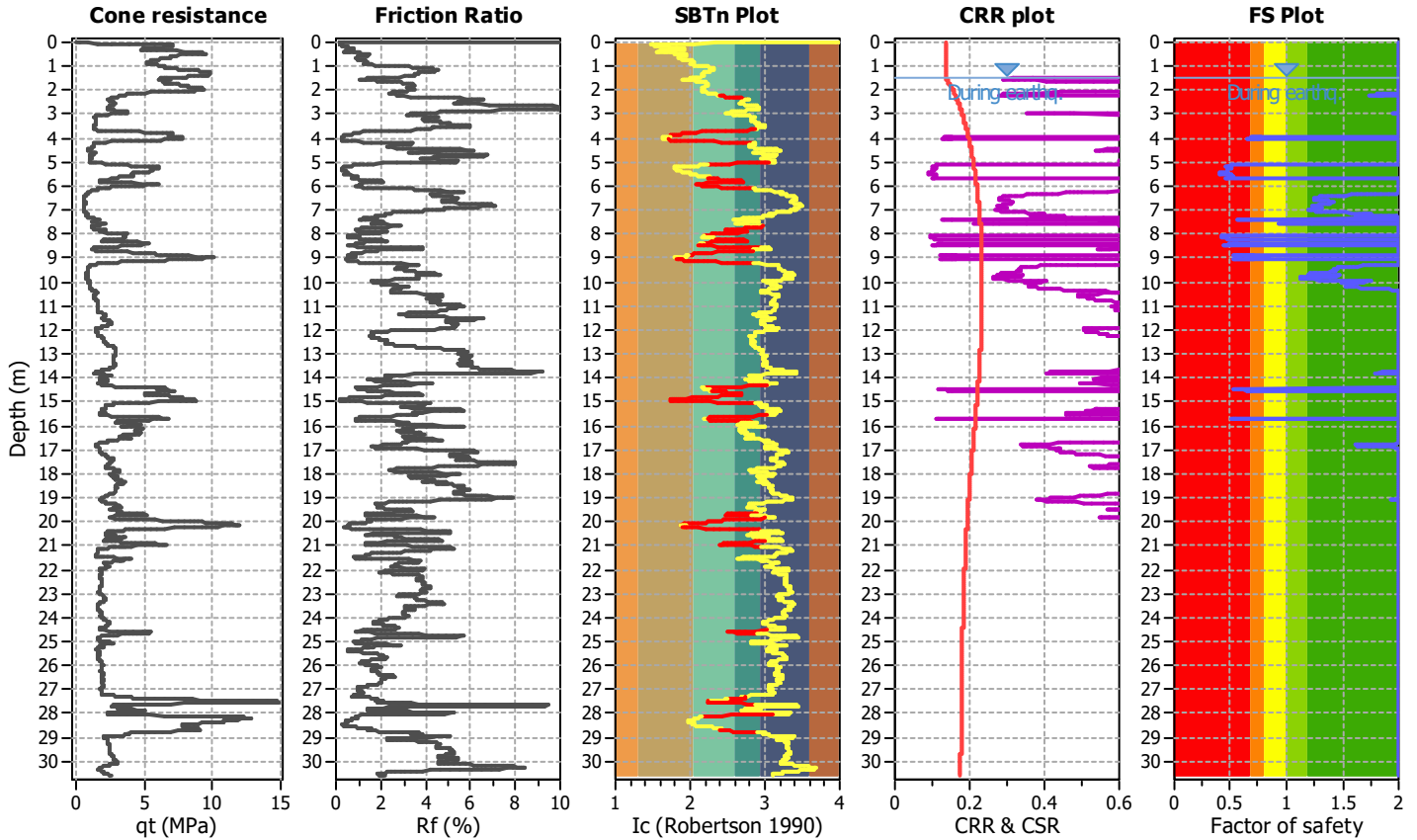
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P51

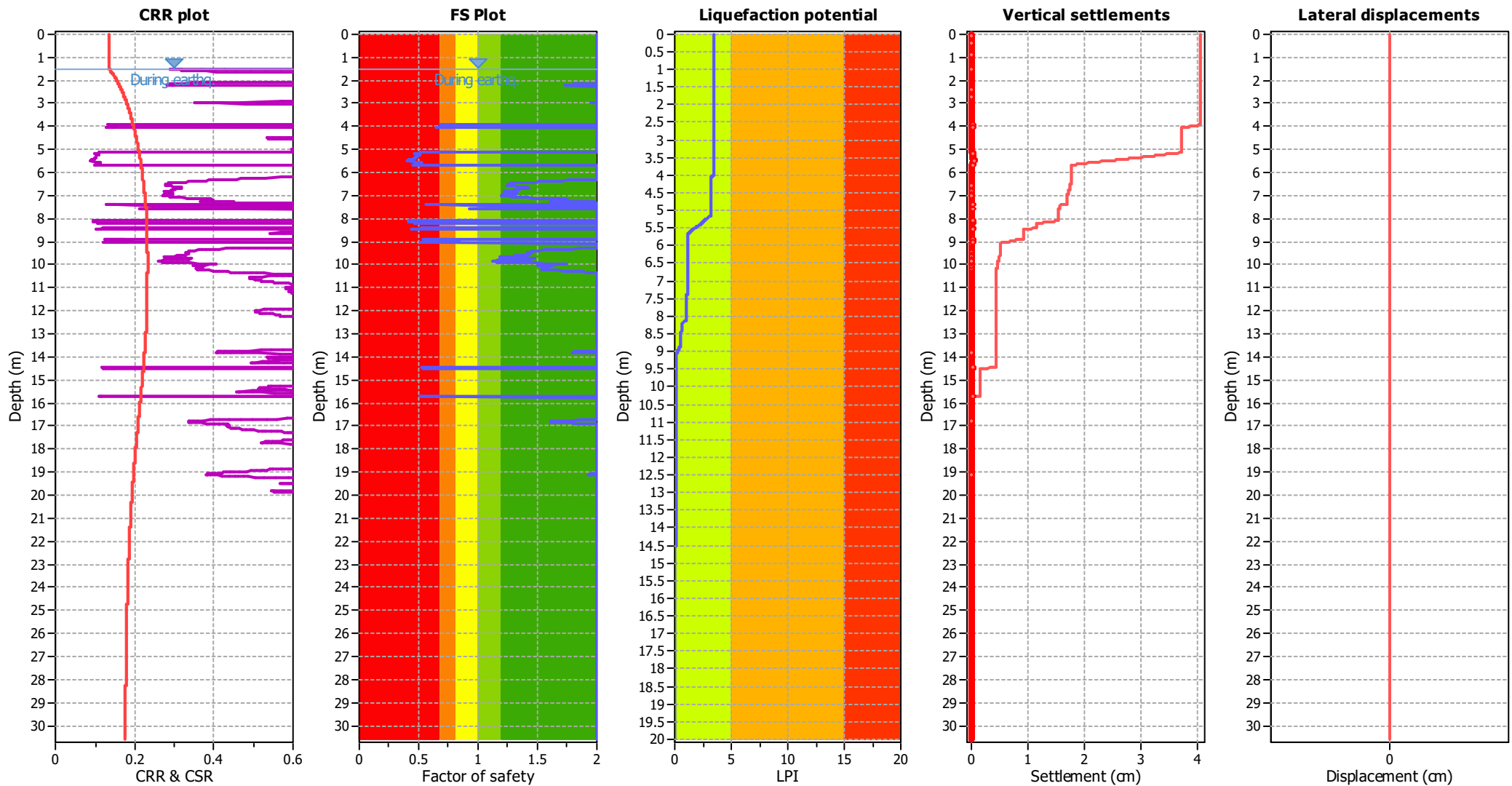
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	3.50 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	20.00 m
Peak ground acceleration:	0.29	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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_v applied:	Yes
Earthquake magnitude M_w :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.29	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.50 m	Fill height:	N/A	Limit depth:	20.00 m

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

LIQUEFACTION ANALYSIS REPORT

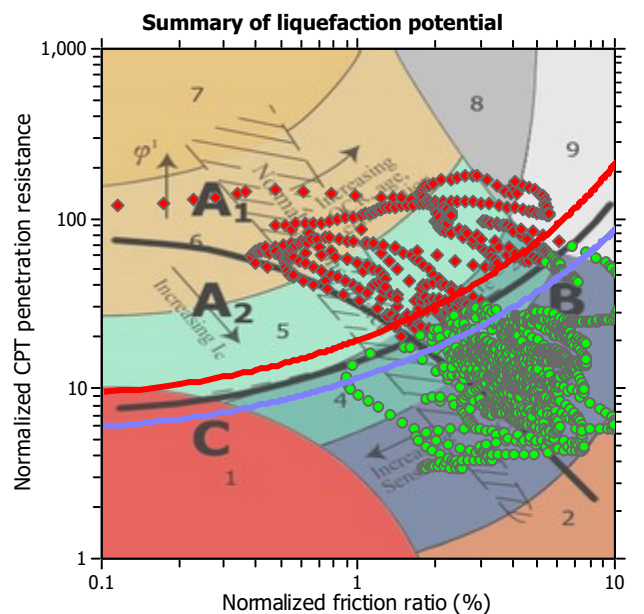
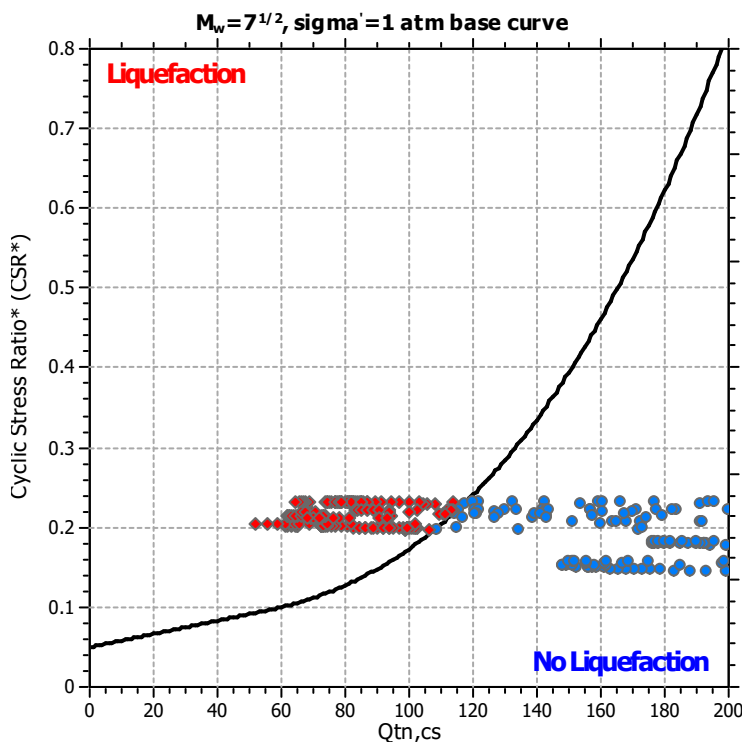
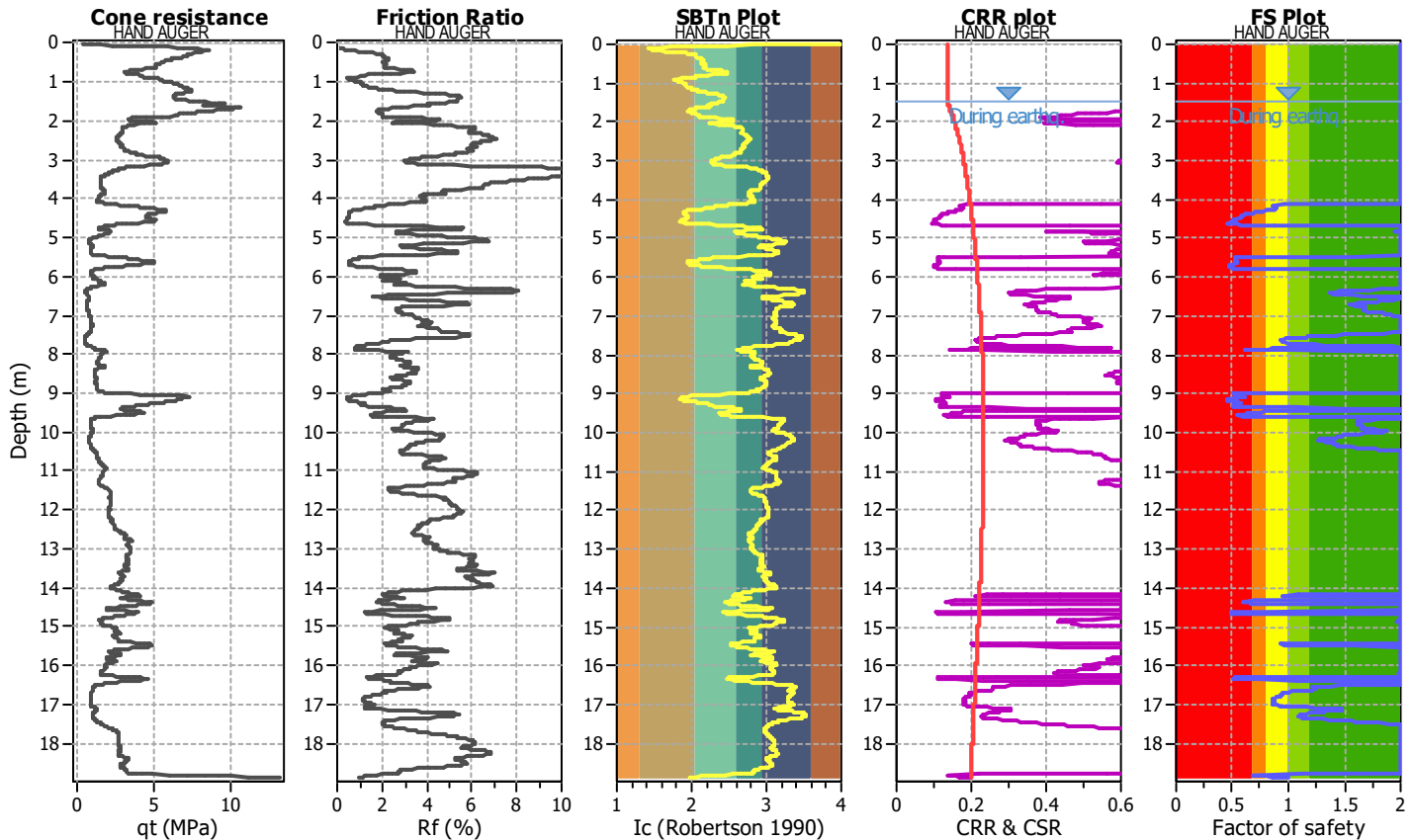
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P5

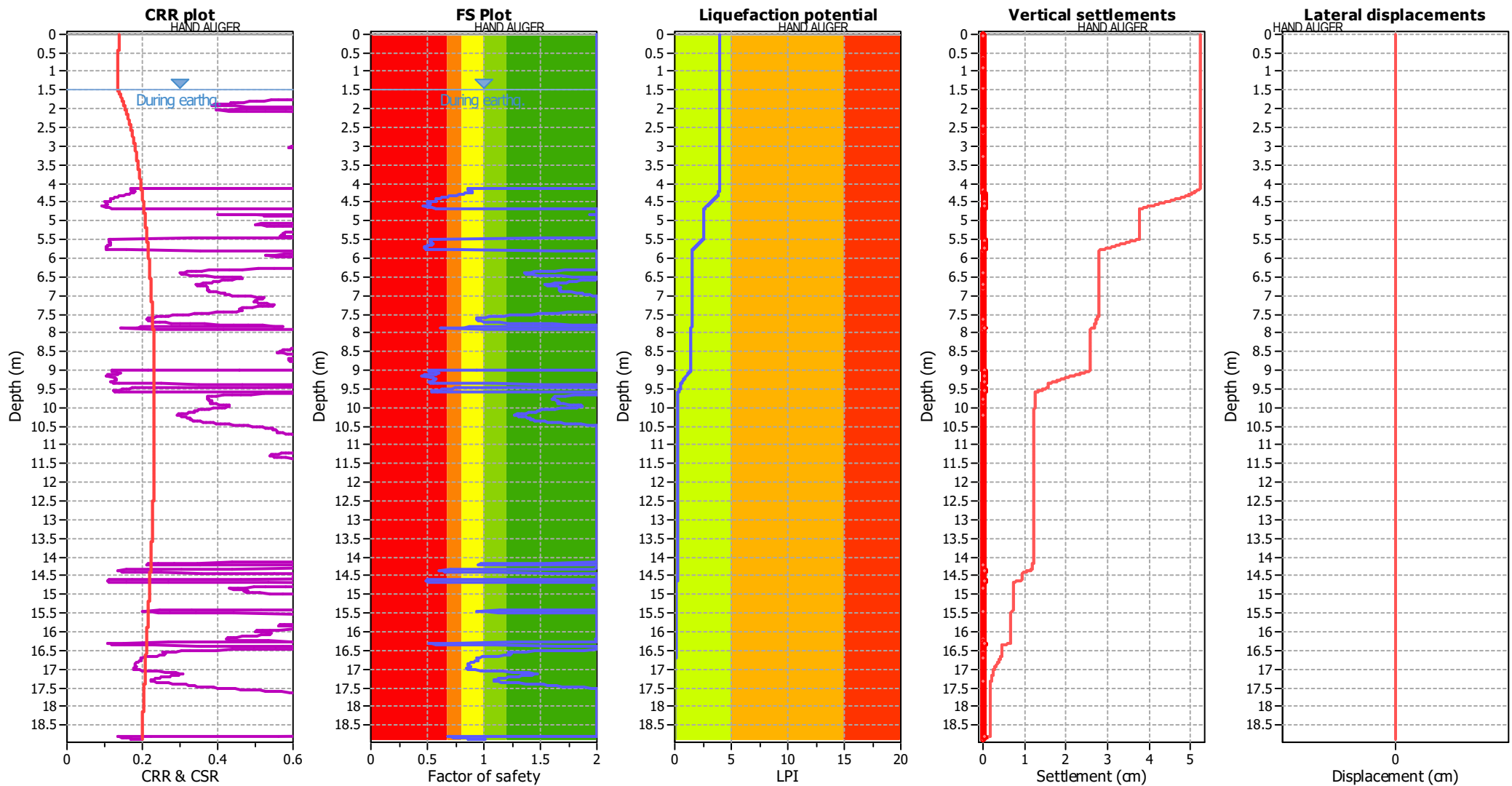
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	2.30 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	20.00 m
Peak ground acceleration:	0.29	Unit weight calculation:	Based on SBT	K_u 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _s applied:	Yes
Earthquake magnitude M _w :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.29	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.30 m	Fill height:	N/A	Limit depth:	20.00 m

