

GEOTECHNICAL REVIEW

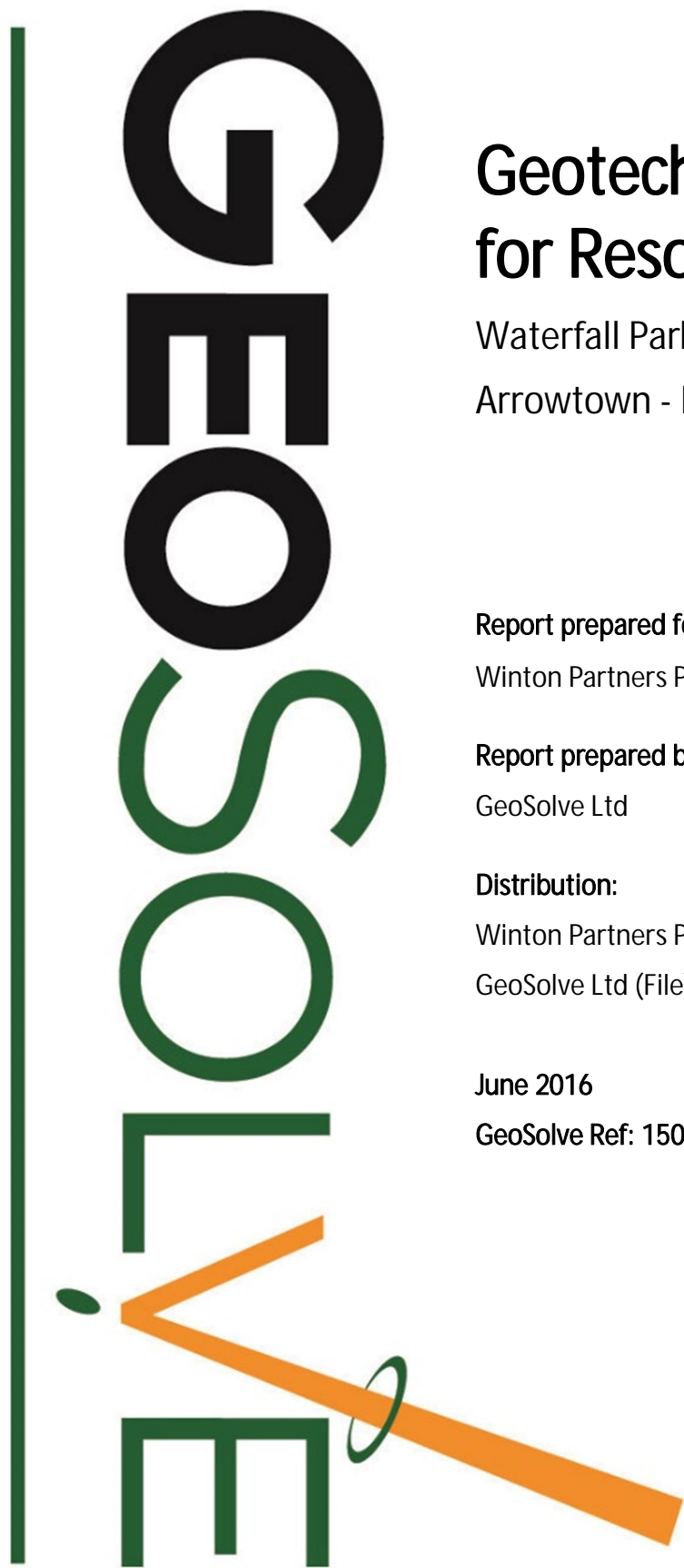
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APPENDICES

EXPRESSION OF INTEREST

JUNE 2016





Geotechnical Report for Resource Consent

Waterfall Park Development,
Arrowtown - Lake Hayes Road

Report prepared for:

Winton Partners Pty Ltd

Report prepared by:

GeoSolve Ltd

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1 Introduction

1.1 General

GeoSolve Ltd has been engaged by Winton Partners Pty Limited to undertake a geotechnical assessment for a proposed residential development (approximately 144 lots) located on the Arrowtown – Lake Hayes Road, Wakatipu.



Photo 1 – Site photo showing the central area of the proposed subdivision looking south along Mill Creek

This report has been completed in accordance with GeoSolve Ltd's proposal dated 14 April 2015, which outlines the scope of works and the conditions of engagement.

1.2 Development

Concept plans provided to Geosolve indicate it is proposed to develop the subject site with a residential subdivision. The subdivision is expected to comprise access roads, services and landscaping. Most of the proposed lots will be in central and southern areas of the development area, however, several lots are proposed in the narrow valley that extends to the north adjacent to Mill Creek.

1.3 Scope of Work

The purpose of this report is to assess the feasibility of a residential sub-division in the proposed location and provide recommendations as appropriate with respect to sub-division consent. Geotechnical issues or hazards pertaining to the site specifically liquefaction, slope stability and alluvial fan hazards have been specifically addressed.

Further investigation and reporting may be required at the detailed design stage once development proposals are better established to address the geotechnical issues identified, and to carry out detailed foundation design. However, based on findings to date cost effective standard engineering solutions, typical of similar residential developments, are likely to be appropriate to address identified issues.

2 Site Description

2.1 General

The subject property is located approximately 1km north of Lake Hayes and 350m to the west of the Arrowtown - Lake Hayes Road from which the site is accessed.

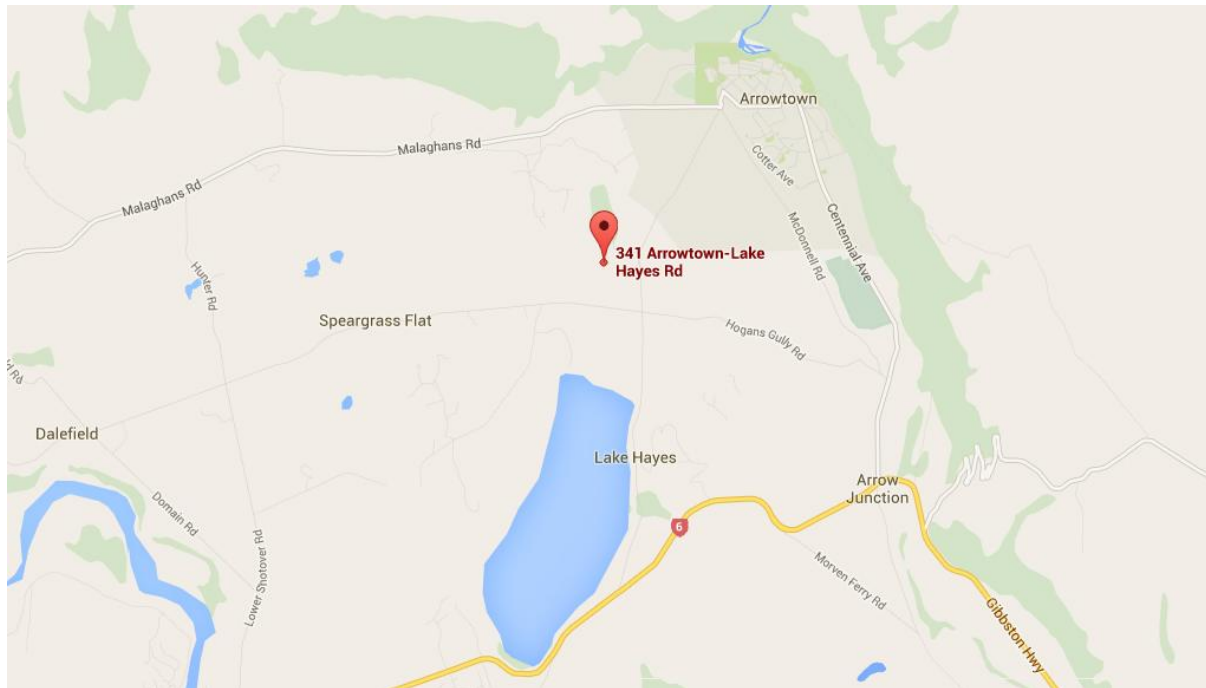


Figure 1 – Site Location Plan

The property is bounded to the south by existing residential developments along Speargrass Road, and to north by the Millbrook Development. Undeveloped farmland adjoins the remaining boundaries of the site. An existing farmhouse and associated buildings and amenities are present in the northern area site to the north. An aerial view of the approximate site area is provided on Figure 1a, Appendix A.

2.2 Topography and Surface Drainage

The development is generally located in a low lying area of the Wakatipu Basin and at the eastern end of the valley containing Speargrass Flat Road. To the north of the development low hills, rise immediately up approximately 60m higher than the valley floor, and to the south the ground undulates but overall falls gently downslope towards Lake Hayes 1km distant.

The northern part of the proposed development is located in a narrow valley adjacent to Mill Creek. Steep wooded slopes up to 60m in heights surround the valley on the northern, eastern and western sides. Mill creek flows south through the centre of the valley and there are localised patches of soft and marshy ground around the creek sides.

Mill Creek runs directly through the site from north to south and continues in a southerly direction towards Lake Hayes. The creek is present in the topographically lowest part of the site which is a well-defined area surrounding the existing farm house and the area to the north and south of this building. In central and Southern areas, to the east and west of the low lying area the ground surface climbs approximately 5-8m up a prominent terrace slope. Development is proposed in the

low lying area adjacent to Mill Creek and on the higher ground immediately to the west above this slope.

Shallow localised drainage channels and features are present on the steep hill slopes that surround the development, with the most prominent channel being immediately to the west.

In southern and central areas the site was observed to be well draining. Wet marshy ground was observed in close proximity to Mill creek, particularly in northern areas.

3 Geotechnical Investigations

The following geotechnical site investigations works have been completed by Geosolve for the purposes of this report:

- A site inspection by an engineering geologist;
- 23 excavator test pits to depths of up to 4.8m;
- 14 cone penetrometer tests (CPT) to depths of up to 18.5m, and;
- 3 drill holes to depths of up to 25m.

The investigation locations are shown on Figure 1a, Appendix A, and the investigation logs are provided in Appendix B.

4 Subsurface Conditions

4.1 Geological Setting

The site is located within the Wakatipu Basin, a feature formed predominately by glacial advances. Published references indicate the last glacial event occurred in the region between 10,000 and 20,000 years ago. The glaciations have left glacial till, glacial outwash and lake sediments over ice-scoured bedrock. Post glacial times have been dominated by erosion of the bedrock and glacial sediments, deposition of alluvial gravels by local watercourses, deposition of lacustrine sediments during periods of high lake levels and the deposition of wind-blown loess.

The site is located in an area where the soil materials comprise windblown, pond, alluvial and glacial deposits overlying schist bedrock.

No active fault traces were observed in the immediate vicinity of the site. However, a significant seismic risk exists in the region from potentially strong ground shaking associated with rupture of the Alpine located along the west coast of the South Island.

There is a high probability an earthquake with a magnitude greater than 7.5 will occur on the Alpine Fault within the next 50 years.

4.2 Stratigraphy

In general, apart from the thin layer of surficial topsoil and loess, the site is underlain by various alluvial deposits which are expected to extend to moderate depth. Lake and pond deposits underlie the site north of the existing farmhouse.

The main geological units present at the site are as follows:

Topsoil comprises dark brown, soft to firm sandy organic SILT with organic rootlets. Deposits are likely to be thick/peaty along Mill Creek in the upper part of the development.

Loess comprises yellow/grey, firm to stiff SILT with some sand.

Alluvial deposits comprise variable interbedded SANDS, SILTS and GRAVELS with minor cobbles and boulders present within the coarser grained deposits. These deposits are generally loose to medium dense in condition.

Pond/lake deposits typically comprise medium dense SANDS and silty SANDS to stiff sandy SILTS and SILTS which extend to a proven depth of 25 m depth in the northern side of the site. Pond sediments are present locally near the surface and comprise dark brown, soft to firm SILT with minor sand.

Fill was identified locally in test pits 5 & 6 and was found to comprise soft brown sandy SILT.

Bedrock was observed outcropping within the development boundary and comprises Otago Schist bedrock. Bedrock is expected to be at depth beneath much of the site.

Full details of the observed subsurface stratigraphy can be found within the test pit and borehole logs contained in Appendix B.

4.3 Groundwater

Groundwater was identified in all 3 drill holes and measured as the following;

- BH1, located in the southern area of the site, depth to groundwater was 8.0m;
- BH2, located in the central area of the site, depth to groundwater was 8.7m, and;

- BH3, located in the northern area of the site, depth to groundwater was 2.0m. Also confirmed in test pit TP11

Note that drill holes were undertaken in the low lying area of the site only specifically to address the potential for liquefaction identified in this area. The groundwater level was not confirmed in elevated western areas, or in northern areas within the narrow valley. Based on available data the groundwater level in elevated area is estimated to be approximately 12-14m below the site surface. In the northern valley areas depth to groundwater is likely to be shallow and will need confirmation during the detailed design phase of future earthworks.

Perched groundwater was identified in 1 location only (TP23) and was present at a depth of 4.4m in test pit TP12.

4.4 Potential Natural Hazards

On the Queenstown Lakes District Council (QLDC) mapping data base the following potential natural hazards are identified within the development area:

- Alluvial Fan hazard, Regional Scale;
- Liquefaction hazard, designated as LIC 2 (P), Possibly moderate risk of liquefaction, and;
- Flooding associated with Mill Creek.

The extent of these mapped hazards in relation to the development is shown on Figure 1b, Appendix A.

5 Slope Stability

5.1 General

Slope stability analysis of the terrace slope located to the west of Mill Creek has been undertaken using the software package "Slope W." The analysis has been undertaken to determine the factors of safety (FoS) of the site under both static and seismic load conditions.

An analysis was carried out using four representative cross sections through the terrace slope.

Target factors of safety (FoS) for residential dwellings constructed close to steeply sloping ground are presented in table 5.1 below:

Table 5.1 – Slope Stability Target Factors of Safety

Load Case	Typical Target Design FoS
Static Load Conditions	FoS > 1.5
Serviceability Limit State (SLS) Seismic Load Conditions PGA = 0.11g	FoS > 1.2
Ultimate Limit State (ULS) Seismic Load Conditions PGA = 0.43g	No Target FoS, estimate likely displacements

5.2 Results

The slope stability results indicate that to achieve the recommended Factors of Safety outlined in Table 5.1 a preliminary 6.0m set-back is appropriate for much of the crest length. In southern areas the slope is higher and steeper and a preliminary set-back of 12m from the steeper section of the slope is recommended. The approximate extent of these areas are shown on Figure 1b, Appendix A.

For the ULS assessment, displacement estimates have been computed by increasing seismic loading until a factor of safety (FOS) of 1 is achieved. This seismic acceleration is then computed using the methodology of Jibson¹ to provide an estimate of lateral displacement under ULS earthquake conditions. This quantification is not precise, and without calibration, only a rough order of magnitude of movement can be estimated.

For the above set-backs lateral displacements under ULS conditions are calculated to be ≤25mm. Factors of safety for static and serviceability conditions at the above set back will be greater than those outlined in Table 5.1.

As ground displacements are expected in a ULS event (albeit relatively minor) at the building setbacks proposed above, any foundations located in this area will need to be designed to cater for such movements. It is understood that the developer will seek to ensure platforms are located appropriately to mitigate this concern.

¹ R.W. Jibson / *Engineering Geology* 91 (2007) 209 – 218 - Regression models for estimating coseismic landslide displacement - Randall W. Jibson

The setbacks provided could potentially be reduced by implementing one or more of the following options:

- Site ground improvement,
- Embedded pallisade walls;
- Specific design of structural foundations that can cope with the identified movements;
- Earthworks to re grade the terrace slope to a reduced batter, removing the need for a setback.

The above assessment is intended for preliminary subdivision layout. A detailed stability assessment of the proposed building platforms along the slope crest should be undertaken as part of the detailed design phase, however findings to date indicate standard engineering solutions are available to ensure construction can be completed adjacent to crest areas.

Slope stability and potential impacts under static and seismic loading should be considered for general infrastructure aspects e.g. access roads, services etc depending on the layout proposed.

6 Liquefaction Assessment

6.1 Design Earthquakes

A liquefaction analysis of the CPT soundings was undertaken using Cliq software and in accordance with NZS1170.0 – Structural Design Actions and recent MBIE guidelines.

Three earthquake scenarios were considered based on a building with Importance Level 2 with a 50 year design life. These scenarios represent the following design performance requirements:

- Serviceability Limit State (SLS) – to avoid damage that would prevent the structure from being used as originally intended without repair, and,
- Ultimate Limit State (ULS) – to avoid collapse of the structural system.

For the purpose of this analysis in terms of NZS 1170, Class C sub-soil conditions (shallow soils) have been adopted.

The earthquake scenarios used in our analyses are presented in Table 6.1.

Table 6.1 – Summary of the earthquake scenarios used in the liquefaction assessment

	Serviceability Limit State (SLS) design earthquake 1	Design earthquake 2	Ultimate Limit State (ULS) design earthquake
Return period (years)	25	<100	500
Moment Magnitude, Mw	7.5	6.5	7.5
Peak horizontal ground acceleration, PGA	0.11g	0.2g	0.43g
Notes The DE2 loading is not from NZS1170, and is a conservative estimate of potential peak ground accelerations for a moderate sized earthquake in relative close proximity to the site.			

6.2 Liquefaction Summary

6.2.1 Analysis Results

A preliminary liquefaction assessment has been carried out in CLiq using the updated Boulanger & Idriss (2014)² deterministic method which incorporates a number of case histories from the recent Christchurch Earthquakes.

No liquefaction is predicted under the site under SLS loading.

Some liquefaction is predicted under ULS loading, albeit generally at depth apart from in the northern part of the site.

Minor liquefaction is predicted under DE2 loading in the northern part of the site only.

Standard and widely used engineering and foundation solutions are available for the level of liquefaction induced settlement identified in the assessment, see Section 7.3 of this report.

Table 6.2 – Summary of factors considered to assess the consequences of the predicted liquefaction

Key Considerations for analysis										
	CPT 1	CPT 2	CPT 3	CPT 4&5	CPT 6	CPT 7-10	CPT 11	CPT 12	CPT 13	CPT 14
Minimum Crust thickness ¹										
SLS	-	-	-	-	-	-	-	-	-	-
DE2	6.5 m	6 m	-	-	-	-	-	-	-	-
ULS	2 m	2 m	13 m	-	8.5 m	-	8.5 m	7 m	8.0 m	8.5 m
Free field settlement range ¹										
SLS	0	0	0	0	0	0	0	0	0	0
DE2	<20 mm	<20 mm	0	0	0	0	0	0	0	0
ULS	60-80mm	110-130mm	<10mm	0	<10mm	0	70-90 mm	<10mm	20-40 mm	<10mm
Liquefaction Severity Number ¹										
SLS	0	0	0	0	0	0	0	0	0	0
DE2	1	2	0	0	0	0	0	0	0	0
ULS	15	22	0	0	0	0	6	0	2	0
¹ refer to Appendix C – Liquefaction Assessment for a detailed explanation. Presented results based on an Ic cut off of 2.6.										

The results of the liquefaction analyses indicate the following:

- Elevated and low lying areas south and west of the farm (See Appendix A, Figure 1b) are expected to suffer negligible effects under the SLS events and ground deformations within typical structural limits under the ULS event. This is due to the thick crust and generally interstratified liquefiable layers at depth separated by non-liquefiable layers. Foundation options for development areas 1 and 2 are discussed in section 7.3.2 of this report.
- The area north of the farm (See Appendix A, Figure 1b) is expected to suffer negligible to minor effects under the SLS events and minor to moderate effects under the ULS event. Owing to the shallow water table and thin crust in this area it is possible that liquefaction during a ULS event may manifest at the surface (e.g. sand boils and abrupt

² Boulanger, R.W. & Idriss, I.M. (2014). CPT AND SPT BASED LIQUEFACTION TRIGGERING PROCEDURES

differential settlement) resulting in localised damage to the site and/or dwellings. Foundation options for this area are discussed in section 7.3.3 of this report.

It should be noted the settlements provided above are to the full depth of the CPT's.

Detailed results of the liquefaction assessment are presented within Appendix C.

6.2.2 Lateral Spreading

The risk of lateral spreading at a site is dependent on the presence, distance and height of a free face (e.g. riverbank), the thickness of any liquefiable soil layers and the earthquake characteristics.

A detailed assessment of lateral spreading has not been undertaken however due to the height of the free face present and the depth to the water table at the site the risk of lateral spreading is considered to be low in the southern part of the site.

In the northern parts of the site, development is proposed in close proximity to Mill Creek. The creek is relatively shallow, however there is some risk of some minor lateral spread in this area that should be considered once subdivision layouts are further developed. Our assessment to date indicates that cost effective engineering solutions are available to address this issue and the foundation options outlined in Section 7.3, or similar, are likely to be appropriate. Further assessment is recommended at the detailed design phase.

7 Engineering Considerations

7.1 General

The recommendations and opinions contained in this report are based upon ground investigation data obtained at discrete locations and historical information held on the GeoSolve database. The nature and continuity of subsoil conditions away from the investigation locations is inferred and cannot be guaranteed.

7.2 Geotechnical Parameters

Table 7.1 provides a summary of the recommended geotechnical design parameters for the soil materials expected to be encountered during construction.

Table 7.1 Recommended Geotechnical Design Parameters

Unit	Thickness (m)	Bulk Density γ (kN/m ³)	Effective Cohesion c' (kPa)	Effective Friction ϕ' (deg)	Elastic Modulus E (kPa)	Poissons Ratio ν
Topsoil (soft-firm sandy organic SILT)	0.2-0.4	16	NA	NA	NA	NA
Loess (firm - stiff SILT with some sand)	0.2-1.3	18	0	30	7,000	0.3
Alluvial Deposit (Loose to medium dense interbedded sands and gravels)	Not proven (Likely 20m+)	19	0	32-36	10-20,000	0.3
Pond Sediment ¹ (Interbedded soft to firm SILT)	Not proven	18	0	28	5,000	0.3

7.3 Settlement and Foundations

7.3.1 General

All unsuitable materials identified in foundation excavations, particularly those softened by exposure to water, should be undercut and replaced with engineered fill during construction. Any fill that is utilised as bearing for foundations should be placed and compacted in accordance with NZS 4431:1989 and certification provided to that effect.

To minimise the effects of freeze-thaw cycles, all shallow foundations on fine grained soils should be founded a minimum of 0.4m below the adjacent finished ground surface.

It is recommended the foundation excavations be inspected by a suitably qualified and experienced geotechnical specialist to confirm the conditions are in accordance with the assumptions and recommendations provided in this report.

7.3.2 Elevated and low lying areas South and West of the Farm

Foundations in these areas will likely comprise a standard 3604 slab on the upper terrace and an enhanced concrete slab or rib raft (waffle slab) foundation for central and southern areas of the lower terrace in order to cater for the liquefaction induced settlements predicted. The final selection of the foundation for a particular lot should take into account the information in this report, particularly section 6.2 and, if appropriate 5.2. Bearing capacity should be confirmed on a lot by lot basis during detailed design of each dwelling.

Figure 7.1 summarises the recommended working stresses for shallow footings which bear upon loess or alluvial sand and gravels. It should be noted the preliminary foundation working stresses presented on Figure 7.1 are governed by bearing capacity in the case of narrow footings and settlement in the case of wide footings.

Figure 7.1 should be used as a guide only and a specific assessment of bearing capacity along with the selection of the most appropriate foundation solution should be carried out at the detailed design stage.

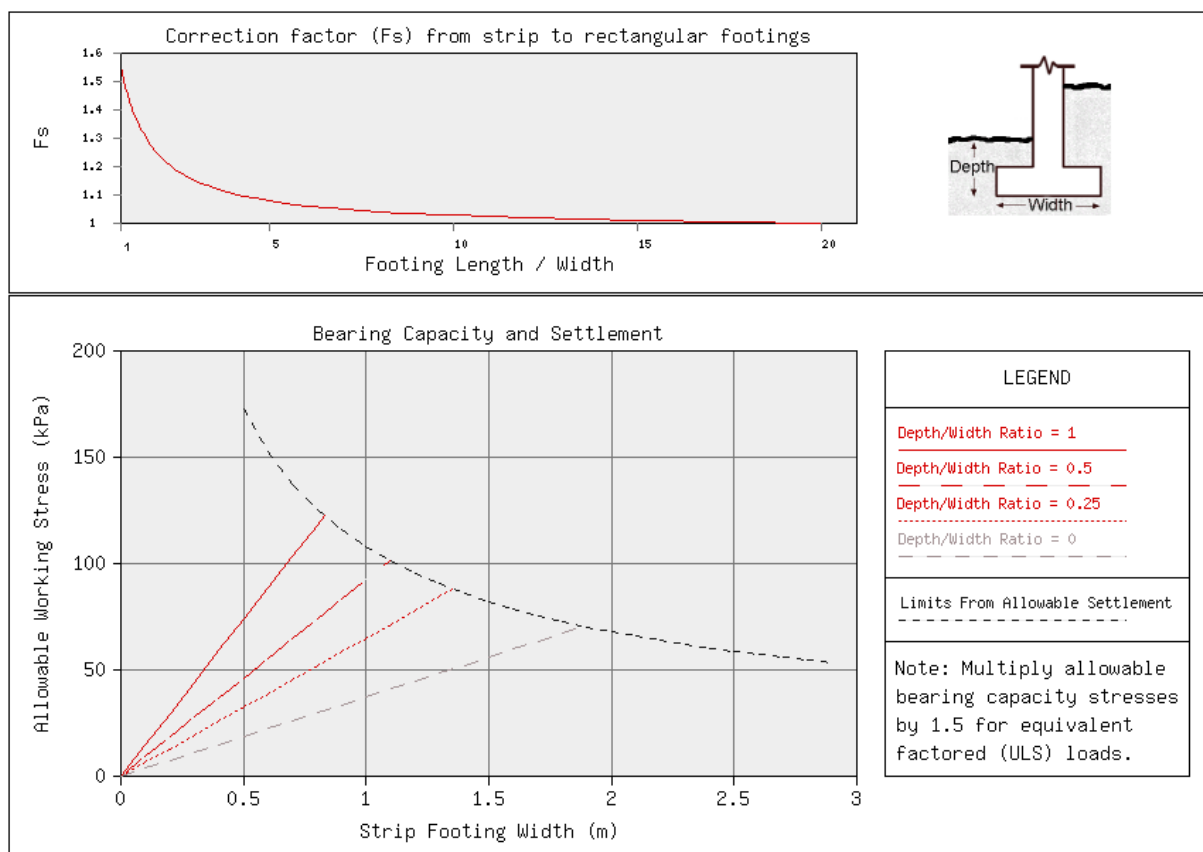


Figure 7.1. Recommended Preliminary Bearing for Shallow Footings on Loess or alluvial sands and gravels.

From Figure 7.1 it can be seen an allowable working stress of approximately 75 kPa is recommended for a 500 mm wide by 500 mm deep strip footing founded within loess or alluvial sands and gravels. This corresponds to a factored (ULS) bearing capacity of approximately 110 kPa and an ultimate geotechnical bearing capacity of 220kPa.

7.3.3 Area North of the Farm

An enhanced concrete slab or rib raft (waffle slab) constructed over a geogrid reinforced compacted granular raft is a possible foundation solution for a light-weight structure in this area.

As a guide a minimum 800mm thick gravel raft, with layers of geogrid is likely to be required to provide protection against sand boils migrating to the underside of the foundation during a large earthquake (which may ordinarily result in abrupt differential settlements at the surface). The foundation would need to be sufficiently tied together and stiff enough to limit differential settlements to the agreed limit, and designed to span over soft spots and soft edges due to shallow liquefaction under the gravel raft.

A geotextile should be laid at the base of the excavation if fine grained sediments are identified during construction.

The above solution is a guide only and specific engineering design at the detailed design stage should be carried out to establish the most appropriate foundation option.

Investigation and assessment will be required at the detailed design phase to confirm the foundation requirements for building lots in the northern valley.

7.4 Site Preparation

During the earthworks operations all topsoil, organic matter, fill and other unsuitable materials should be removed from the construction areas in accordance with the recommendations of NZS 4431:1989.

Owing to the moderately erodible nature of some of the soils present across the site, sediment control measures should be instigated during earthworks construction.

Water should not be allowed to pond or collect near or under a foundation slab. Positive grading of the subgrade should be undertaken to prevent water ingress or ponding.

All fill that is utilised as bearing for foundations should be placed and compacted in accordance with the recommendations of NZS 4431:1989 and certification provided to that effect. The granular alluvial deposits observed on site could be used as engineered fill (during good weather and in accordance with an earth fill specification). Boulders and cobbles over 75 mm in size will need to be screened from engineered fill sources. An earth fill specification can be provided on request.

We recommend topsoil stripping and subsequent earthworks be undertaken only when a suitable interval of fair weather is expected, or during the earthworks construction season.

7.5 Excavations

We recommend that any excavations should be inspected by a geotechnical practitioner during earthworks construction.

Only minor localised seepage was encountered during test pitting at shallow depths and hence groundwater is unlikely to be encountered during excavations. However, a geotechnical practitioner should inspect any seepage, spring flow that may be encountered during construction.

Recommendations for temporary batters are as follows:

Table 7.2 Recommended Batter for Temporary Cuts up to 3 m in Height

Material Type	Recommended Maximum Batter for Temporary Cuts Less than 3 m High (horizontal to vertical)	
	Dry Ground	Wet Ground
Loess, Fill, Topsoil	2 : 1	3 : 1.

Alluvial Deposits	1.5 : 1	3 : 1
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Temporary batters which are required to be higher or steeper than those described above should be subject to specific design.

We understand no permanent cut batters are currently proposed and hence any permanent cut batters will be subject to specific design at the detailed design stage.

7.6 Engineered Fill Slopes

Any engineered fill slopes less than 3 m in height should be constructed with a batter of 2.5 : 1 (horizontal to vertical) or flatter, provided these slopes are well drained.

Fill slopes which are required to be higher or steeper than those described above should be subject to specific engineering design.

7.7 Ground Retention

We understand that no retention of cuts is currently proposed however any retaining wall should be designed by a chartered professional engineer using the geotechnical parameters recommended in Table 7.1 of this report. Due allowance should be made during the detailed design of all retaining walls for any additional loads upslope of the wall (i.e. surcharge due to back-slope, traffic and seismic loading).

All temporary slopes for retaining wall construction should be battered at 1.5:1 (horizontal to vertical) provided these are within granular alluvial deposits.

Perched groundwater was identified in one test pit and has the potential to develop following completion of the earthworks in other areas of the development, in particular as a result of heavy or prolonged rainfall. To ensure potential groundwater seeps and flows are properly controlled behind the retaining walls, the following recommendations are provided:

- A minimum 0.3m width of durable free draining granular material should be placed behind all retaining structures;
- A heavy duty non-woven geotextile cloth, such as Bidim A19, should be installed between the natural ground surface and the free draining granular material to prevent siltation and blockage of the drainage media; and
- A heavy-duty (TNZ F/2 Class 500) perforated pipe should be installed within the drainage material at the base of all retaining structures to minimise the risk of excessive groundwater pressures developing. This drainage pipe should be connected to the permanent piped storm water system.

7.8 Groundwater Issues

The regional groundwater table, is expected to lie well below the finished floor levels. Dewatering or other groundwater-related construction issues are therefore unlikely to be required for site earthworks. Perched groundwater horizons may be encountered at shallow depths if excavations are completed in close proximity to Mill Creek. Any earthworks completed in close proximity to Mill Creek should include geotechnical input during the detailed design phase.

7.9 Flooding Risk

Flooding risks associated with Mill Creek are indicated on the QLDC hazard mapping. This hazard has been assessed separately by others and is not addressed in this report. Suitable erosion/scour protection will be required along Mill Creek.

In topographically lower areas of the site total settlements following a large earthquake event may be of the order of 100 mm – 200mm. We recommend that this change in level be taken into account when finalising site levels and flood assessments.

7.10 Alluvial Fan Hazard

QLDC hazard mapping identifies parts of the development site as potentially subject to active debris-dominated alluvial fan activity, see Figure 2, Appendix A. The relevant fan assessment and mapping is to regional scale (1:50,000) and as such is of relatively coarse resolution, indicating simply that site-specific assessment is desirable.

Subsequent higher resolution (1:25,000) assessment by ORC of specific alluvial fan areas did not identify any of the sites as lying with active fan areas, but noted "...the absence of information on alluvial fan hazard for a certain property or area does not necessarily mean that alluvial fan activity will not affect that property or area", again indicating that site-specific assessment may be desirable.

The hillslopes above the site in central and southern areas are stable geologically with gradients generally less than 20° in upper areas increasing to 30-40° in lower areas, with the exception of a small steep bluff. Slope in the northern valley show indications of soil creep. No active deep seated land sliding is visible or likely; thus there is negligible sediment supply for debris mobilisation. Site sub soils are generally alluvial but not indicative of debris flow or debris flood activity. The risk factors for alluvial fan hazard are not present to any significant extent and there is no evidence of previous such activity, therefore it is considered that the risk of alluvial fan hazards are very low for the proposed development area.

A tributary to Mill Creek is located immediately to the west of the development, see location on Figure 1b, Appendix A. To assess potential for flooding from this flow path, analysis was undertaken by the Rational Method with a 15% increase to allow for future climate change. This analysis indicates a 100-year ARI (average recurrence interval) peak flow of 0.93 m³/s from the 14 hectare catchment area. Based on observed channel dimensions and gradient, it is calculated that in a 100-year flood it will flow no deeper than 300 mm which will be confined well within the channel banks. A small dam exists in the tributary channel, but the water volume retained is clearly insufficient to pose any danger associated with potential dam breach. It is concluded that there is no flooding hazard to the development sites from the western tributary in a 100-year ARI flood.

It is recommended a small diversion channel be constructed around the foot of the hill above development areas, to intercept any upslope runoff/springflow and convey it into the adjacent watercourse(s). This channel will also serve to contain any minor earth flows which may emanate from the hillside particularly in the vicinity of the springs. The upslope catchment area is only a very few hectares in size and is well vegetated and stable geologically, so the diversion channel need only be say 750 mm deep and wide. Alternative to an excavated channel, similar protection could be achieved by forming a small landscape bund or accessway embankment above the building platforms.

Minimum finished floor levels as per standard construction requirements will provide sufficient freeboard against any local runoff or ponding, provided the overall site is well drained by surface contours.

7.11 Site Subsoil Category

For detailed design purposes it is recommended the magnitude of seismic acceleration be estimated in accordance with the recommendations provided in NZS 1170.5:2004.

The site has assumed to be Class C (Shallow soil site) in accordance with NZS 1170.5:2004 seismic provisions for the purpose of liquefaction assessment.

Structural design should assume Class C (Deep soil site) in absence of deep drilling data (~50m depth).

8 Neighbouring Structures/Hazards

Natural Hazards: The risk of seismic activity has been identified for the region as a whole and appropriate allowance should be made for seismic loading during the detailed design phase.

Distances to adjoining structures: No adverse effects are expected to impact the existing structures on or neighbouring the site, however any potential implications should be assessed at the detailed design stage.

Aquifers: No aquifer resource will be adversely affected as a result of the development.

Erosion and Sediment Control: The site presents potential to generate silt runoff. Effective systems for erosion control are runoff diversion drains and contour drains, while for sediment control, options are earth bunds, silt fences, hay bales, vegetation buffer strips and sediment ponds. Only the least amount of subsoil should be exposed at any stage and surfacing established as soon as practical. Details for implementation are given in within the following link

<http://ecan.govt.nz/publications/General/FullErosionandSedimentControlGuideline.pdf>

Noise: Conventional earthmoving equipment such as excavators will be required to complete earthworks at the site however rock-breaking and/or blasting is unlikely to be required.

Dust: Unlikely to be an issue, but regular dampening of soil materials with sprinklers should be effective if required.

Vibration: Minor vibration induced settlement may occur in these soil types. If appropriate a separate assessment of effects to neighbouring structures should be carried out during the detailed design stage once foundation solutions have been established.

9 Further Work

During the detailed design phase of the project the following geotechnical inputs are recommended:

- Investigation and assessment to confirm foundation and earthwork designs for the northern valley area, to include liquefaction, settlement, lateral spreading, and other requirements.
- Review liquefaction analysis completed to date and adjust accordingly to account for recent best practice recommendations.

10 Conclusions and Recommendations

- The development of a residential subdivision in the proposed development area is considered feasible from a geotechnical perspective provided the recommendations of this report are followed.
- Soil materials typically comprise loess overlying pond sediments (in the north only), overlying alluvial sands and gravels.
- Depth to groundwater varies from 2.0 to 8.7m in low lying areas of the site and is assessed as being 12 to 14m in elevated western areas.
- A risk of liquefaction and associated surface deformation has been identified in low lying areas of the site, and is discussed in Section 6.0. No liquefaction is predicted under SLS loading. Some liquefaction is predicted under ULS loading, however this is generally at depth apart from in the northern part of the site;
- Foundation recommendations for dwellings constructed in areas prone to liquefaction are provided in Section 7.3.
 - Standard 3604 slabs are likely to be feasible on the western upper terrace;
 - An enhanced concrete slab or rib raft (waffle slab) foundation is likely to be suitable for central and southern areas of the lower terrace;
 - An enhanced concrete slab or rib raft (waffle slab) constructed over a geogrid reinforced compacted granular raft is a possible foundation solution in the northern part of the site, where some surface disruption (e.g. sand boils) is predicted under ULS loading;
- A stability assessment of the slope to the west of Mill Creek has been completed and construction set-backs from the crest of this slope are discussed in Section 5.2, ranging from 6m to 12m;
- An alluvial fan risk is identified on the QLDC hazard mapping and is assessed in Section 7.10 of this report. The risk to the development from debris flow or flooding associated with the alluvial fan hazard is assessed to be very low. Surface run-off directly from the hills to the north is expected and a small diversion bund to address this issue is recommended.
- A flooding risk is identified on the QLDC hazard maps. The risk of flooding has been assessed separately by others however changes in ground level (100-200mm) as a result of liquefaction have been identified. It is recommended that when flooding assessments and site levels are finalised this be taken into account.
- Further works are recommended at the detailed design phase, as outlined in Section 9.

11 Applicability

This report has been prepared for the benefit of Winton Partners Ltd with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

It is important that we be contacted if there is any variation in subsoil conditions from those described in this report.

Report prepared by:

A handwritten signature in blue ink, appearing to read "Stuart Minty".

.....
Stuart Minty
Project Engineer

Reviewed for GeoSolve Ltd by:

A handwritten signature in blue ink, appearing to read "Paul Faulkner".

.....
Paul Faulkner
Senior Engineering Geologist

Authorised for GeoSolve Ltd by:

A handwritten signature in black ink, appearing to read "Colin Macdiarmid".

.....
Colin Macdiarmid
Senior Geotechnical Engineer

Appendix A: Site Plans



Legend

- Test pit location
- CPT location
- Borehole location

SCALE 1:4000

0 40 80 120 160 200 (m)

Level 1, 70 MacAndrew Road, South Dunedin
www.geosolve.co.nz

DRAWN	WCG	Jun'16
DRAFTING CHECKED		
APPROVED		
CADFILE: 150098_01_SPF.dwg		
SCALES (AT A3 SIZE): AS SHOWN		
PROJECT No: 150098.01		

Ayrburn Farm Development Ltd

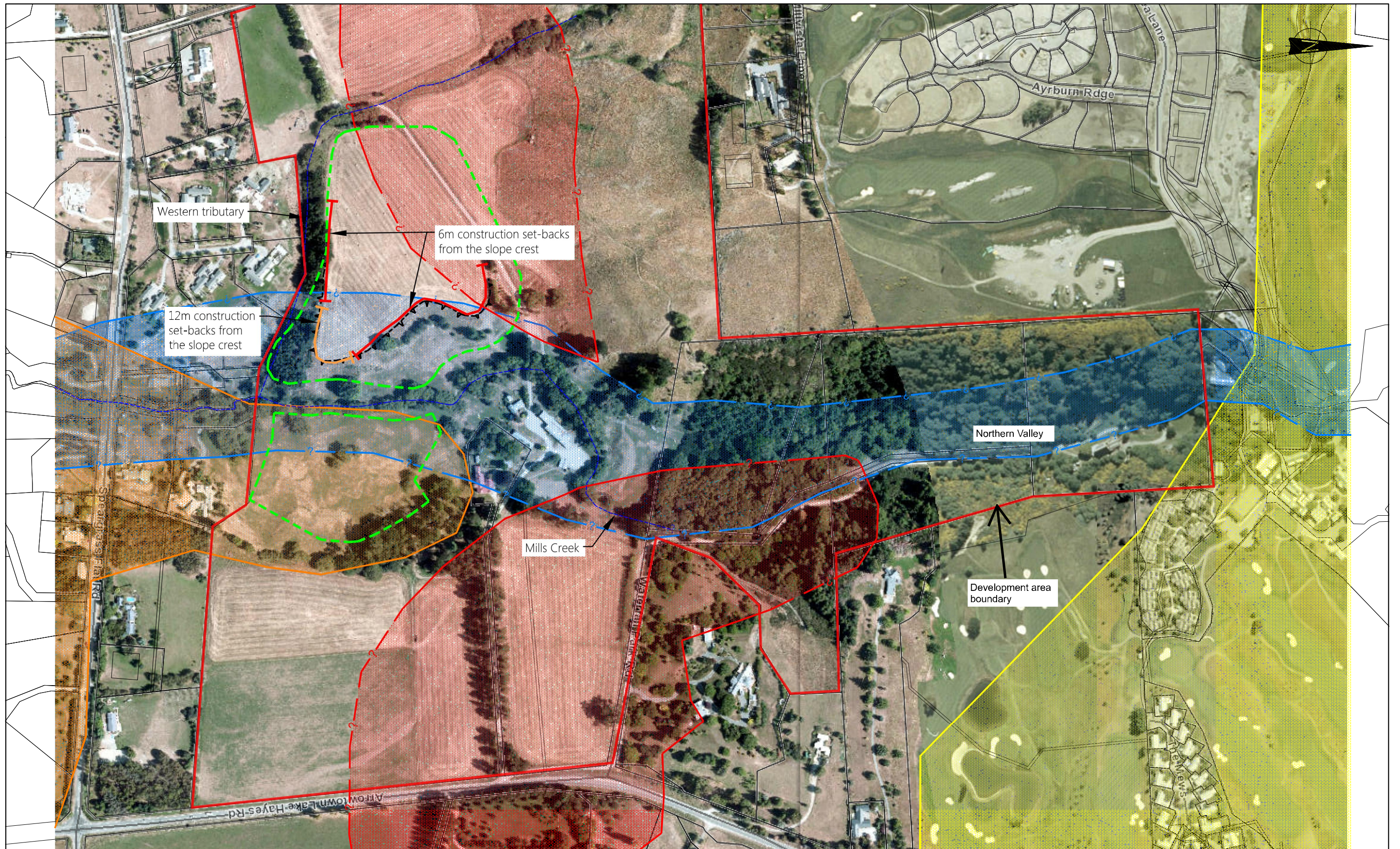
Geotechnical Investigation

Arrowtown-Lake Hayes Road








Site Investigation Plan

FIG No:
Appendix A, Figure 1a

REV
0




Legend

 Regional scale alluvial fan activity	 Flooding Area	 Approximate extent of proposed residential development areas
 LIC1 liquefaction risk area	 Creek	
 LIC2 liquefaction risk area	 Terrace Slope	

SCALE 1:4000

0 40 80 120 160 200 (m)



Level 1, 70 MacAndrew Road, South Dunedin
www.geosolve.co.nz

DRAWN	WCG	Jun_16
DRAFTING CHECKED		
APPROVED		
CADFILE: 150098_01_SPf.dwg		
SCALES (AT A3 SIZE): AS SHOWN		
PROJECT No: 150098.01		

Ayrburn Farm Development Ltd

Geotechnical Investigation

Arrowtown-Lake Hayes Road

Hazard Plan

FIG No:
Appendix A, Figure 1b

REV
0

Appendix B: Investigation Data

DRILL HOLE No: BH1
Hole Location: SEE PLAN
SHEET 1 OF 2

ROCKLOG TT ROCKLOG.GPJ 24/03/04

DRILL HOLE LOG

DRILL HOLE No: BH 1

Hole Location: SEE PLAN.

SHEET... 2 ... OF ... 2 ...

PROJECT: AYRBUEN FARM.		LOCATION: LAKE HAYES - ARROWTOWN		JOB No: 150098									
CO-ORDINATES mN mE		DRILL TYPE: SONIC 3"		HOLE STARTED: 22-4-2015									
DIRECTION: N/A °		DATUM: N/A		HOLE FINISHED: 22-4-2015									
ANGLE FROM HORIZ.: 90°		R.L. GROUND: N/A m		DRILLED BY: N. NEILL									
		R.L. COLLAR: N/A m		LOGGED BY: PGF CHECKED:									
DESCRIPTION OF CORE													
GEOLOGICAL UNIT	ROCK OR SOIL TYPE, WEATHERING, HARDNESS, STRENGTH, COLOUR, LITHOLOGICAL FEATURES (bedding, cement, foliation, mineralogy, texture, etc.);			CORE LOSS / LIFT (%)	TEST SYMBOL								
						METHOD, CORE & CASING	DEPTH (m)	GRAPHIC LOG	PIEZOMETER		DATE / DEPTH	WATER	
<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> <p>ALLUVIAL DEPOSITS</p> </div> <div style="width: 35%;"> <p>silty SAND, with some silty sand bands, grey-brown, moist.</p> </div> <div style="width: 15%;"> <p>16 17 18 19 20</p> </div> <div style="width: 15%;"> <p>PIEZOMETER TERMINATED AT 15m.</p> </div> <div style="width: 15%;"> <p>HOLE COMPLETED ON 22-4-2015</p> </div> <div style="width: 15%;"> <p>SPT AT 17.5m 2, 4, 5, 5, 6, 7 N = 23</p> </div> </div>													
<p>BOREHOLE COMPLETE FINAL DEPTH 20.5m.</p>													
<p>SPT AT 20.5m 5, 5, 5, 6, 9, 8 N = 28</p>													

SHEET 1 OF 1

ROCKLOG TT ROCKLOG.GPJ 24/03/04

DRILL HOLE No: BH 3
Hole Location: SEE PLAN.
SHEET 1 OF 2

ROCKLOG TT ROCKLOG.GPJ 24/03/04

DRILL HOLE LOG

DRILL HOLE No: BH3
Hole Location: SEE PLAN
SHEET... 2 ... OF ... 2 ...

PROJECT: AYR BURN FARM		LOCATION: LAKE HAYES - ARROWTOWN		JOB No:	
CO-ORDINATES mN mE		DRILL TYPE: SONIC		HOLE STARTED: 24-4-15	
DIRECTION: °		DATUM: N/A		HOLE FINISHED: 24-4-15	
ANGLE FROM HORIZ.: °		R.L. GROUND: N/A m		DRILLED BY: McNEILL	
		R.L. COLLAR: N/A m		LOGGED BY: PGF CHECKED:	
DESCRIPTION OF CORE					
GEOLOGICAL UNIT	ROCK OR SOIL TYPE, WEATHERING, HARDNESS, STRENGTH, COLOUR, LITHOLOGICAL FEATURES (bedding, cement, foliation, mineralogy, texture, etc...);	CORE LOSS / LIFT (%)	METHOD, CORE & CASING	TEST SYMBOL	DEPTH (m)
<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>silty SAND, grey, sand is fine.</p> <p>SILT with some sand and sandy-silt bands, grey, non-plastic, moist</p> <p>silty SAND, with some very silty bands, grey, sand is fine, moist.</p> <p>Very sandy SILT; moist, non-plastic.</p> <p>BOREHOLE COMPLETE AT 25m.</p> </div> <div style="width: 30%;"> <p>PIEZOMETER</p> <p>PIEZOMETER TERMINATES AT 15m.</p> </div> <div style="width: 30%;"> <p>23-4-2015 0.0 - 20.5m</p> <p>20.5 - 25m</p> <p>24-4-2015</p> </div> </div>					



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 1

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 22-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 22-Apr-15	

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
	NO SEEPAGE	0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		0.8		Yellow grey, SILT with some fine sand. Firm to stiff.	Moist	LOESS
		2.4		Grey brown, gravelly SAND with minor silt and gravel lenses. Gravel is fine with sub-rounded to rounded clasts. Medium dense. Sub-horizontal bedding.	Moist	ALLUVIAL SAND
		4.0		Grey brown, sandy GRAVEL with minor silt and cobbles. Gravel is fine with sub-rounded to rounded clasts. Medium dense. Sub-horizontal bedding.	Moist	ALLUVIAL GRAVEL

Total Depth = 4 m

COMMENT: Test pit was dry and sides were stable.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 2

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 22-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 22-Apr-15	

						GEOLOGICAL
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		0.7		Yellow grey, SILT with some fine sand. Firm to stiff.	Moist	LOESS
		1.0		Grey brown, sandy GRAVEL with minor silt and cobbles. Gravel is fine with sub-rounded to rounded clasts. Medium dense. Sub-horizontal bedding.	Moist	ALLUVIAL GRAVEL
		2.3		Grey brown, gravelly SAND with minor silt and gravel lenses. Gravel is fine with sub-rounded to rounded clasts. Medium dense. Sub-horizontal bedding.	Moist	ALLUVIAL SAND
	NO SEEPAGE	4.1		Grey brown, sandy GRAVEL with minor silt and cobbles. Gravel is fine with sub-rounded to rounded clasts. Medium dense. Sub-horizontal bedding.	Moist	ALLUVIAL GRAVEL

Total Depth = 4.1 m

COMMENT: Test pit was dry and sides were stable.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



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EXCAVATION LOG

EXCAVATION NUMBER:

TP 3

PROJECT: Ayrburn Farm	Job Number: 150098
LOCATION: See Site Plan	Inclination: VERTICAL Direction:

EASTING: mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes
NORTHING: mN	INFOMAP NO.	COMPANY: Earthworks and Drainage
ELEVATION: m	DIMENSIONS:	HOLE STARTED: 22-Apr-15
METHOD:	EXCAV. DATUM:	HOLE FINISHED: 22-Apr-15

						GEOLOGICAL
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		0.6		Yellow grey, SILT with some fine sand. Firm to stiff.	Moist	LOESS
		4.0		Grey brown, gravelly SAND with minor silt and gravel lenses. Gravel is fine with sub-rounded to rounded clasts. Medium dense. Sub-horizontal bedding.	Moist	ALLUVIAL SAND
		4.2		Grey brown, sandy GRAVEL with minor silt and cobbles. Gravel is fine with sub-rounded to rounded clasts. Medium dense. Sub-horizontal bedding.	Moist	ALLUVIAL GRAVEL

Total Depth = 4.2 m

COMMENT: Test pit was dry and sides were stable.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



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EXCAVATION LOG

EXCAVATION NUMBER:

TP 4

PROJECT: Ayrburn Farm	Job Number: 150098
LOCATION: See Site Plan	Inclination: VERTICAL Direction:

EASTING: mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes
NORTHING: mN	INFOMAP NO.	COMPANY: Earthworks and Drainage
ELEVATION: m	DIMENSIONS:	HOLE STARTED: 22-Apr-15
METHOD:	EXCAV. DATUM:	HOLE FINISHED: 22-Apr-15

						GEOLOGICAL
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.2		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		0.4		Yellow grey, SILT with some fine sand. Firm to stiff.	Moist	LOESS
		0.8		Grey brown, sandy GRAVEL with minor silt and cobbles. Gravel is fine with sub-rounded to rounded clasts. Medium dense. Sub-horizontal bedding.	Moist	ALLUVIAL GRAVEL
	NO SEEPAGE	4.4		Grey brown, silty SAND with some fine gravel and thin bed of laminated sandy silt at 4.2m. Medium dense.	Moist	ALLUVIAL SAND

Total Depth = 4.4 m

COMMENT: Test pit was dry and sides were stable.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



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EXCAVATION LOG

EXCAVATION NUMBER:

TP 5

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 22-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 22-Apr-15	

						GEOLOGICAL
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
	NO SEEPAGE	0.6		Dark brown, sandy SILT with organic rootlets. Soft.	Moist	FILL
		0.9		Dark brown, organic SILT with traces of clay and sand. Soft.	Moist	HISTORIC TOPSOIL
		1.3		Yellow grey, SILT with some fine sand. Firm to stiff.	Moist	LOESS
		2.4		Grey brown, sandy gravelly SILT. Firm. Massive.	Moist	ALLUVIAL FAN
		4.2		Grey brown, sandy GRAVEL with minor silt and cobbles. Gravel is fine with sub-rounded to rounded clasts. Medium dense. Sub-horizontal bedding.	Moist	ALLUVIAL GRAVEL

Total Depth = 4.2 m

COMMENT: Test pit was dry and sides were stable.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 6

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 22-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 22-Apr-15	

						GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION	
	NO SEEPAGE	0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL	
		0.7		Grey brown, sandy SILT. Soft.	Moist	FILL	
		1.0		Yellow grey, SILT with some fine sand. Firm to stiff.	Moist	LOESS	
		2.5		Grey brown, sandy GRAVEL with minor silt and cobbles. Gravel is fine with sub-rounded to rounded clasts. Medium dense. Sub-horizontal bedding.	Moist	ALLUVIAL GRAVEL	
		4.8		Yellow grey, silty SAND. Loose to medium dense. Massive.	Moist	ALLUVIAL SAND	

Total Depth = 4.8 m

COMMENT: Test pit was dry and sides were stable.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



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EXCAVATION LOG

EXCAVATION NUMBER:

TP 7

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination:	VERTICAL	Direction:
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 22-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 22-Apr-15	

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
	NO SEEPAGE	4.4		Grey brown, sandy GRAVEL with cobbles and boulders up to 350 mm. Gravel is fine to coarse and sub-rounded to rounded. Loose to medium dense. Bedded.	Moist	ALLUVIAL GRAVEL

Total Depth = 4.4 m

COMMENT: Test pit was dry, minor instability of pit sides.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 8

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 22-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 22-Apr-15	

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		0.7		Yellow grey, SILT with some fine sand. Firm to stiff.	Moist	LOESS
	NO SEEPAGE	4.2		Grey brown, sandy GRAVEL with cobbles and boulders up to 350 mm. Gravel is fine to coarse and sub-rounded to rounded. Loose to medium dense. Bedded.	Moist	ALLUVIAL GRAVEL

Total Depth = 4.2 m

COMMENT: Test pit was dry, minor instability of pit sides.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



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EXCAVATION LOG

EXCAVATION NUMBER:

TP 9

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination:	VERTICAL	Direction:
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 22-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 22-Apr-15	

						GEOLOGICAL
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
	NO SEEPAGE	0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		0.6		Yellow grey, SILT with some fine sand. Firm to stiff.	Moist	LOESS
		3.0		Grey brown, sandy GRAVEL with minor silt and cobbles. Gravel is fine with sub-rounded to rounded clasts. Medium dense. Sub-horizontal bedding.	Moist	ALLUVIAL GRAVEL
		4.3		Grey brown, silty SAND with some fine gravel and thin bed of laminated sandy silt at 4.2m. Medium dense.	Moist	ALLUVIAL SAND

Total Depth = 4.3 m

COMMENT: Test pit was dry and sides were stable. M	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 10

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 22-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 22-Apr-15	

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		0.7		Yellow grey, SILT with some fine sand. Firm to stiff.	Moist	LOESS
	NO SEEPAGE	3.6		Grey brown, sandy GRAVEL with minor silt, sand and gravel bands. Gravel is fine to coarse and sub-rounded to rounded. Loose. Bedded.	Moist	ALLUVIAL GRAVEL

Total Depth = 3.6 m

COMMENT: Test pit was dry. Alluvial gravel collapsing into pit.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 11

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 22-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 22-Apr-15	

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. soft.	Moist	TOPSOIL
		0.6		Yellow grey, SILT with some fine sand. Firm to stiff.	Moist	LOESS
	Seepage @ 1.8 m ↓	2.0		Grey brown, sandy GRAVEL with minor silt and cobbles up to 120 mm. Gravel is fine to coarse and sub-rounded to rounded. Loose to medium dense. Bedded.	Wet	ALLUVIAL GRAVEL
		2.3		Dark grey brown, SILT with minor sand. Sand is fine. Soft to firm.	Moist	POND SEDIMENT
		4.0		Grey brown, sandy GRAVEL with some cobbles and boulders. Gravel is fine to coarse and sub-rounded to rounded. Boulders are up to 250 mm. Loose to medium dense.	Moist	ALLUVIAL GRAVEL

Total Depth = 4 m

COMMENT: Strong groundwater inflow at 1.8 m. Alluvial gravel collapsing into pit.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 12

PROJECT: Ayrburn Farm		Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 22-Apr-15
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 22-Apr-15

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.2		Dark brown, sandy organic SILT with rootlets and traces of clay. soft.	Moist	TOPSOIL
		1.0		Yellow grey, SILT with some fine sand. Firm to stiff.	Moist	LOESS
		2.0		Grey brown, sandy GRAVEL with minor sand, cobbles and boulders. Gravel is fine to coarse and sub-rounded to rounded. Boulders are up to 350 mm. Loose to medium dense. Bedded.	Moist	ALLUVIAL GRAVEL
		3.6		Dark grey brown, SILT with minor sand. Sand is fine. Soft to firm.	Moist	POND SEDIMENT
		3.8		Grey brown, silty SAND. Sand is fine to medium. Loose to medium dense.	Moist	ALLUVIAL SAND
		4.5		Dark grey brown, SILT with minor sand. Sand is fine. Soft to firm.	Moist	POND SEDIMENT

Total Depth = 4.5 m

COMMENT: Slow groundwater seepage at 4.4 m.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 13

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 23-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 23-Apr-15	

						GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS		WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
	NO SEEPAGE	0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. soft.		Moist	TOPSOIL
		1.3		Yellow grey, SILT with some fine sand. Firm to stiff.		Moist	LOESS
		3.5		Grey brown, sandy GRAVEL with minor cobbles. Gravel is fine to coarse and sub-rounded to rounded. Loose.		Moist	ALLUVIAL GRAVEL
		4.4		Dark grey brown, SILT with minor sand. Sand is fine. Soft to firm.		Moist	POND SEDIMENT
		4.7		Grey brown, sandy GRAVEL with minor silt. Loose.		Moist	ALLUVIAL GRAVEL

Total Depth = 4.7 m

COMMENT: Test pit was dry. Alluvial gravel collapsing into pit.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 14

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 23-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 23-Apr-15	

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
	NO SEEPAGE	0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		0.9		Yellow brown, SILT with some fine sand. Firm to stiff.	Moist	LOESS
		3.2		Grey brown, sandy GRAVEL with minor cobbles. Gravel is fine to coarse. Sand is fine to medium. Cobbles up to 70 mm. Loose to medium dense.	Moist	ALLUVIAL GRAVEL
		4.1		Grey brown, silty SAND. Sand is fine to medium. Loose to medium dense.	Moist	ALLUVIAL SAND

Total Depth = 4.1 m

COMMENT: Test pit was dry. Alluvial gravel collapsing into pit.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 15

PROJECT: Ayrburn Farm			Job Number: 150098		
LOCATION: See Site Plan		Inclination:		VERTICAL	Direction:
EASTING:		mE	EQUIPMENT: 13 Tonne Excavator		OPERATOR: Tony Brookes
NORTHING:		mN	INFOMAP NO.		COMPANY: Earthworks and Drainage
ELEVATION:		m	DIMENSIONS:		HOLE STARTED: 23-Apr-15
METHOD:			EXCAV. DATUM:		HOLE FINISHED: 23-Apr-15

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		1.3		Yellow brown, SILT with some fine sand. Firm to stiff.	Moist	LOESS
		3.8		Grey brown, sandy GRAVEL with minor cobbles. Gravel is fine to coarse. Sand is fine to medium. Cobbles up to 70 mm. Loose to medium dense.	Moist	ALLUVIAL GRAVEL
	NO SEEPAGE	4.0		Grey brown, silty SAND. Sand is fine to medium. Loose to medium dense.	Moist	ALLUVIAL SAND

Total Depth = 4 m

COMMENT: Test pit was dry. Alluvial gravel collapsing into pit.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 16

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 23-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 23-Apr-15	

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.4		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		0.9		Dary grey, SILT with minor sand. Sand is fine. Firm to stiff.	Moist	LOESS
	NO SEEPAGE	4.3		Grey brown, sandy GRAVEL with minor cobbles. Gravel is fine to coarse. Sand is fine to medium. Cobbles up to 70 mm. Medium dense.	Moist	ALLUVIAL GRAVEL

Total Depth = 4.3 m

COMMENT: Test pit was dry. Alluvial gravel collapsing into pit.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 17

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 23-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 23-Apr-15	

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.2		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		1.2		Dary grey, SILT with minor sand. Sand is fine. Firm to stiff.	Moist	LOESS
	NO SEEPAGE	4.7		Grey brown, sandy GRAVEL with minor cobbles. Gravel is fine to coarse. Sand is fine to medium. Cobbles up to 150 mm and are sub-rounded to sub-angular. Loose to medium dense.	Moist	ALLUVIAL GRAVEL

Total Depth = 4.7 m

COMMENT: Test pit was dry. Alluvial gravel collapsing into pit.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 18

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination:	VERTICAL	Direction:
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 23-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 23-Apr-15	

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		0.9		Yellow brown, SILT with some fine sand. Firm to stiff.	Moist	LOESS
	NO SEEPAGE	4.5		Grey brown, sandy GRAVEL with minor cobbles. Gravel is fine to coarse. Sand is fine to medium. Cobbles up to 150 mm and are sub-rounded to sub-angular. Loose to medium dense.	Moist	ALLUVIAL GRAVEL

Total Depth = 4.5 m

COMMENT: Test pit was dry. Alluvial gravel collapsing into pit.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 19

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 23-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 23-Apr-15	

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.2		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		1.0		Yellow brown, SILT with some fine sand. Firm to stiff.	Moist	LOESS
		1.5		Grey brown, Interbedded GRAVEL and sandy SITL. Gravel is fine to coarse. Sand is fine. Gravel is medium dense, silt is soft to firm.	Moist	ALLUVIAL GRAVEL
	NO SEEPAGE	4.5		Grey brown, sandy GRAVEL with minor silt and cobbles. Gravel is fine to coarse. Sand is fine to medium. Bobbles up to 70 mm. Loose to medium dense.	Moist	ALLUVIAL GRAVEL

Total Depth = 4.5 m

COMMENT: Test pit was dry. Alluvial gravel collapsing into pit.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 20

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 23-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 23-Apr-15	

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		1.0		Yellow brown, SILT with some fine sand. Firm to stiff.	Moist	LOESS
	NO SEEPAGE	4.3		Grey brown, sandy GRAVEL with minor cobbles and minor boulders. Gravel is fine to coarse. Sand is fine to medium. Boulders up to 300 mm. Loose to medium dense.	Moist	ALLUVIAL GRAVEL

Total Depth = 4.3 m

COMMENT: Test pit was dry. To 2.6 m alluvial gravel collapsing into pit, below 2.6 m pit stood well.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 21

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 23-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 23-Apr-15	

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.3		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		1.3		Yellow brown, SILT with some fine sand. Firm to stiff.	Moist	LOESS
	NO SEEPAGE	4.4		Grey brown, sandy GRAVEL with minor cobbles and minor boulders. Gravel is fine to coarse. Sand is fine to medium. Boulders upto 500 mm. Loose to medium dense.	Moist	ALLUVIAL GRAVEL

Total Depth = 4.4 m

COMMENT: Test pit was dry. Aluvial gravel collapsing into pit.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 22

PROJECT: Ayrburn Farm		Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 23-Apr-15
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 23-Apr-15

					GEOLOGICAL	
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
		0.2		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		1.5		Yellow brown, SILT with some fine sand. Firm to stiff.	Moist	LOESS
		4.4		Grey brown, sandy GRAVEL with minor cobbles. Gravel is fine to coarse. Sand is fine to medium. Cobbles up to 150 mm. Loose to medium dense.	Moist	ALLUVIAL GRAVEL
	NO SEEPAGE	4.6		Grey brown, silty SAND with some gravel. Gravel is fine to medium. Sand is fine to medium. Soft to firm.	Moist	

Total Depth = 4.6 m

COMMENT: Test pit was dry. Alluvial gravel collapsing into pit.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1



GeoSolve Ltd

EXCAVATION LOG

EXCAVATION NUMBER:

TP 23

PROJECT: Ayrburn Farm			Job Number: 150098	
LOCATION: See Site Plan		Inclination: VERTICAL	Direction:	
EASTING:	mE	EQUIPMENT: 13 Tonne Excavator	OPERATOR: Tony Brookes	
NORTHING:	mN	INFOMAP NO.	COMPANY: Earthworks and Drainage	
ELEVATION:	m	DIMENSIONS:	HOLE STARTED: 23-Apr-15	
METHOD:		EXCAV. DATUM:	HOLE FINISHED: 23-Apr-15	

						GEOLOGICAL
SCALA PENETRATION	GROUNDWATER / SEEPAGE	DEPTH (m)	GRAPHIC LOG	SOIL / ROCK CLASSIFICATION, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, WEATHERING, SECONDARY AND MINOR COMPONENTS	WATER CONTENT	SOIL / ROCK TYPE, ORIGIN, MINERAL COMPOSITION, DEFECTS, STRUCTURE, FORMATION
	Seepage @ 2.2 m	0.2		Dark brown, sandy organic SILT with rootlets and traces of clay. Soft.	Moist	TOPSOIL
		1.2		Yellow brown, SILT with some fine sand. Firm to stiff.	Moist	LOESS
		2.2		Grey brown, sandy GRAVEL with minor cobbles. Gravel is fine to coarse. Sand is fine to medium. Cobbles up to 70 mm. Loose to medium dense.	Moist	ALLUVIAL GRAVEL
		2.4		Light brown, clay SILT. Firm to stiff.	Moist	ALLUVIAL SILT
		4.2		Grey brown, sandy GRAVEL with minor cobbles. Gravel is fine to coarse. Sand is fine to medium. Cobbles up to 70 mm. Loose to medium dense.	Moist	ALLUVIAL GRAVEL

Total Depth = 4.2 m

COMMENT: Perched water table at 2.2 m, on top of clay SILT. Strong inflow, approximately 1 L/sec. Alluvial gravel collapsing into pit.	Logged By: PGF
	Checked Date:
	Sheet: 1 of 1

Appendix C: Liquefaction Analysis

Appendix C - Liquefaction Assessment

General

Liquefaction occurs when susceptible, saturated soils attempt to move to a denser state under cyclic shearing. In this report, liquefaction is defined as when pore pressures rise to reach the overburden stress. When this occurs, the following effects can happen at flat sites:

- loss of strength;
- ejection of material under pressure to the ground surface; and
- post-liquefaction volumetric densification as the materials reconsolidate.

In addition, sloping sites or sites with a 'free face' may experience lateral spreading or movement.

Liquefaction Susceptibility

Soils susceptible to liquefaction have the following characteristics:

- Saturated. Below the ground water level;
- Have "sand like" behaviour¹; and
- Are in loose or medium dense condition.

Soils which are susceptible to liquefaction require a certain level of earthquake shaking (trigger) to cause them to liquefy. Denser soils require more intense and/or longer duration of shaking (higher trigger) than less dense soil.

CPT Analysis

Analyses were performed using the software package 'Cliq' to evaluate the liquefaction potential of the loose to medium dense sands and non-plastic silts from the CPT soundings, utilising the updated Boulanger & Idriss (2014) deterministic method which incorporates a number of case histories from the recent Christchurch Earthquakes². This method uses information obtained from soil logging and in-situ testing, such as soil type, fines content, layer thicknesses, and blow count.

Assessment of Consequences of Liquefaction

The following can be assessed to estimate the consequences of liquefaction at this site:

- Crust thickness.
- Liquefaction severity index.
- Free field settlements.
- Lateral spread.