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

LIQUEFACTION ANALYSIS REPORT

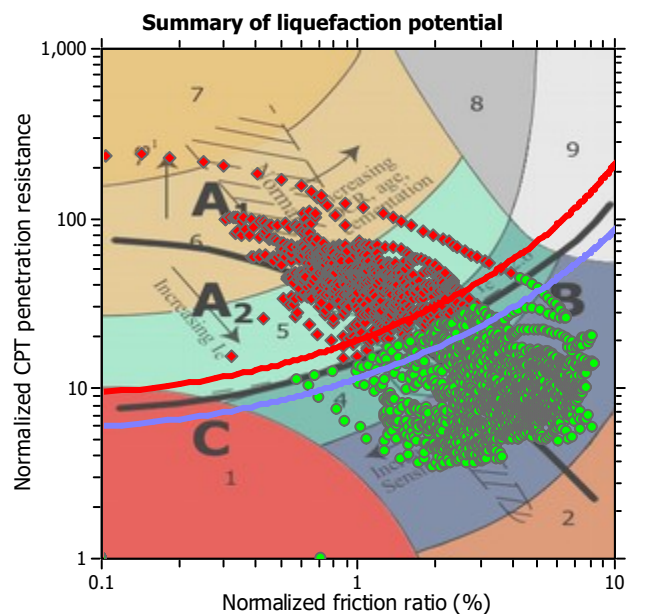
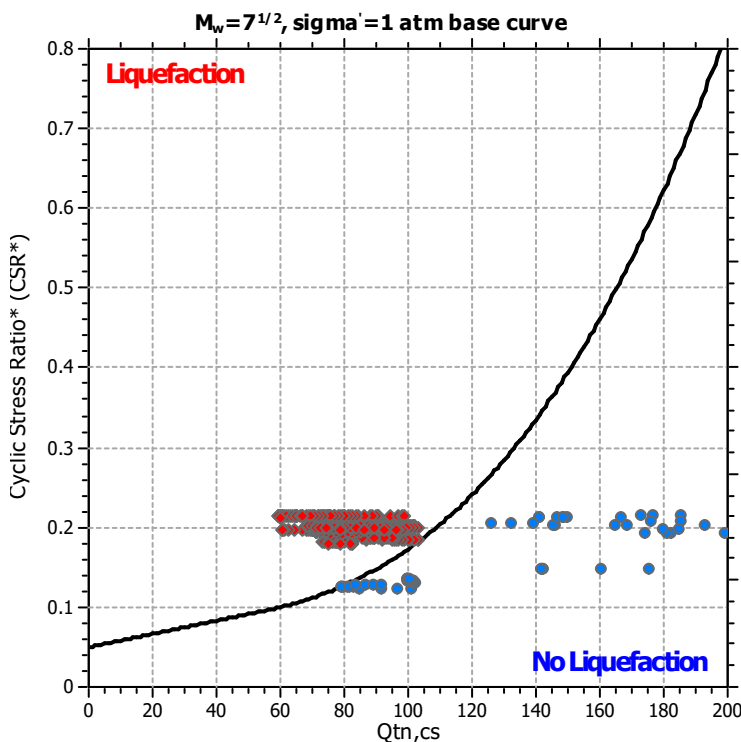
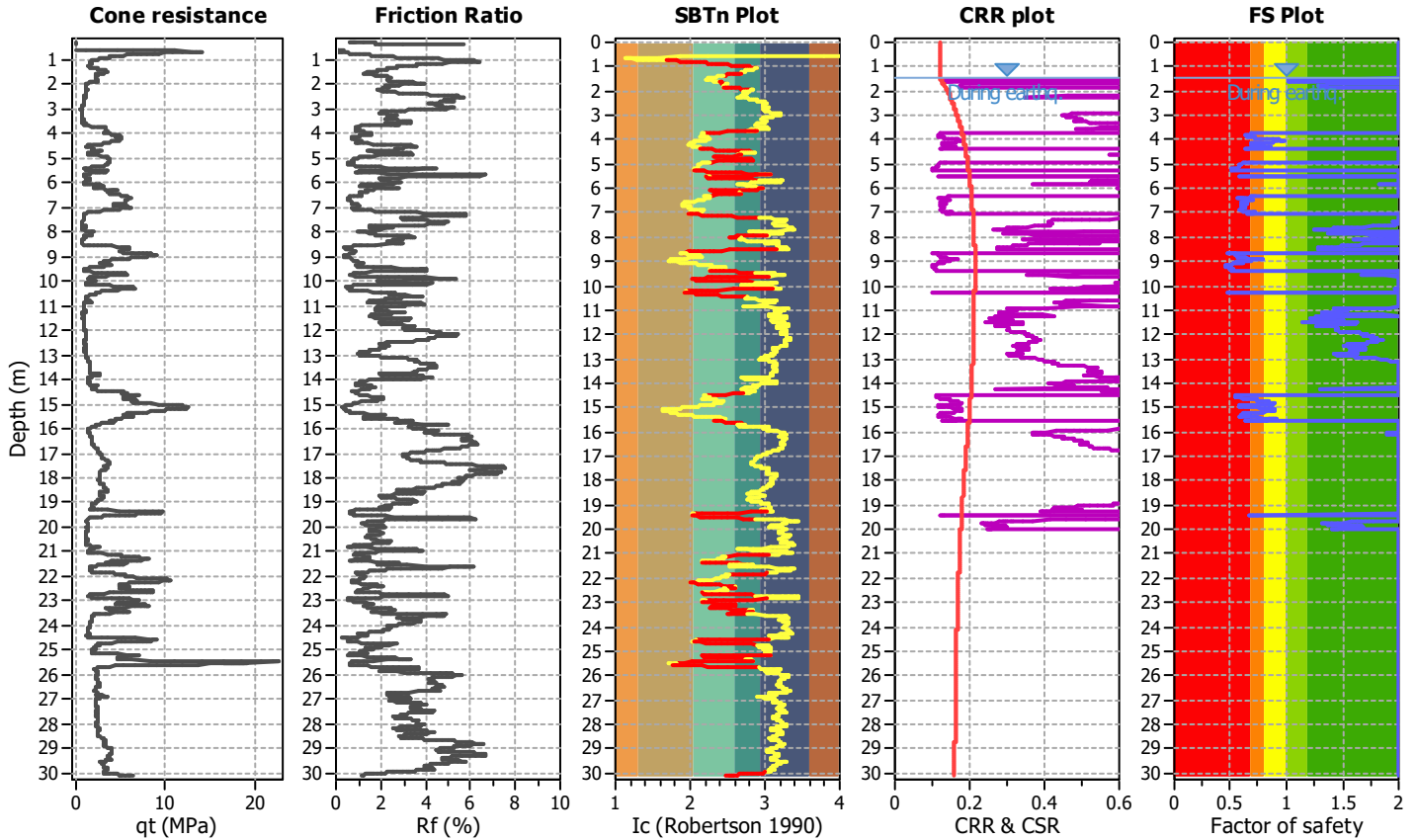
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P52

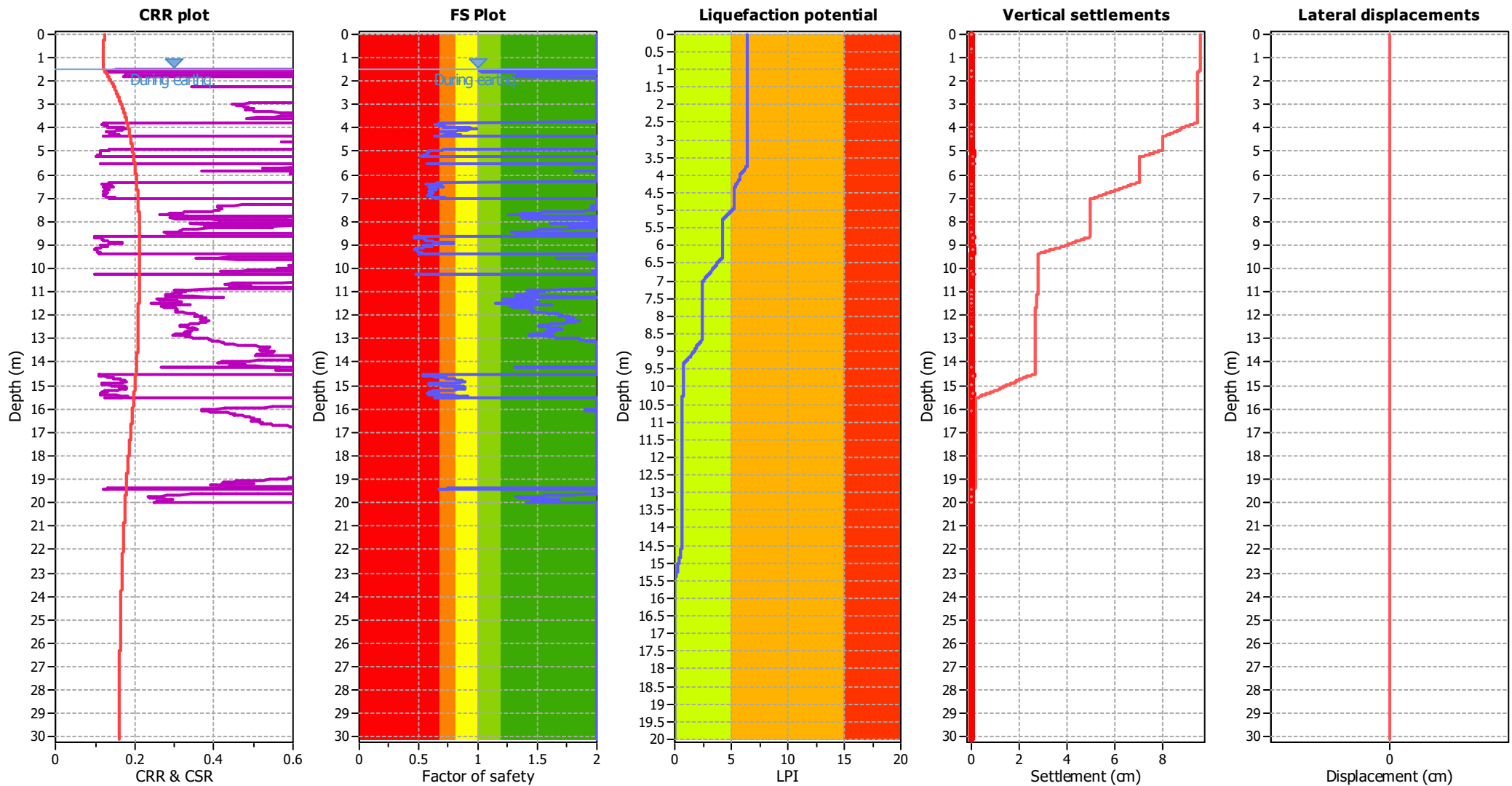
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	2.80 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	20.00 m
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_u 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _s applied:	Yes
Earthquake magnitude M _w :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.80 m	Fill height:	N/A	Limit depth:	20.00 m

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

LIQUEFACTION ANALYSIS REPORT

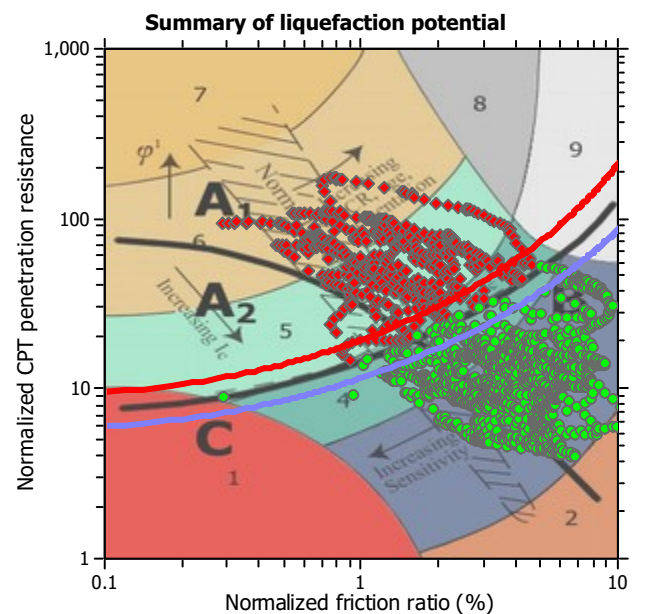
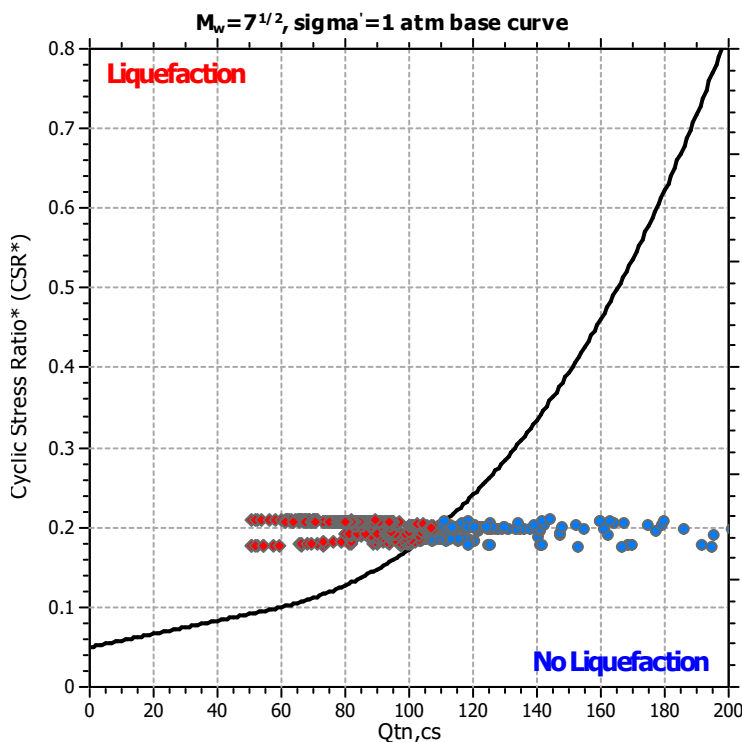
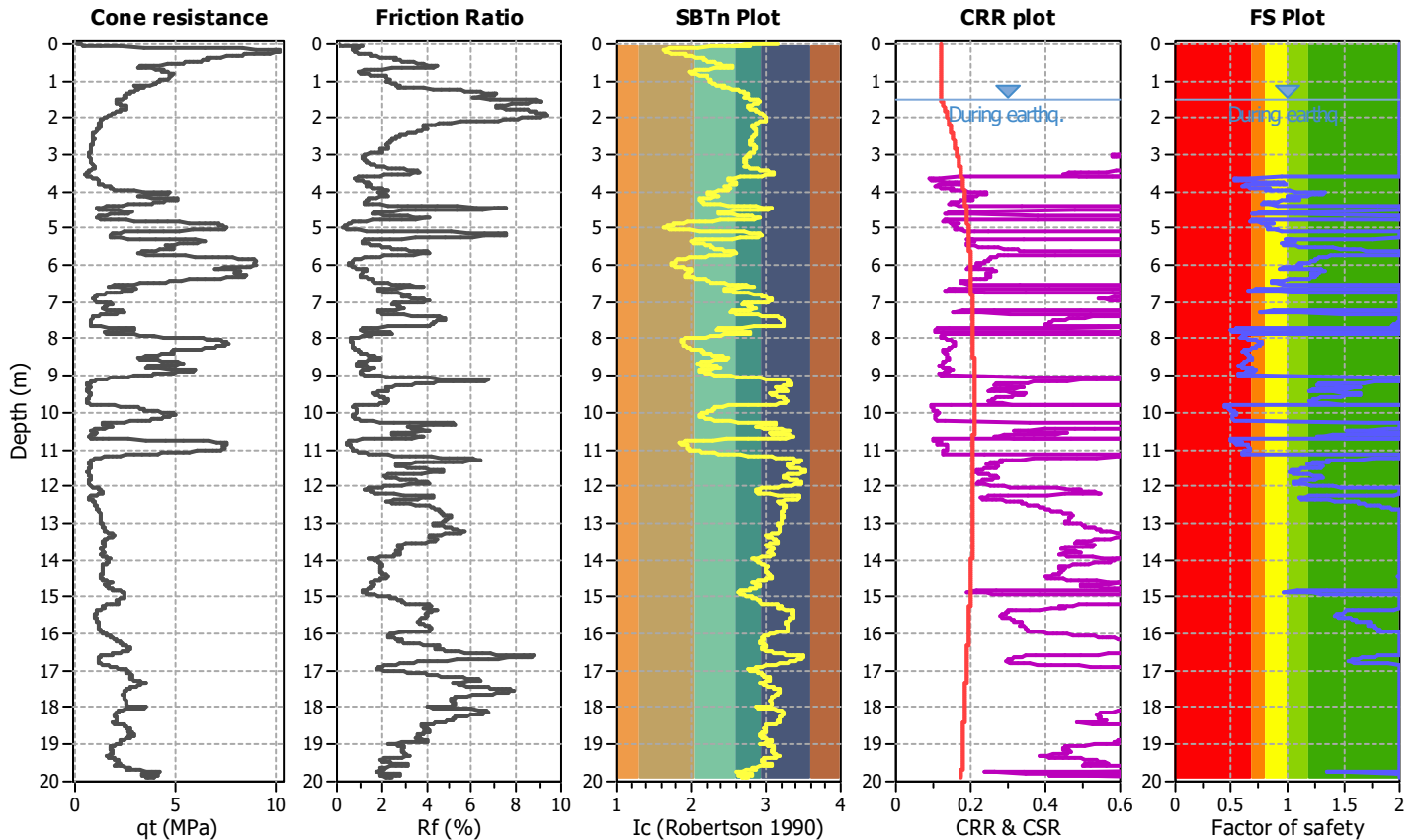
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P3

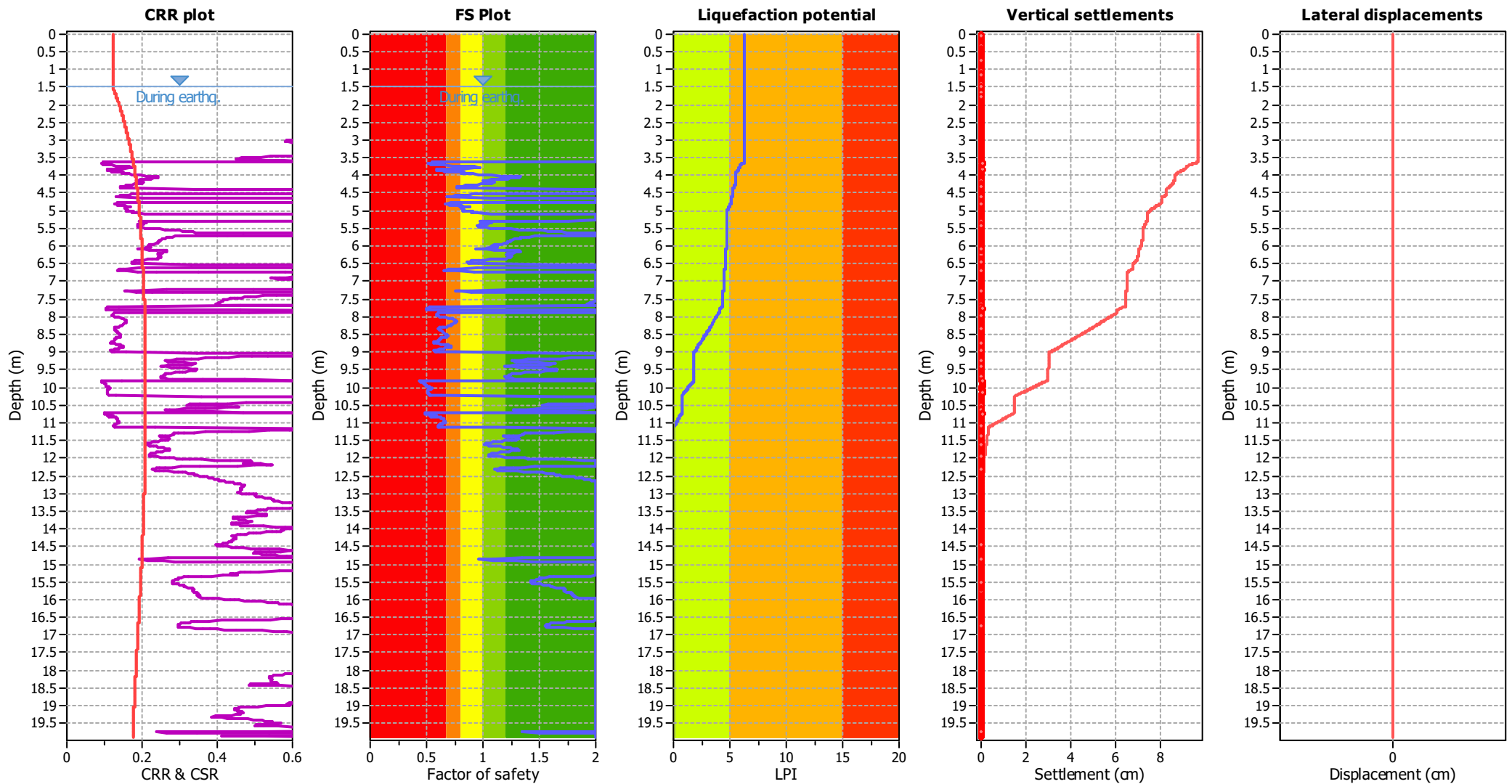
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	2.30 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	20.00 m
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_u 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method: Robertson (2009)
Fines correction method: Robertson (2009)
Points to test: Based on Ic value
Earthquake magnitude M_w : 6.16
Peak ground acceleration: 0.26
Depth to water table (insitu): 2.30 m