Crust Thickness

The non-liquefiable upper layer of soils (crust) provides some protection against ground surface damage as a result of liquefaction. The thicker the crust, the less ground surface damage is expected with significant protection provided by thicknesses of more than 5m.

² Boulanger, R.W. & Idriss, I.M. (2014). CPT AND SPT BASED LIQUEFACTION TRIGGERING PROCEDURES

Empirical correlations have been developed by Ishihara⁵ to quantify the thickness of non-liquefiable crust required to prevent the formation of sand boils resulting from the liquefaction of underlying soil layers. These correlations indicate that for a given thickness of liquefiable soil, as the peak ground acceleration increases a greater thickness of non-liquefiable soil is required to prevent liquefaction damage from manifesting on the surface.

Liquefaction Severity Number

Liquefaction severity number (LSN) is a single value which can be calculated from a liquefaction assessment considering the thickness density and depth of liquefiable layers and the intensity of earthquake shaking. Based on observations of ground surface damage in Christchurch an indicative correlation has been developed between ground surface damage from liquefaction and LSN as described below.

As the LSN increases, so does the risk of severe effects on the land and structure. In general, the following surface effects are considered likely at sites with various LSN values.

Table 2 - Liquefaction Severity Number

LSN	Effects
0 – 10	Little to no expression of liquefaction, minor effects
10 – 20	Minor expression of liquefaction, some sand boils
20 – 30	Moderate expression of liquefaction, with sand boils and some structural damage
30 – 40	Moderate to severe expression of liquefaction, settlement can cause structural damage
40 – 50	Major expression of liquefaction, undulations and damage to ground surface, severe total and differential settlement of structures
>50	Severe damage, extensive evidence of liquefaction at surface, severe total and differential settlements affecting structures, damage to services.

1.1.1 Free Field Settlements

The reconsolidation settlement of the liquefiable layers identified was computed using the methodology in Zhang Robertson and Brachman (2002)⁶ as recommended by Boulanger & Idriss (2014). This describes the settlement of ground not occupied by a building, occurring due to dissipation of excess pore water pressure generated during earthquake shaking. The liquefaction analysis methods assume a flat or gently sloping ground site. At this site, we consider this a reasonable assumption. It should be noted that total settlement describes the expected overall settlement of the ground surface relative to pre-earthquake level; differential settlement describes the expected variability in settlement across the building footprint.

A component of building settlement may also occur due to yield of the liquefied founding soils. This component of settlement is very difficult to predict and depends on the interaction of the building and the soil it is founded on.

⁵ Ishihara, K. (1985). "Stability of natural deposits during earthquakes," Theme lecture, Proc. 11th Int. Conf. On Soil Mechanics and Foundation Engineering, San Francisco, 2, 321-376pp.

⁶ Zhang, G, Robertson P.K. & Brachman R.W.I. (2002) Estimating liquefaction induced ground settlements from CPT from ground level, Canadian Geotechnical Journal, 39, pp 1168-1180

1.1.2 Lateral Spreading

Lateral spreading is a term applied to tracts of land that experience lateral displacement as a result of liquefaction of a layer below the surface. It is often observed near river banks, estuaries or on gentle slopes. Displacements can range from a few centimetres to a metre or more, and lateral spreading is often one of the more damaging effects of liquefaction.

The risk of lateral spreading at a site is dependent on:

- The presence and height of a free face. Generally, the “free face” associated with the lateral spreading is a riverbank or old river or stream channel. The free face height is the difference between the level of the ground surface adjacent to the riverbank and the riverbed;
- The thickness of liquefiable soil layers;
- The properties of the liquefied soil such as the grain size and fines content;
- The earthquake characteristics such as the peak ground acceleration, magnitude and distance from the earthquake source.

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LIQUEFACTION ANALYSIS REPORT

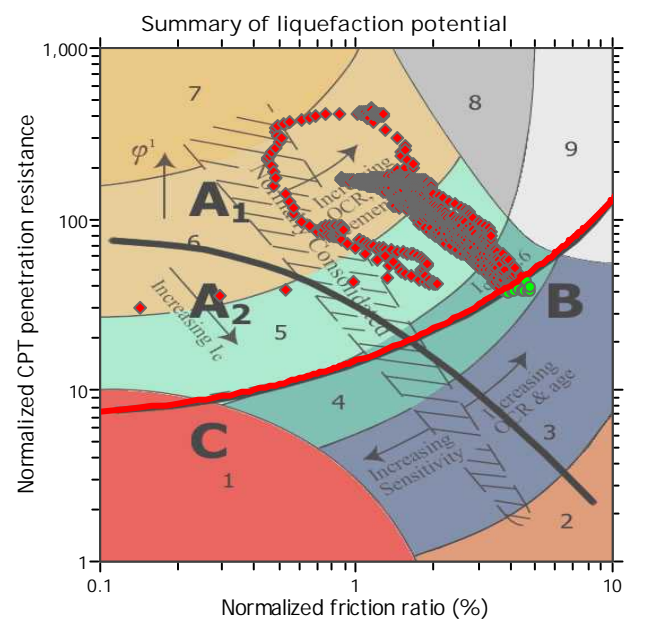
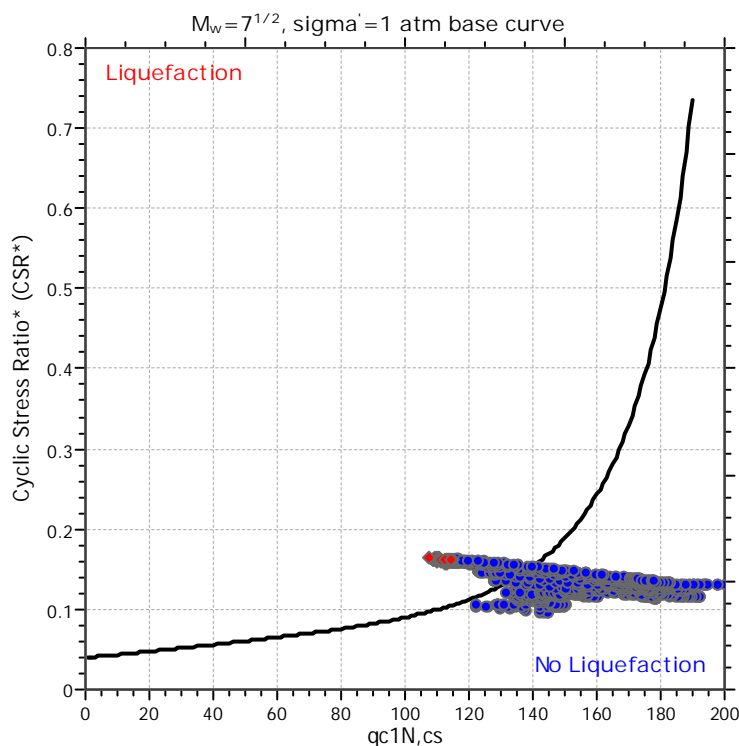
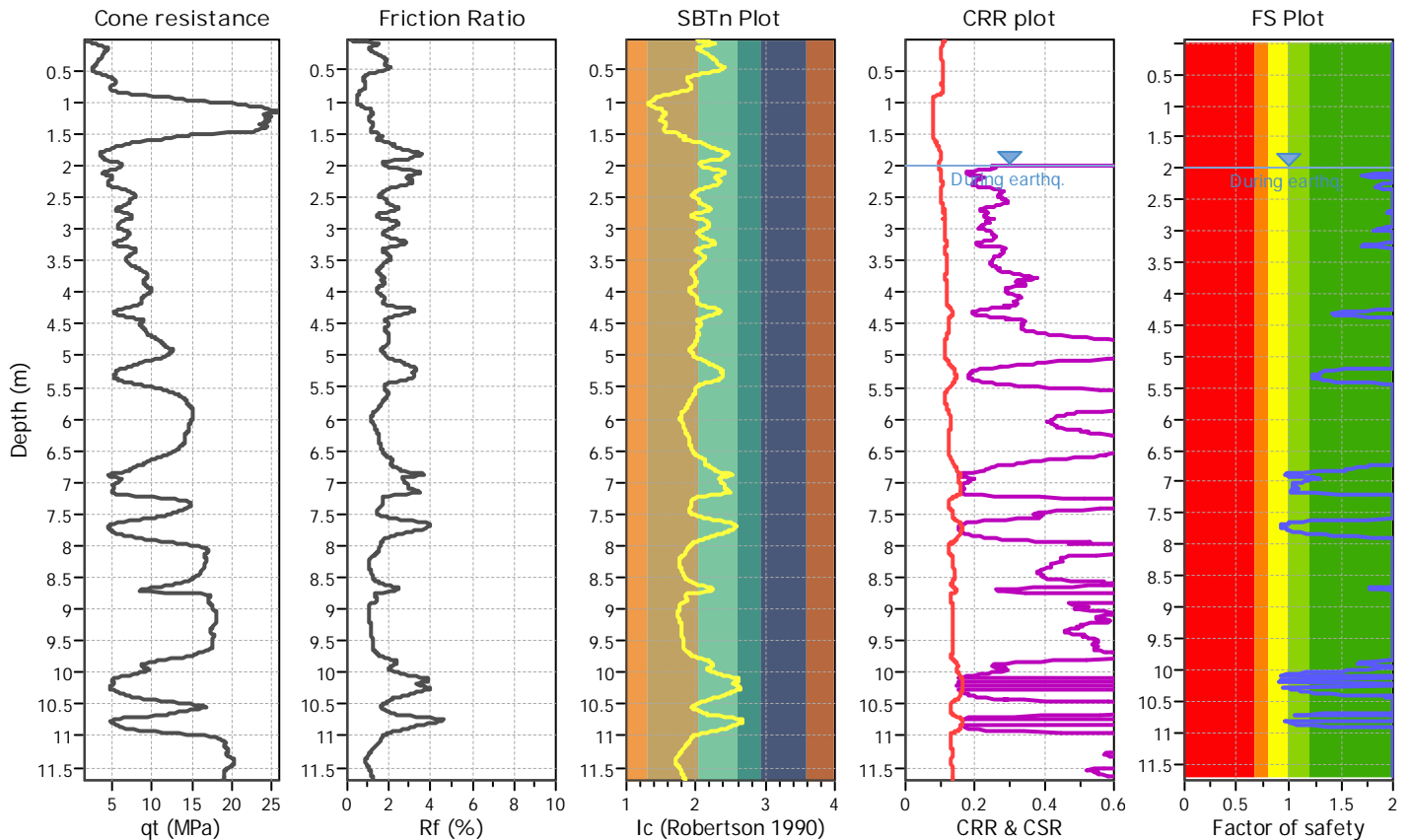
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Location :

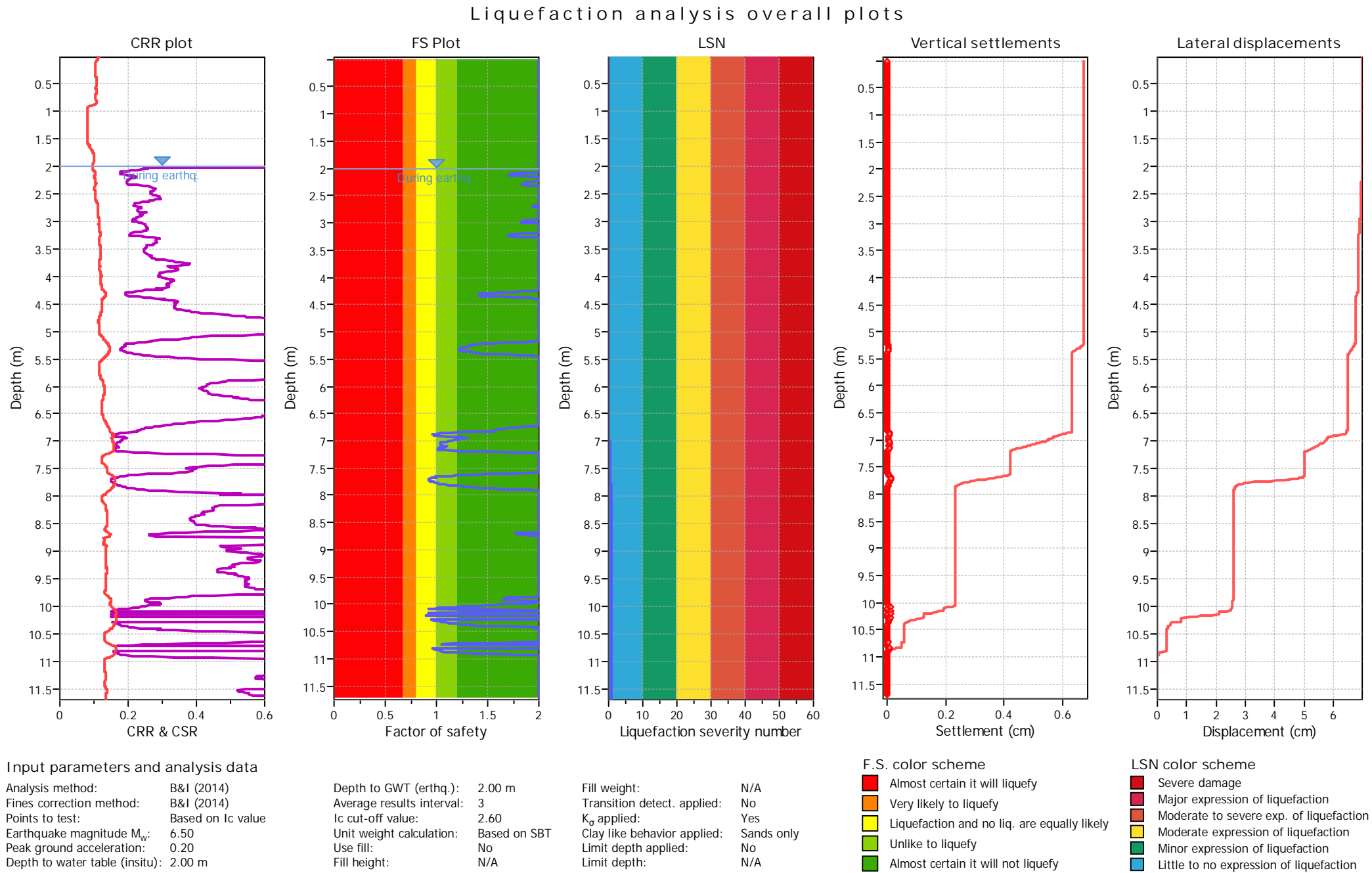
CPT file : 8270-020_CPT001

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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 REPORT

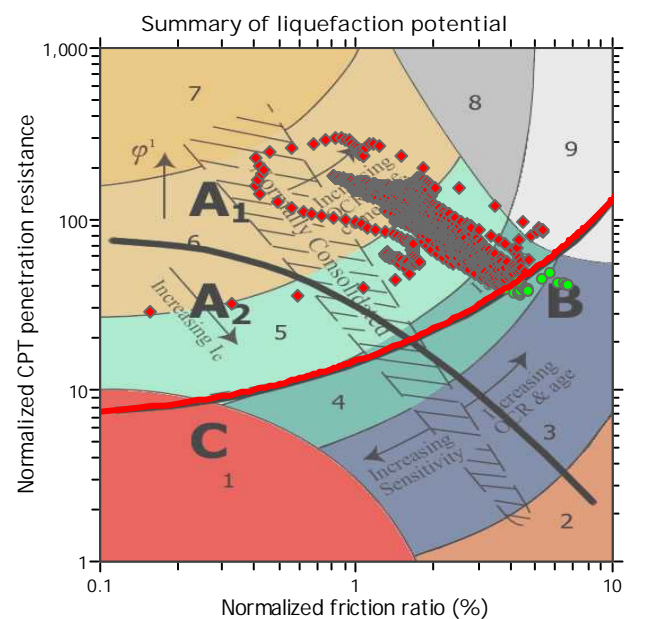
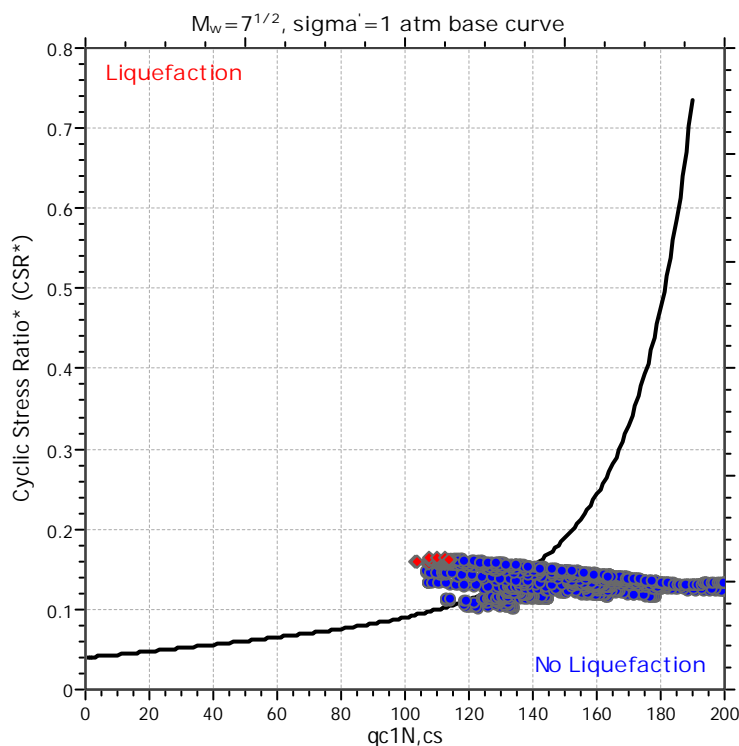
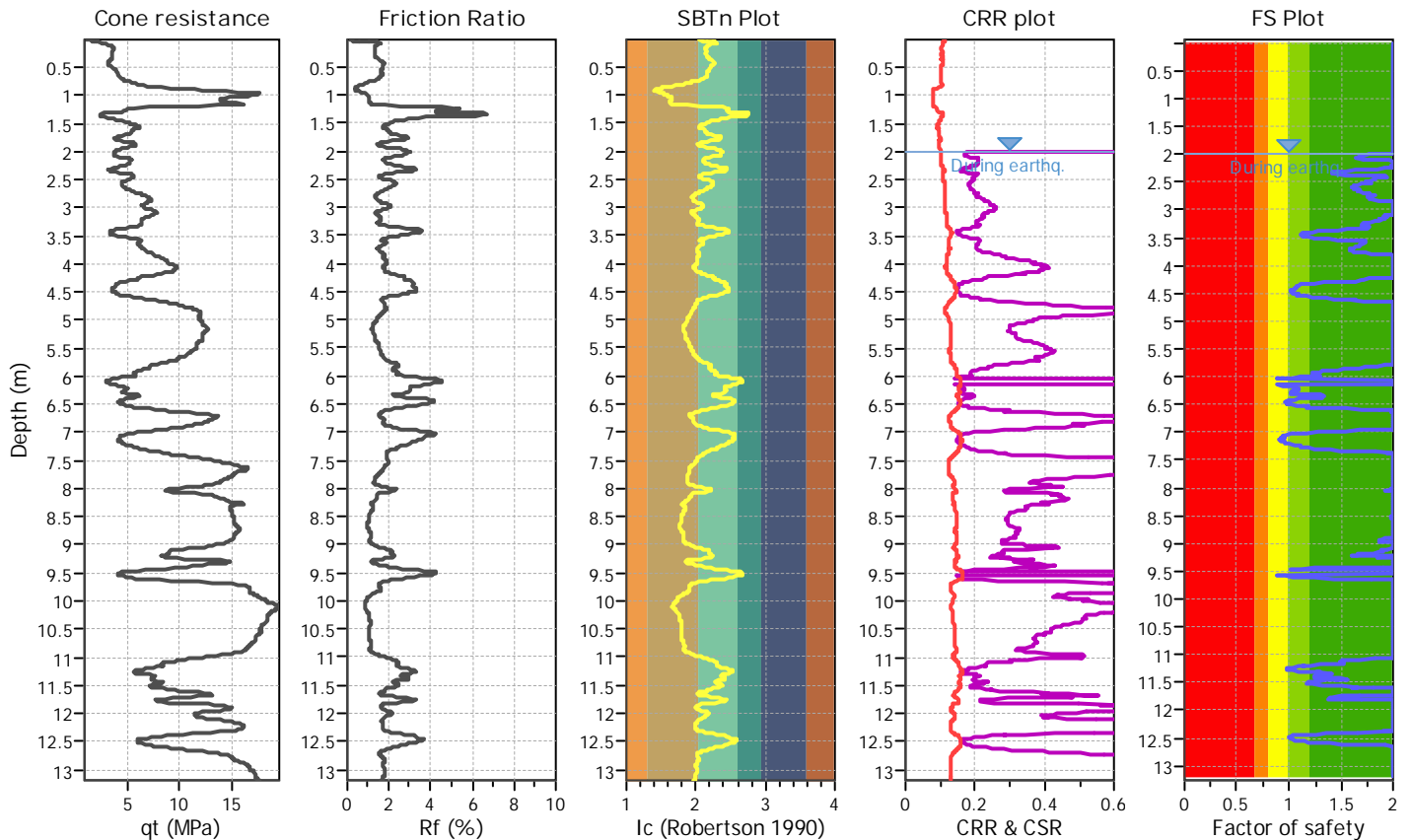
Project title :

Location :

CPT file : 8270-020_CPT002

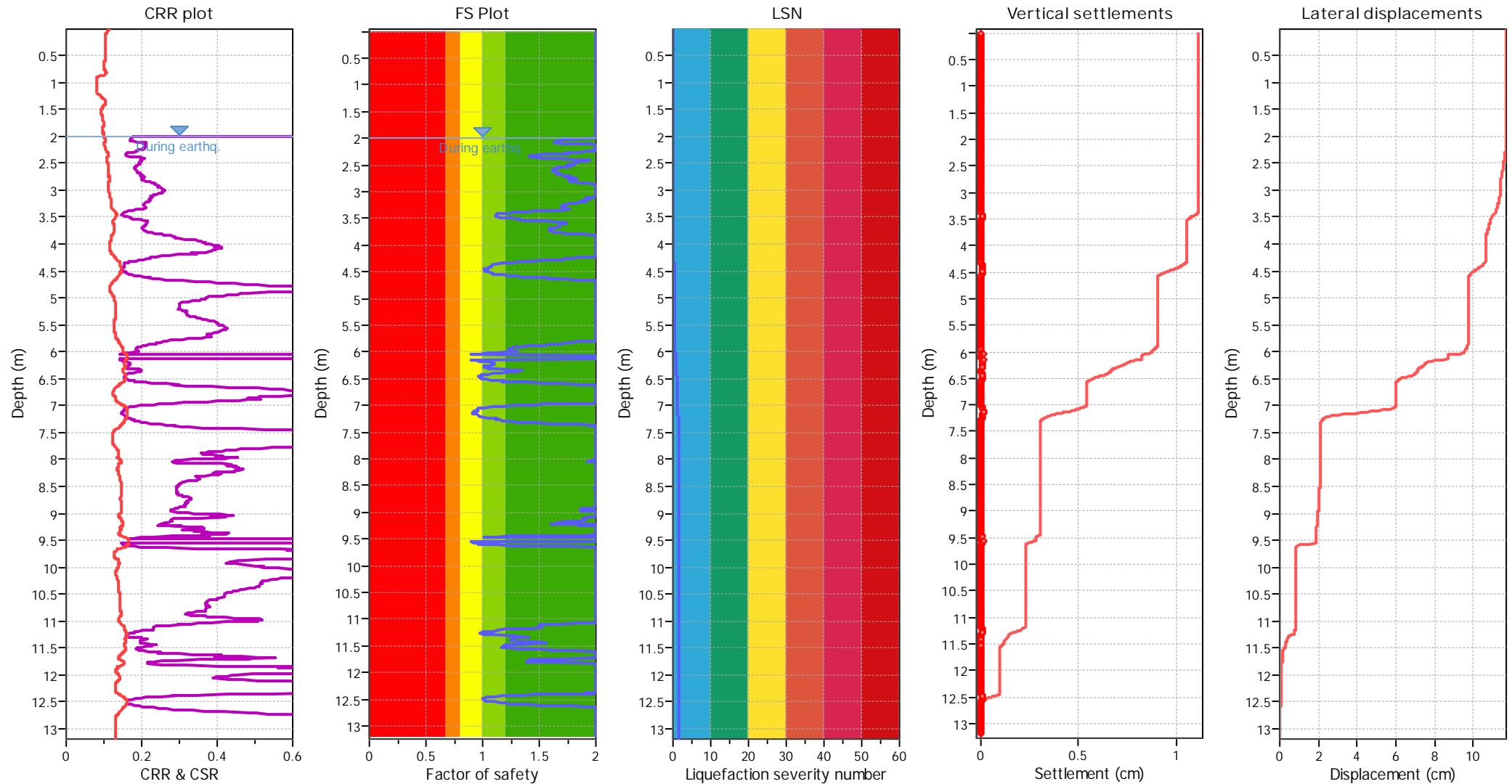
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (earthq.):	2.00 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_0 applied:	Yes
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.20	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

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

LSN color scheme

Red	Severe damage
Dark Red	Major expression of liquefaction
Orange	Moderate to severe exp. of liquefaction
Yellow	Moderate expression of liquefaction
Light Green	Minor expression of liquefaction
Blue	Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

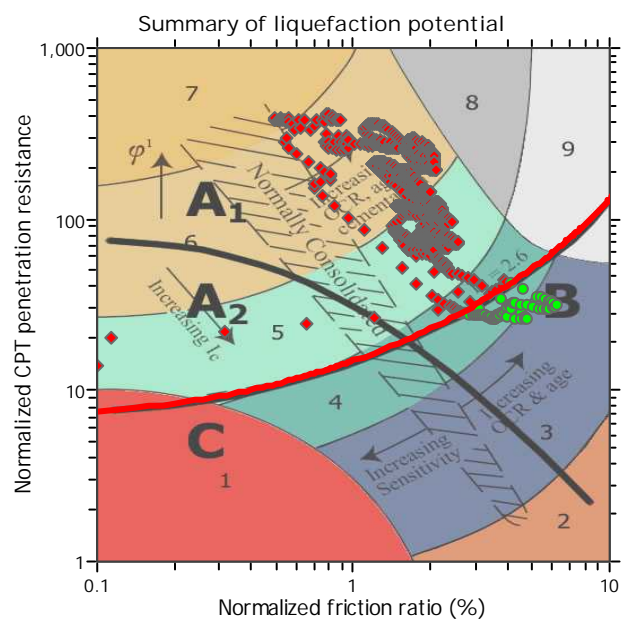
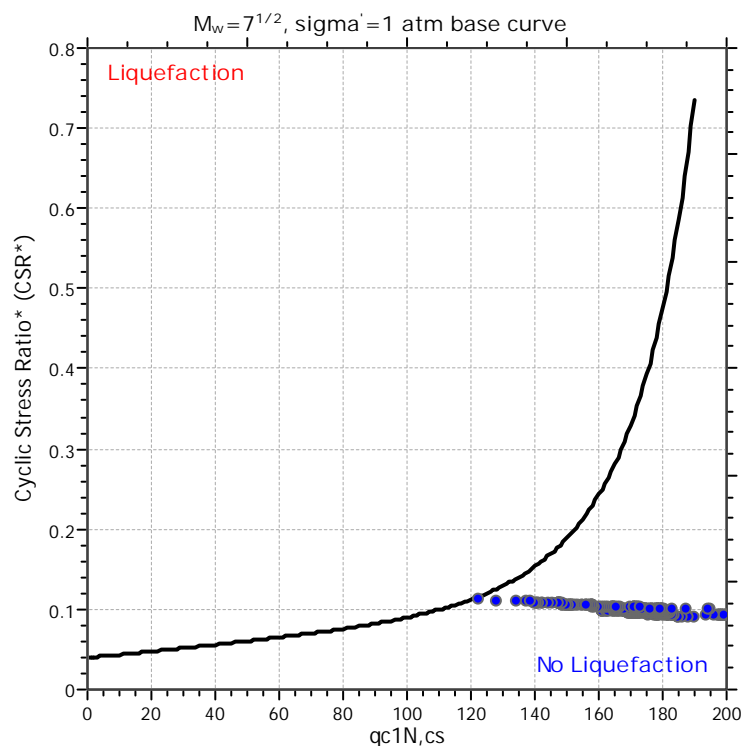
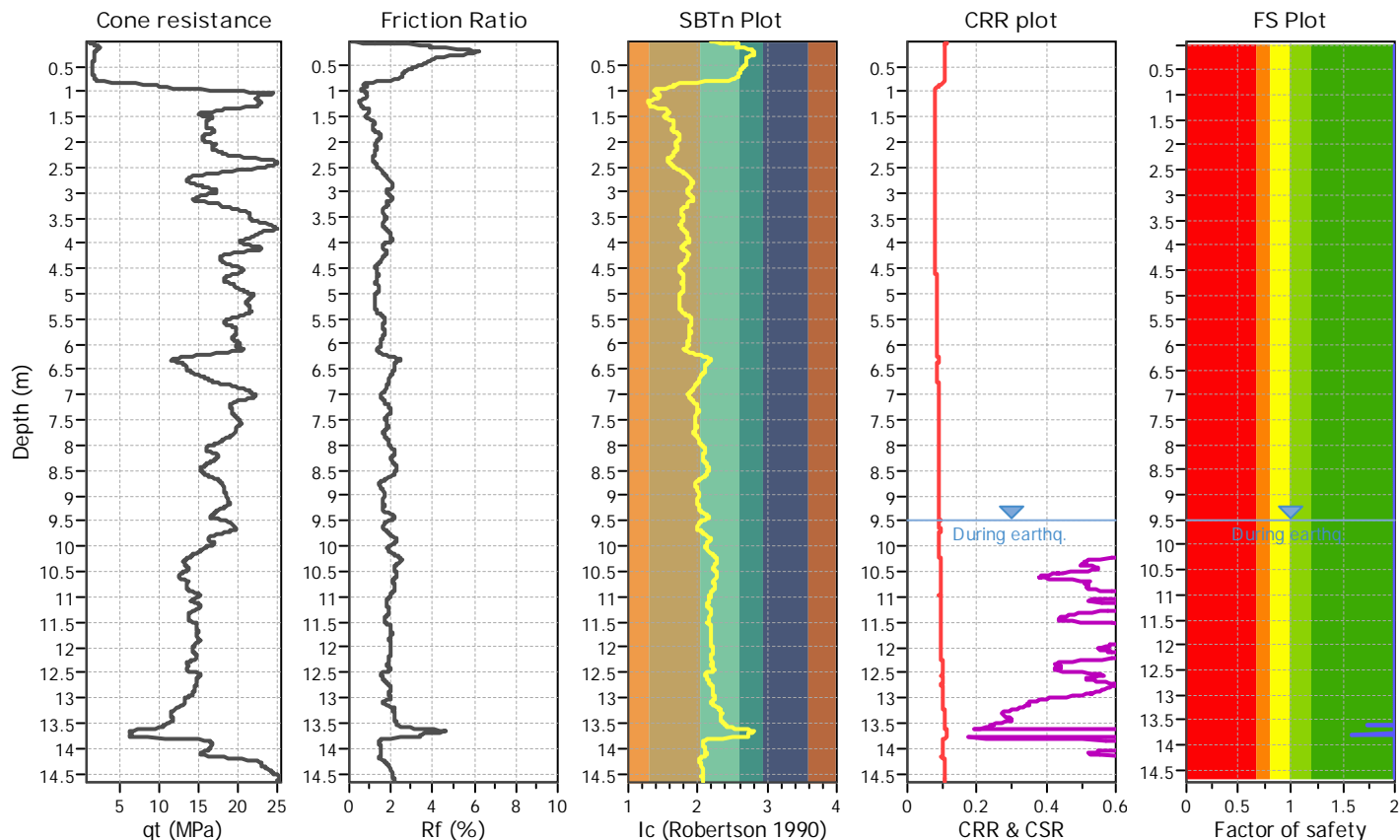
Project title :

Location :

CPT file : 8270-020_CPT003

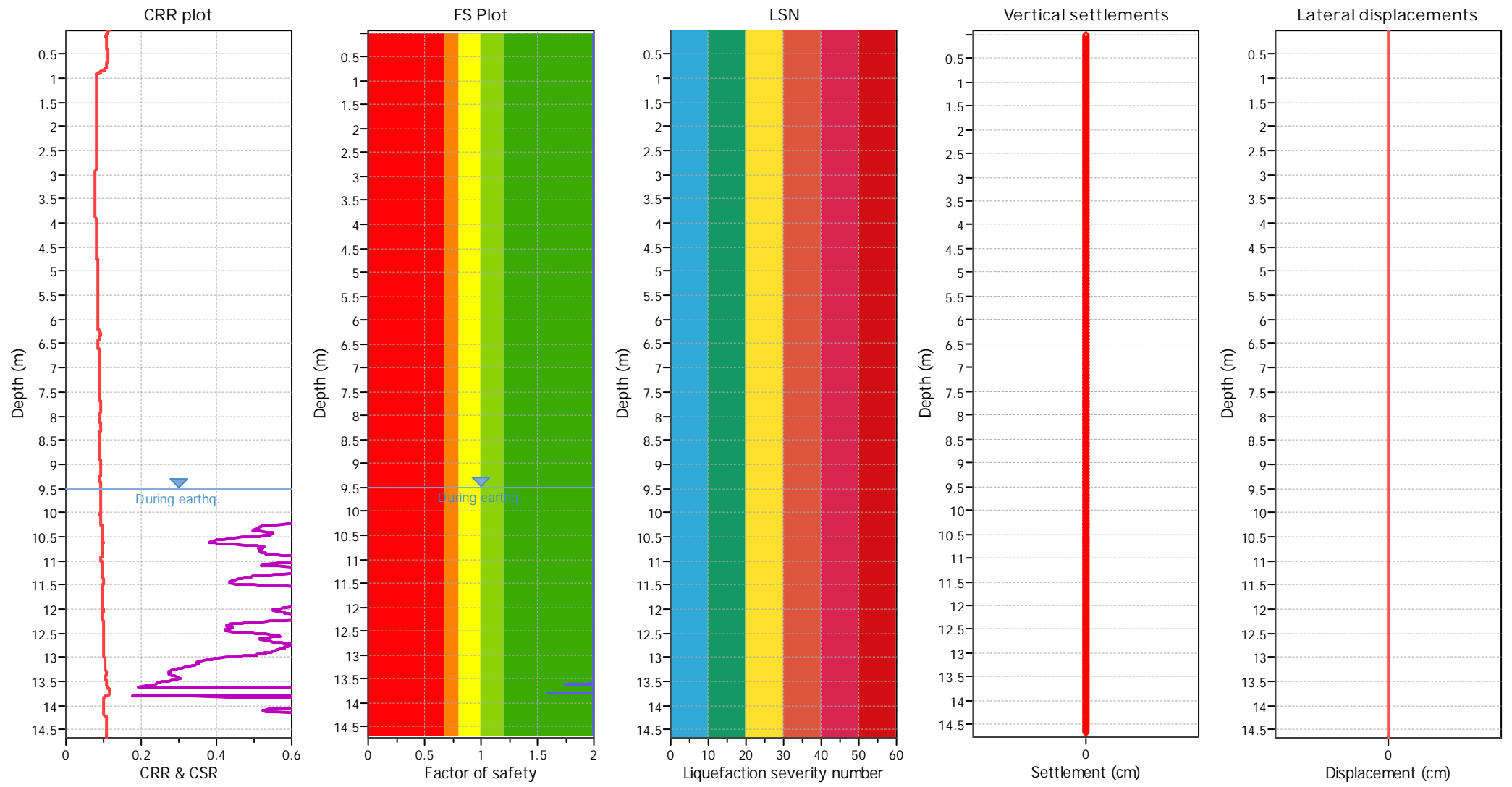
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	9.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	9.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (earthq.):	9.50 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 :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.20	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	9.50 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

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

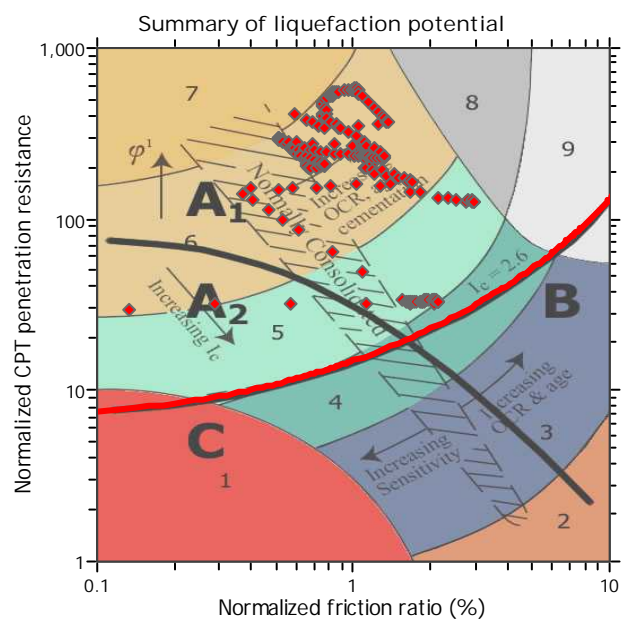
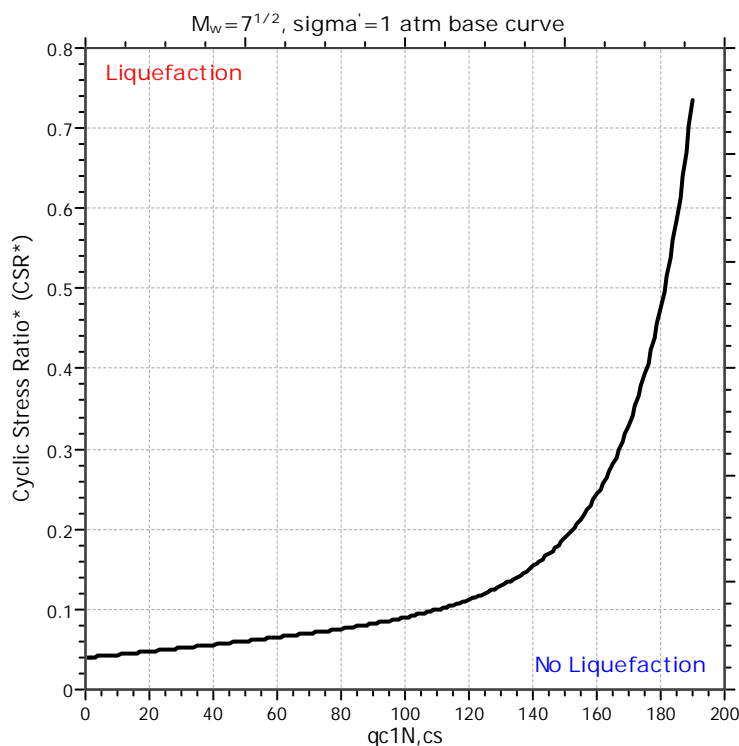
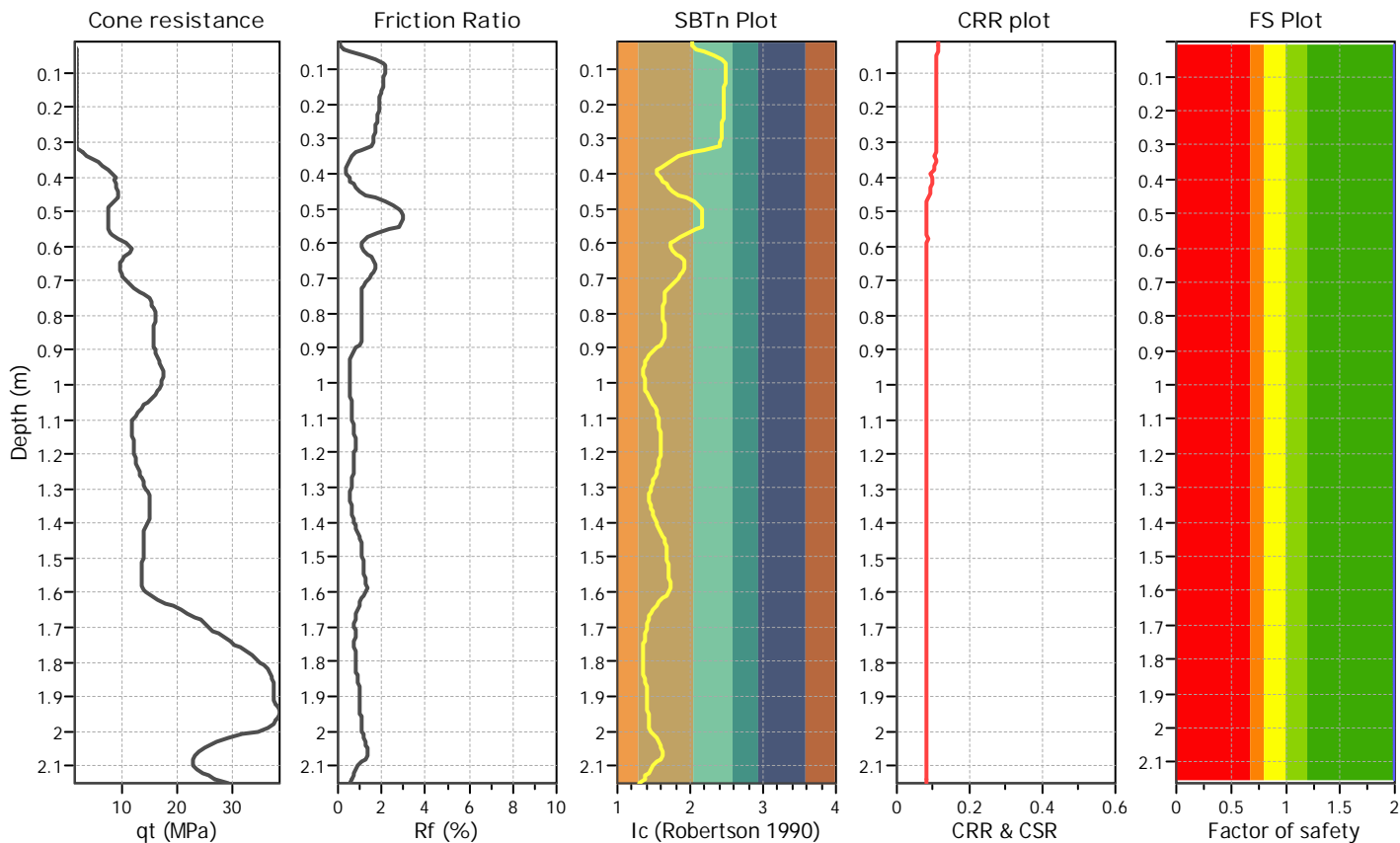
Project title :

Location :

CPT file : 8270-020_CPT004

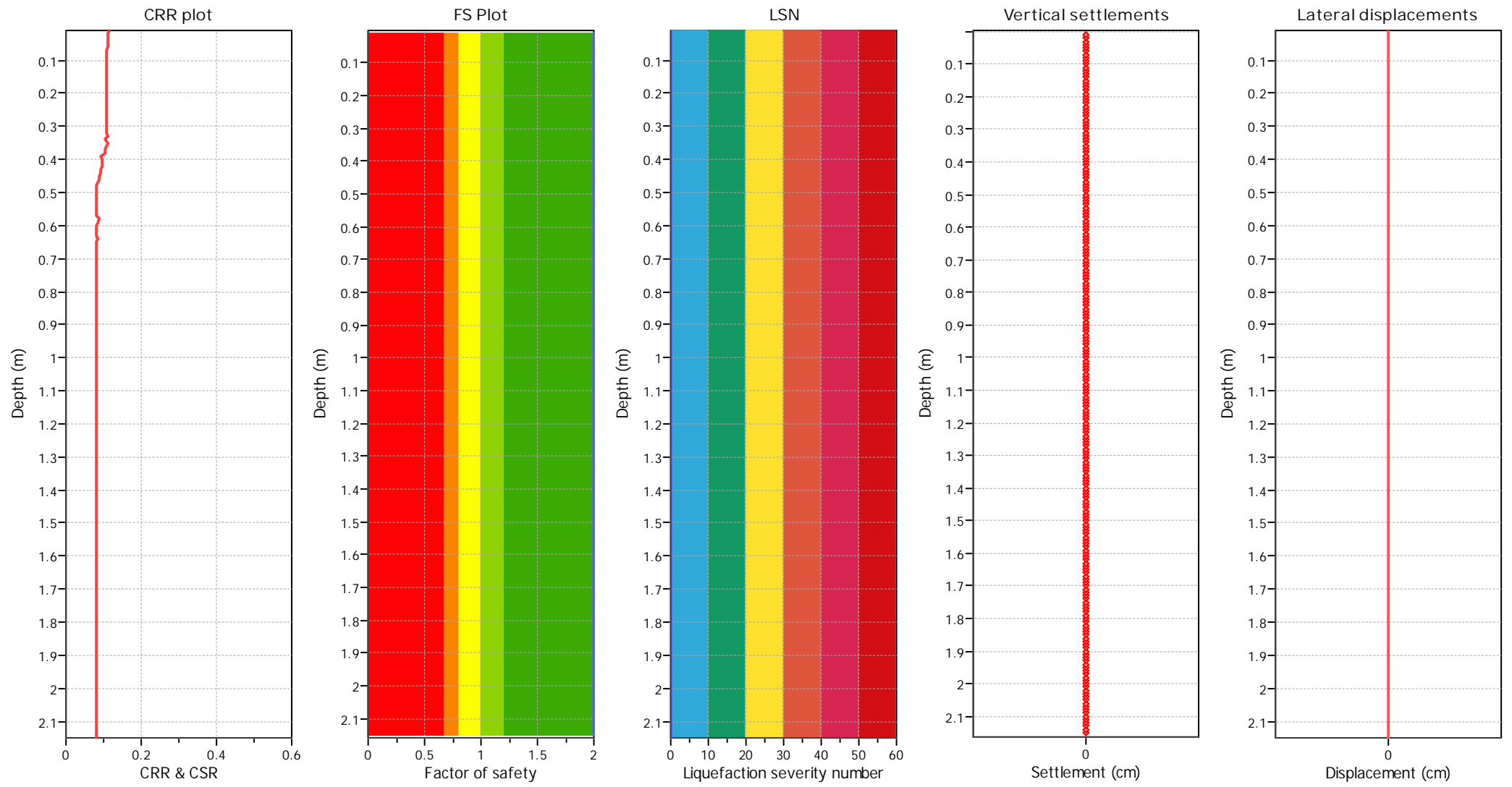
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	9.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	9.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	9.50 m	Fill weight:	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	LSN color scheme Severe damage Major expression of liquefaction Moderate to severe exp. of liquefaction Moderate expression of liquefaction Minor expression of liquefaction Little to no expression of liquefaction
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 :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only		
Peak ground acceleration:	0.20	Use fill:	No	Limit depth applied:	No		
Depth to water table (insitu):	9.50 m	Fill height:	N/A	Limit depth:	N/A		

LIQUEFACTION ANALYSIS REPORT

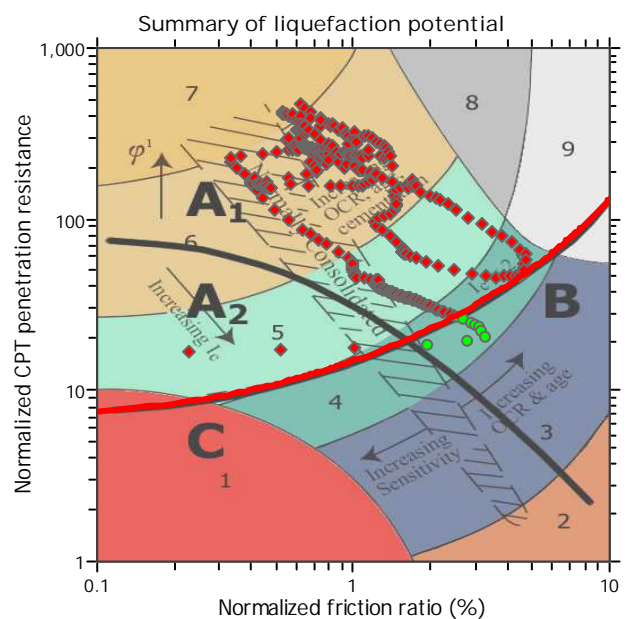
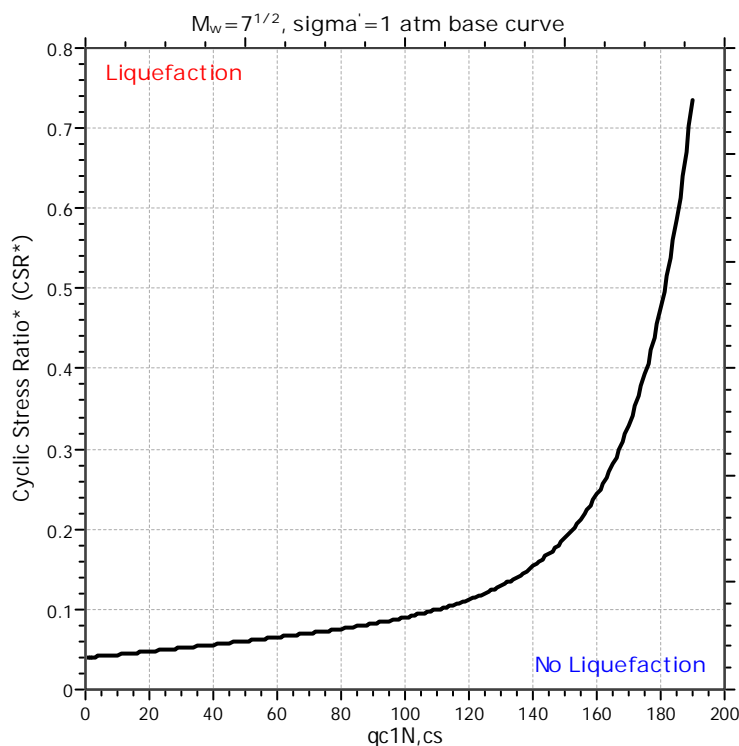
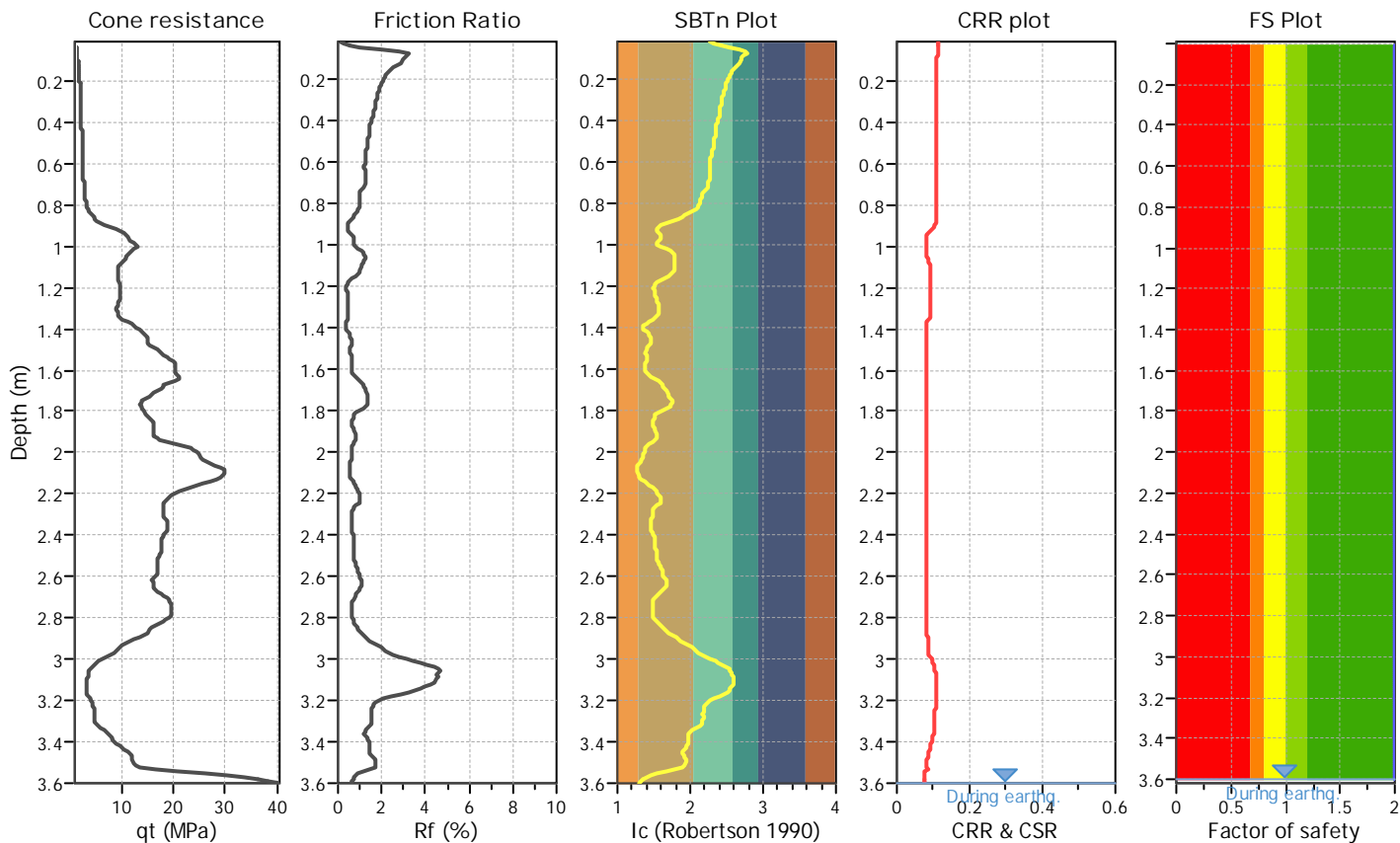
Project title :

Location :

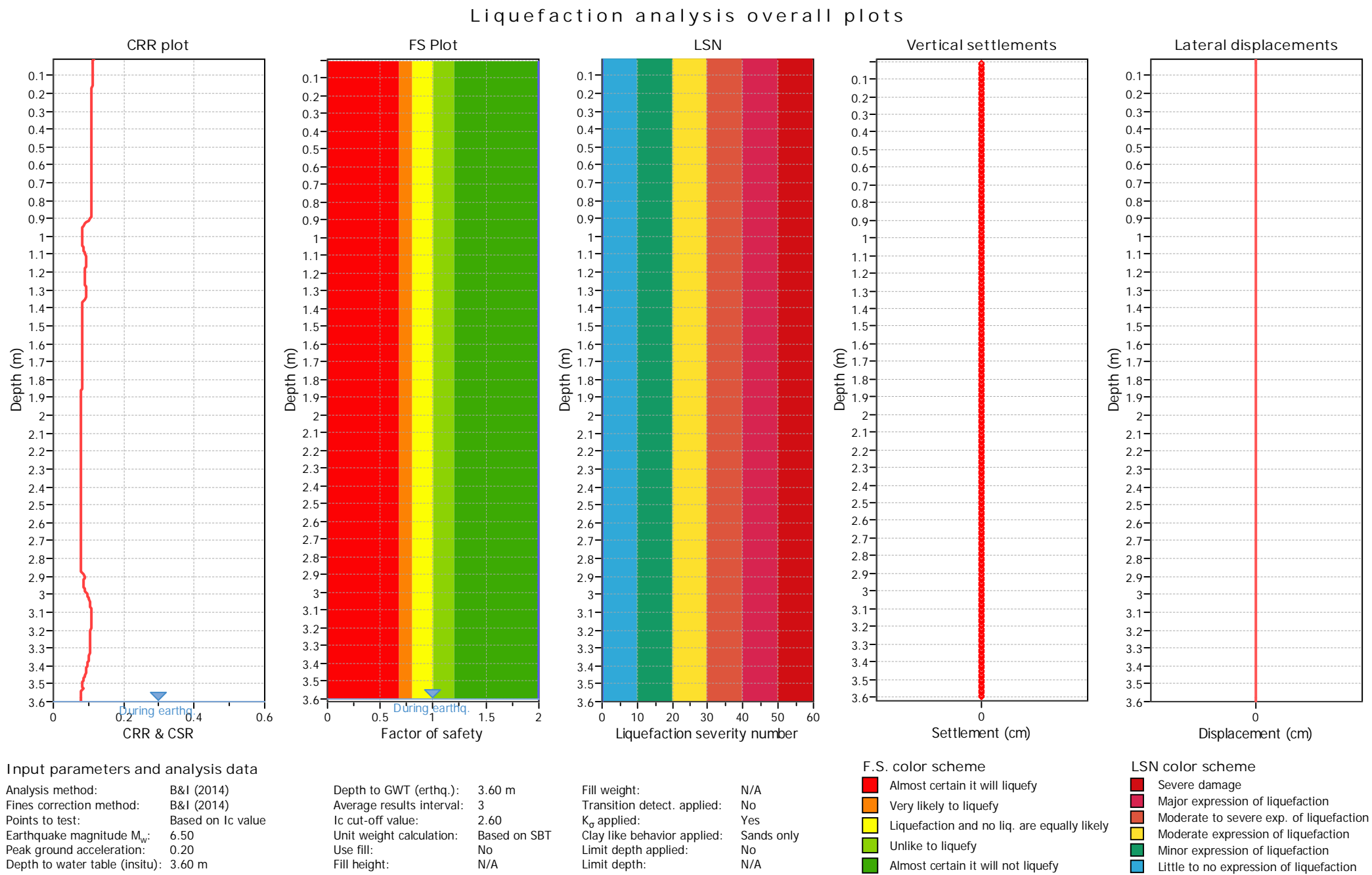
CPT file : 8270-020_CPT005

Input parameters and analysis data

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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.60 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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 REPORT

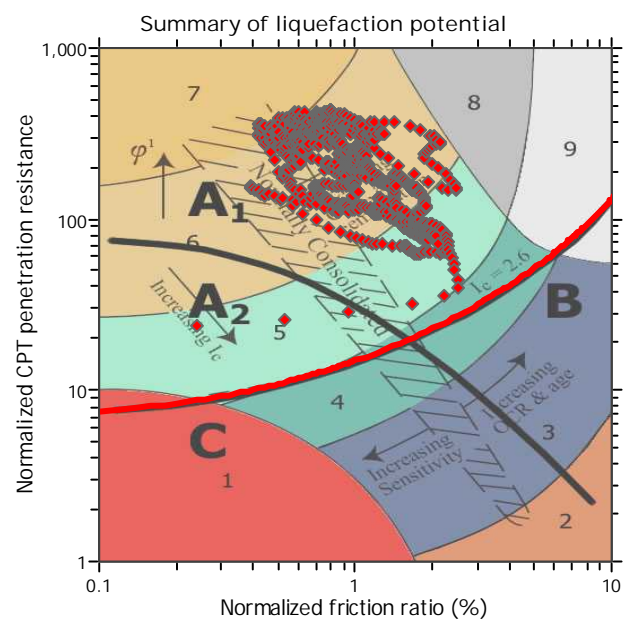
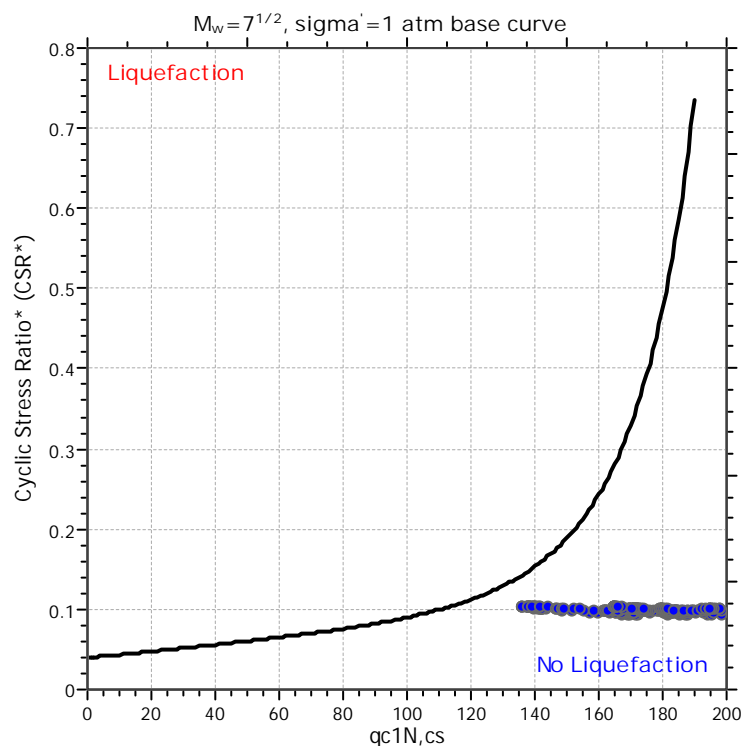
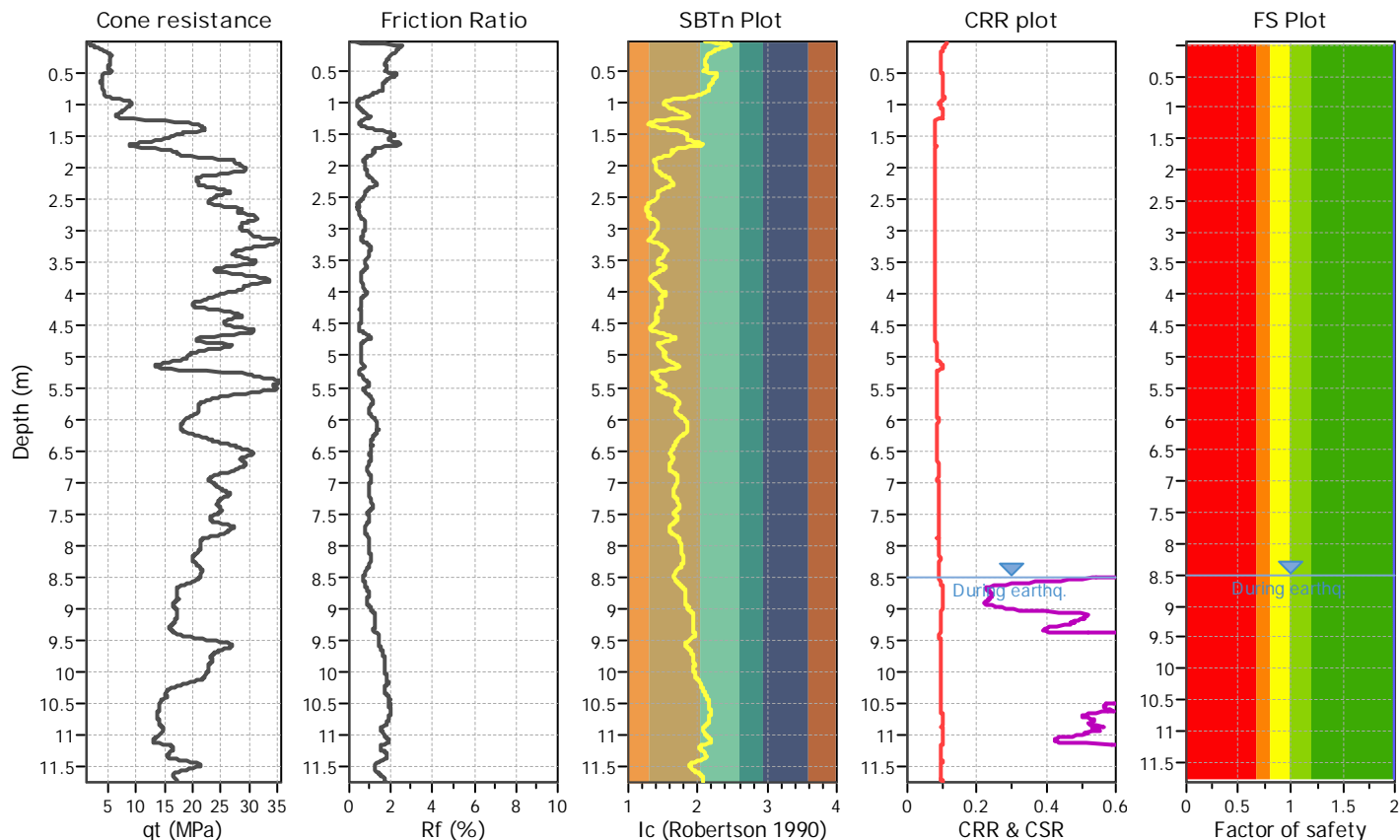
Project title :

Location :

CPT file : 8270-020_CPT006

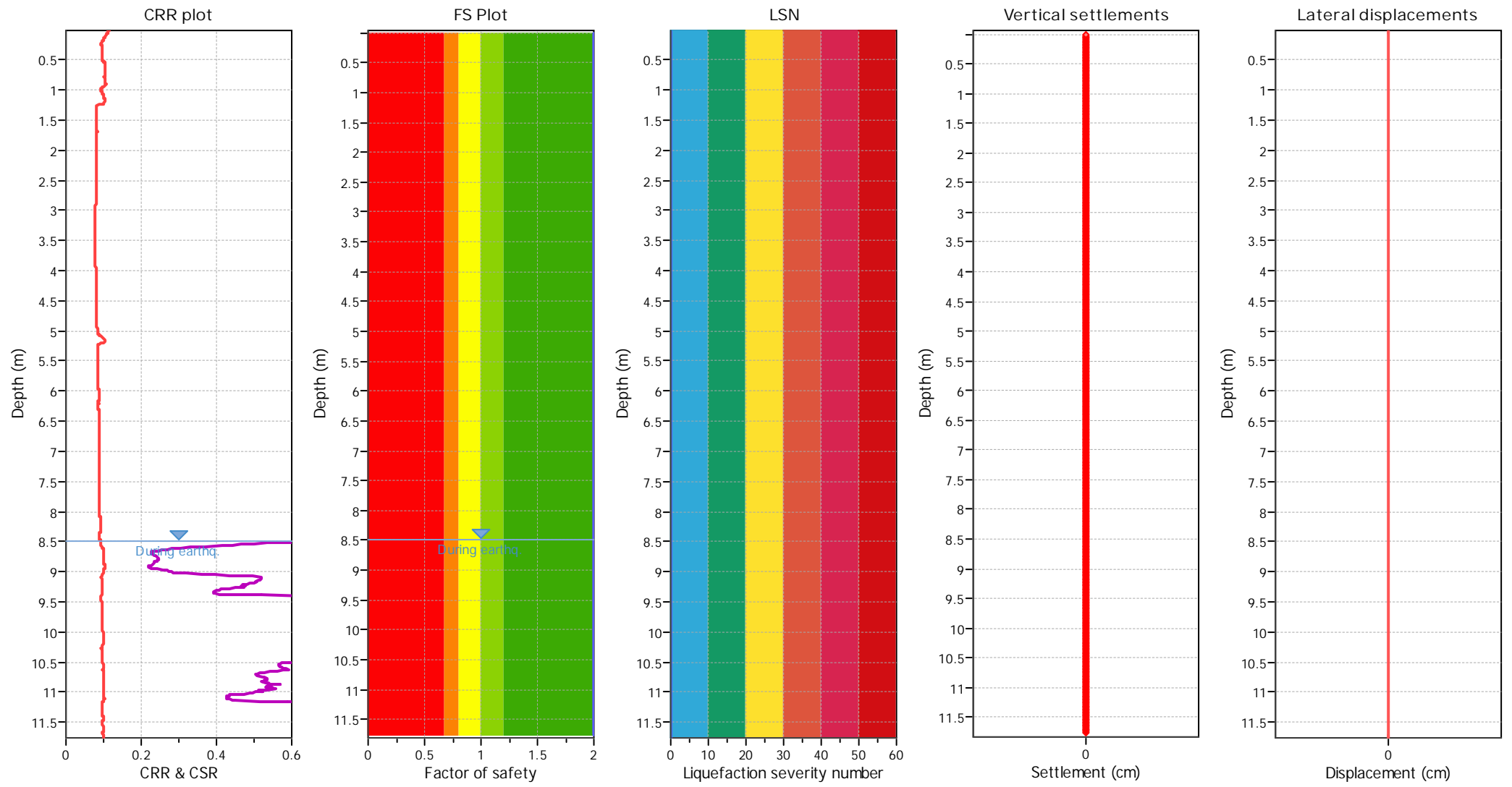
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (earthq.):	8.50 m	Fill weight:	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	LSN color scheme Severe damage Major expression of liquefaction Moderate to severe exp. of liquefaction Moderate expression of liquefaction Minor expression of liquefaction Little to no expression of liquefaction
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 :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only		
Peak ground acceleration:	0.20	Use fill:	No	Limit depth applied:	No		
Depth to water table (insitu):	8.50 m	Fill height:	N/A	Limit depth:	N/A		