Depth to water table (earthq.): 1.50 m
Average results interval: 5
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_0 applied: Yes
Clay like behavior applied: All soils
Limit depth applied: Yes
Limit depth: 20.00 m

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

LIQUEFACTION ANALYSIS REPORT

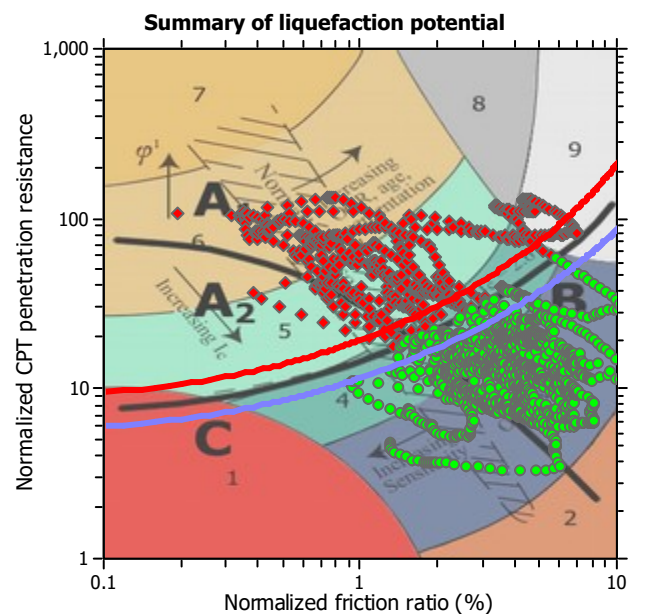
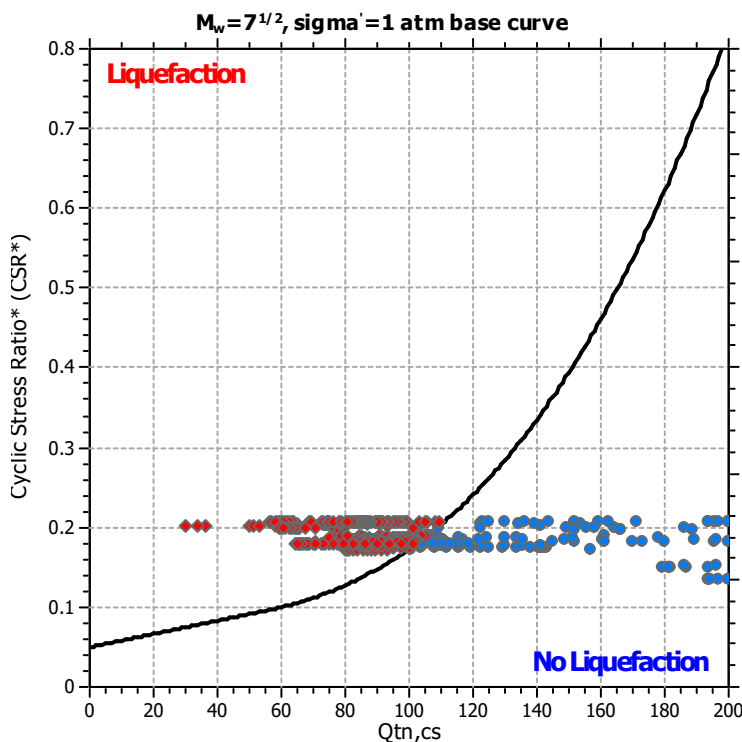
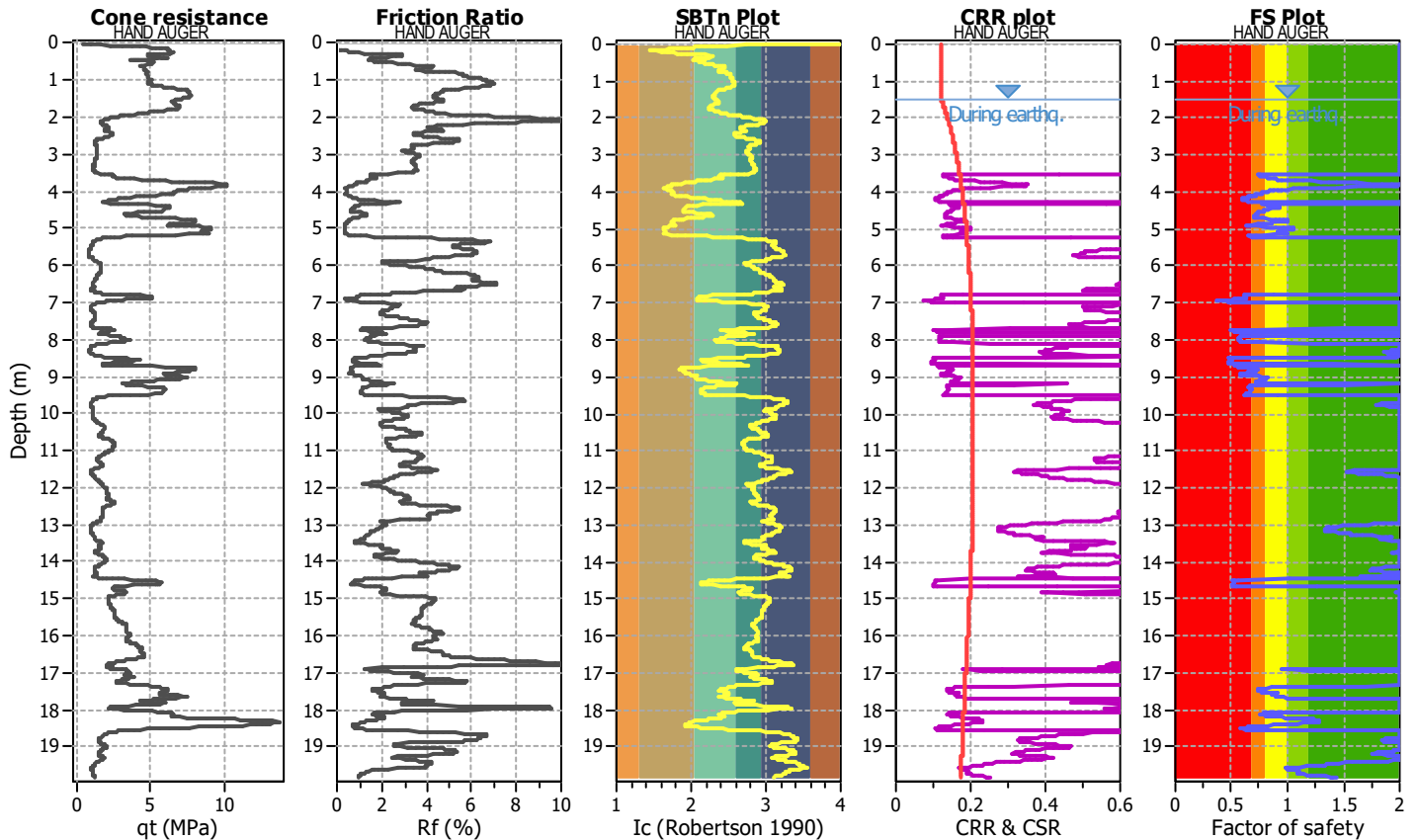
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P6

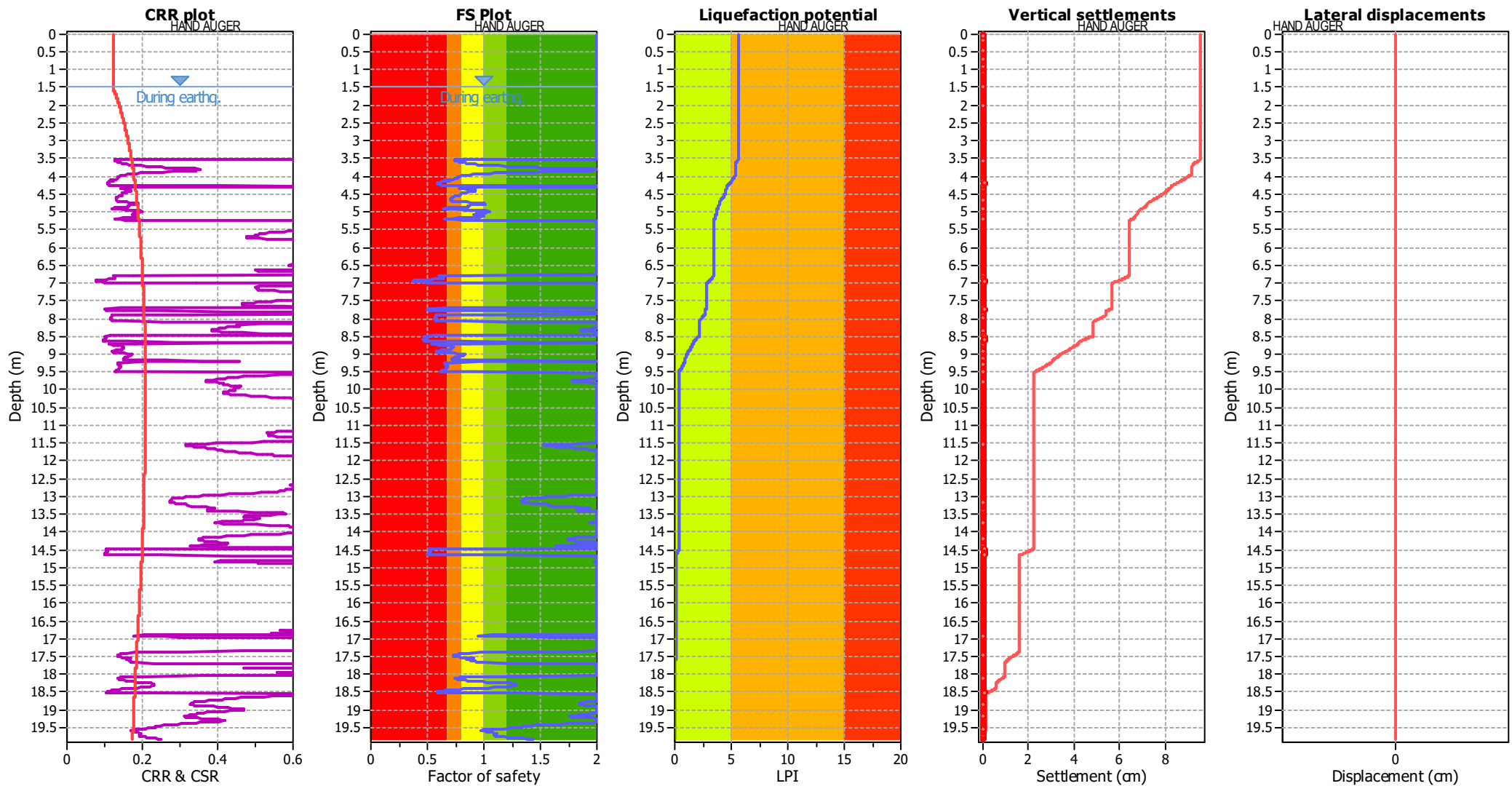
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	2.70 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	20.00 m
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_u 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _s applied:	Yes
Earthquake magnitude M _w :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.70 m	Fill height:	N/A	Limit depth:	20.00 m

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

LIQUEFACTION ANALYSIS REPORT

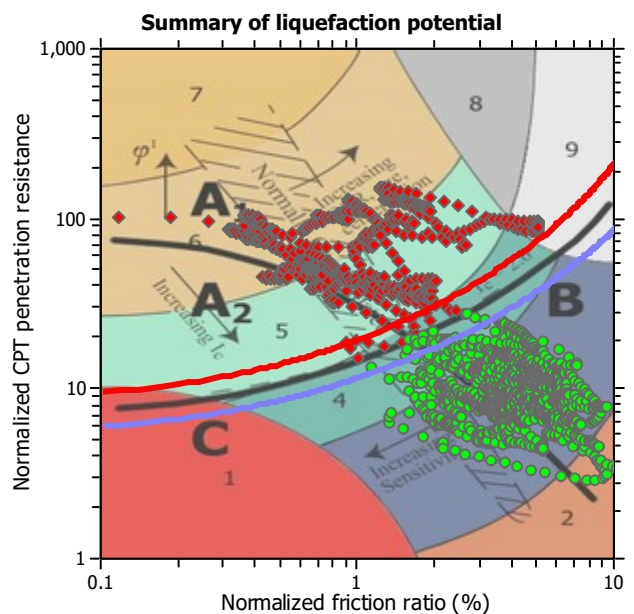
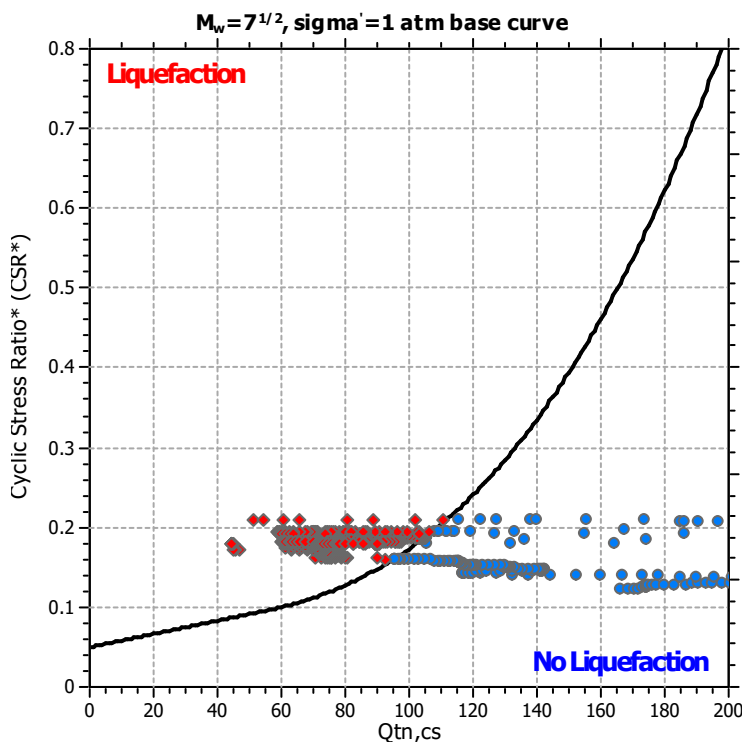
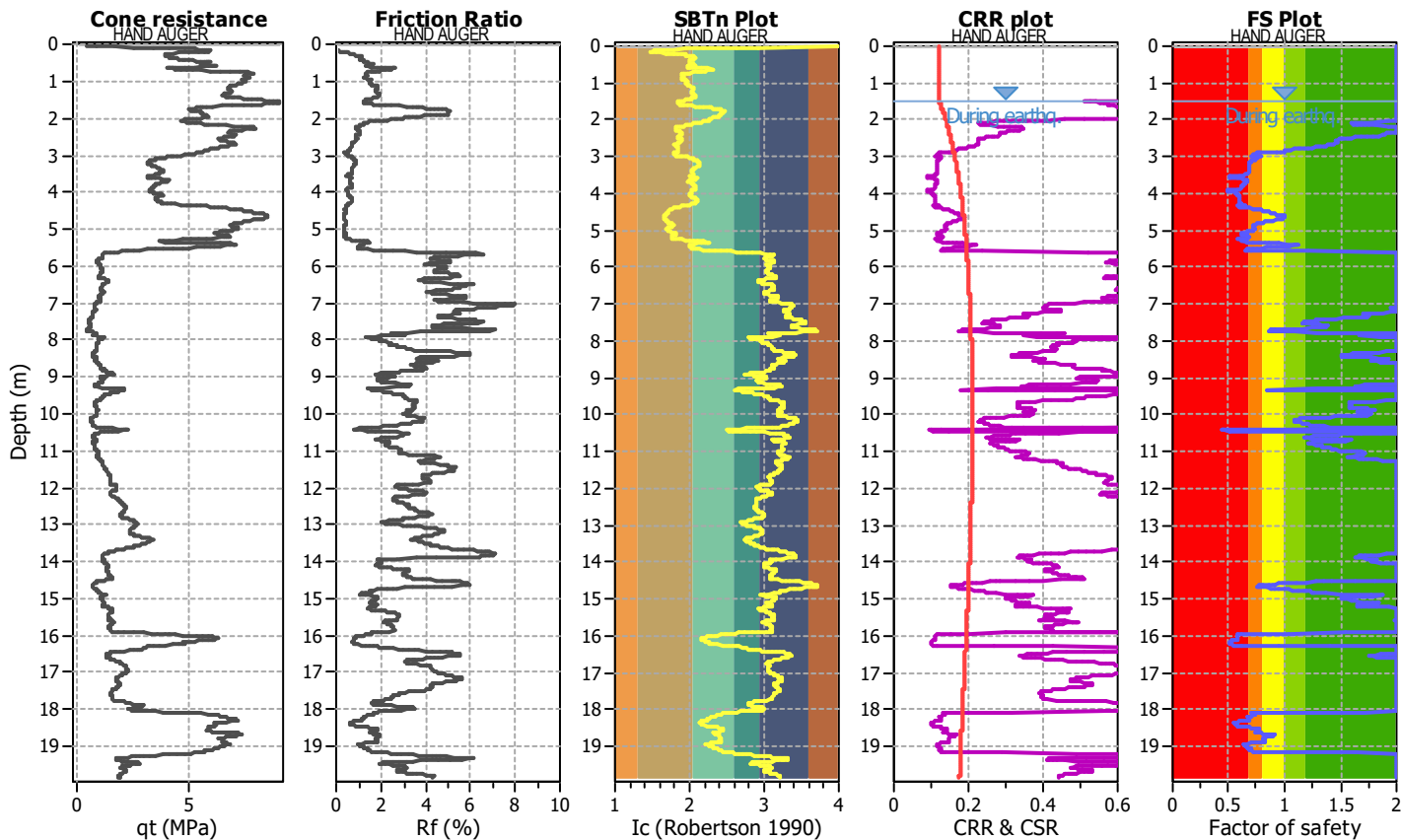
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P7

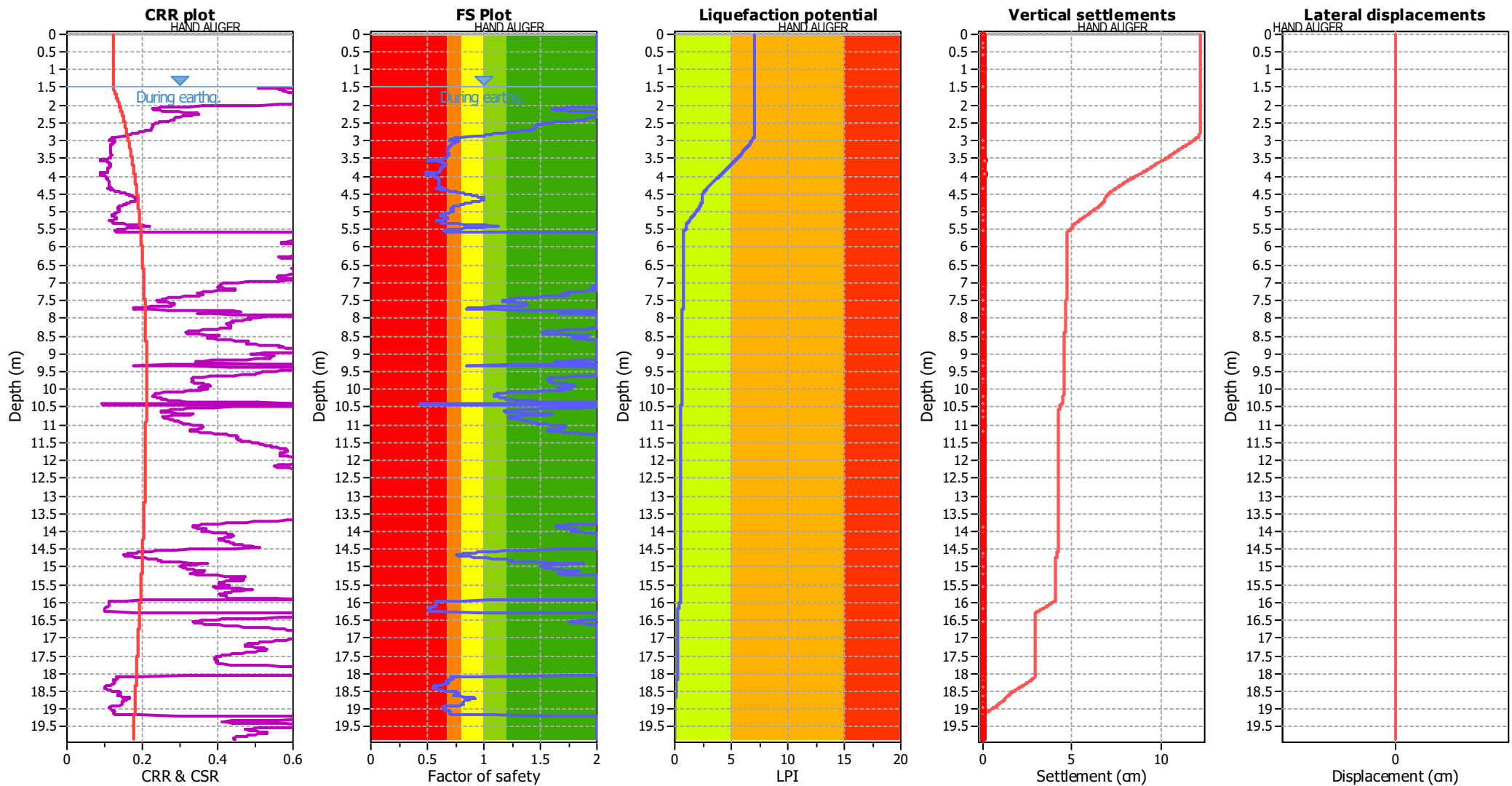
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	2.80 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	20.00 m
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_u applied:	Yes	MSF method:	Method based



Zone A: 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _s applied:	Yes
Earthquake magnitude M _w :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.80 m	Fill height:	N/A	Limit depth:	20.00 m

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

LIQUEFACTION ANALYSIS REPORT

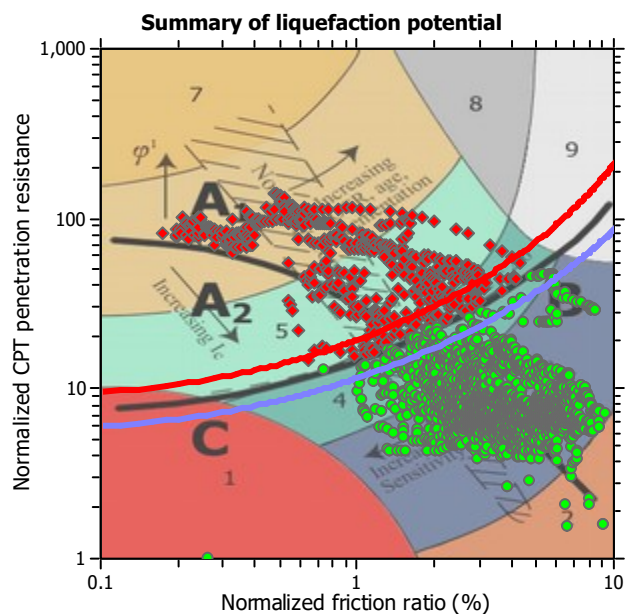
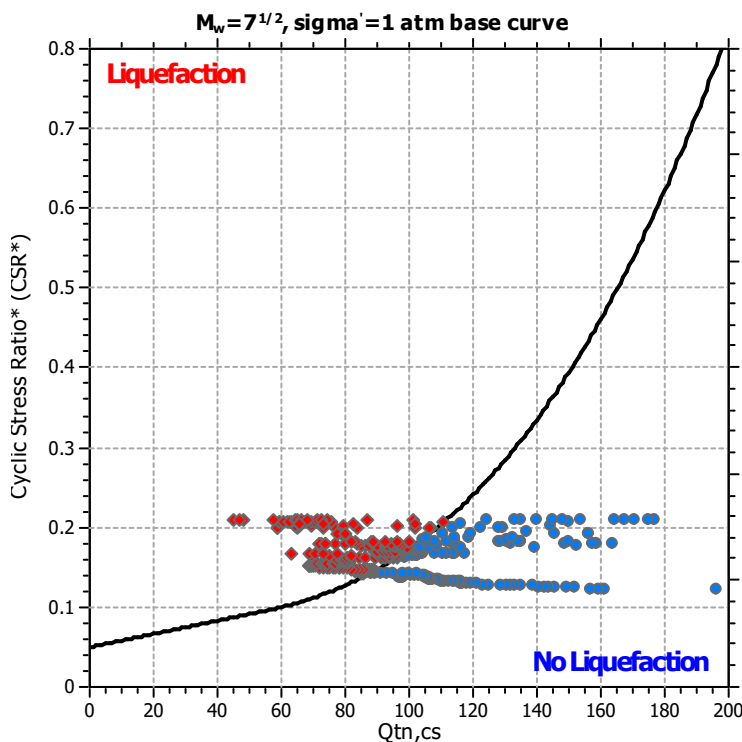
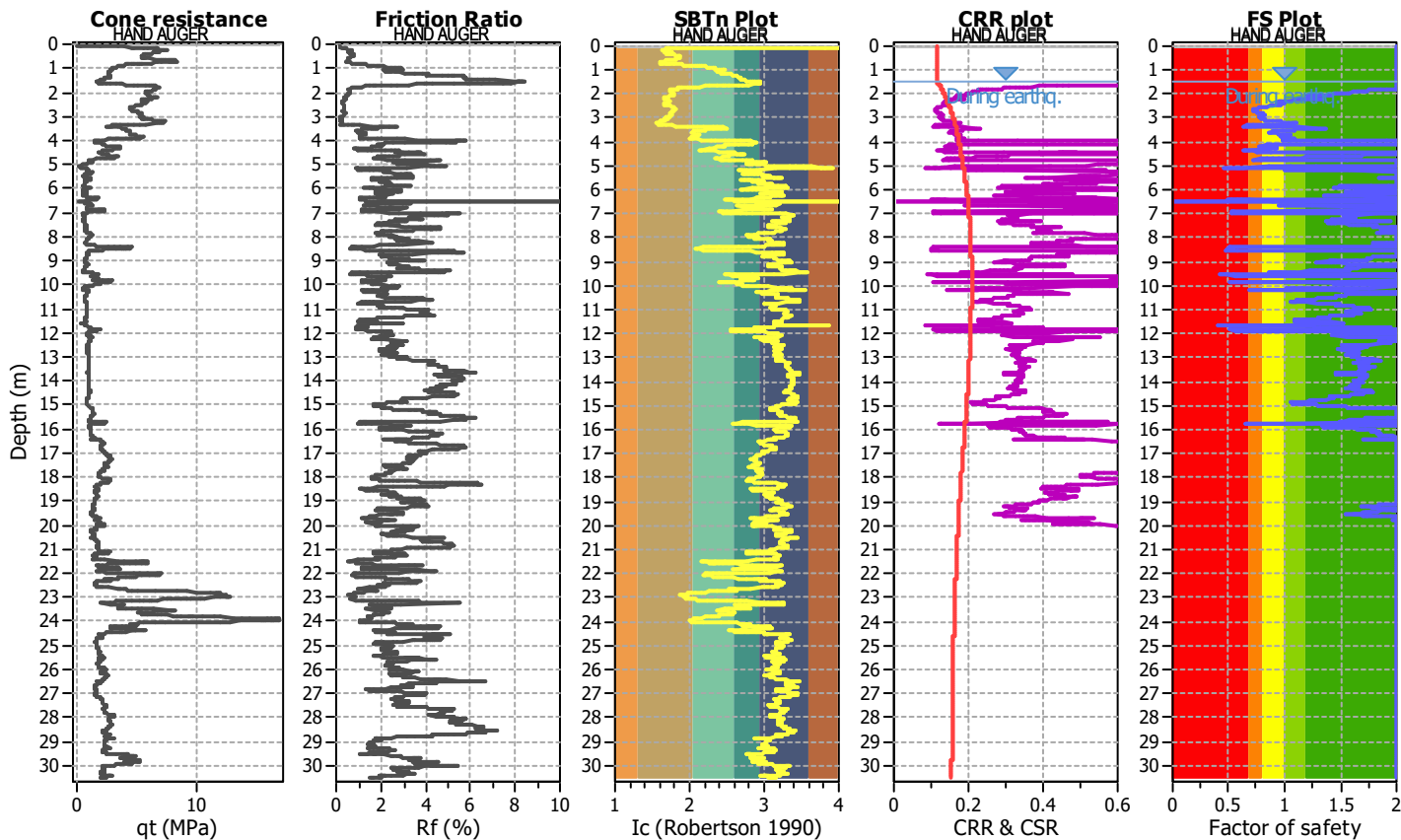
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P53

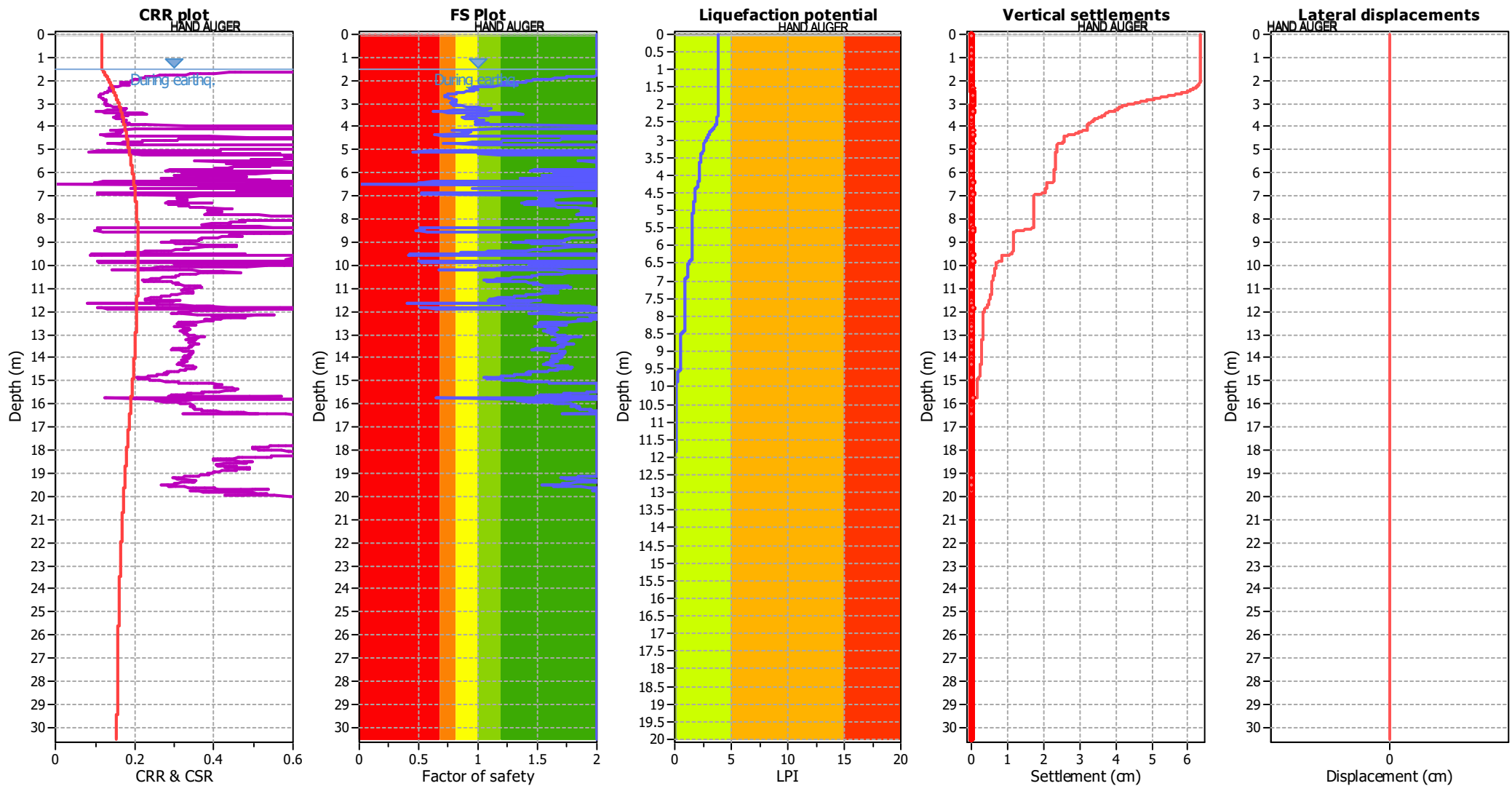
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	2.30 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	20.00 m
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_u 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_s applied:	Yes
Earthquake magnitude M_w :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.25	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.30 m	Fill height:	N/A	Limit depth:	20.00 m

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

LIQUEFACTION ANALYSIS REPORT

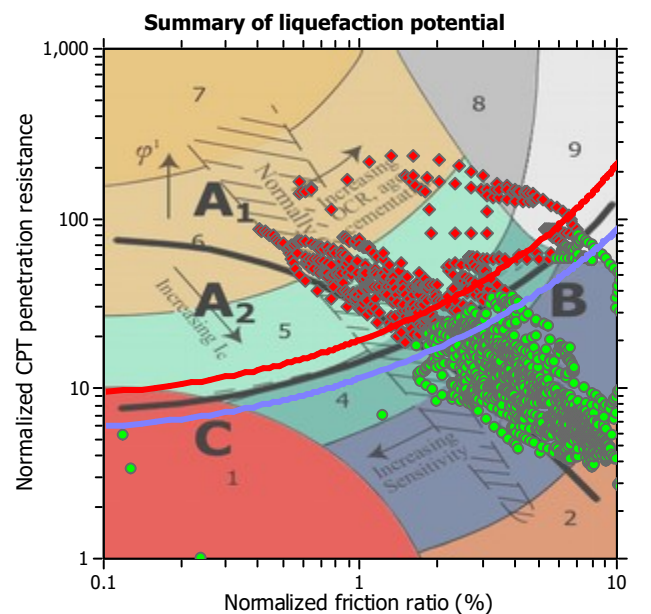
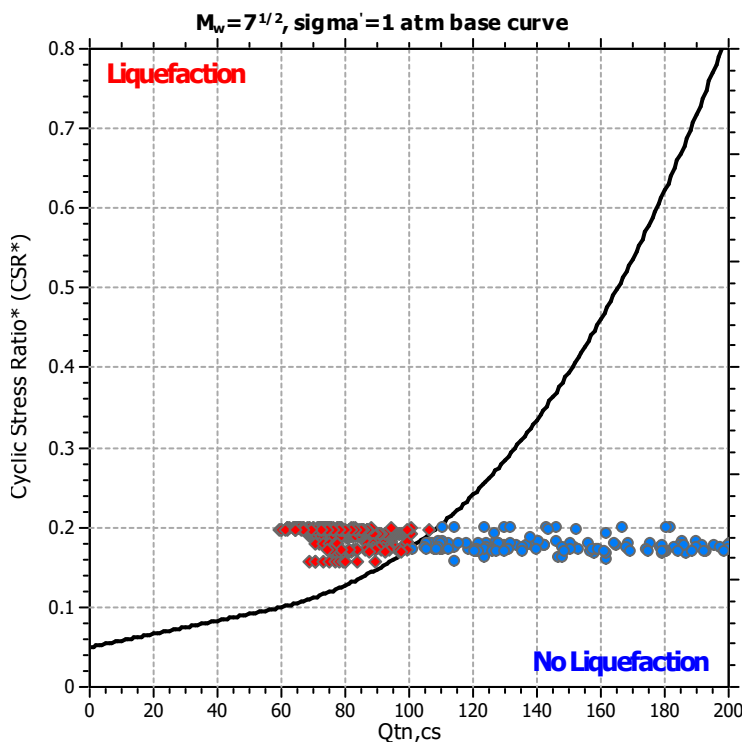
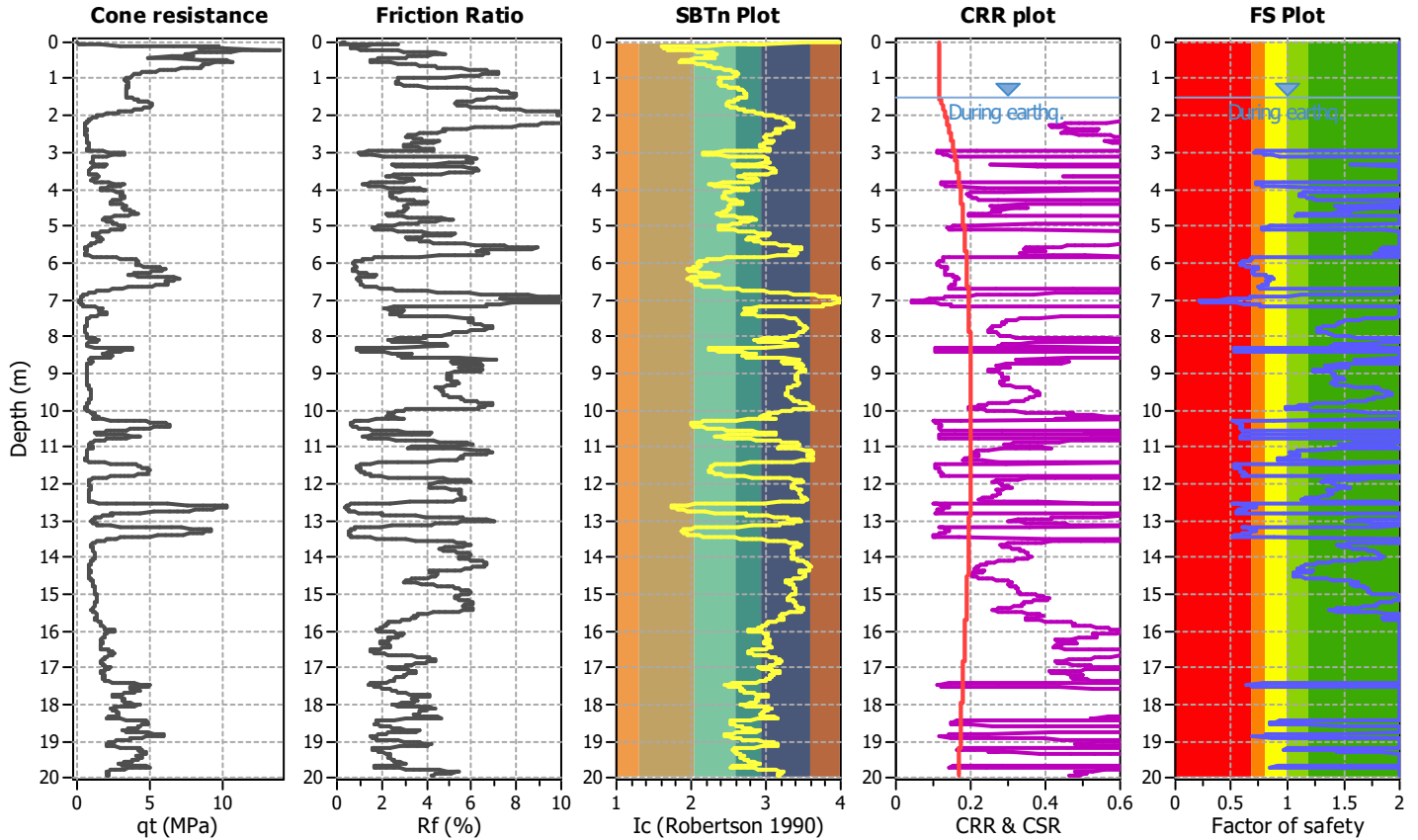
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P2