LIQUEFACTION ANALYSIS REPORT

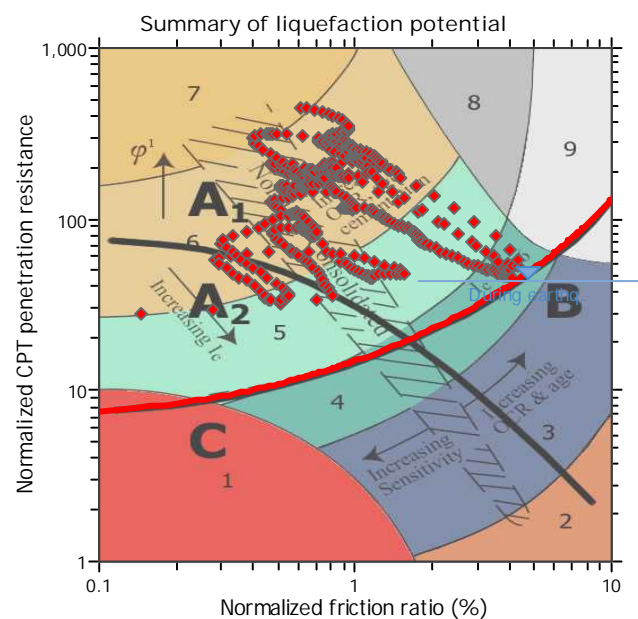
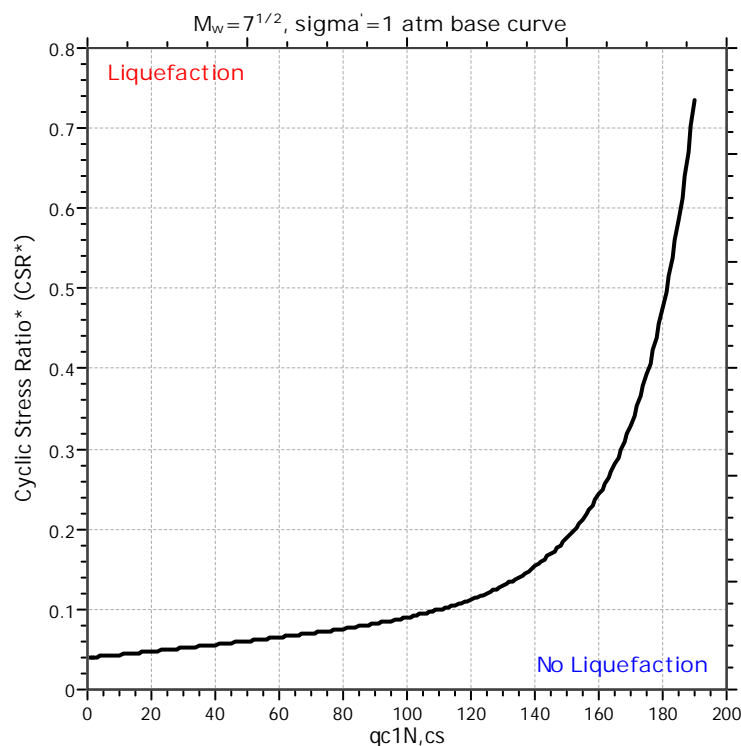
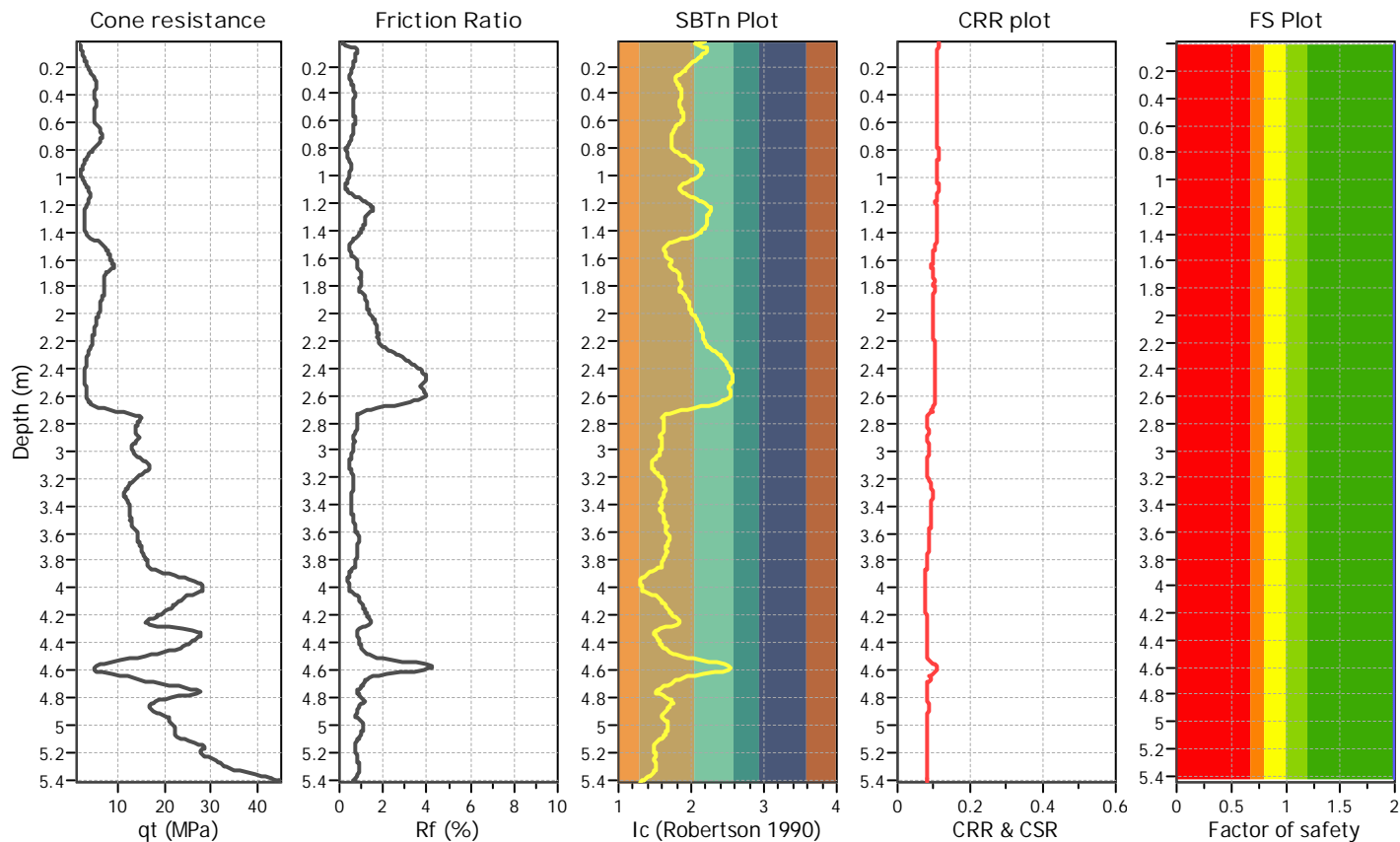
Project title :

Location :

CPT file : 8270-020_CPT007

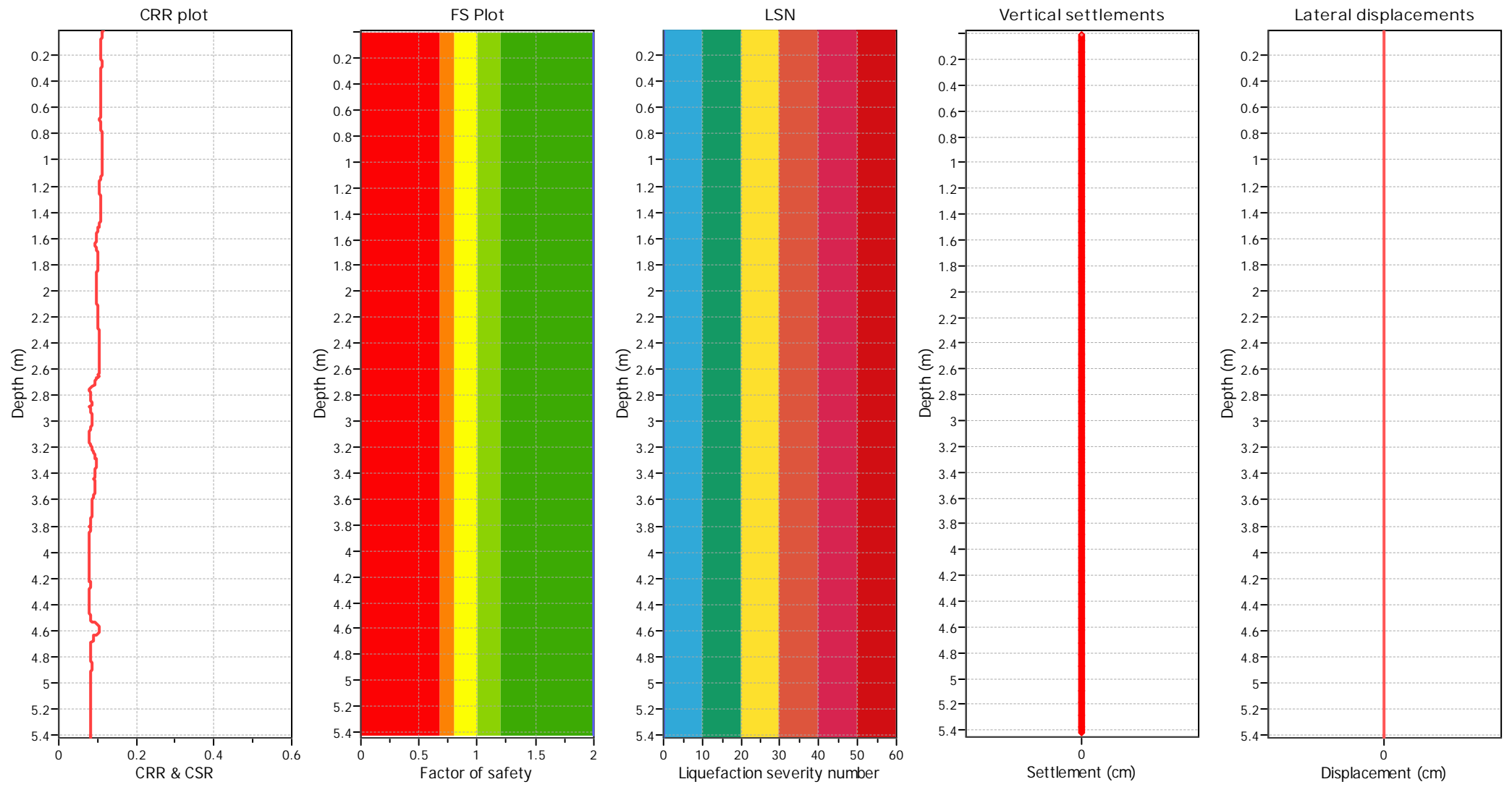
Input parameters and analysis data

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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	8.00 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 :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.20	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 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

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

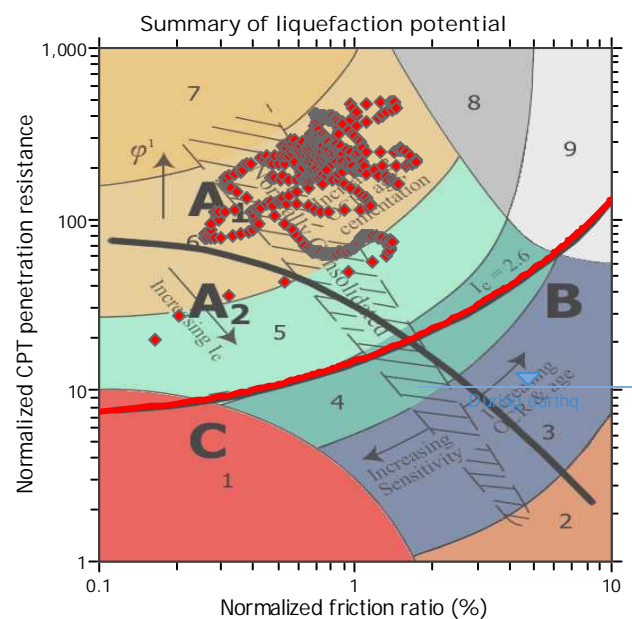
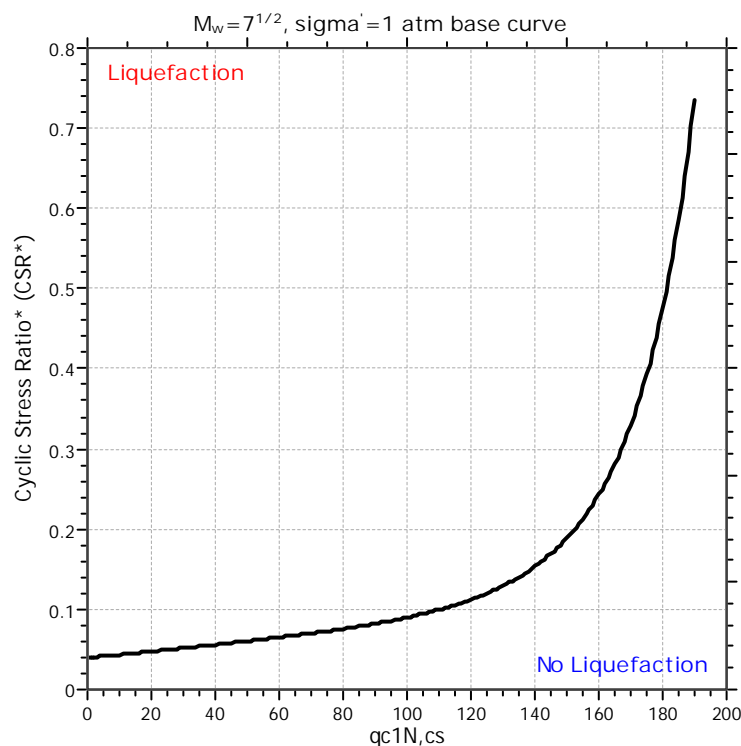
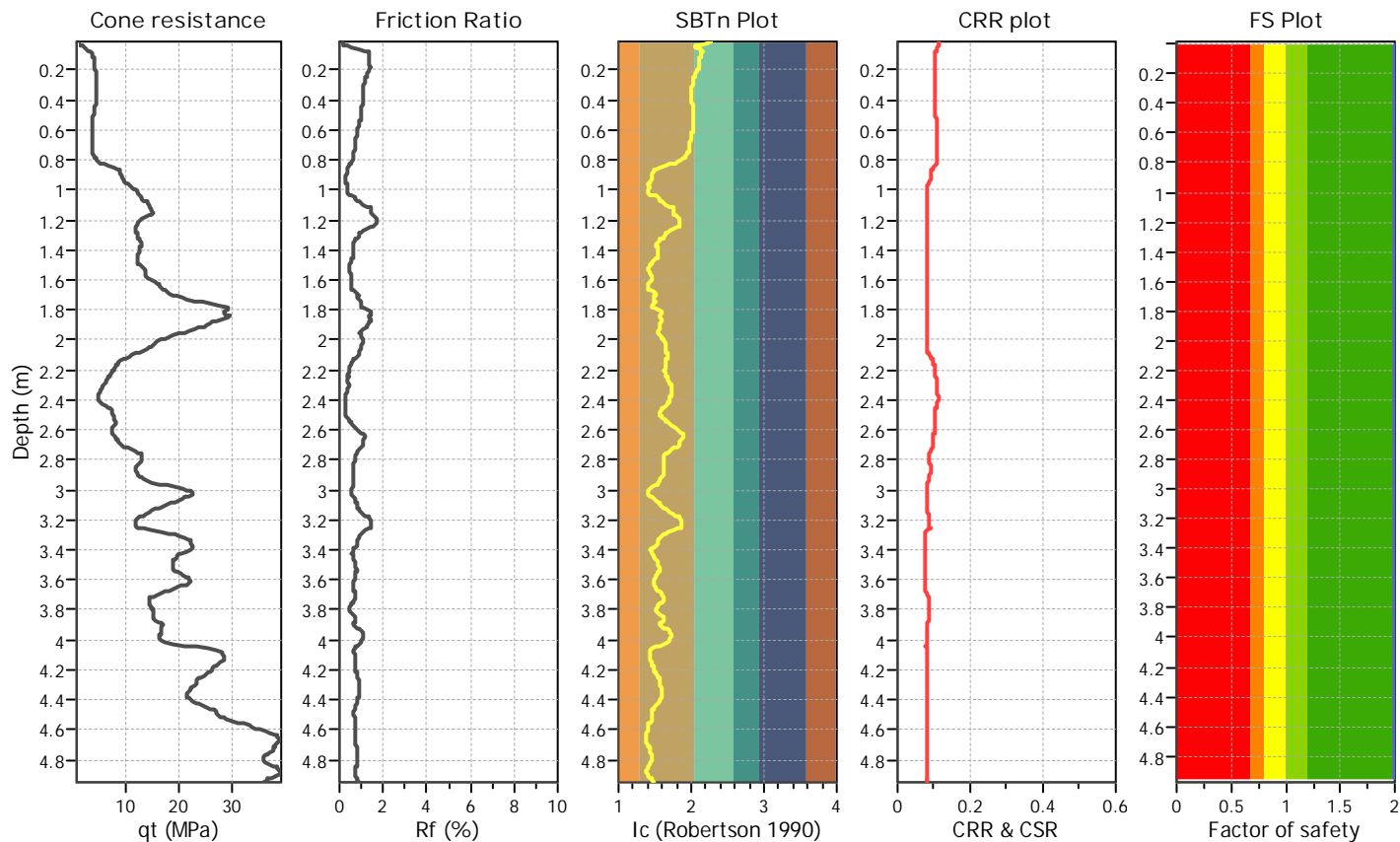
Project title :

Location :

CPT file : 8270-020_CPT008

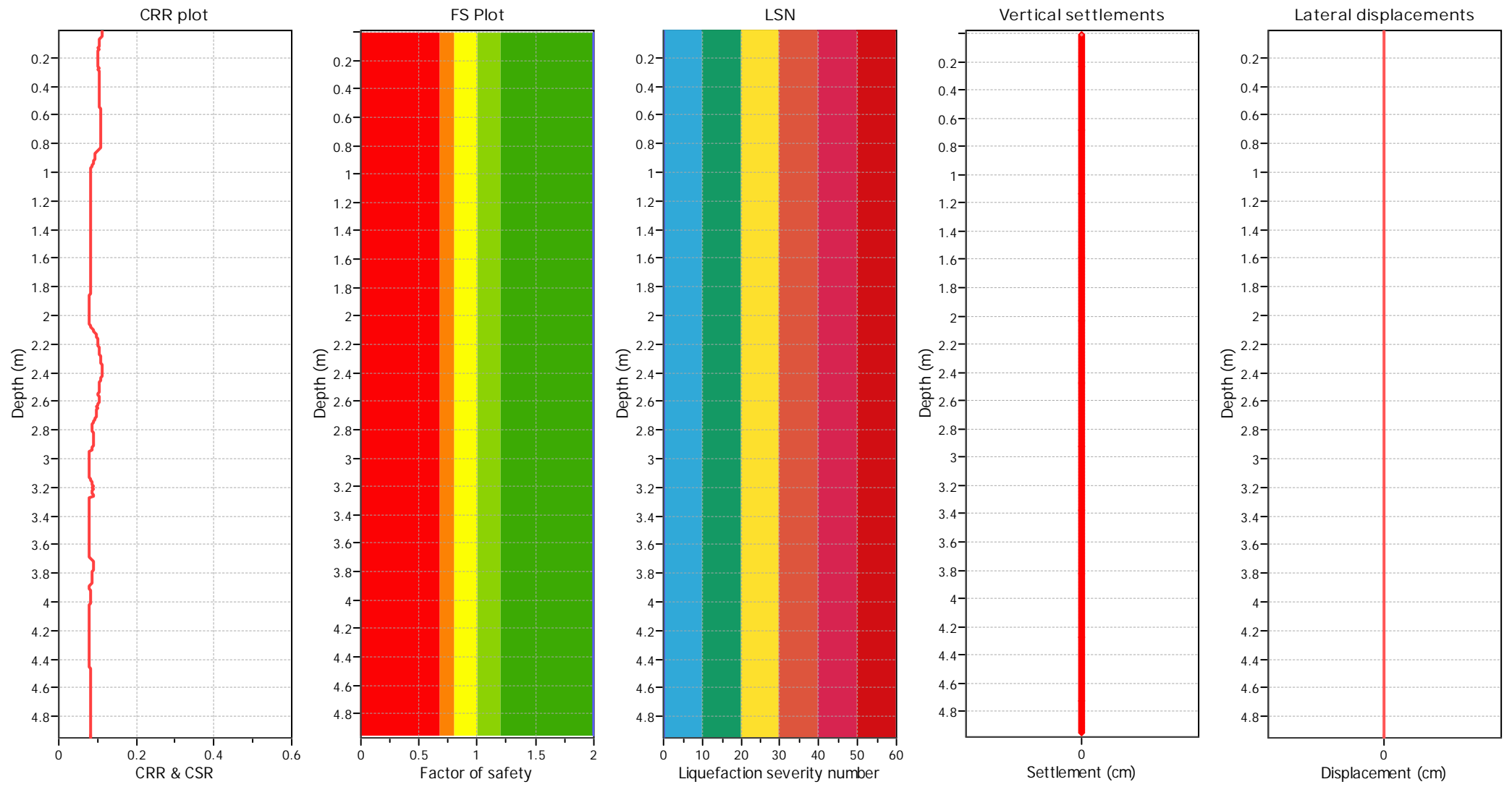
Input parameters and analysis data

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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	8.00 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 :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.20	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme			LSN color scheme		
Red	Almost certain it will liquefy		Red	Severe damage	
Orange	Very likely to liquefy		Orange	Major expression of liquefaction	
Yellow	Liquefaction and no liq. are equally likely		Orange	Moderate to severe exp. of liquefaction	
Light Green	Unlike to liquefy		Yellow	Moderate expression of liquefaction	
Dark Green	Almost certain it will not liquefy		Green	Minor expression of liquefaction	
			Blue	Little to no expression of liquefaction	

LIQUEFACTION ANALYSIS REPORT

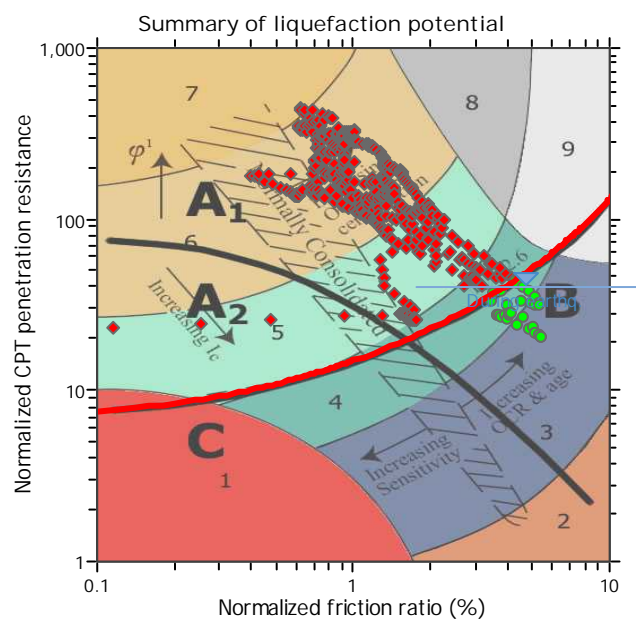
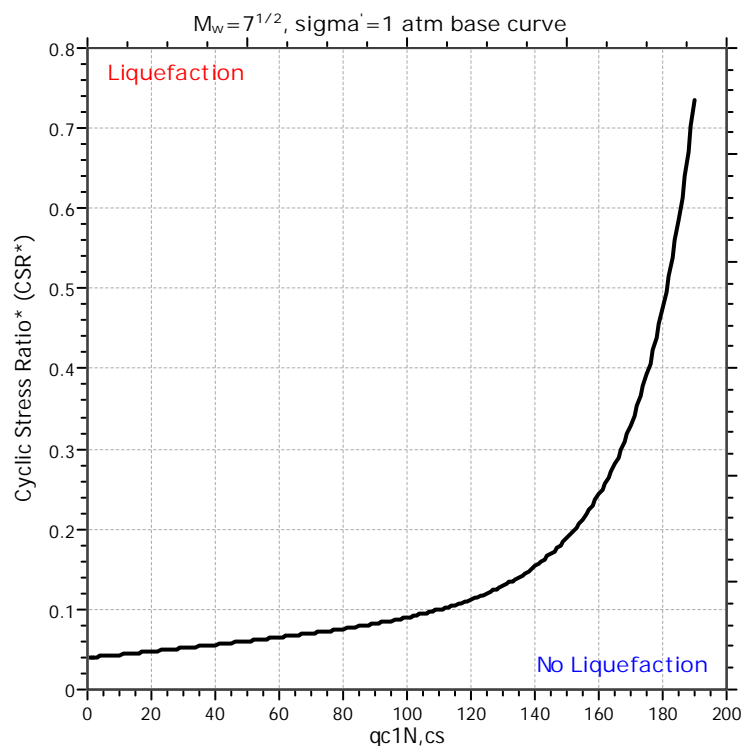
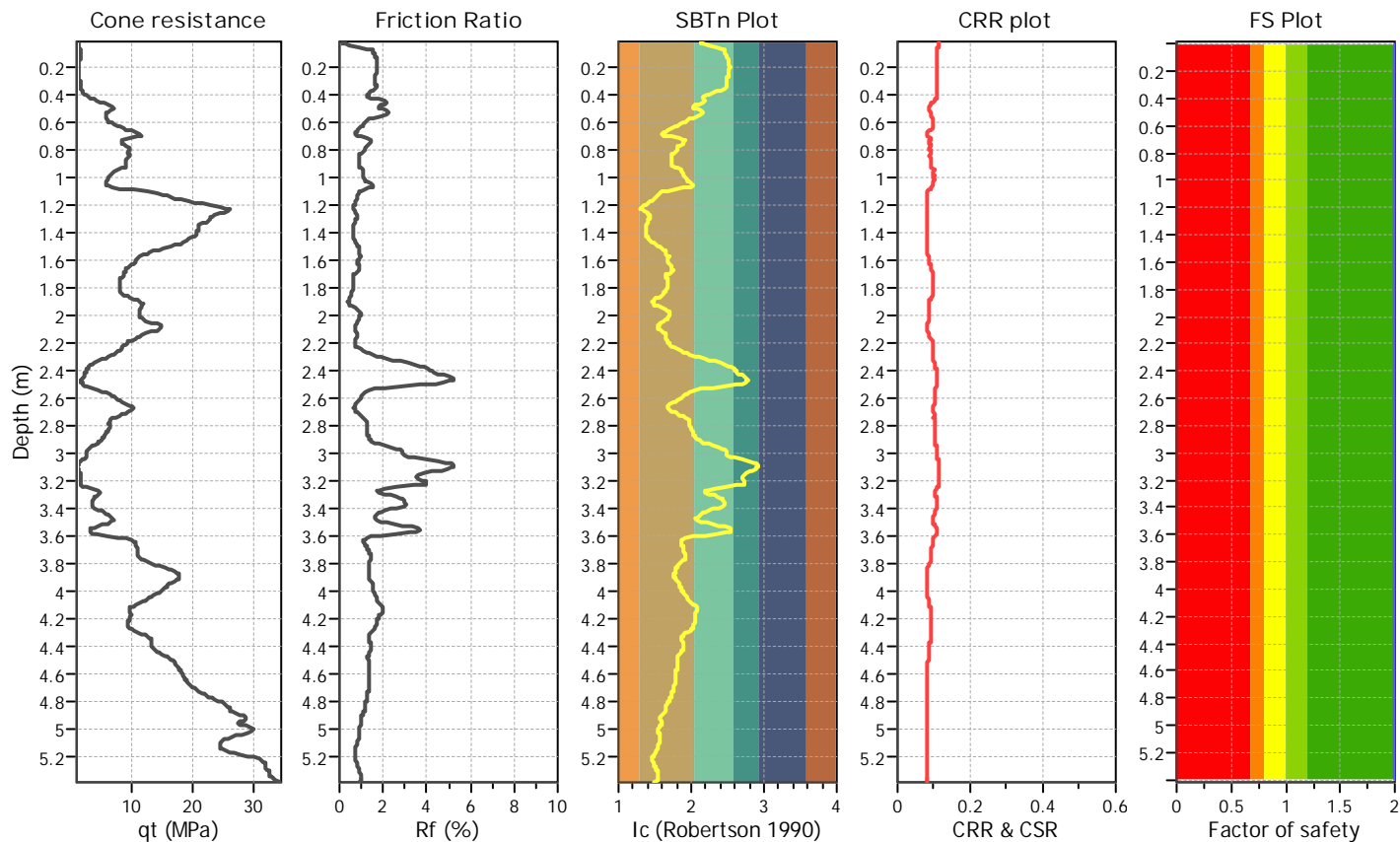
Project title :

Location :

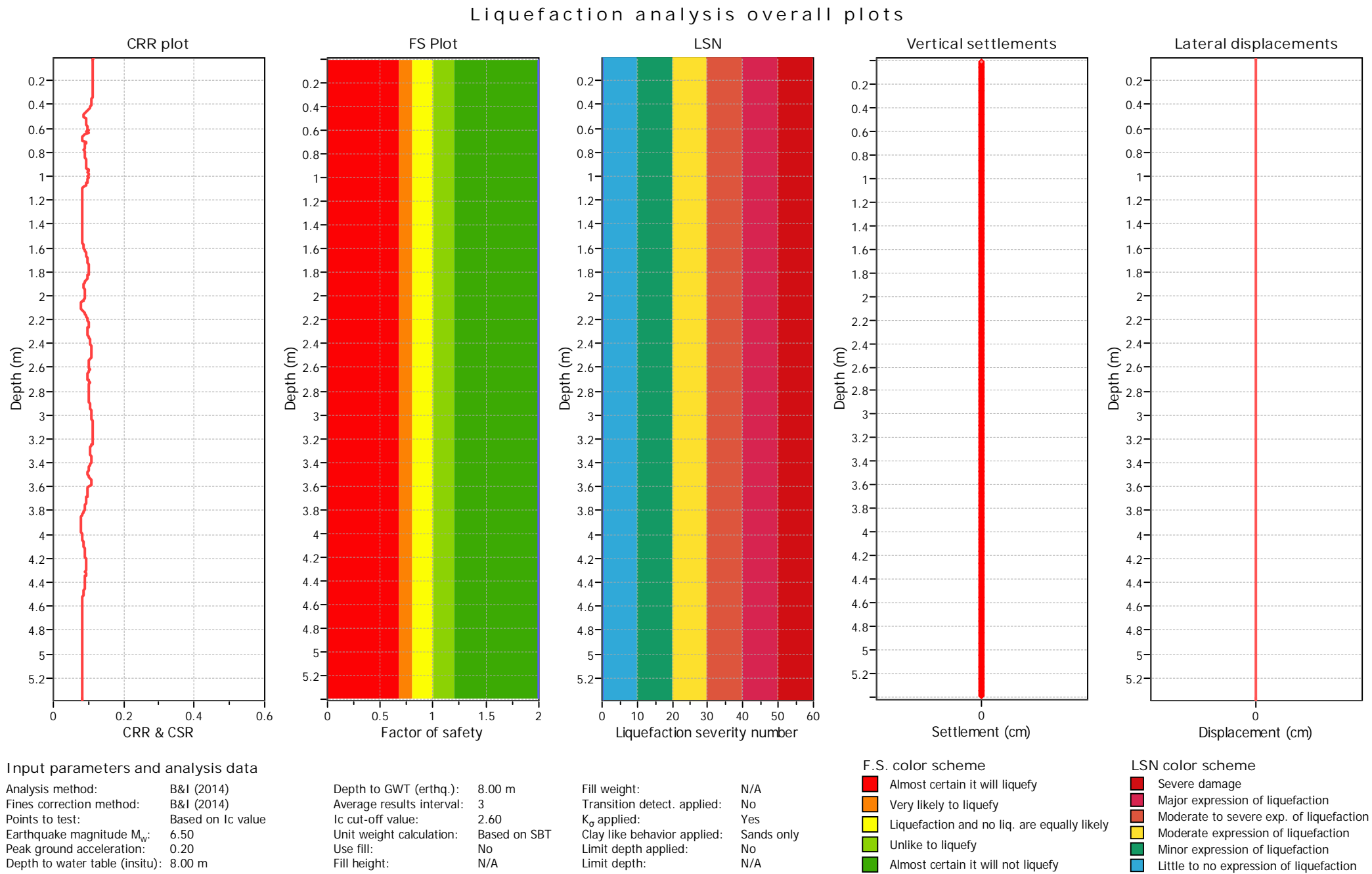
CPT file : 8270-020_CPT009

Input parameters and analysis data

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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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 REPORT