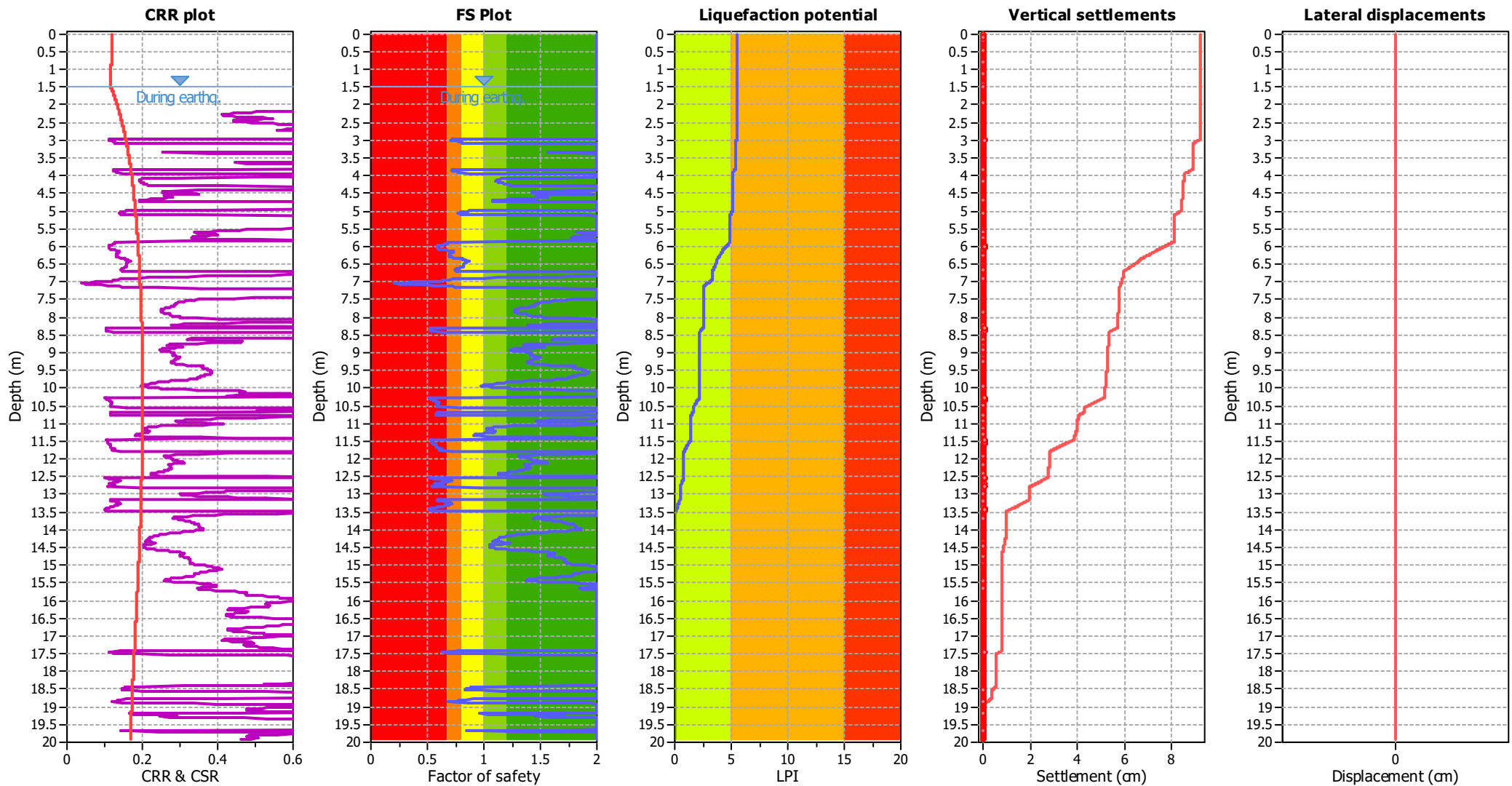
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	2.90 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	20.00 m
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_u 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	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 :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.25	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.90 m	Fill height:	N/A	Limit depth:	20.00 m

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

LIQUEFACTION ANALYSIS REPORT

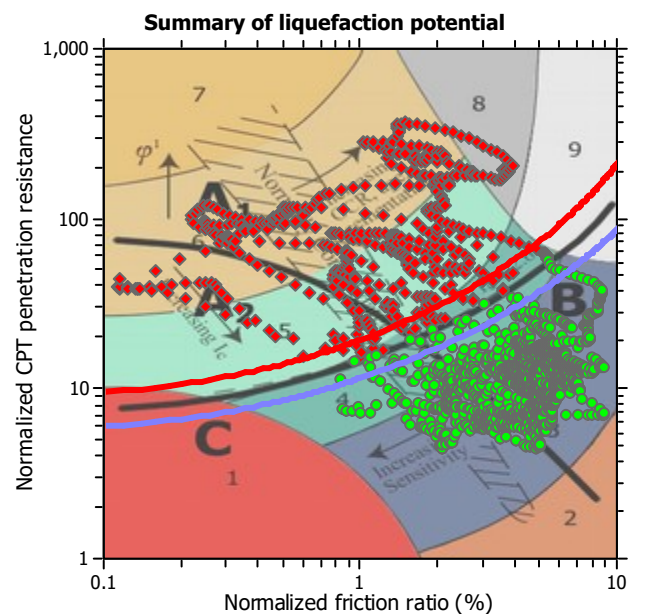
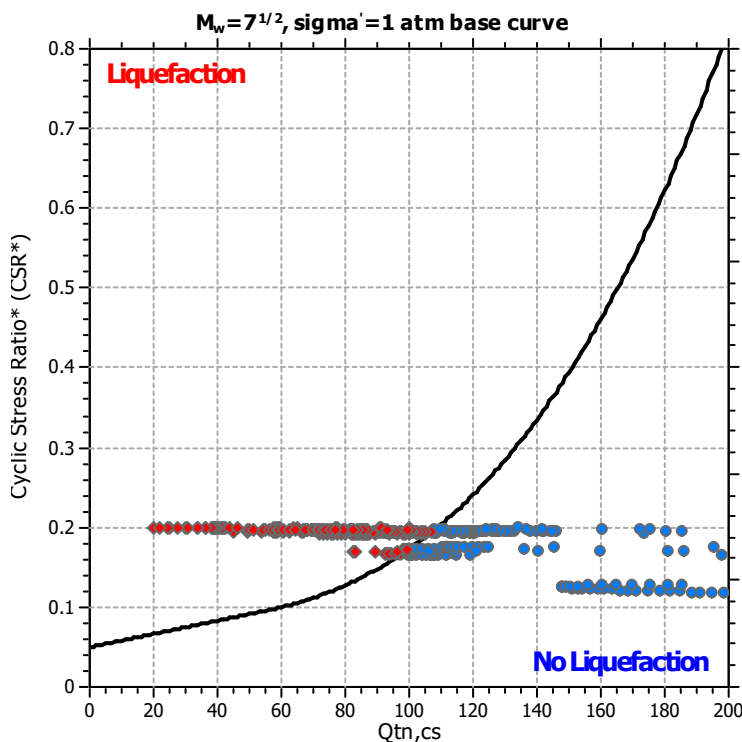
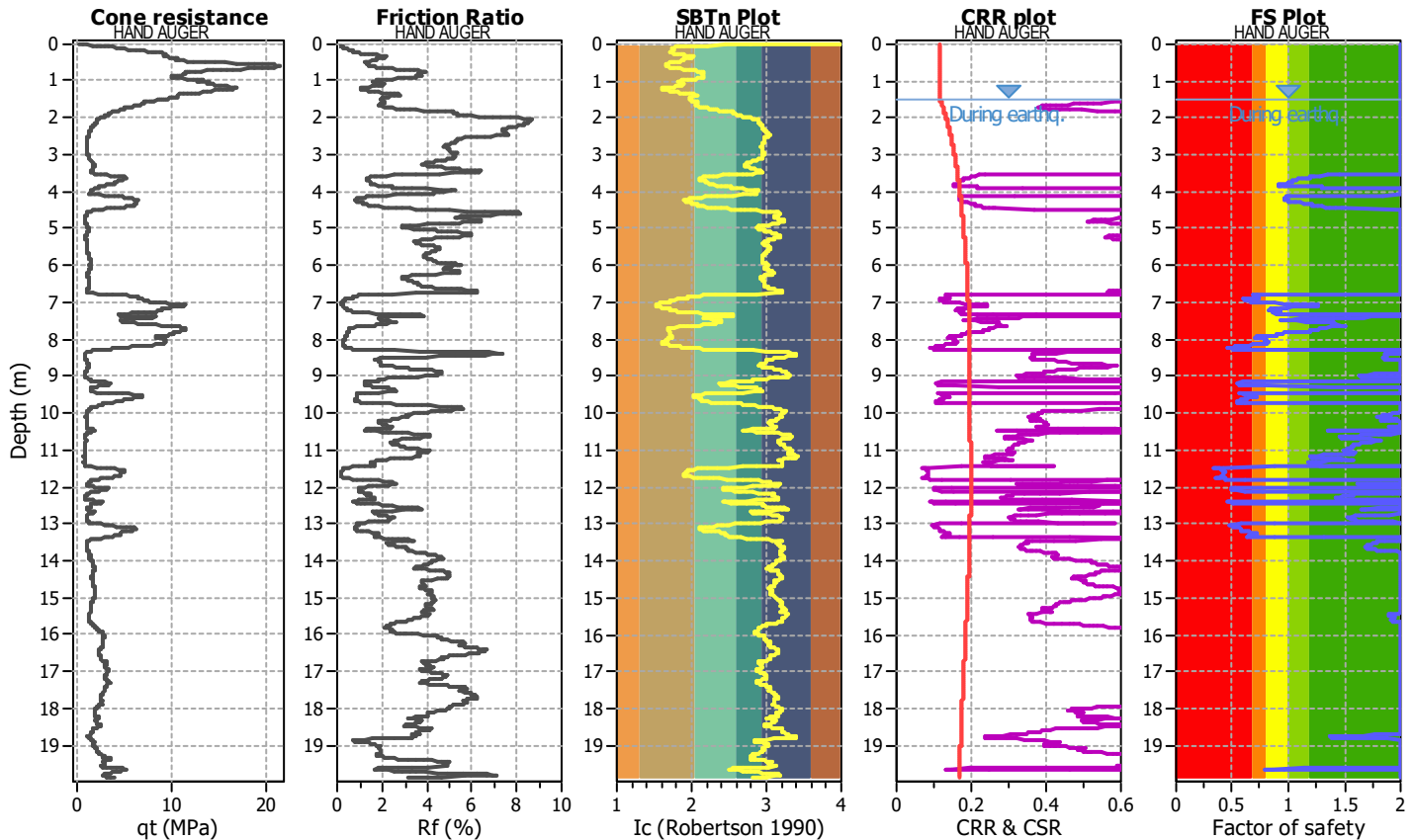
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P4

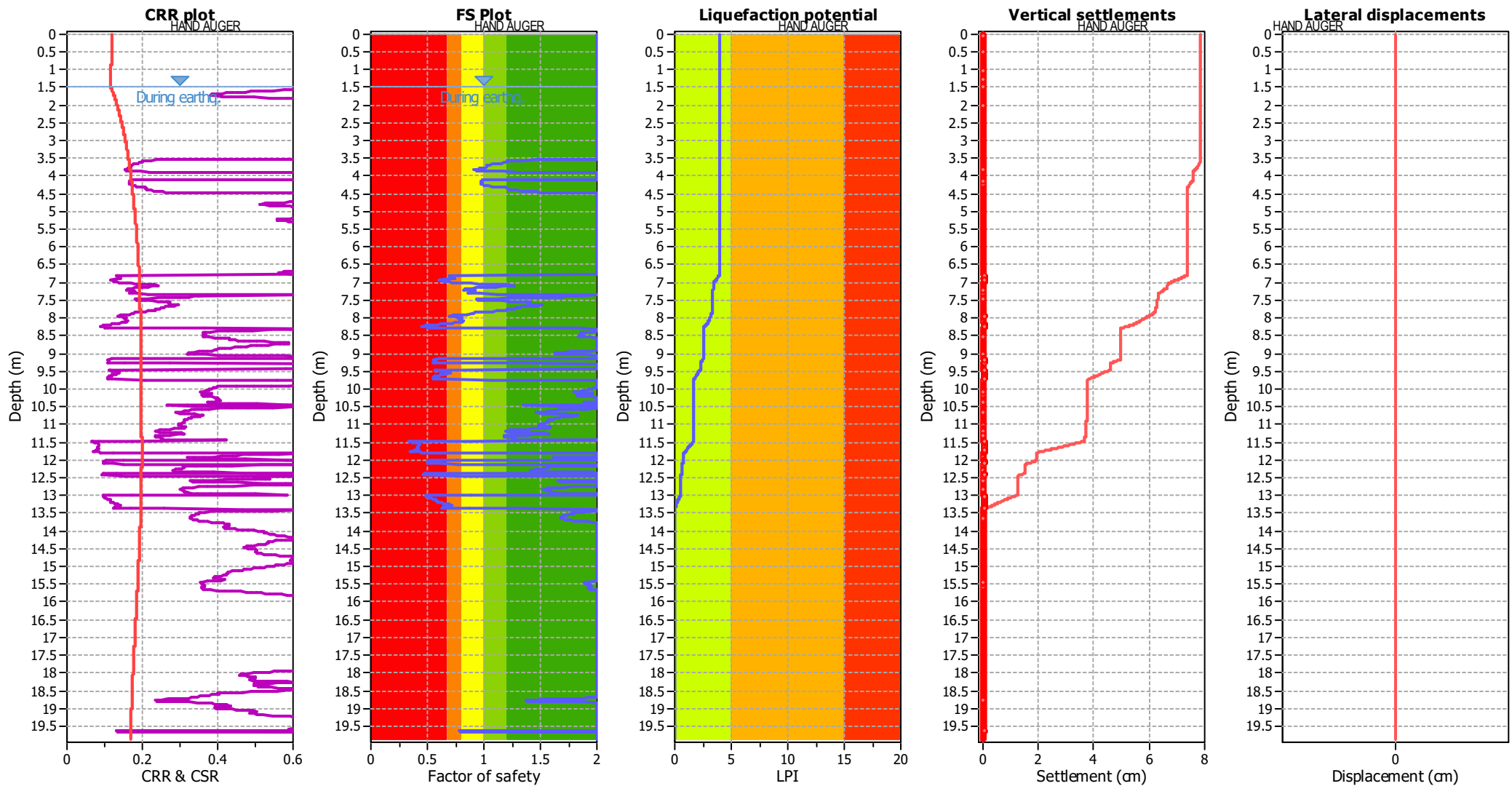
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	2.70 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	20.00 m
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_v 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _s applied:	Yes
Earthquake magnitude M _w :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.25	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.70 m	Fill height:	N/A	Limit depth:	20.00 m

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
Green	Low risk

LIQUEFACTION ANALYSIS REPORT

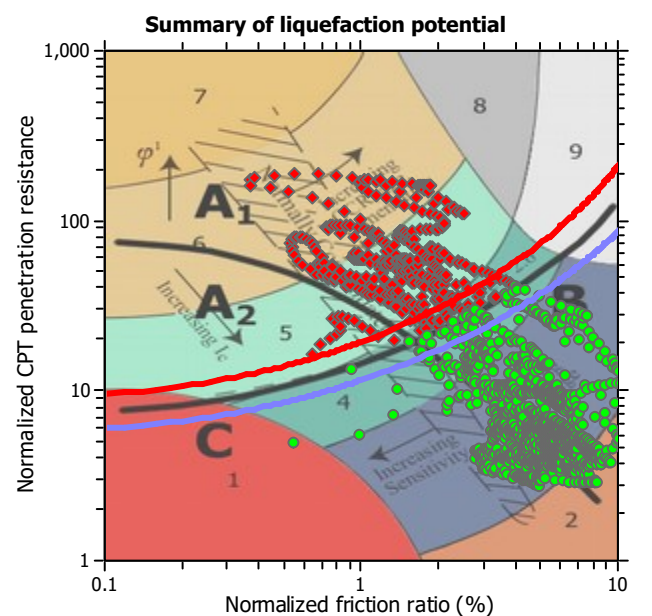
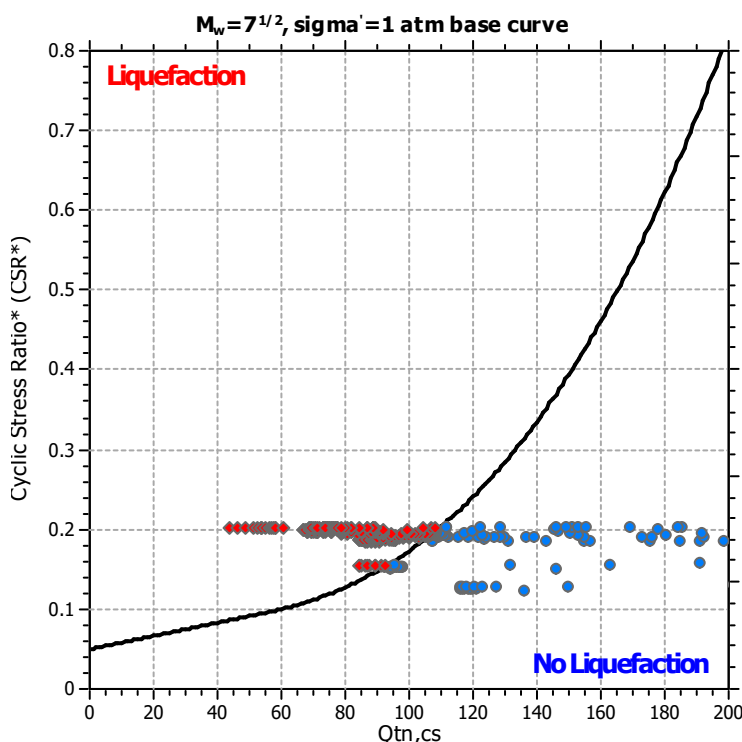
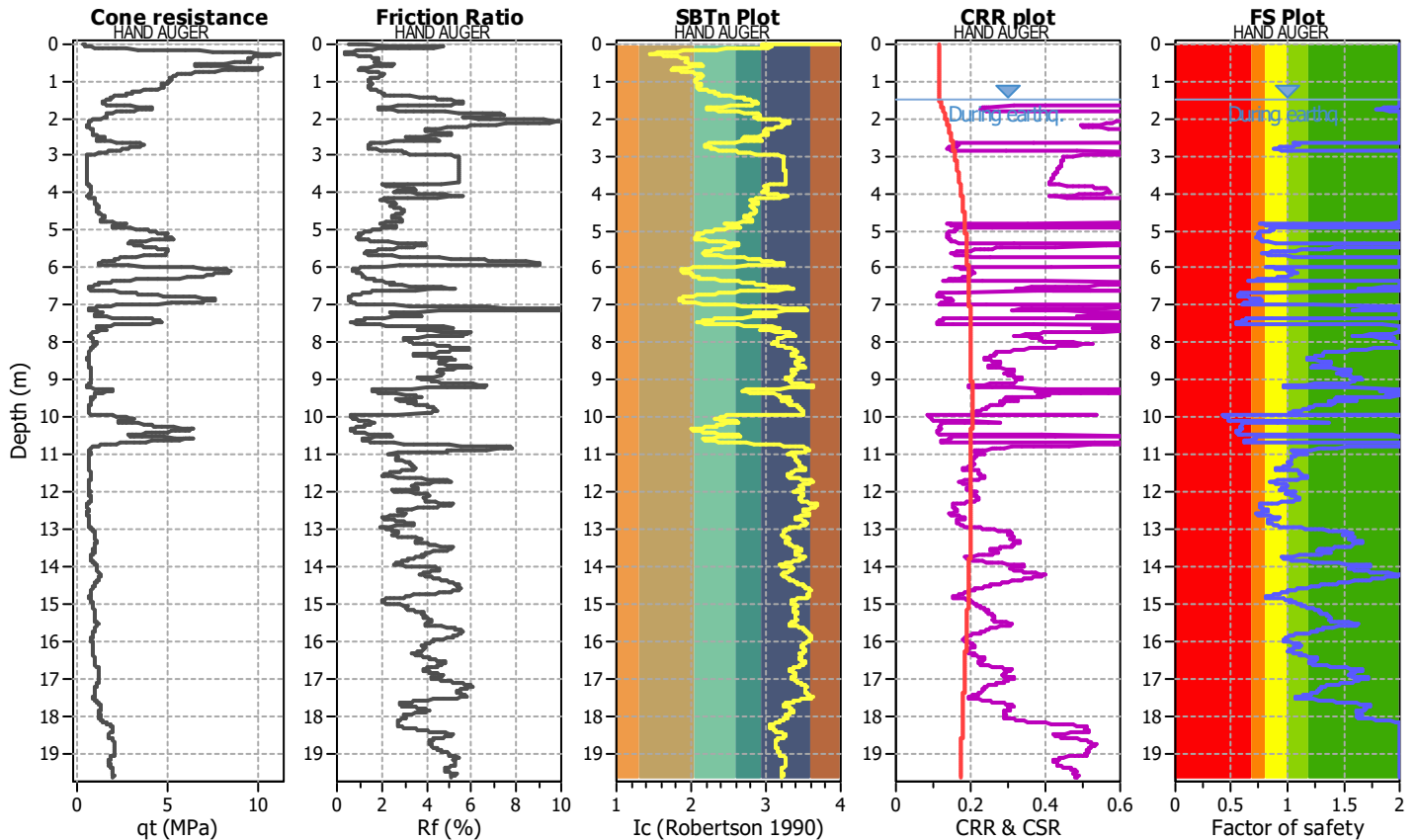
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P10

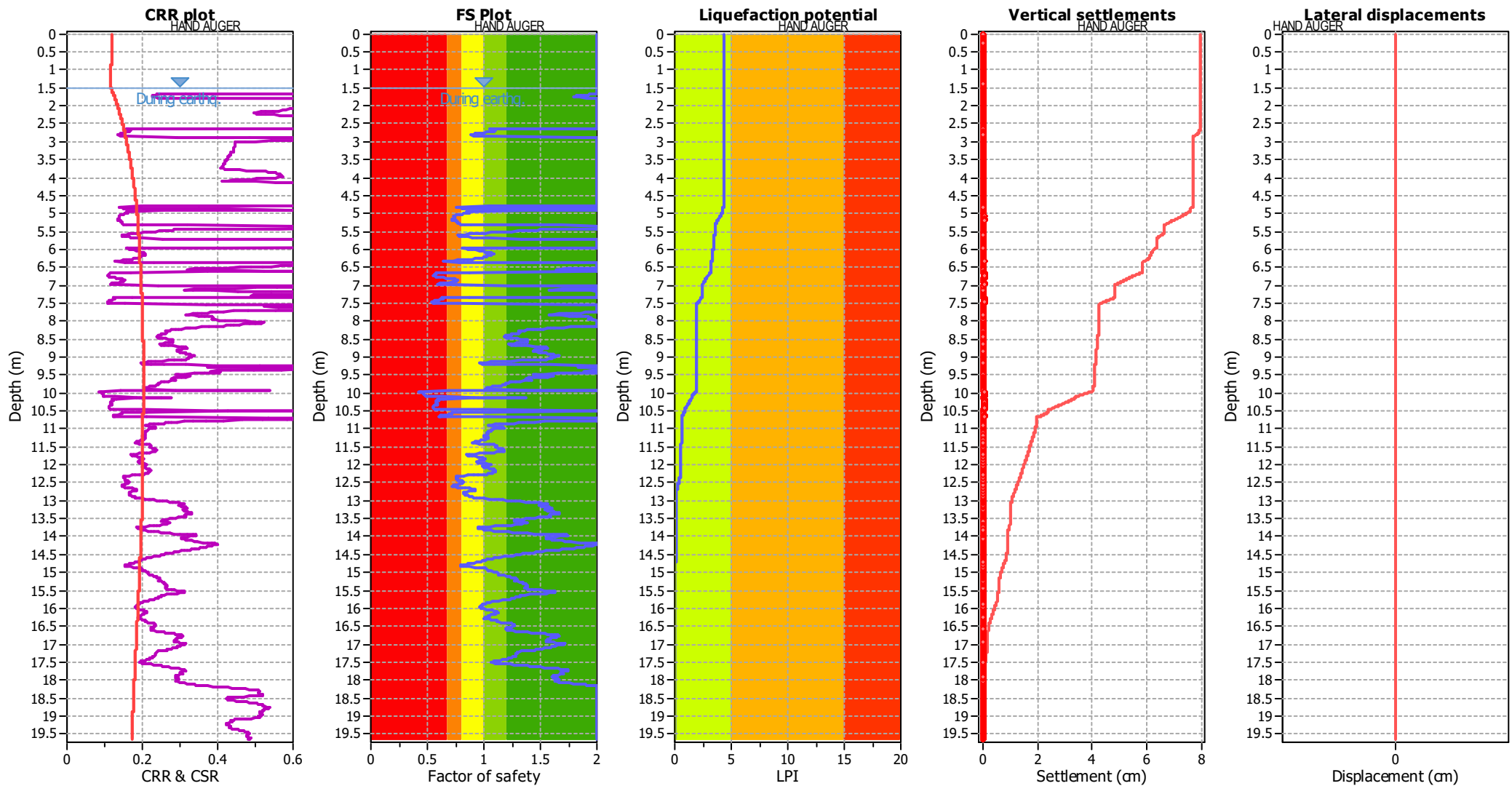
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	3.30 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	20.00 m
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_v 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _s applied:	Yes
Earthquake magnitude M _w :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.25	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.30 m	Fill height:	N/A	Limit depth:	20.00 m

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

LIQUEFACTION ANALYSIS REPORT

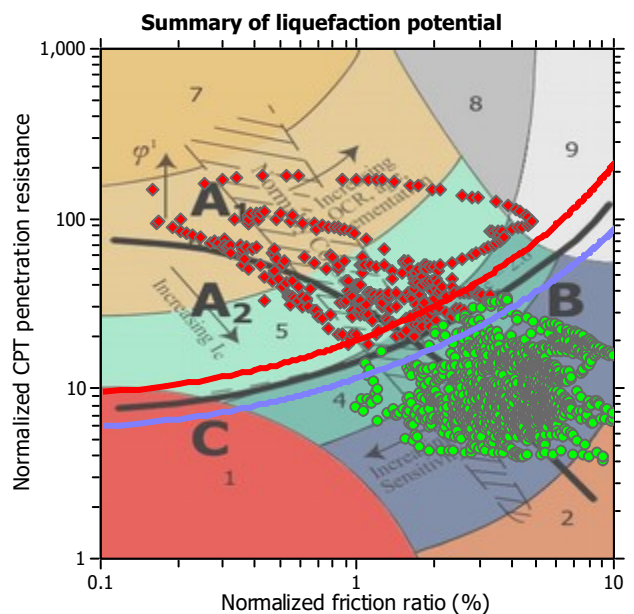
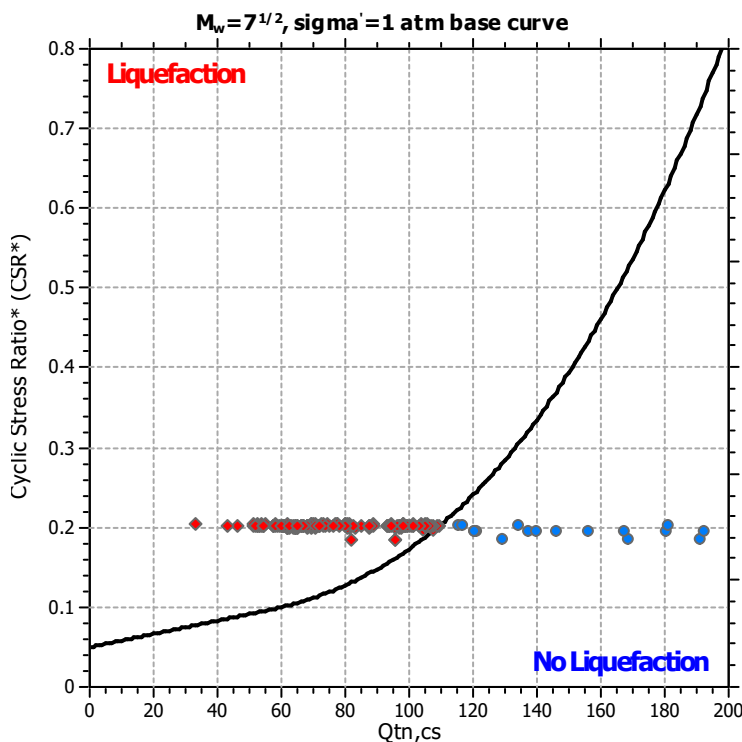
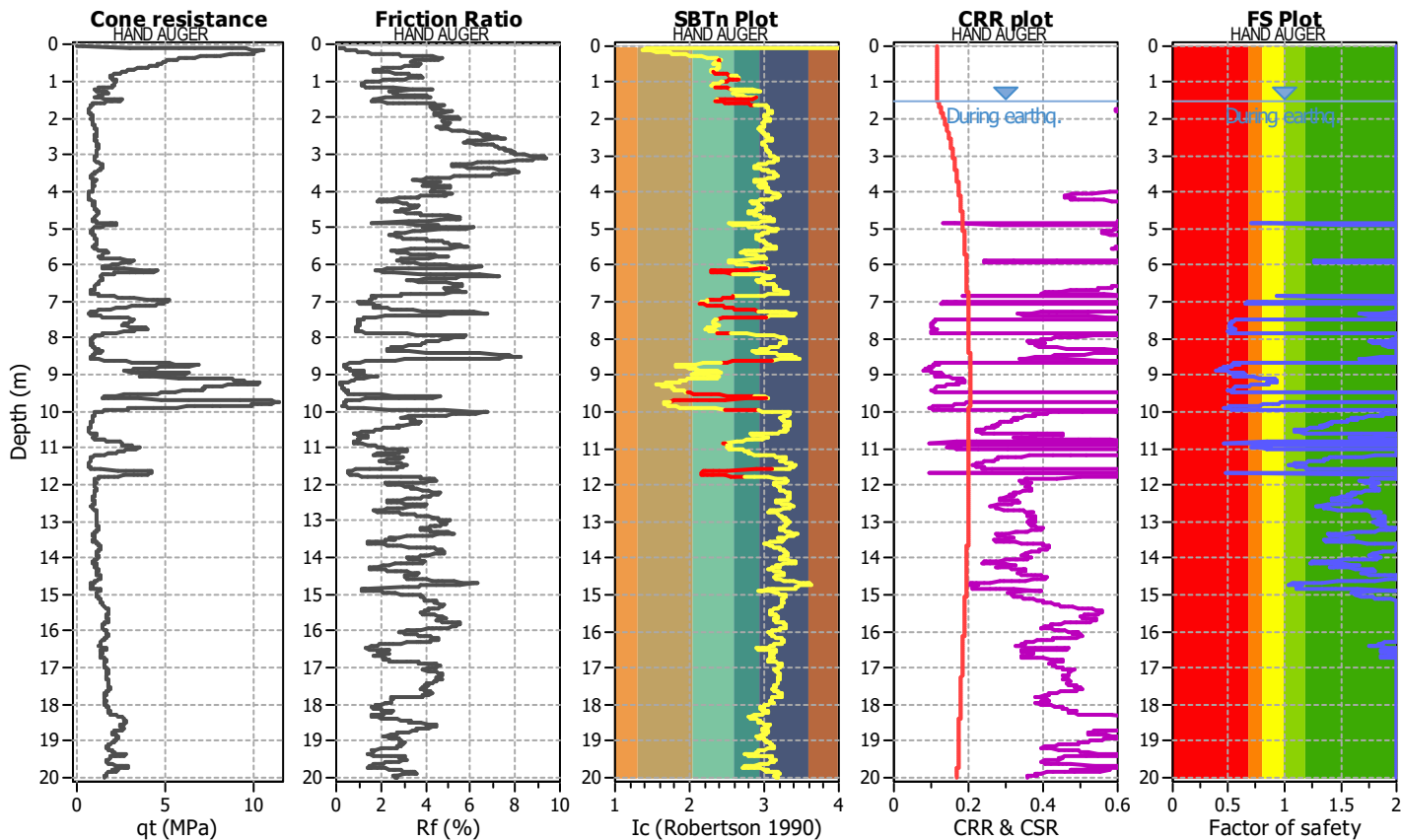
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P46

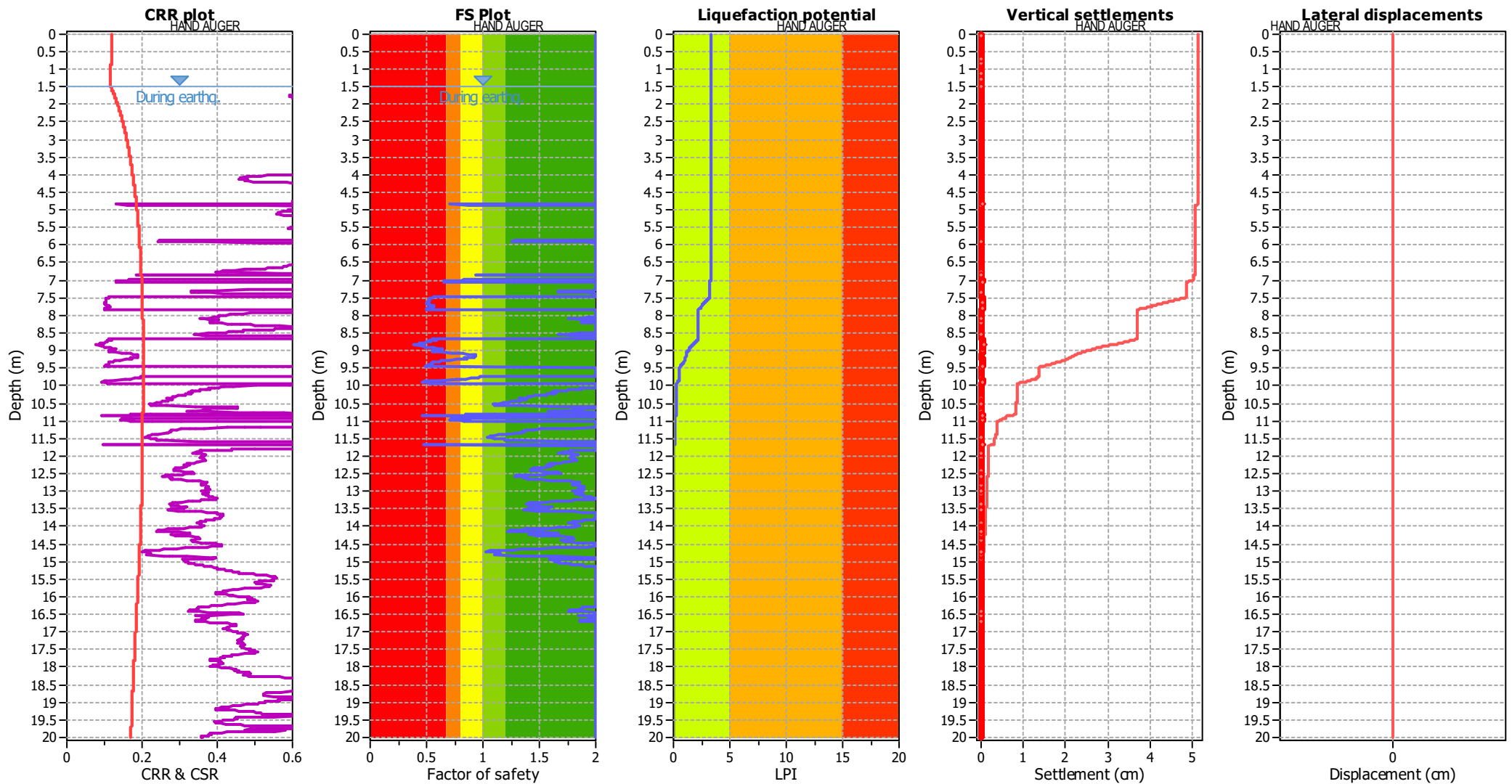
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	3.10 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	20.00 m
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_u 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _s applied:	Yes
Earthquake magnitude M _w :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.25	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.10 m	Fill height:	N/A	Limit depth:	20.00 m