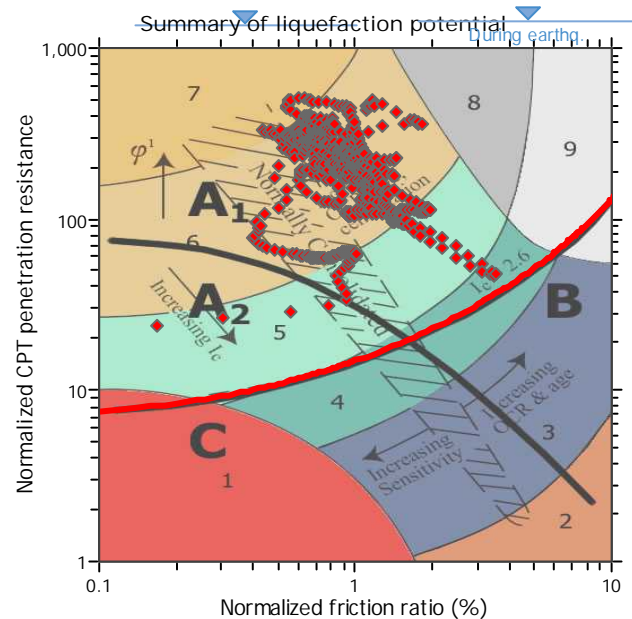
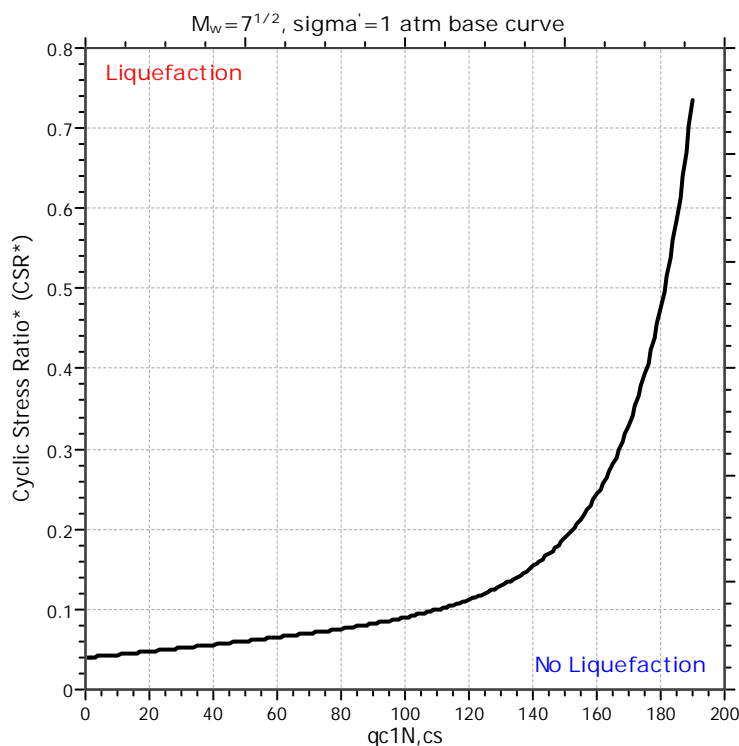
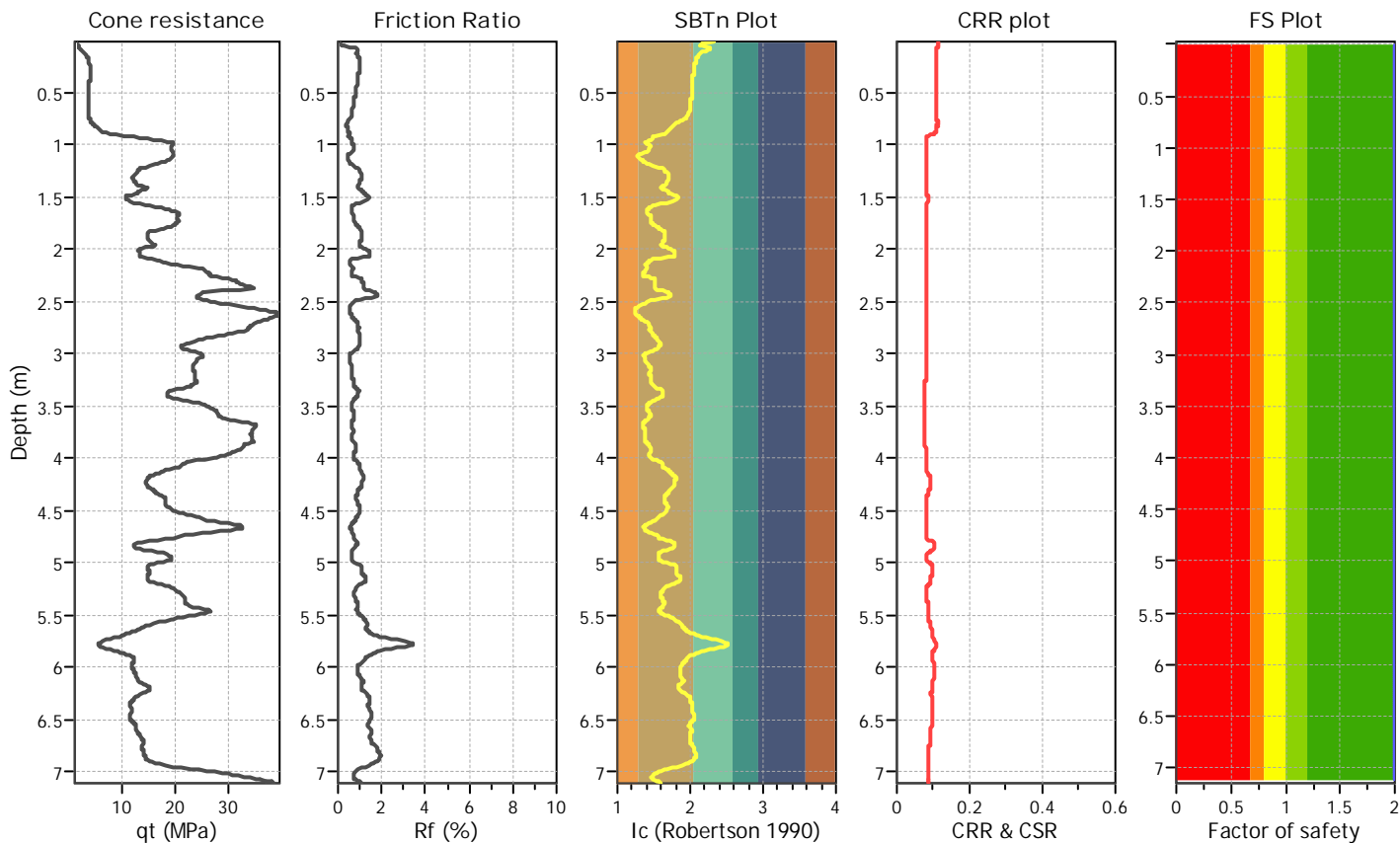
Project title :

Location :

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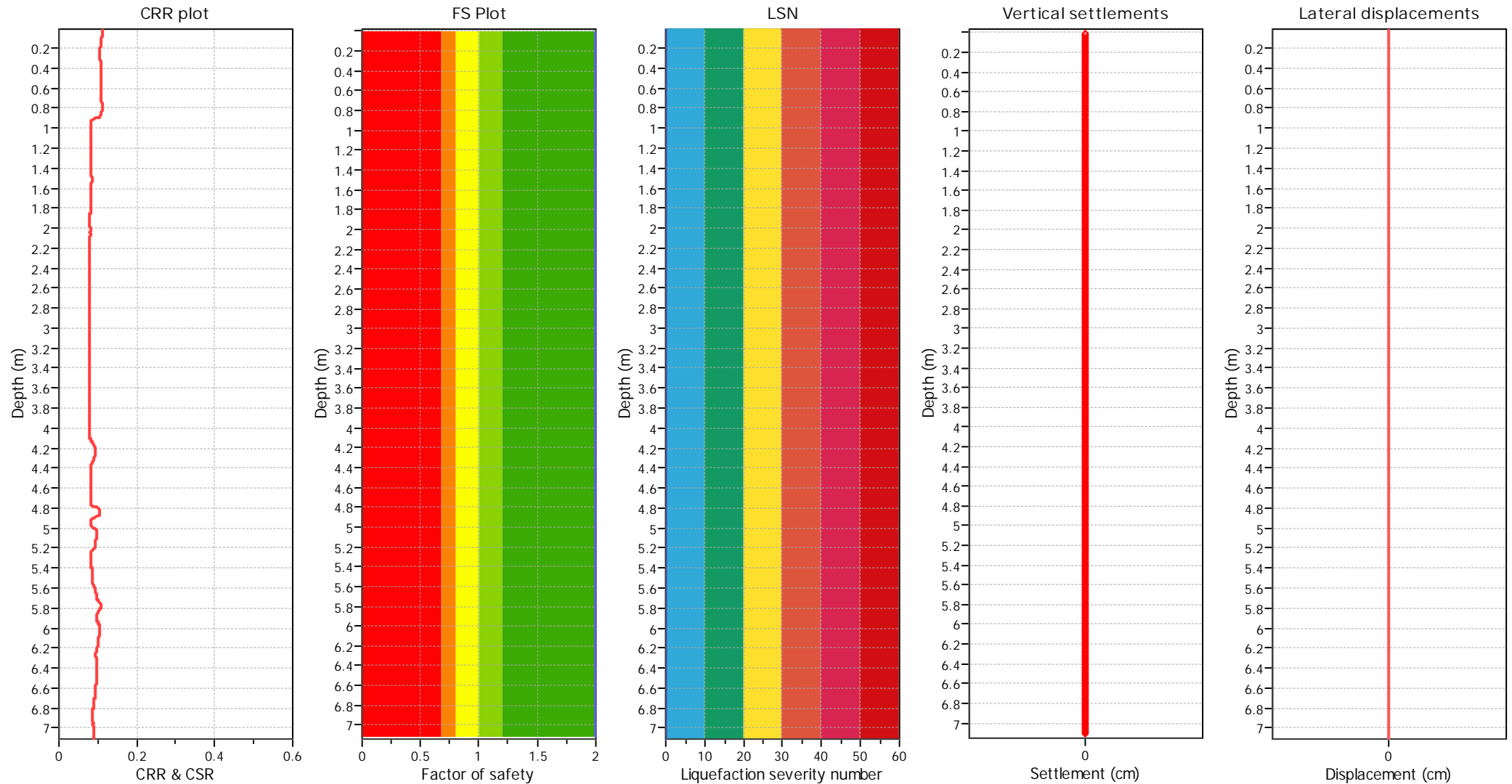
Input parameters and analysis data

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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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: B&I (2014)
 Fines correction method: B&I (2014)
 Points to test: Based on Ic value
 Earthquake magnitude M_w : 6.50
 Peak ground acceleration: 0.20
 Depth to water table (insitu): 8.00 m

Depth to GWT (insitu): 8.00 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_0 applied: Yes
 Clay like behavior applied: Sands only
 Limit depth applied: No
 Limit depth: N/A

F.S. color scheme

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

LSN color scheme

[Red] Severe damage
 [Pink] Major expression of liquefaction
 [Orange] Moderate to severe exp. of liquefaction
 [Yellow] Moderate expression of liquefaction
 [Green] Minor expression of liquefaction
 [Blue] Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

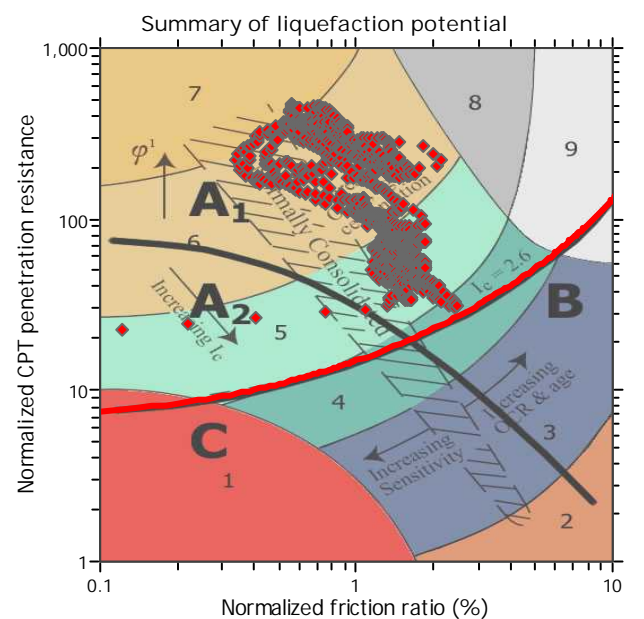
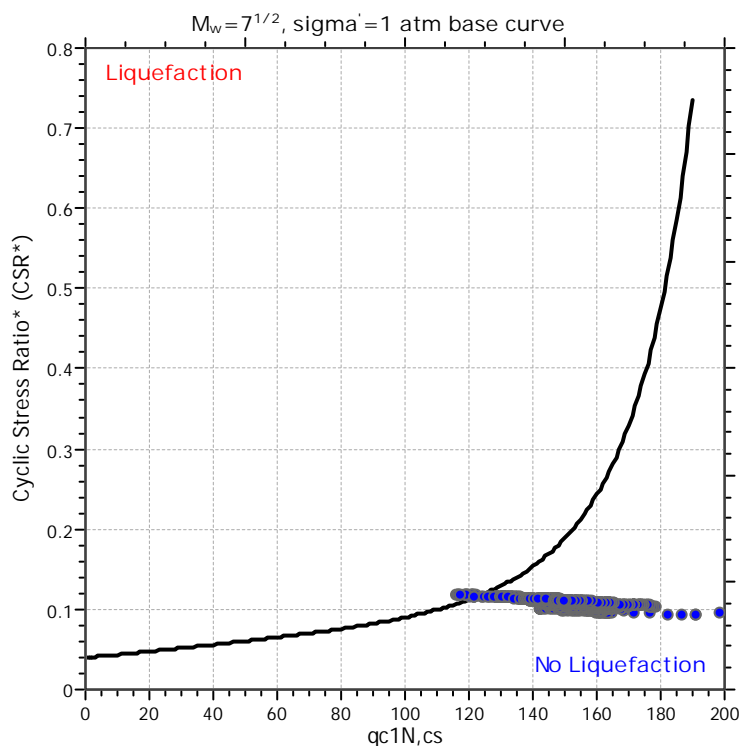
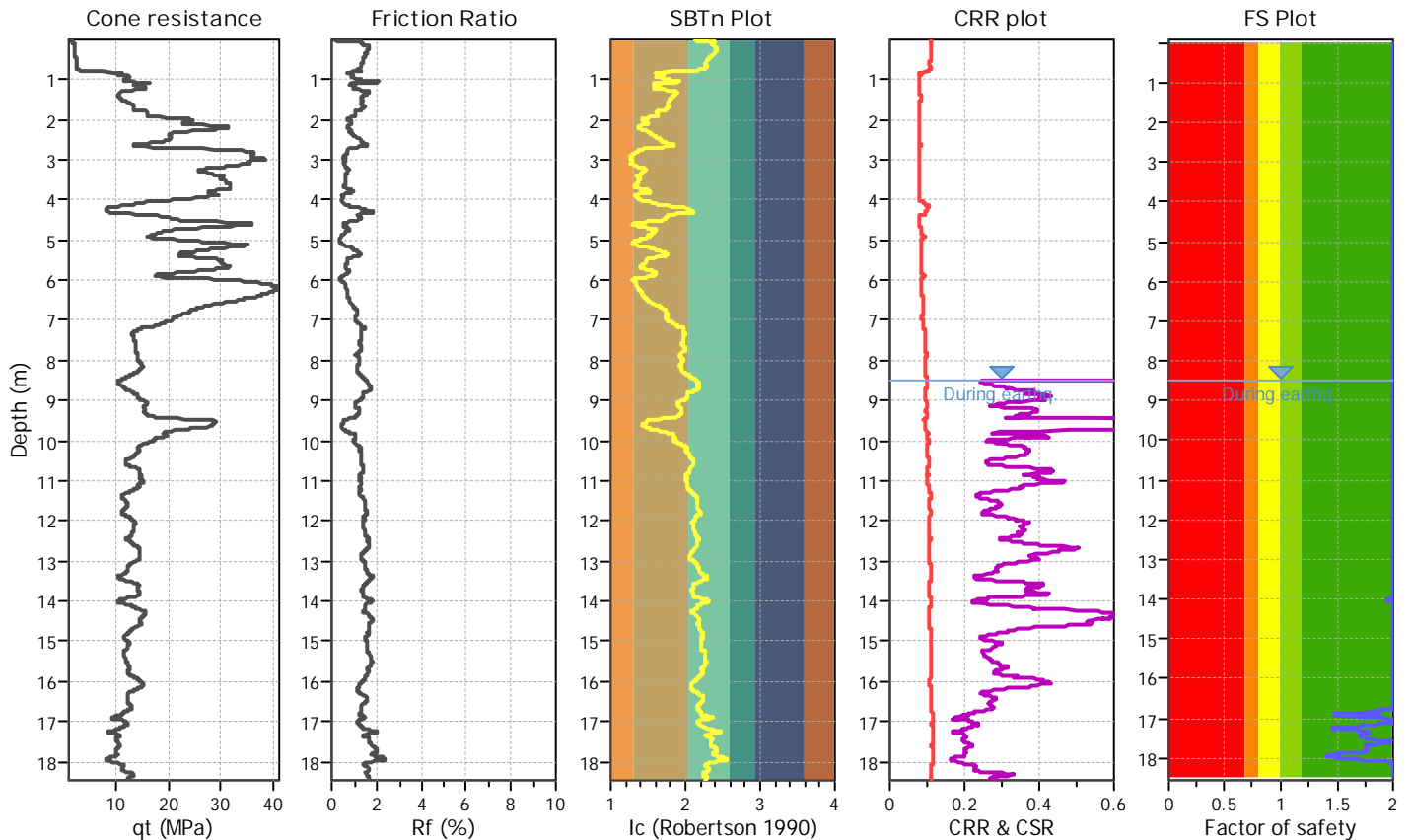
Project title :

Location :

CPT file : 8270-020_CPT011

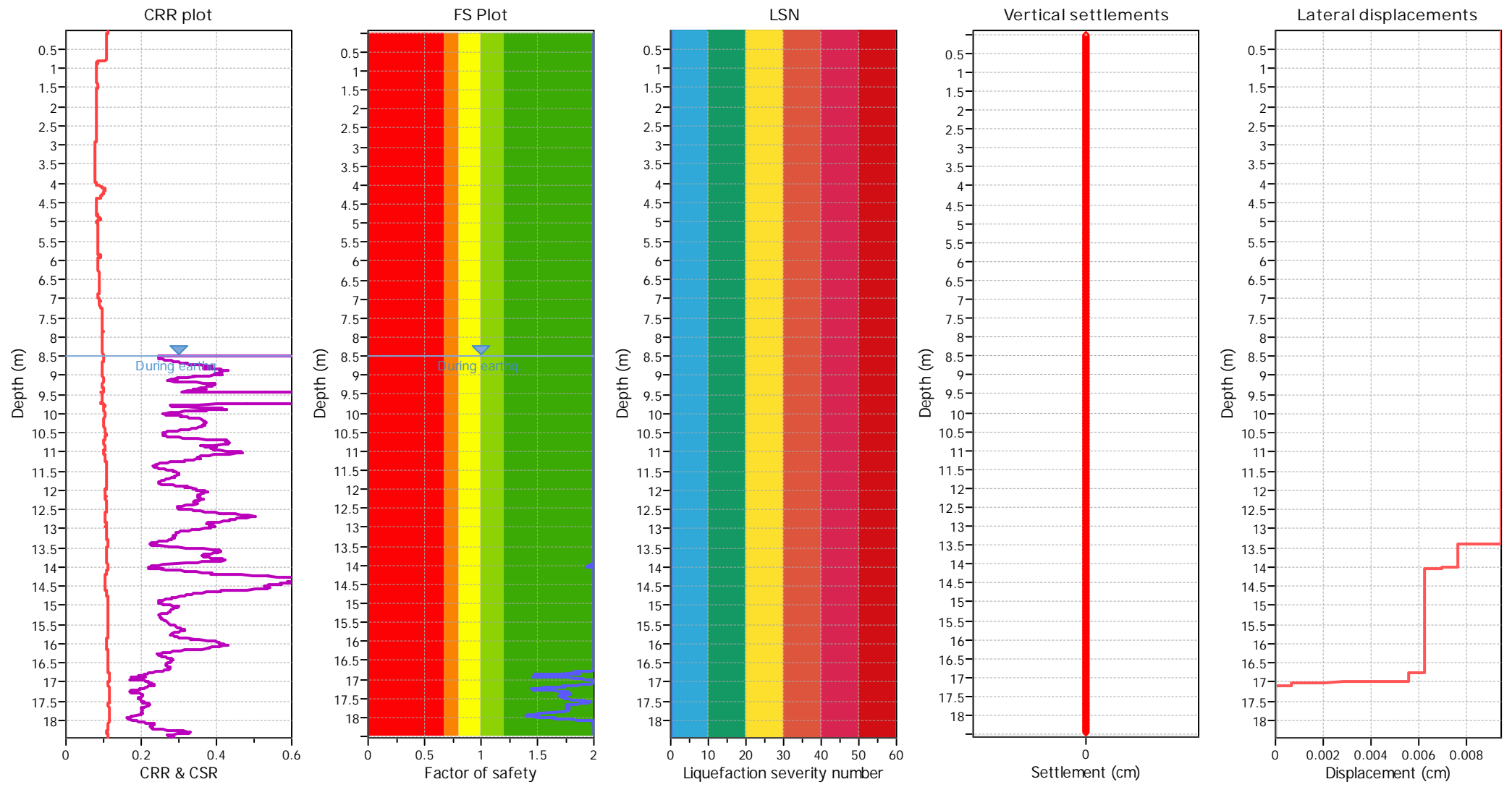
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	8.50 m	Fill weight:	N/A	F.S. color scheme		LSN color scheme	
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No		Almost certain it will liquefy		Severe damage
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_0 applied:	Yes		Very likely to liquefy		Major expression of liquefaction
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only		Liquefaction and no liq. are equally likely		Moderate to severe exp. of liquefaction
Peak ground acceleration:	0.20	Use fill:	No	Limit depth applied:	No		Unlike to liquefy		Moderate expression of liquefaction
Depth to water table (insitu):	8.50 m	Fill height:	N/A	Limit depth:	N/A		Almost certain it will not liquefy		Minor expression of liquefaction
									Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

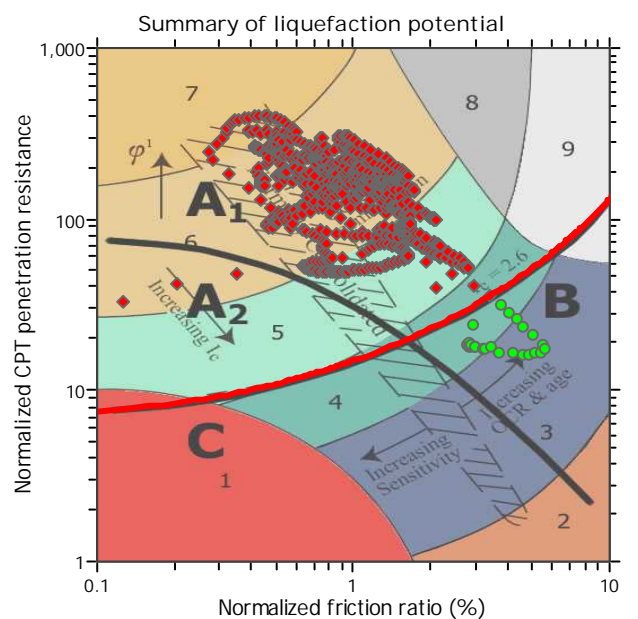
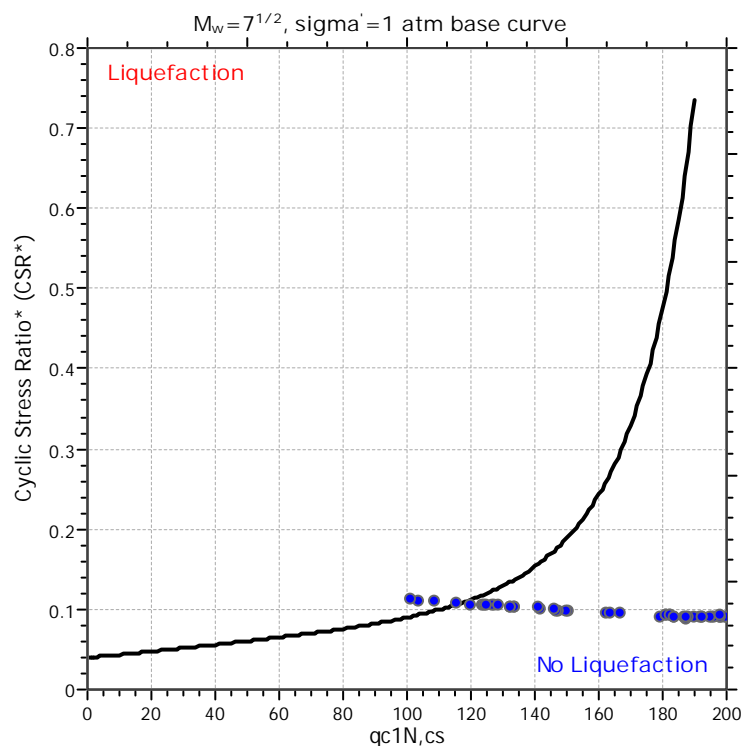
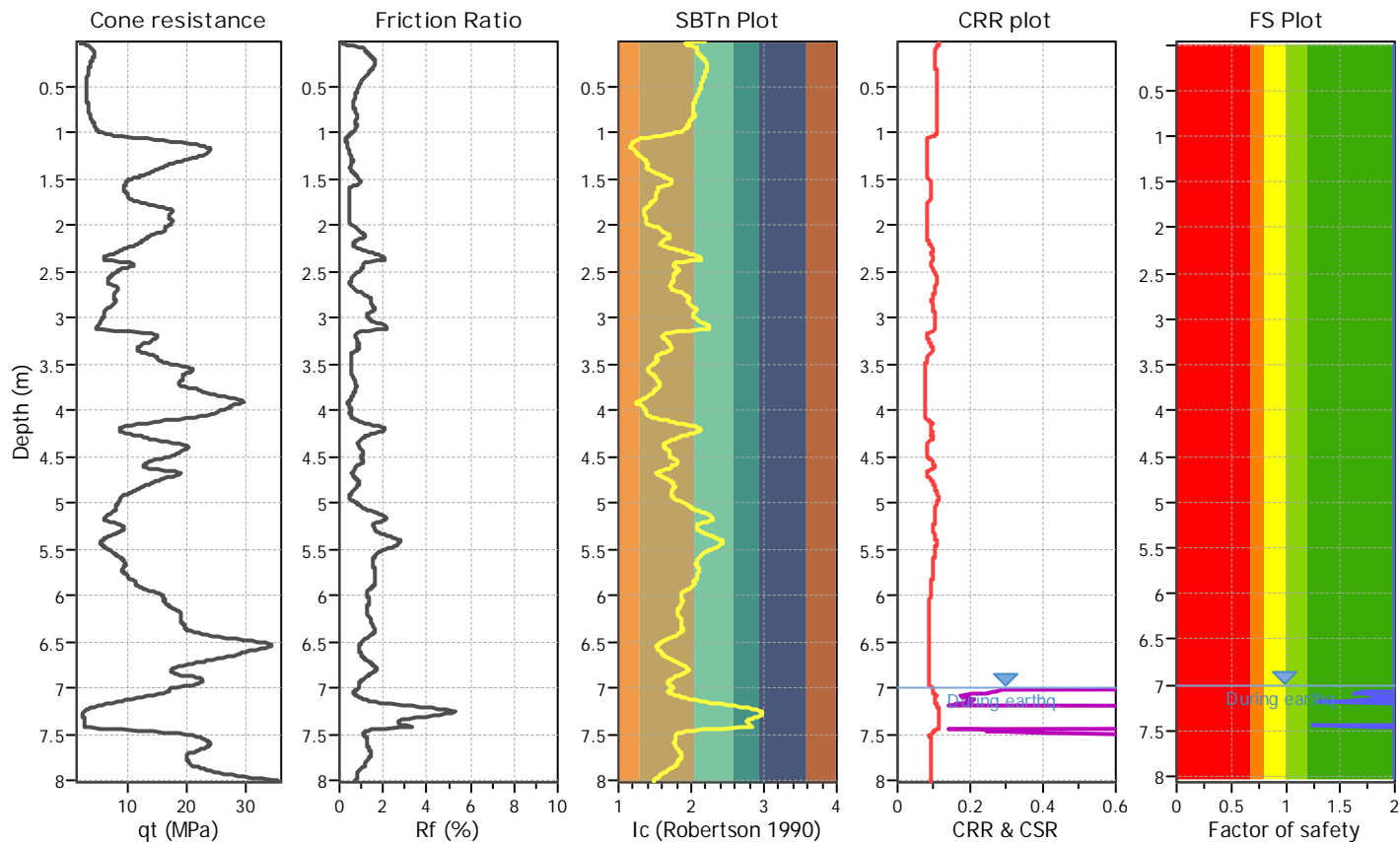
Project title :

Location :

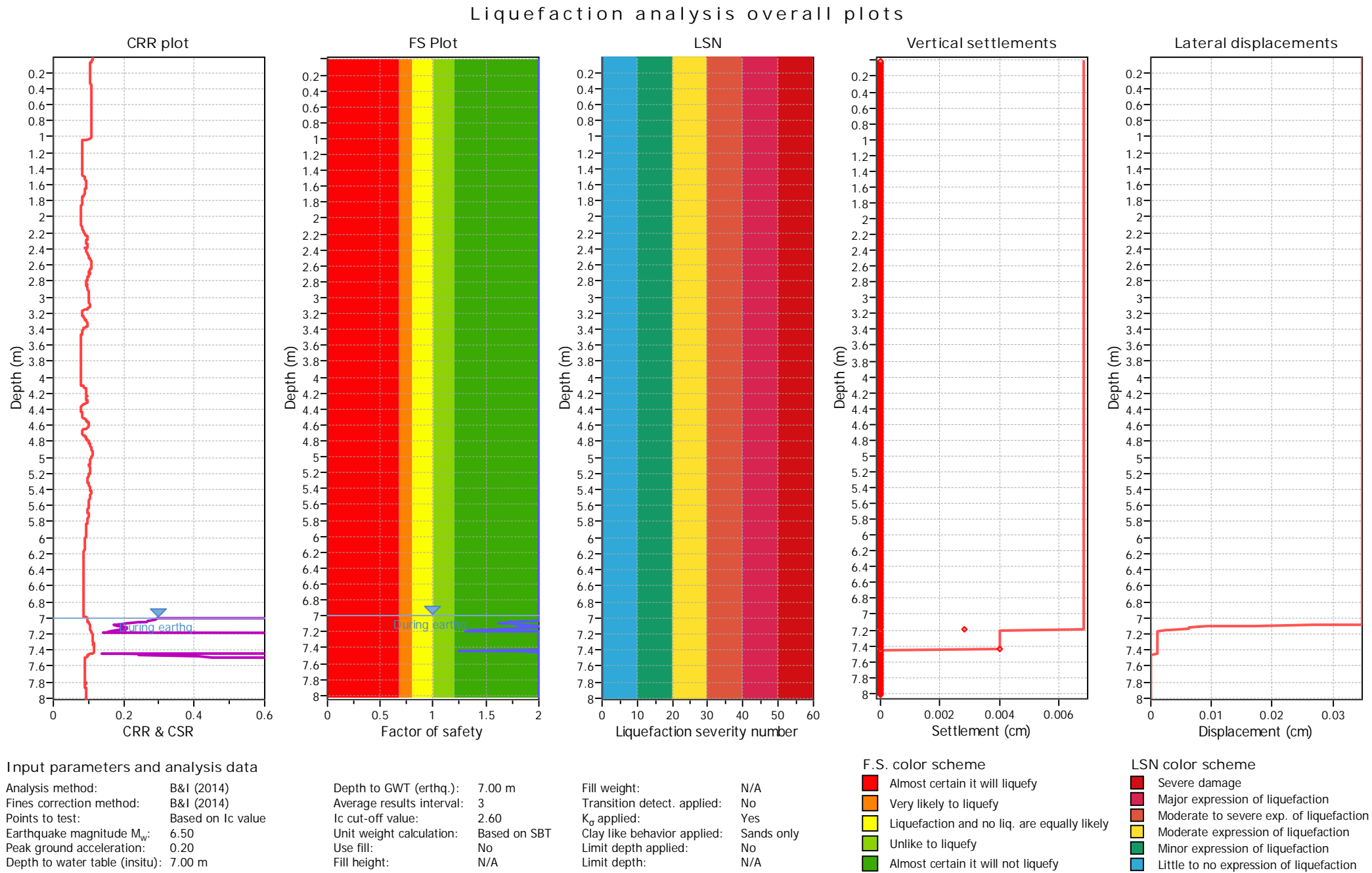
CPT file : 8270-020_CPT012

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	7.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_0 applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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 REPORT