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

LIQUEFACTION ANALYSIS REPORT

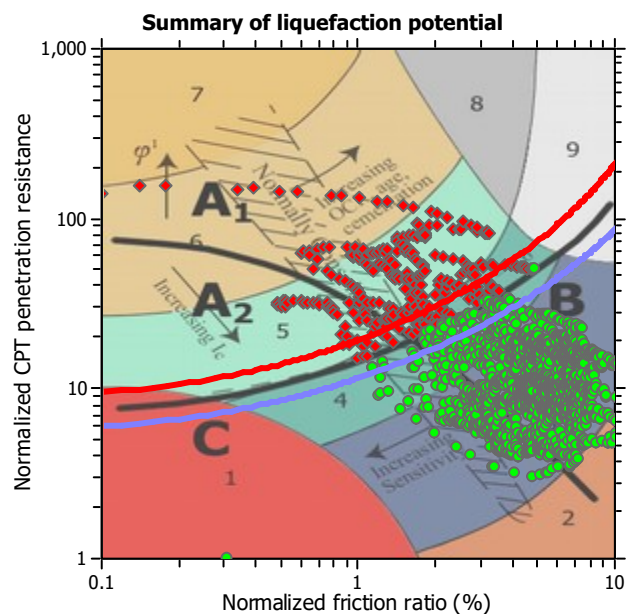
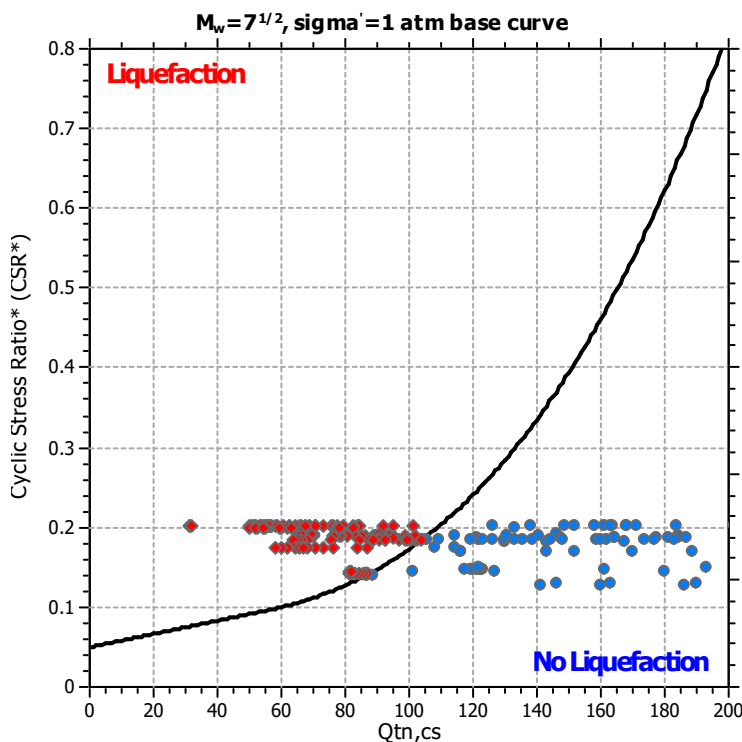
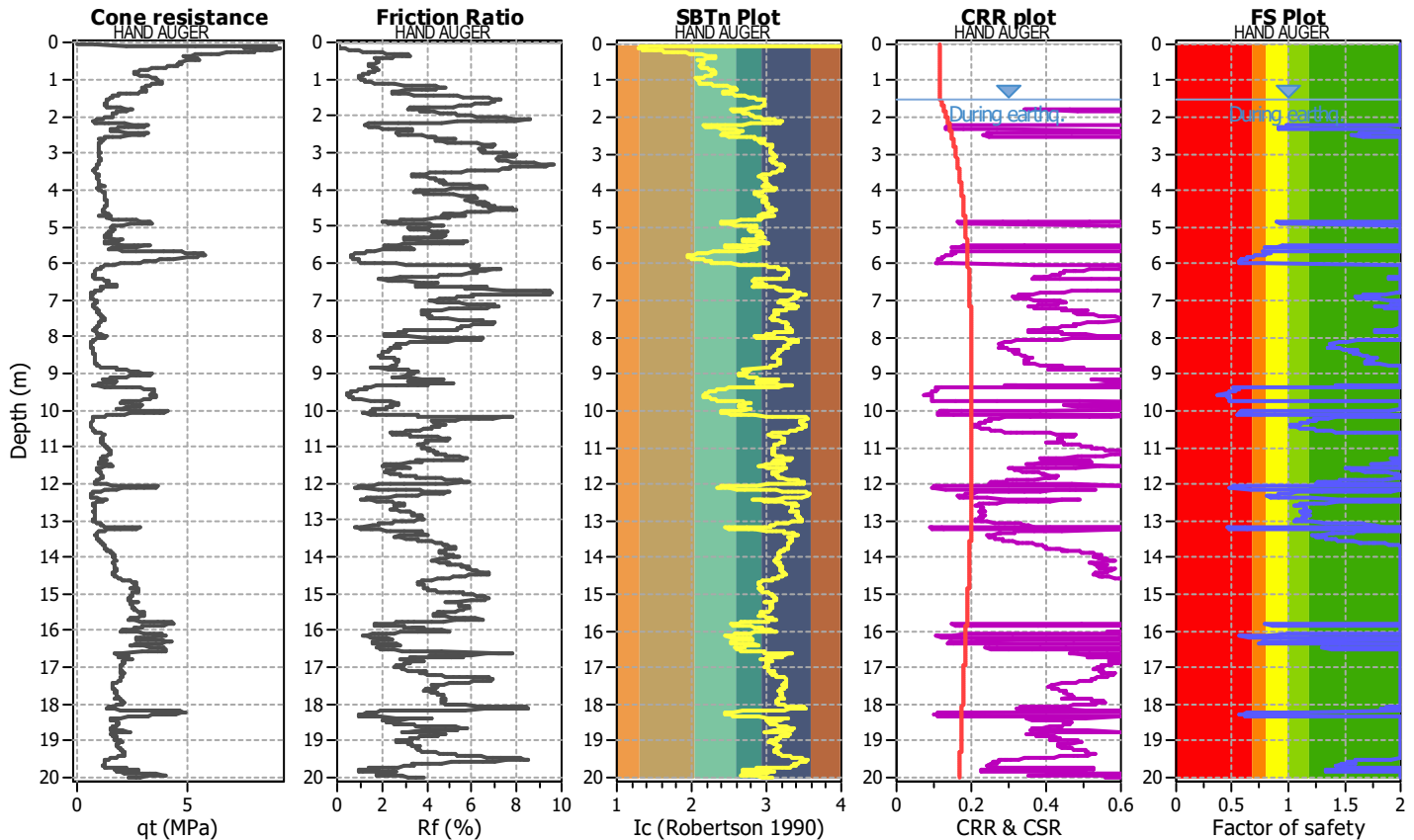
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P47

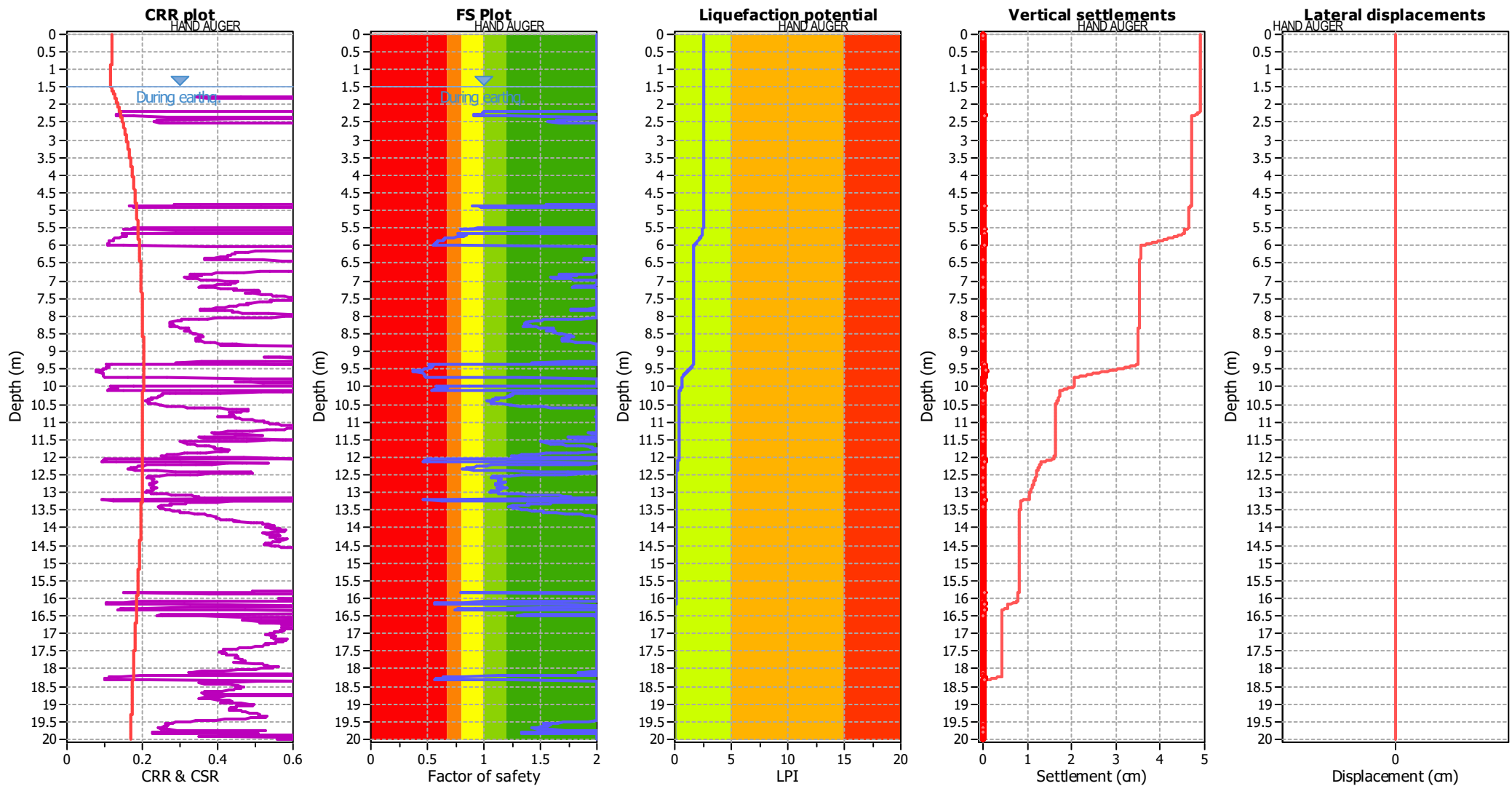
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	3.10 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	20.00 m
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_u 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _s applied:	Yes
Earthquake magnitude M _w :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.25	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.10 m	Fill height:	N/A	Limit depth:	20.00 m

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

LIQUEFACTION ANALYSIS REPORT

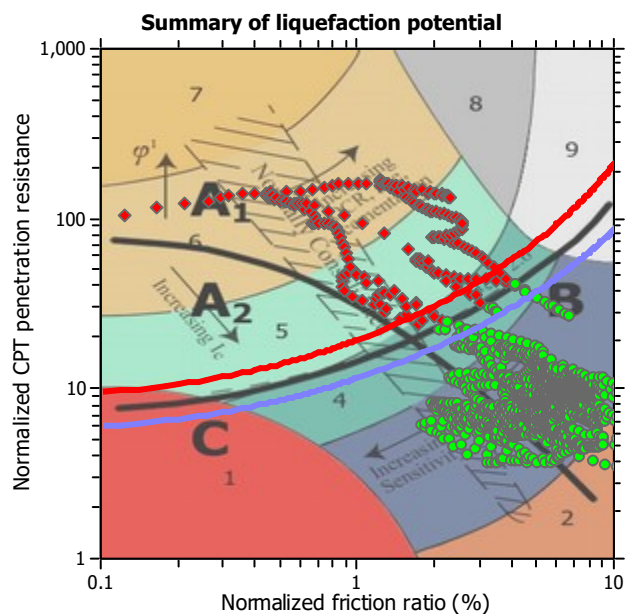
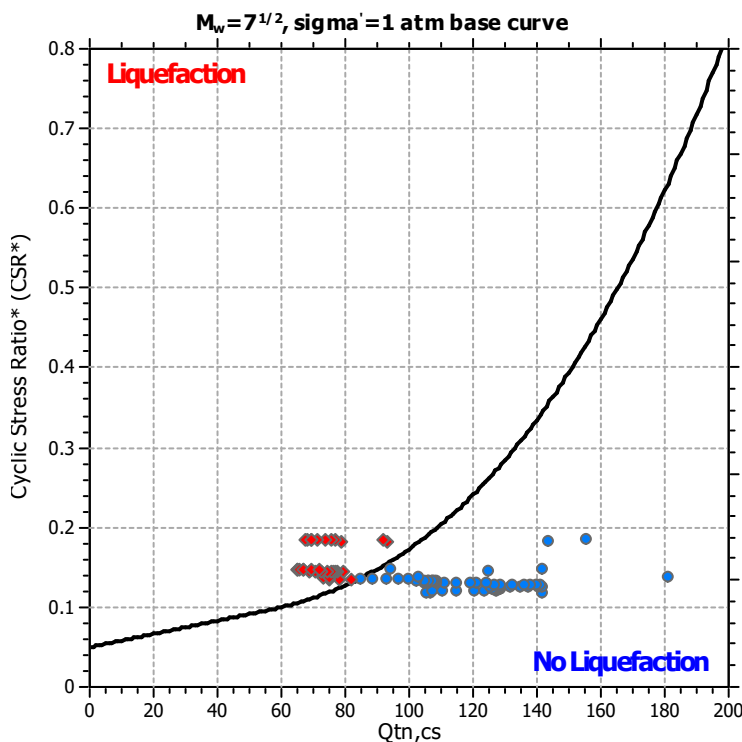
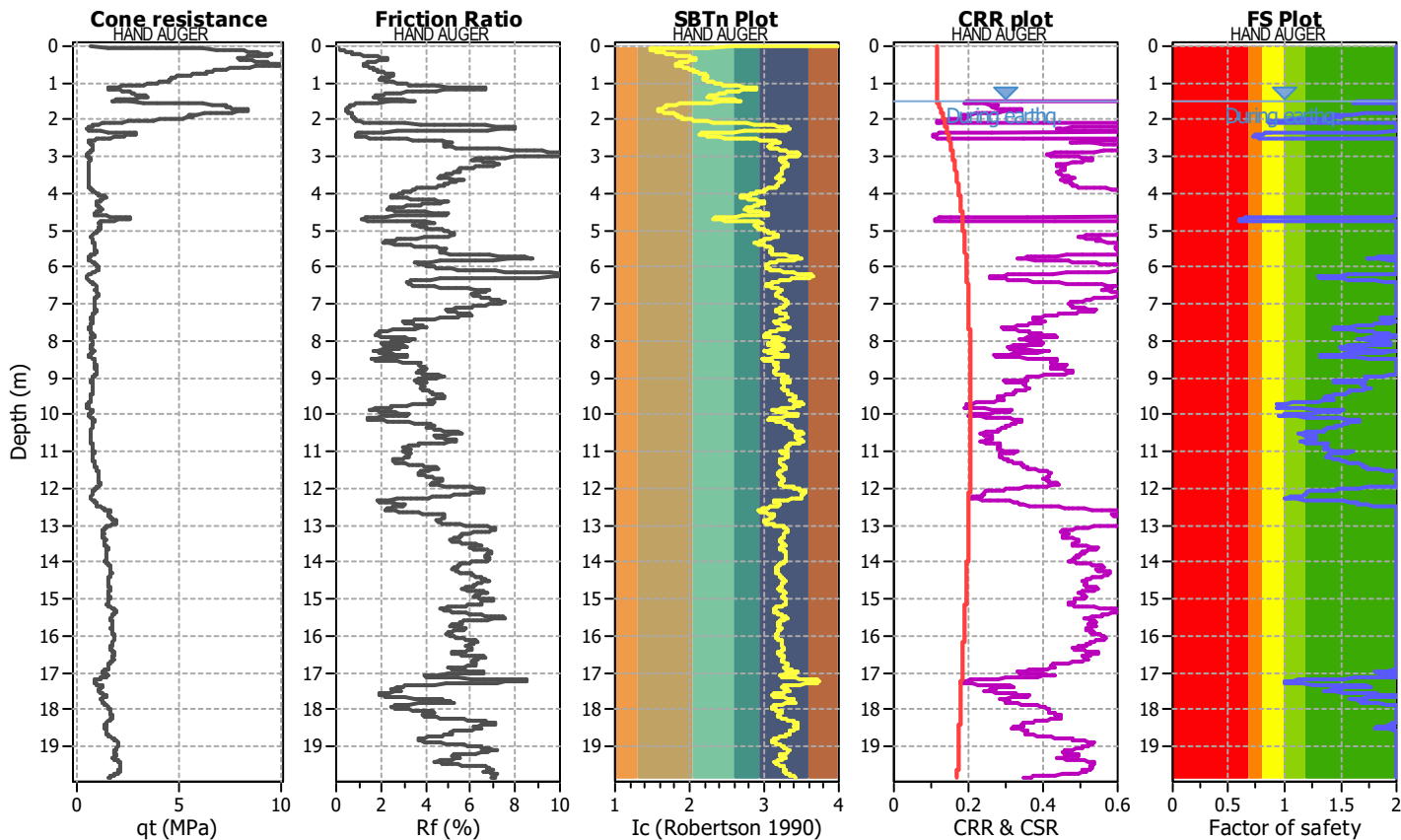
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P48

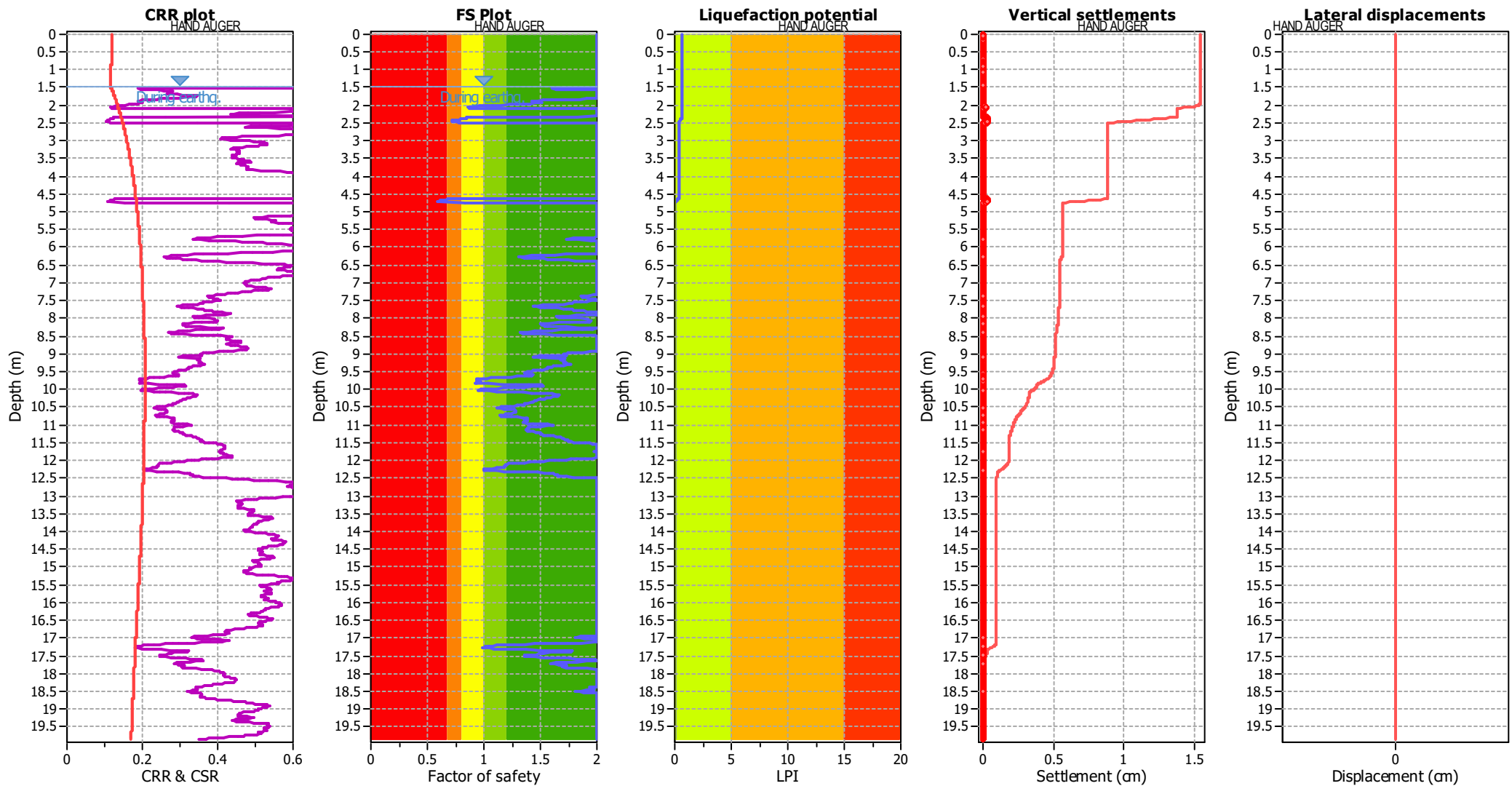
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	2.50 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	20.00 m
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_u 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _s applied:	Yes
Earthquake magnitude M _w :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.25	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.50 m	Fill height:	N/A	Limit depth:	20.00 m

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

LIQUEFACTION ANALYSIS REPORT

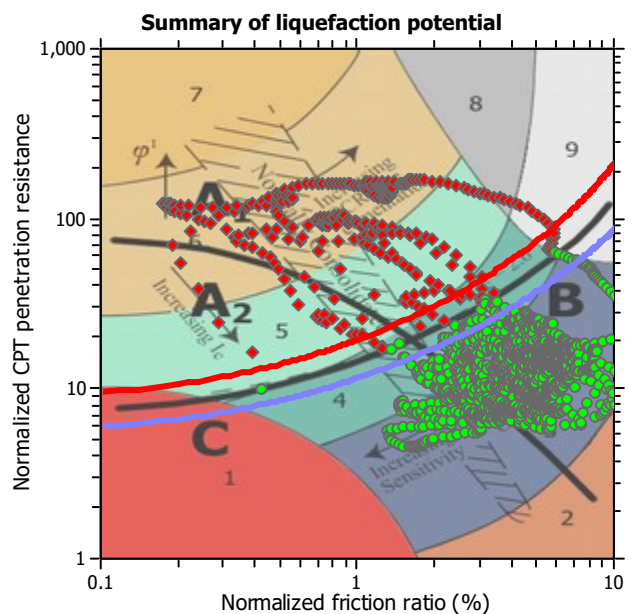
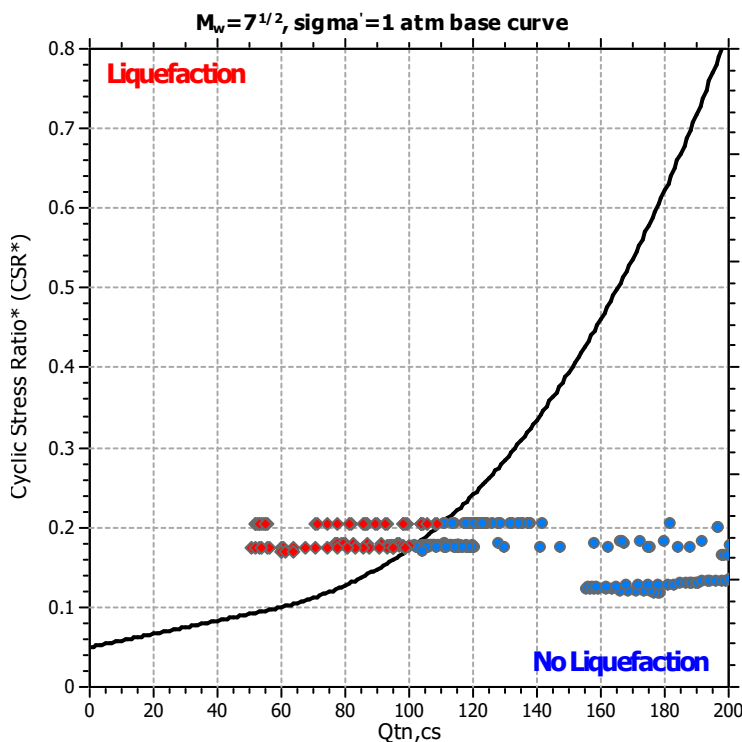
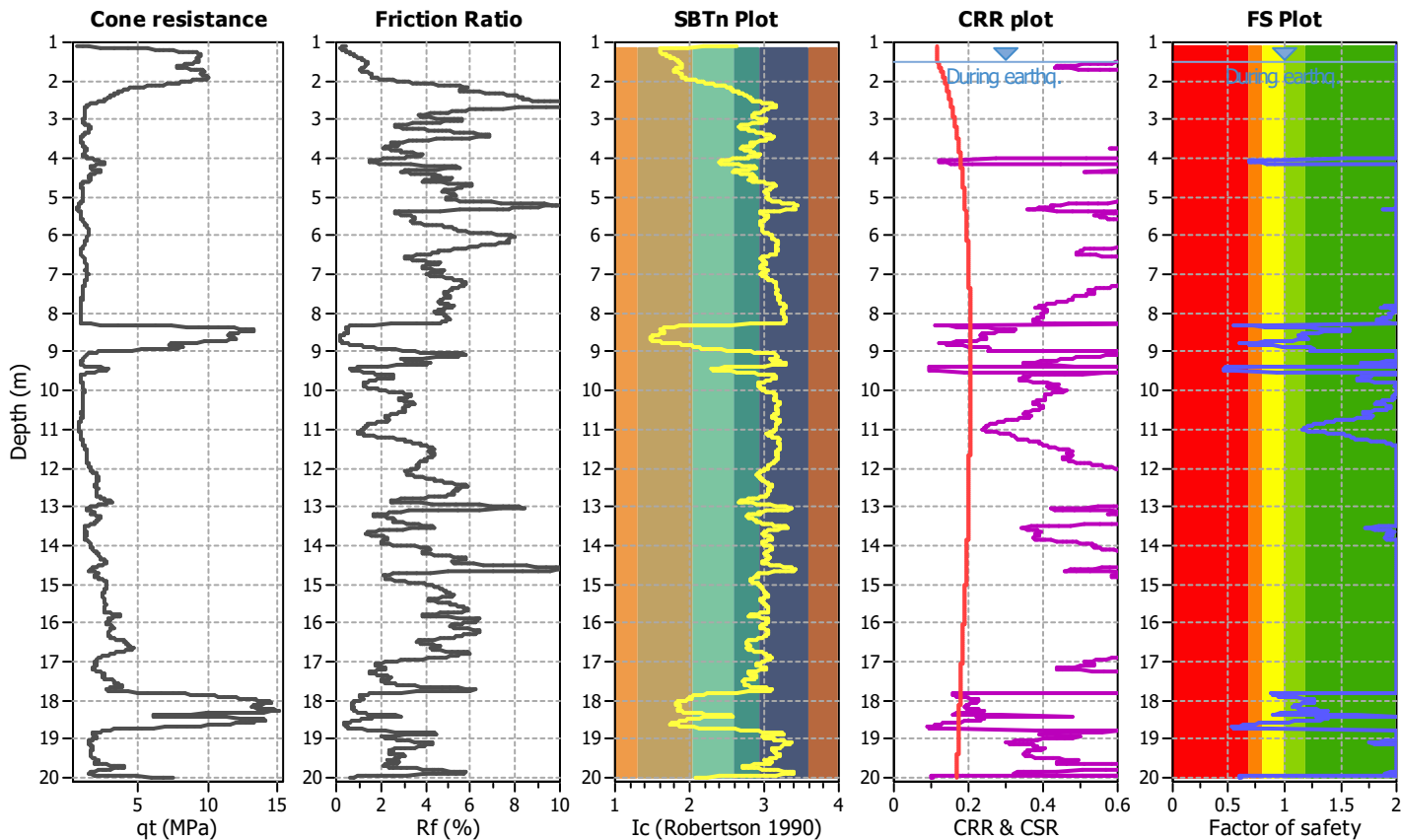
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P49

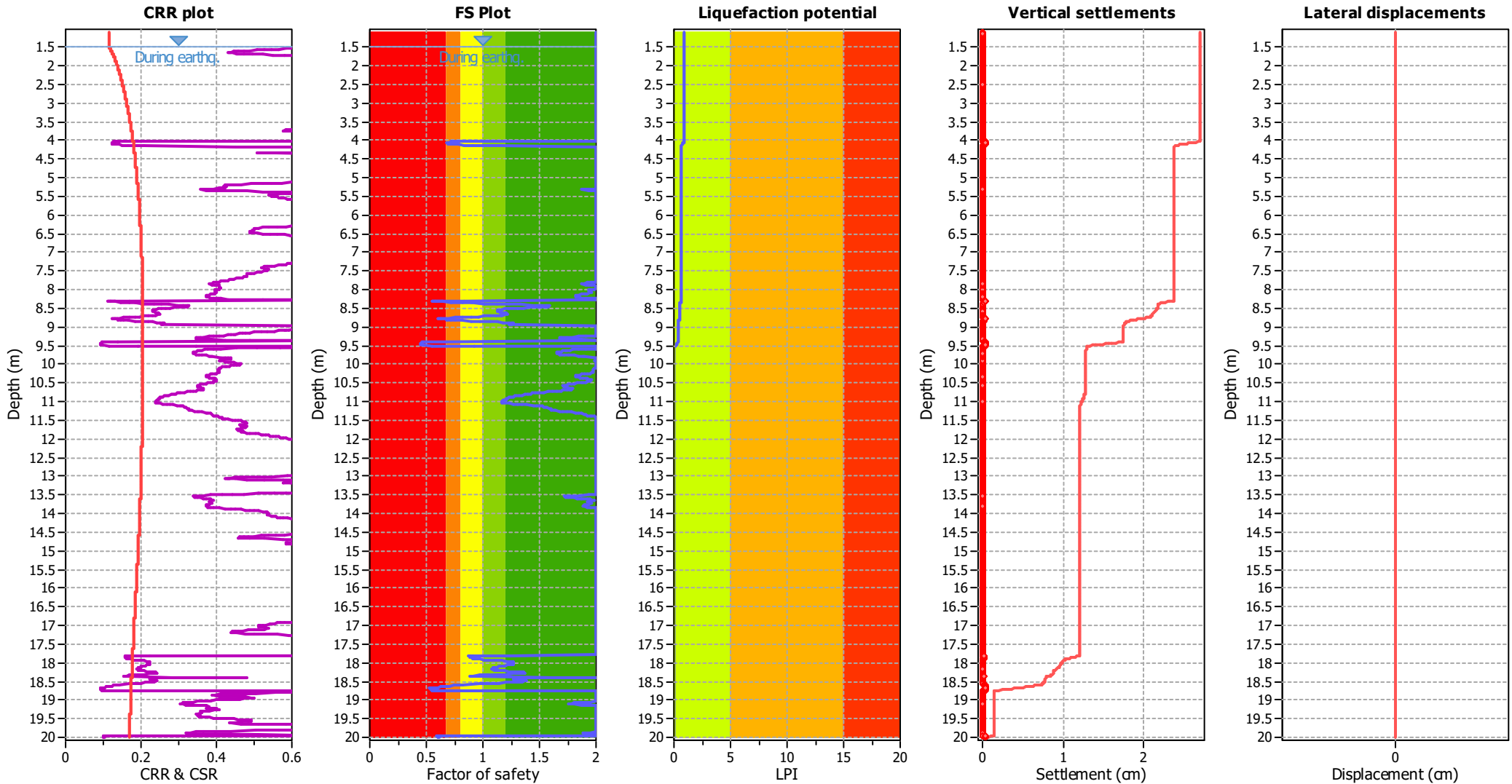
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	2.90 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	20.00 m
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_u 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _s applied:	Yes
Earthquake magnitude M _w :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.25	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.90 m	Fill height:	N/A	Limit depth:	20.00 m

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

LIQUEFACTION ANALYSIS REPORT

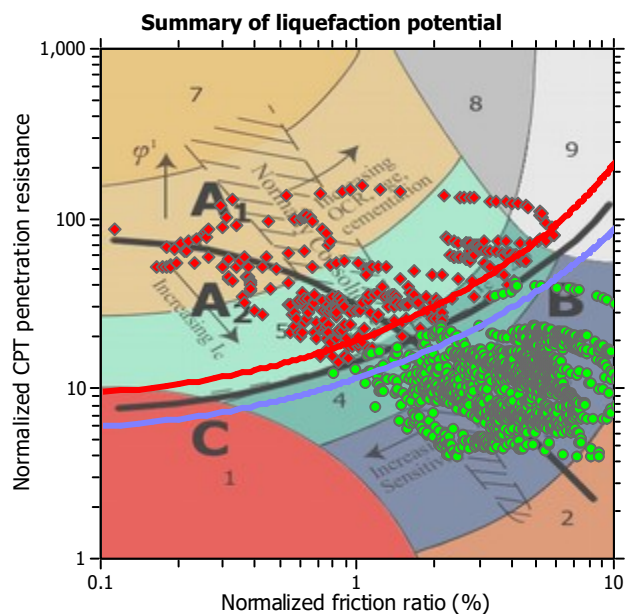
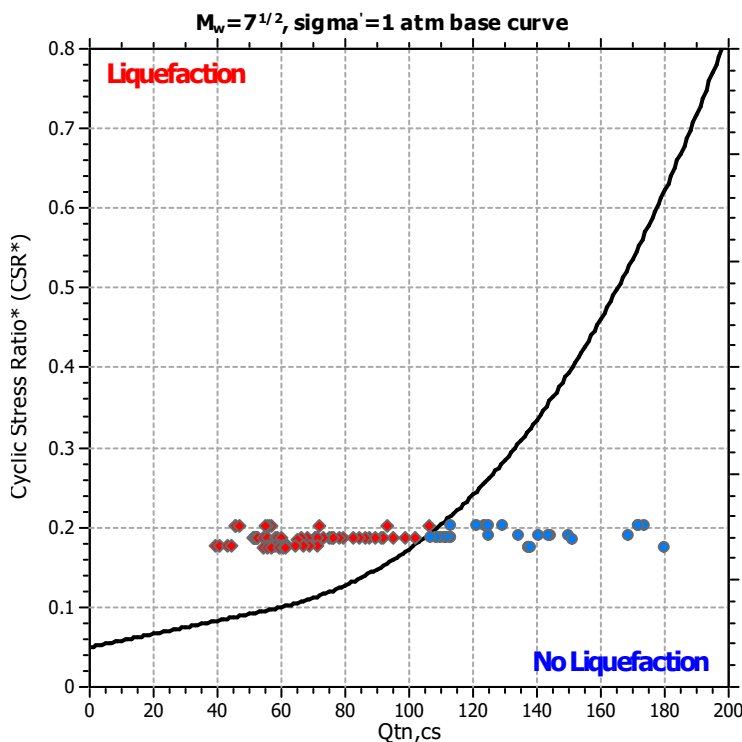
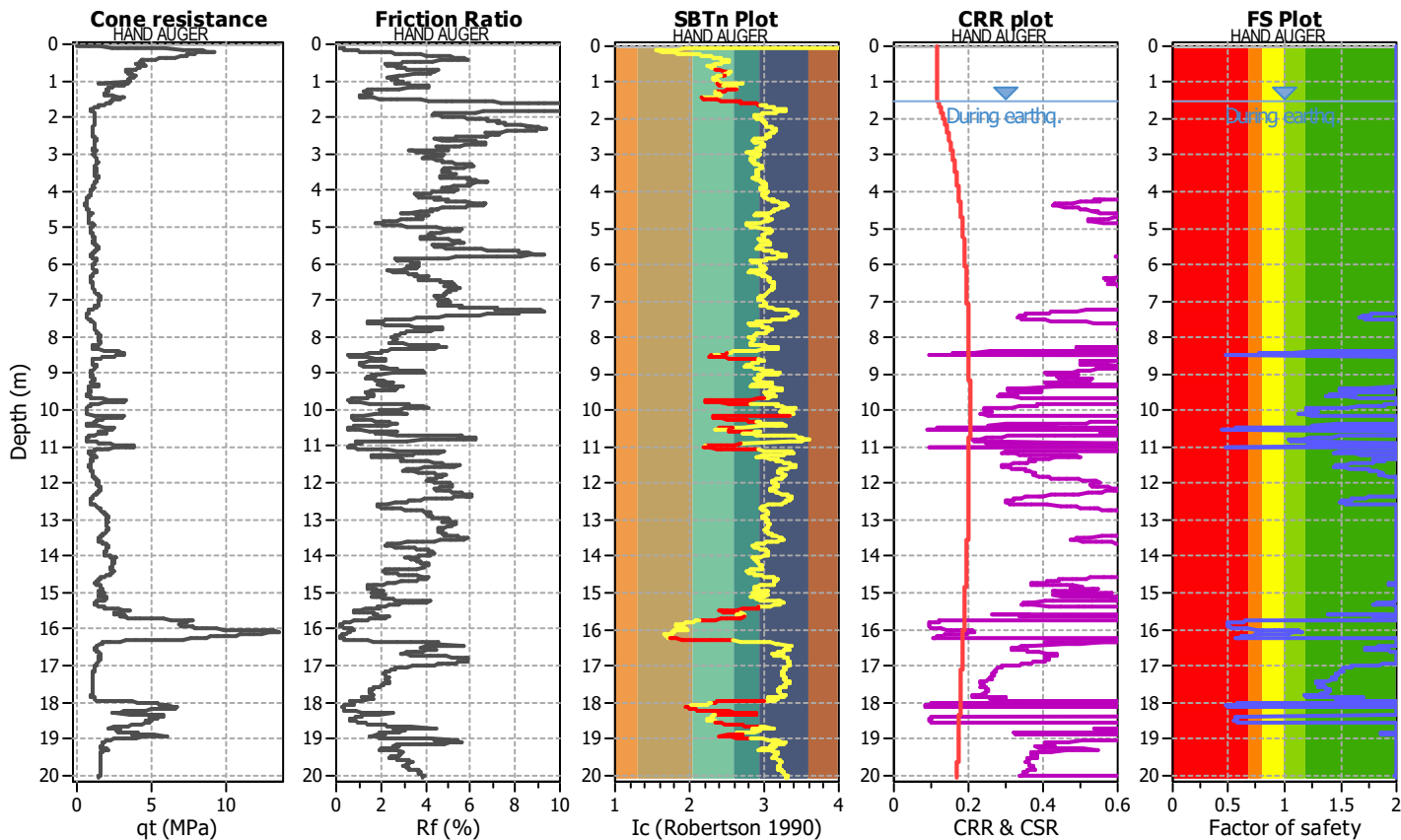
Project title : MS3 Gambettola

Location : Gambettola

CPT file : 040015P50

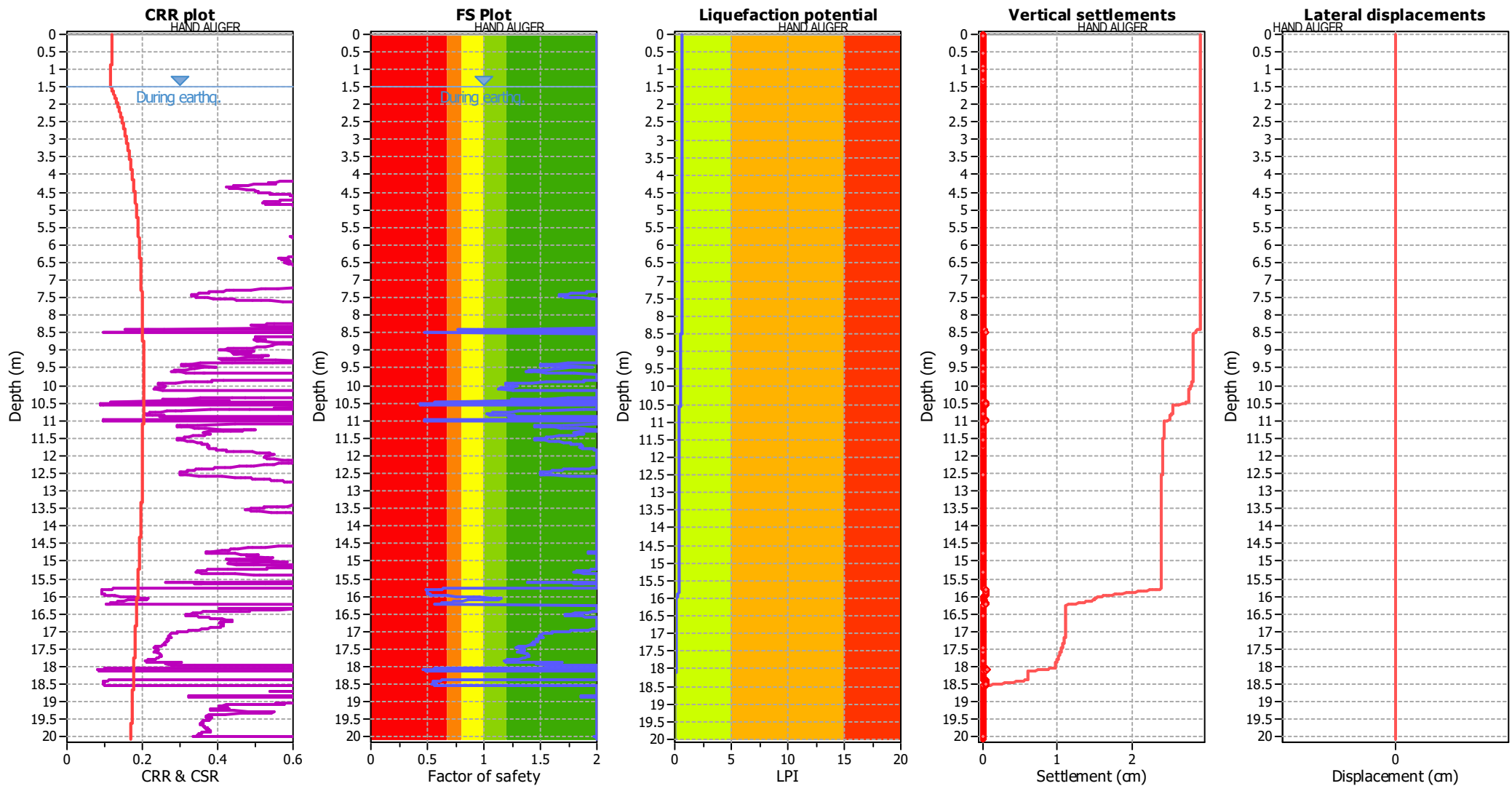
Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	2.70 m	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.50 m	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.16	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	20.00 m
Peak ground acceleration:	0.25	Unit weight calculation:	Based on SBT	K_u 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

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _s applied:	Yes
Earthquake magnitude M _w :	6.16	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.25	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.70 m	Fill height:	N/A	Limit depth:	20.00 m

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