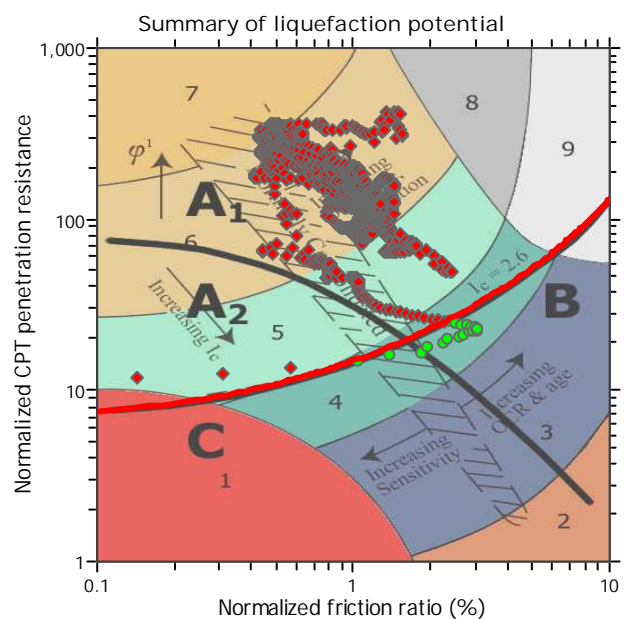
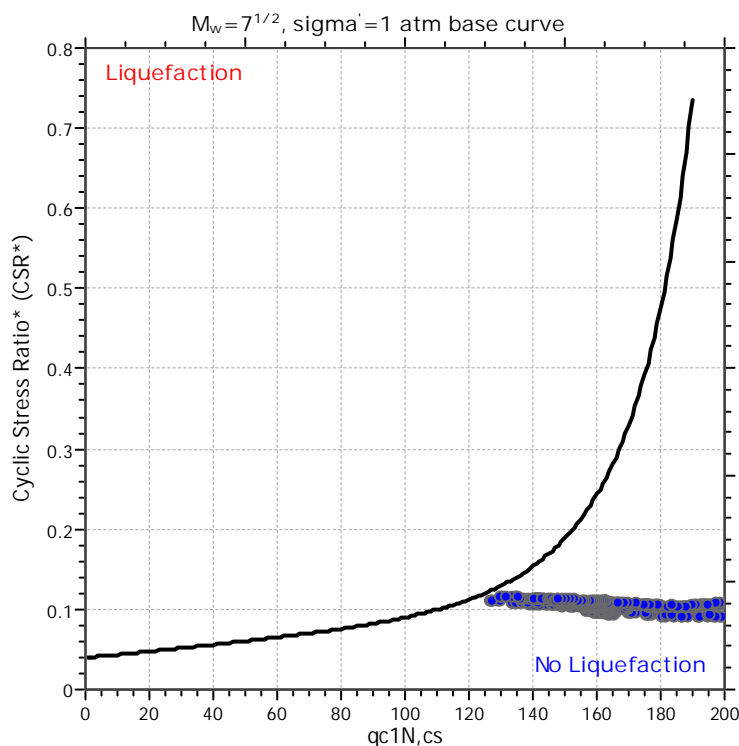
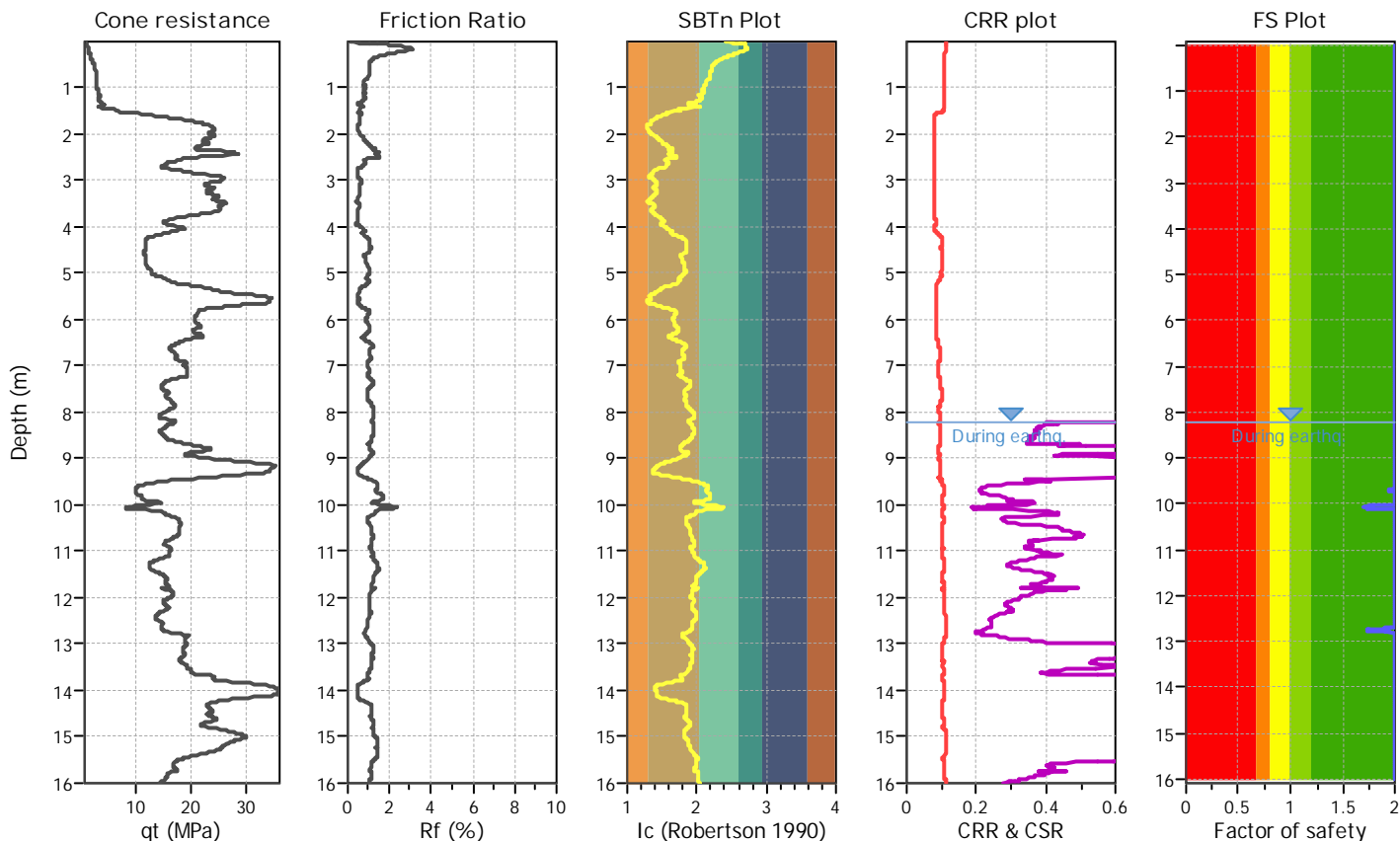
Project title :

Location :

CPT file : 8270-020_CPT013

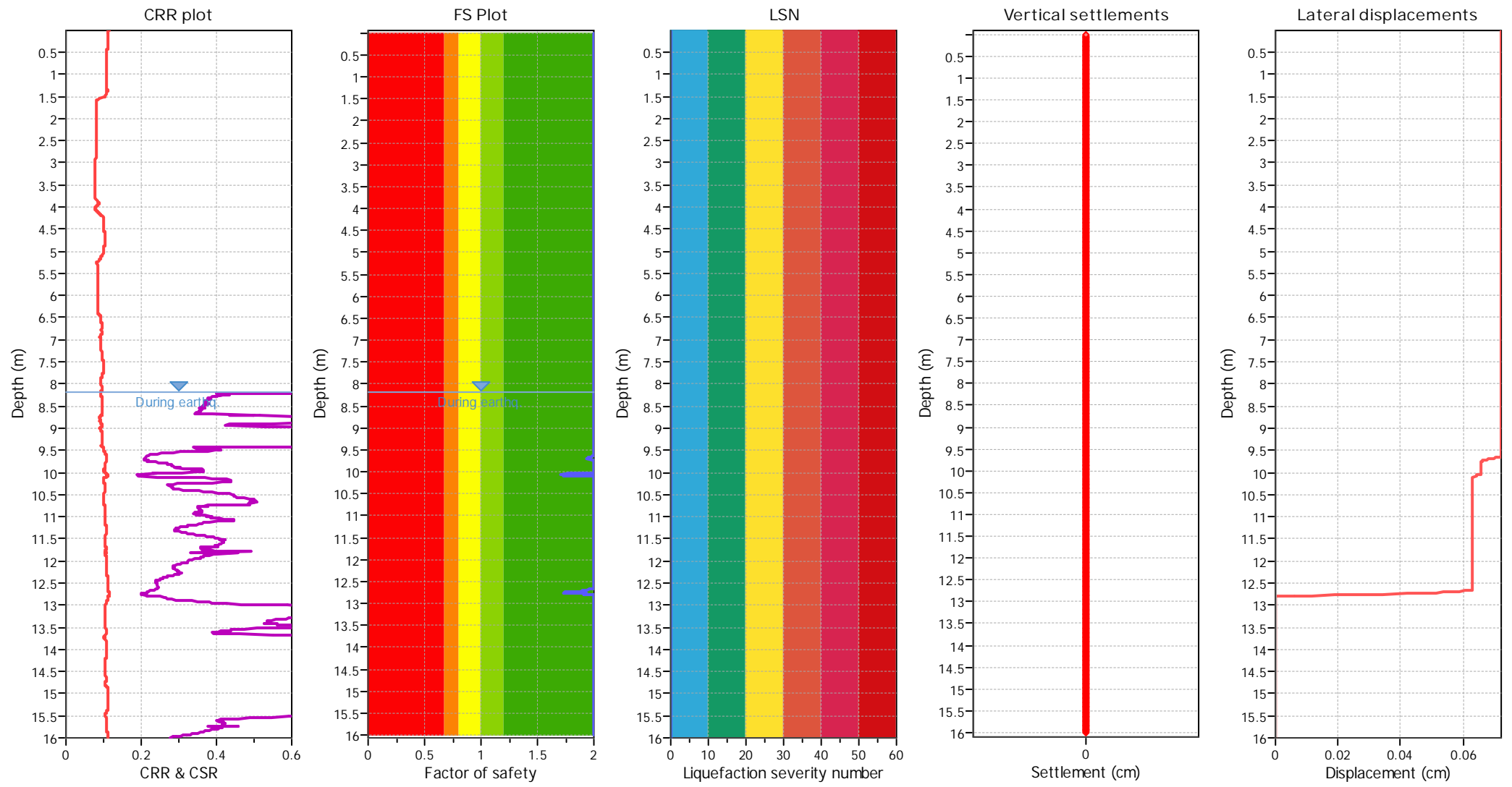
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.20 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	8.20 m	Fill weight:	N/A	F.S. color scheme		LSN color scheme	
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No	<div></div> Almost certain it will liquefy	<div></div> Severe damage	<div></div> Major expression of liquefaction	
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_0 applied:	Yes	<div></div> Very likely to liquefy	<div></div> Moderate to severe exp. of liquefaction	<div></div> Moderate expression of liquefaction	
Earthquake magnitude M_w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only	<div></div> Liquefaction and no liq. are equally likely	<div></div> Minor expression of liquefaction	<div></div> Little to no expression of liquefaction	
Peak ground acceleration:	0.20	Use fill:	No	Limit depth applied:	No	<div></div> Unlike to liquefy			
Depth to water table (insitu):	8.20 m	Fill height:	N/A	Limit depth:	N/A	<div></div> Almost certain it will not liquefy			

LIQUEFACTION ANALYSIS REPORT

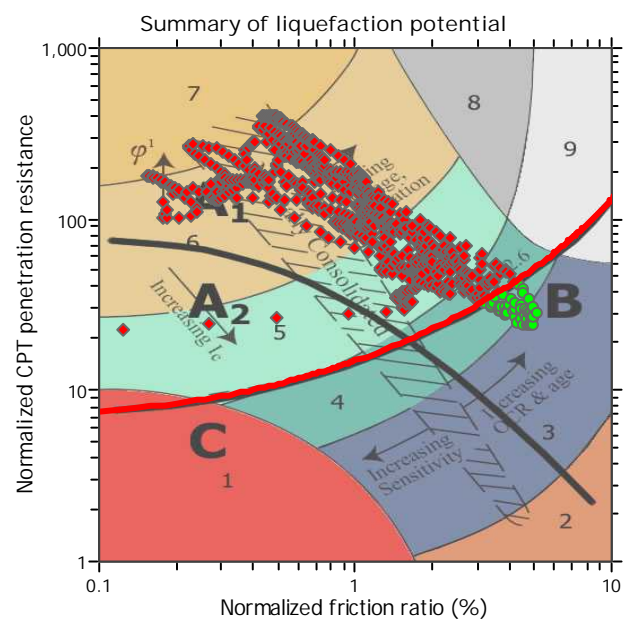
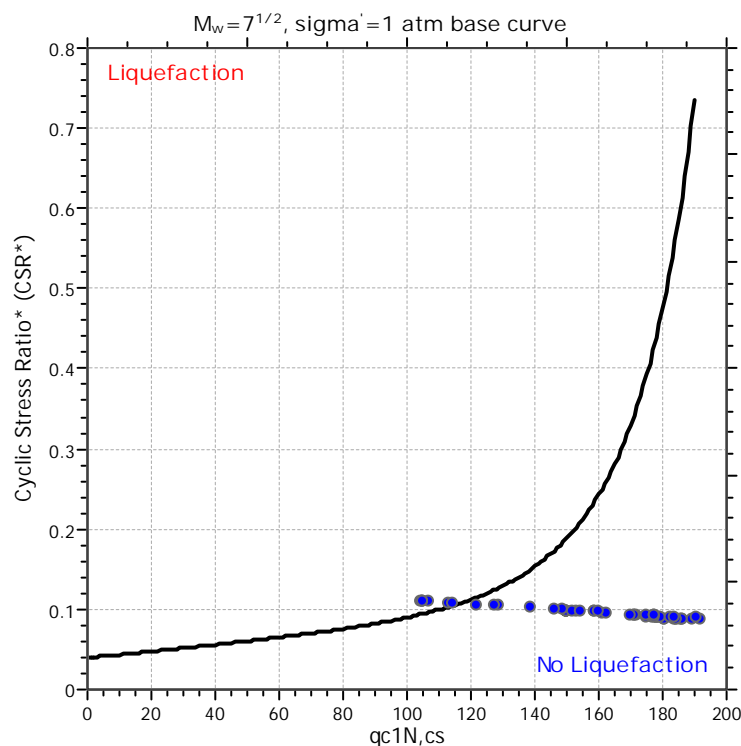
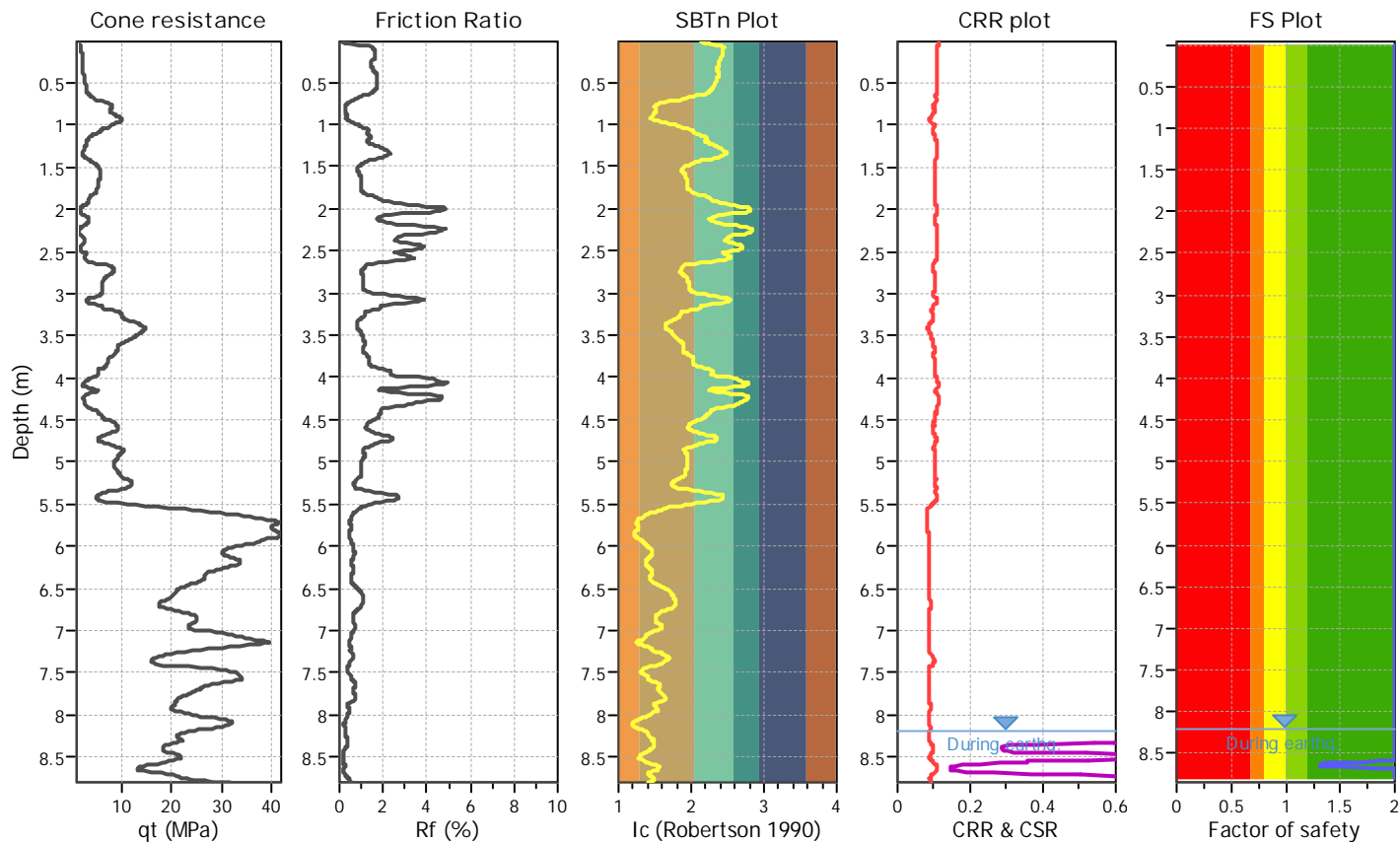
Project title :

Location :

CPT file : 8270-020_CPT014

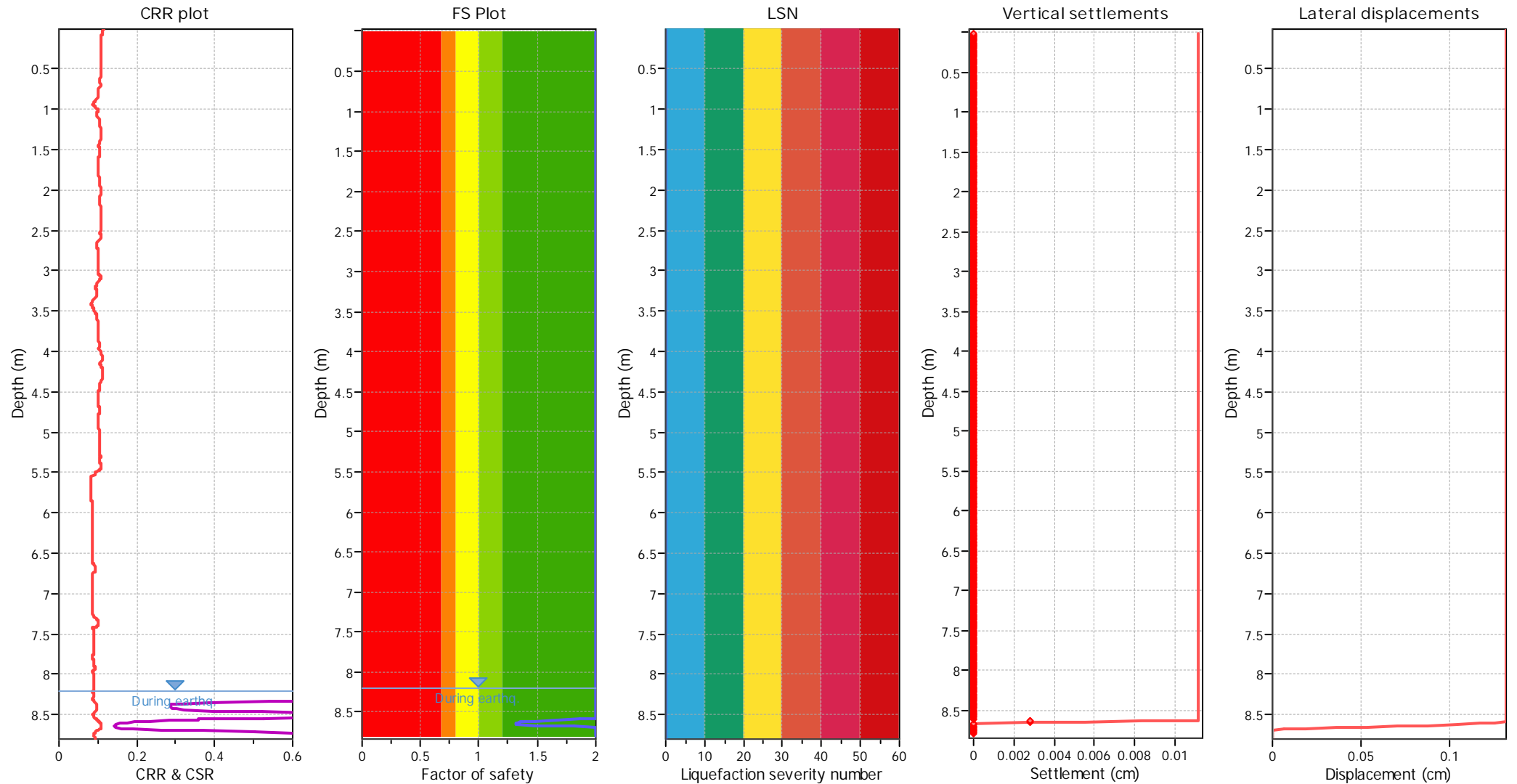
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.20 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	6.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.20	Unit weight calculation:	Based on SBT	K_g applied:	Yes		



Zone A1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (earthq.):	8.20 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 ₀ applied:	Yes
Earthquake magnitude M _w :	6.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.20	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.20 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

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

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LIQUEFACTION ANALYSIS REPORT

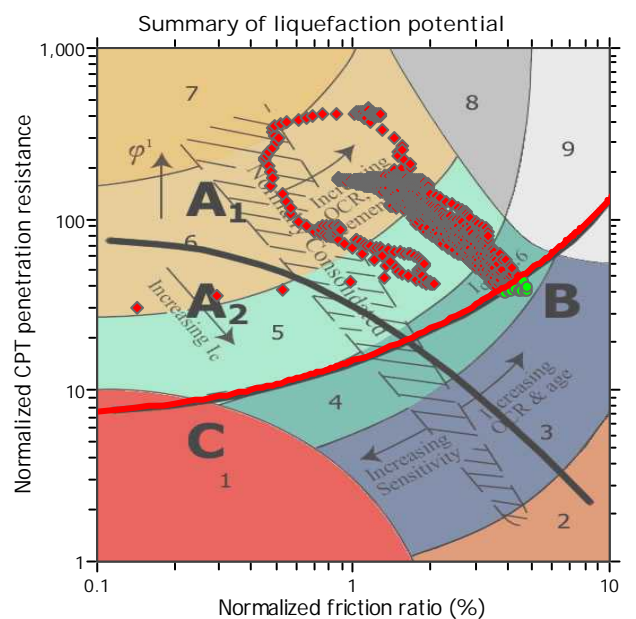
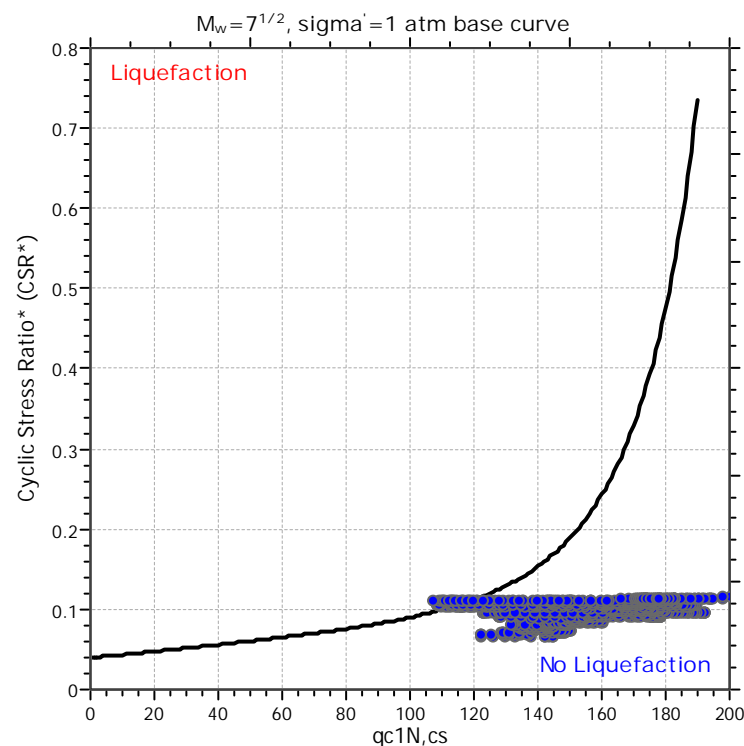
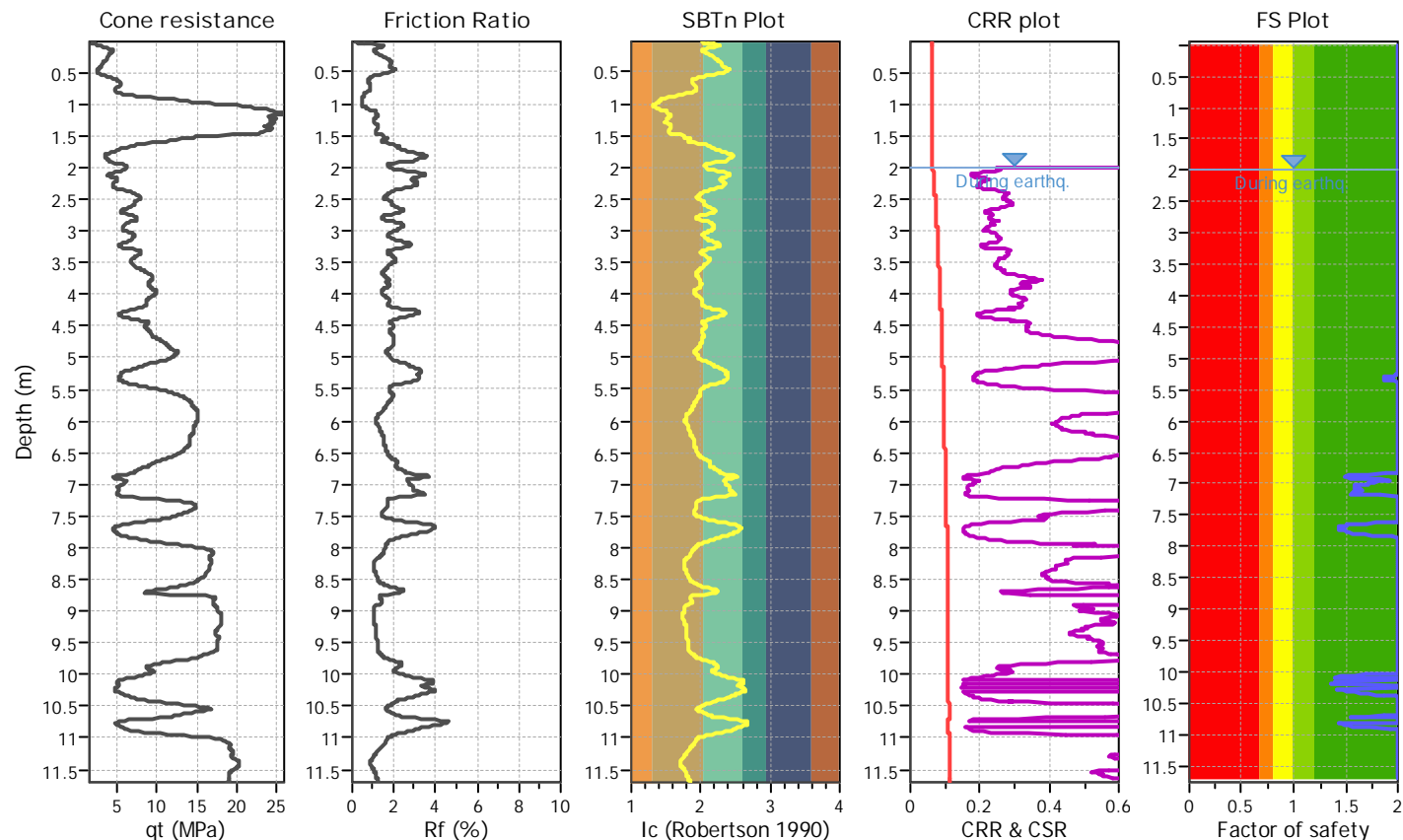
Project title :

Location :

CPT file : 8270-020_CPT001

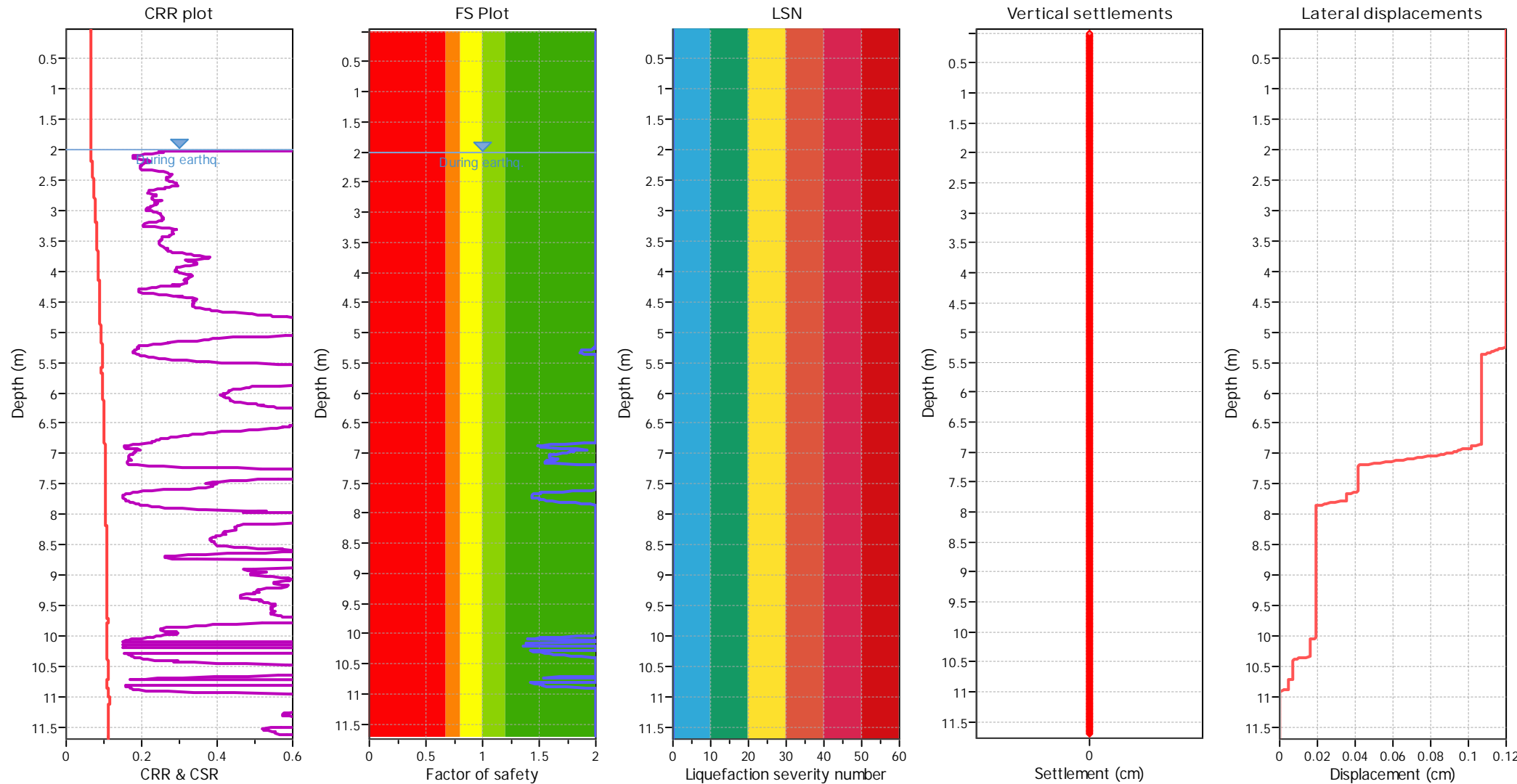
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	2.00 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 :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 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

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

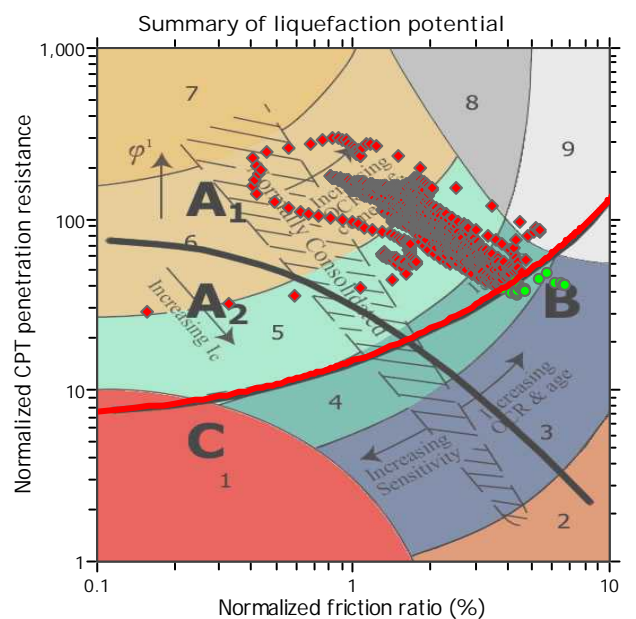
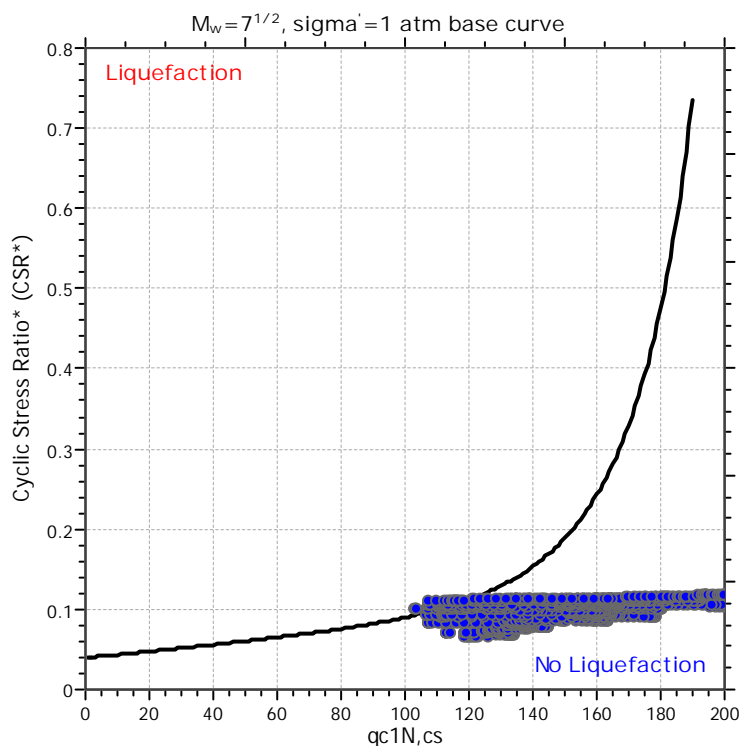
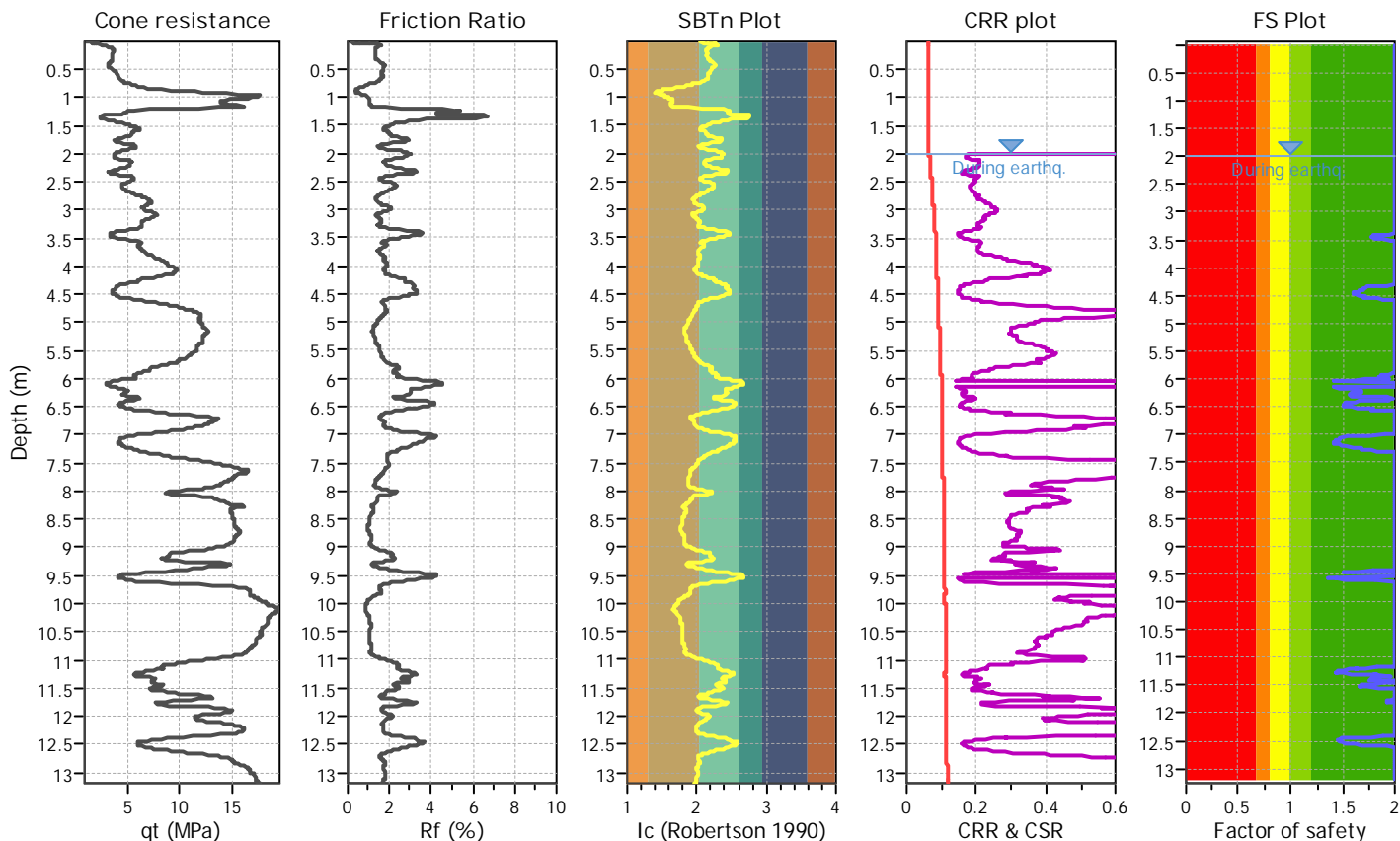
Project title :

Location :

CPT file : 8270-020_CPT002

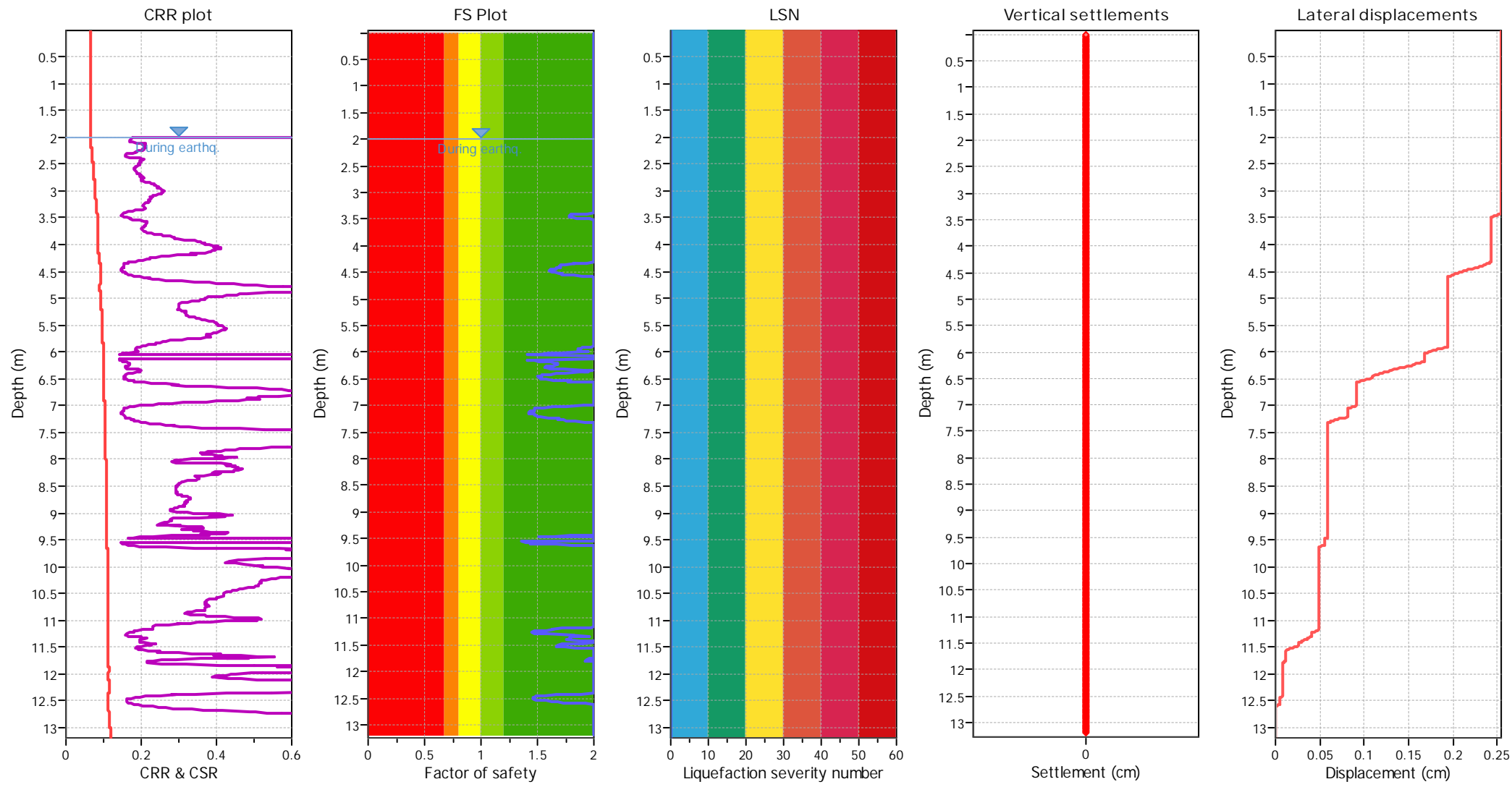
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (earthq.):	2.00 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 :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 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

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

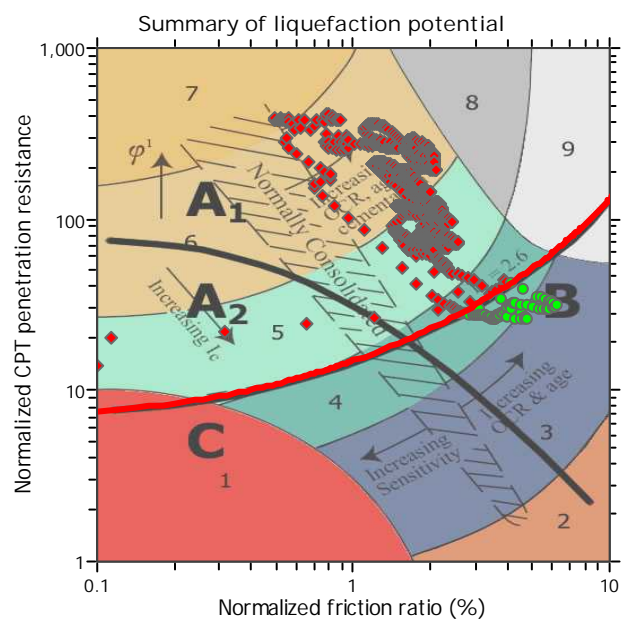
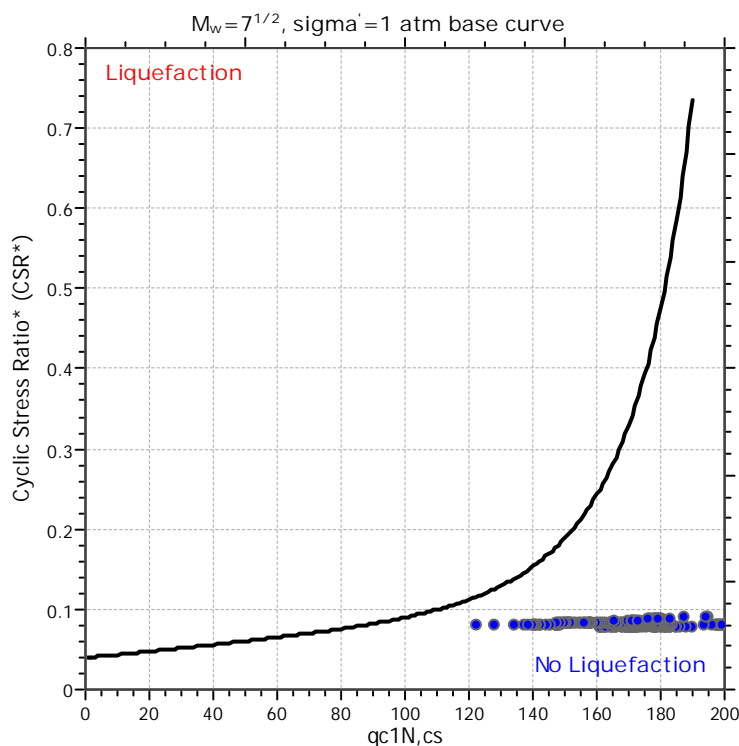
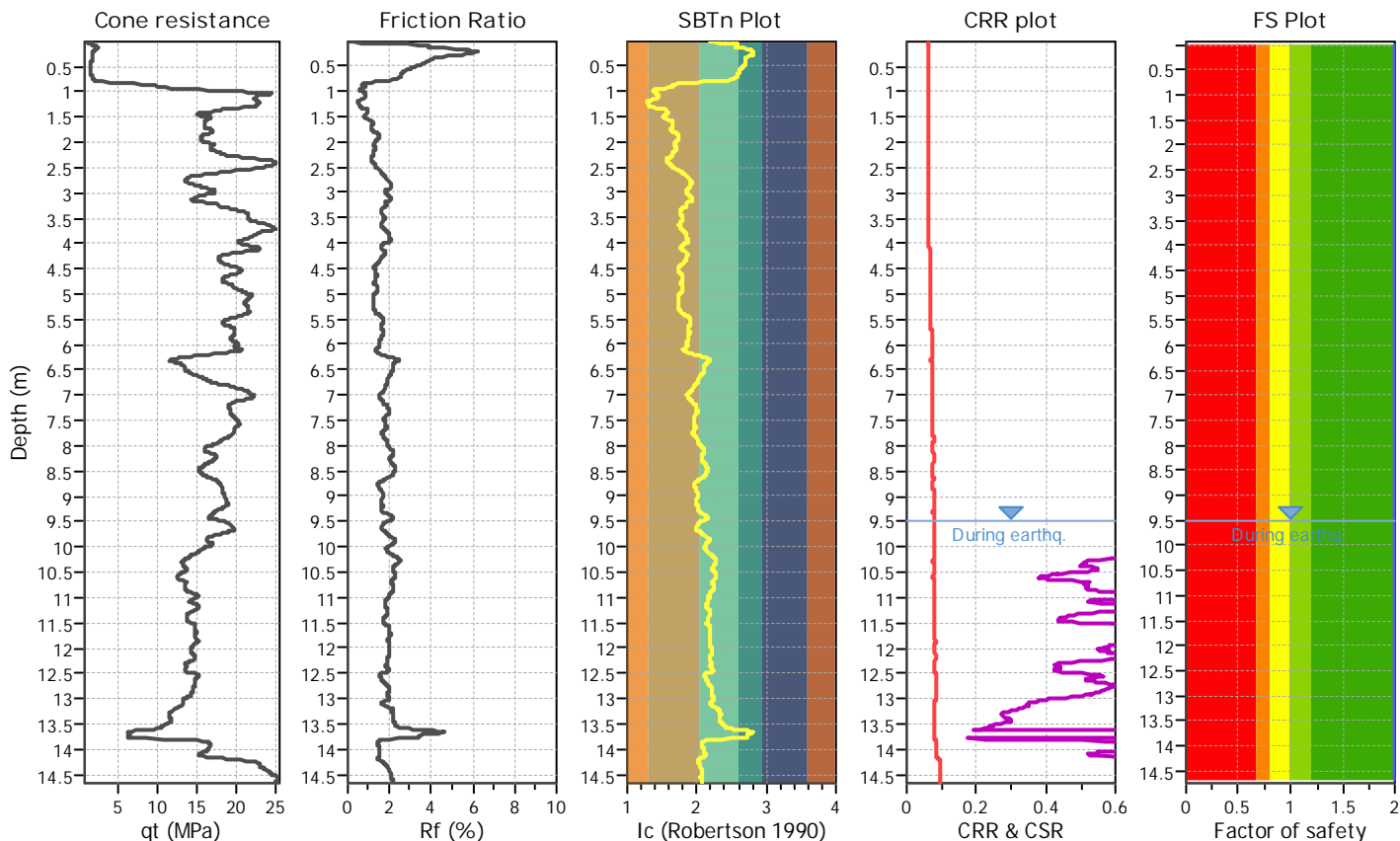
Project title :

Location :

CPT file : 8270-020_CPT003

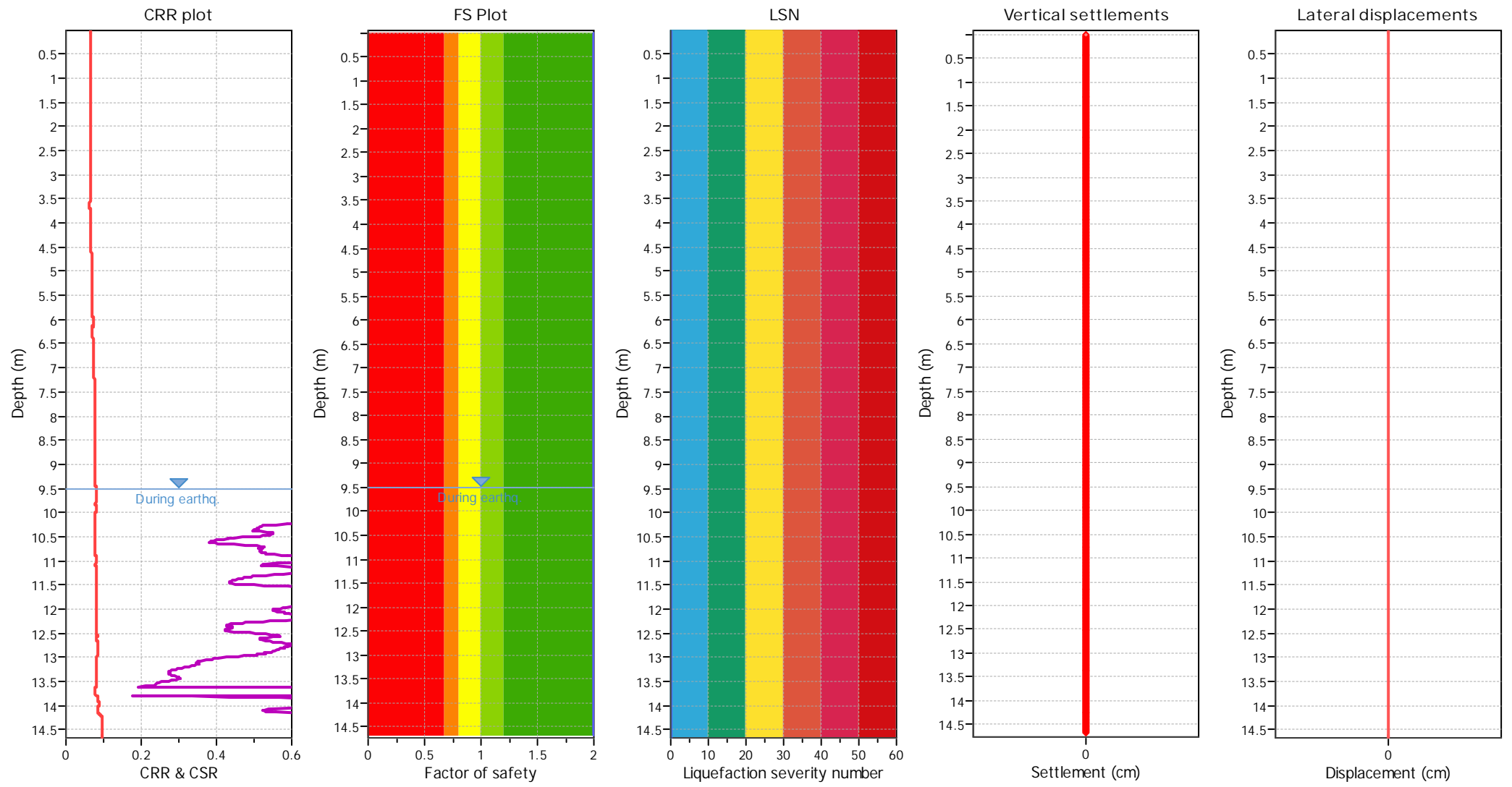
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	9.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	9.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (earthq.):	9.50 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 :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	9.50 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

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

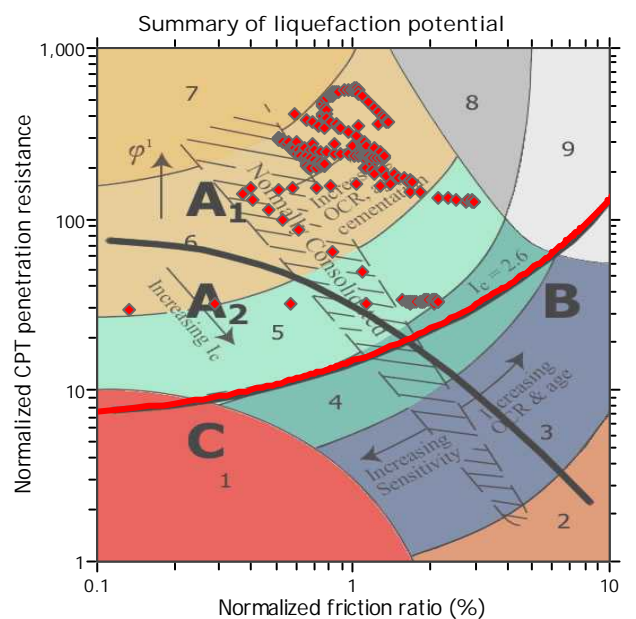
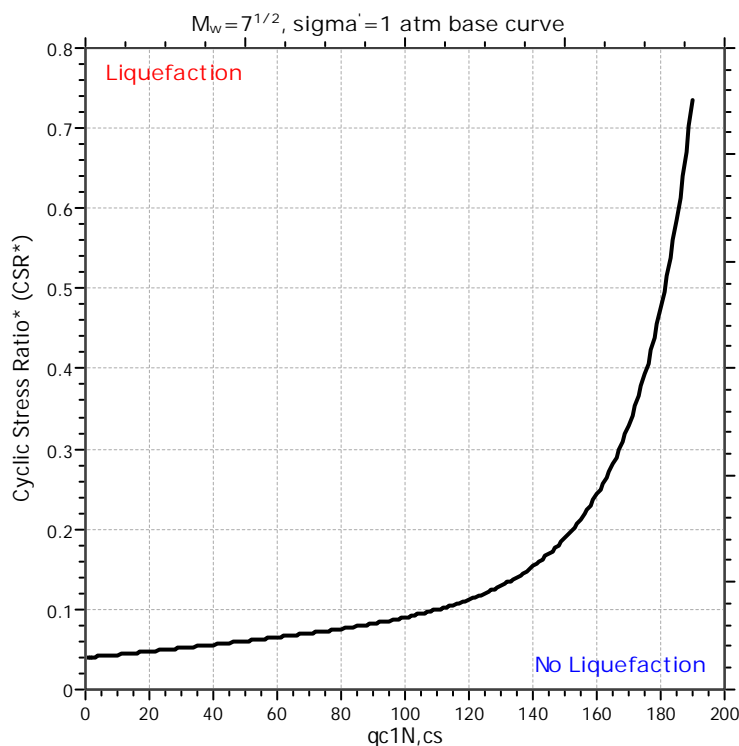
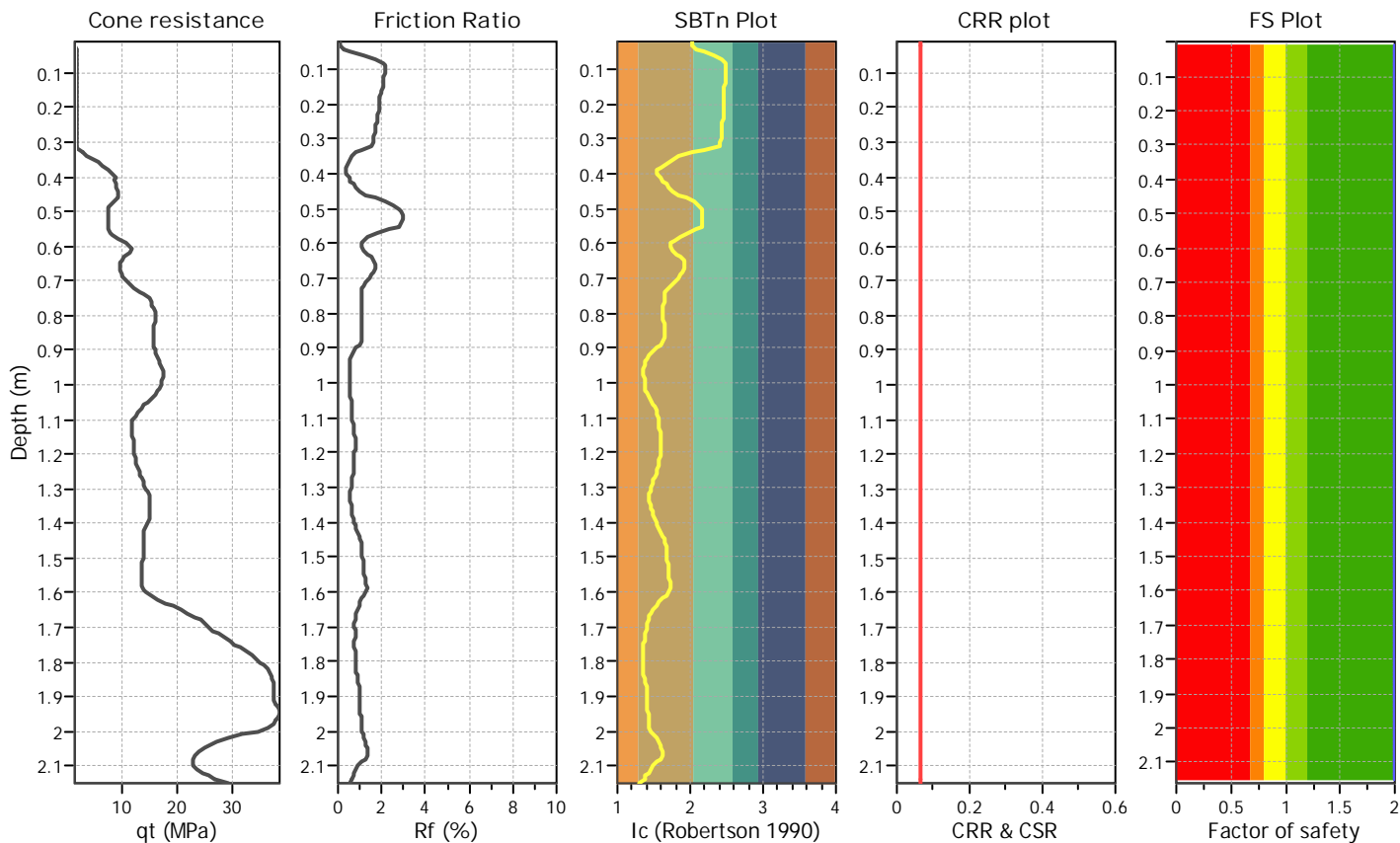
Project title :

Location :

CPT file : 8270-020_CPT004

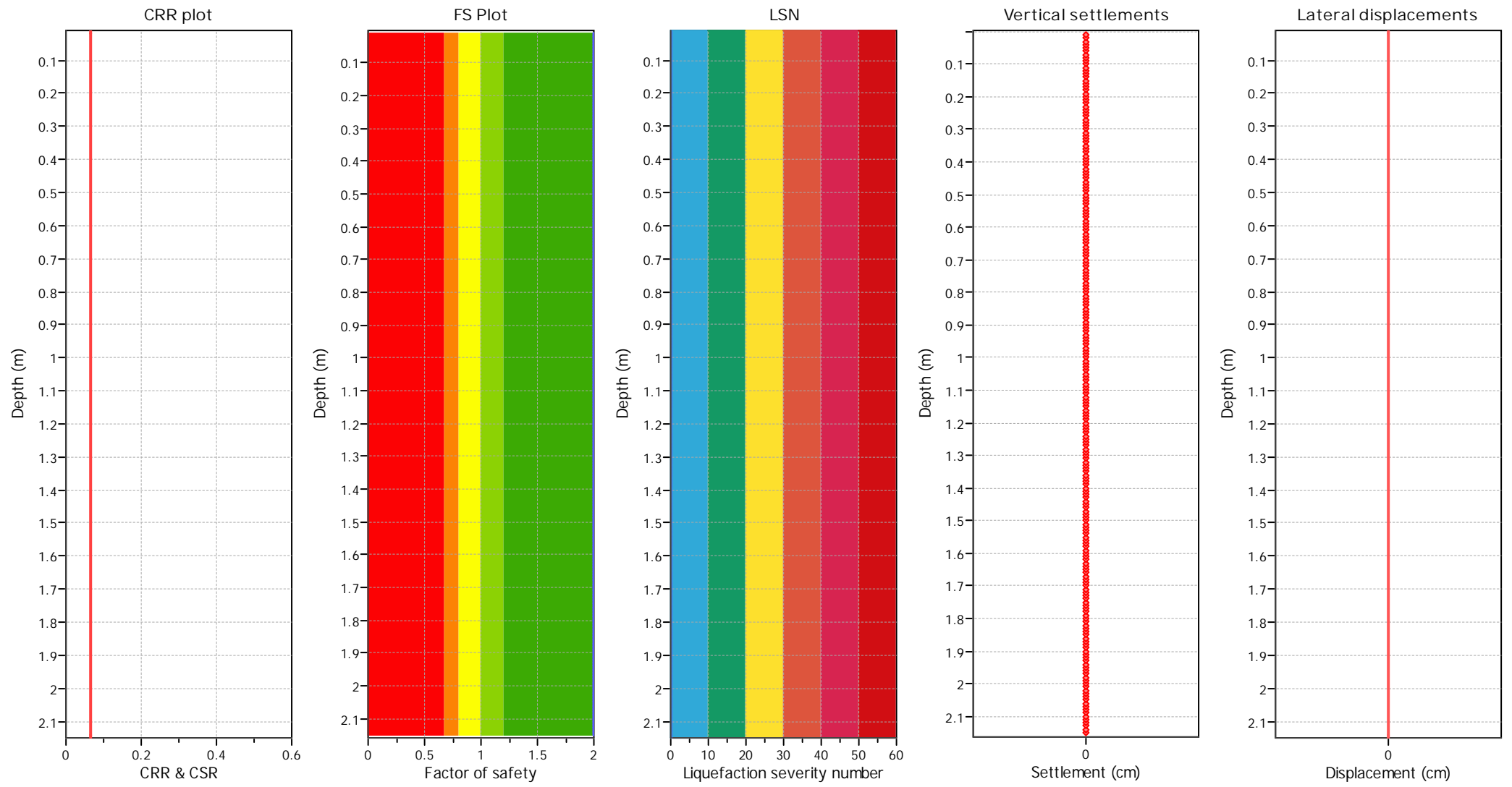
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	9.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	9.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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			F.S. color scheme		LSN color scheme	
Analysis method:	B&I (2014)	Depth to GWT (erthq.):	9.50 m	<div></div> Almost certain it will liquefy	<div></div> Severe damage	
Fines correction method:	B&I (2014)	Average results interval:	3	<div></div> Very likely to liquefy	<div></div> Major expression of liquefaction	
Points to test:	Based on Ic value	Ic cut-off value:	2.60	<div></div> Liquefaction and no liq. are equally likely	<div></div> Moderate to severe exp. of liquefaction	
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	<div></div> Unlike to liquefy	<div></div> Moderate expression of liquefaction	
Peak ground acceleration:	0.11	Use fill:	No	<div></div> Almost certain it will not liquefy	<div></div> Minor expression of liquefaction	
Depth to water table (insitu):	9.50 m	Fill height:	N/A		<div></div> Little to no expression of liquefaction	
		Fill weight:	N/A			
		Transition detect. applied:	No			
		K_0 applied:	Yes			
		Clay like behavior applied:	Sands only			
		Limit depth applied:	No			
		Limit depth:	N/A			

LIQUEFACTION ANALYSIS REPORT

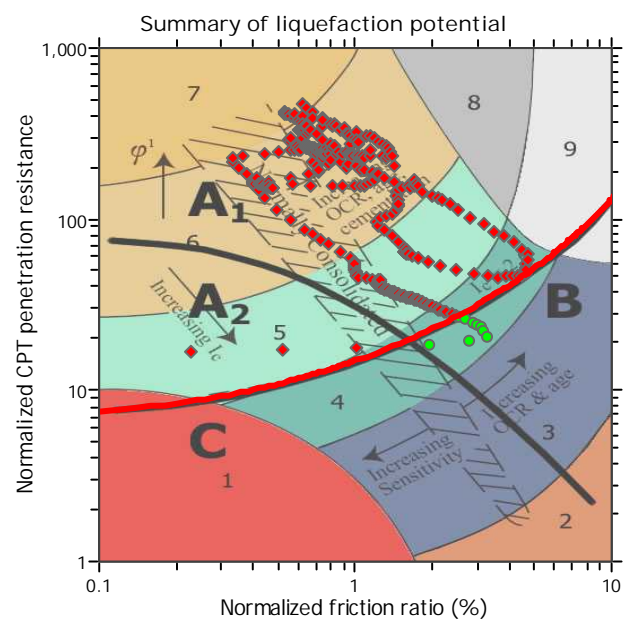
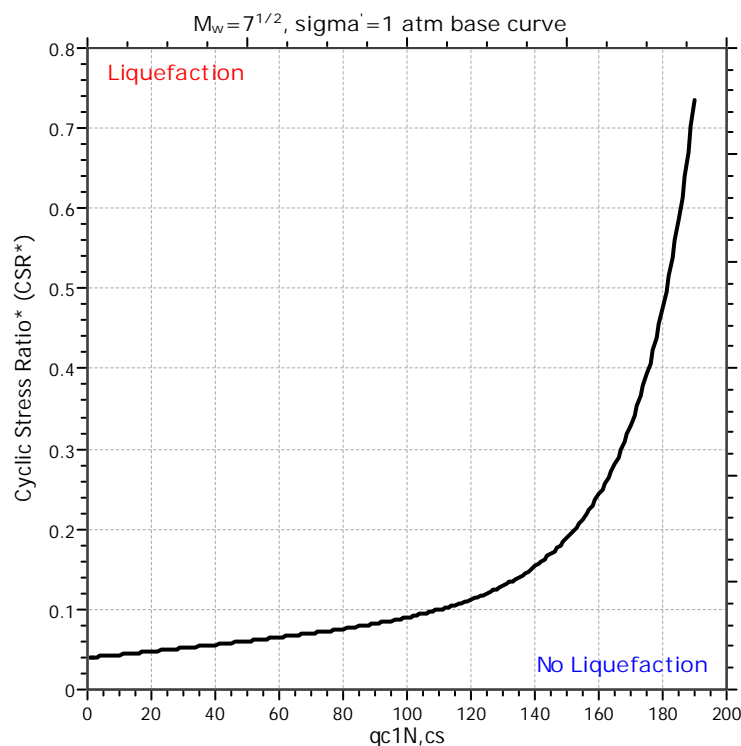
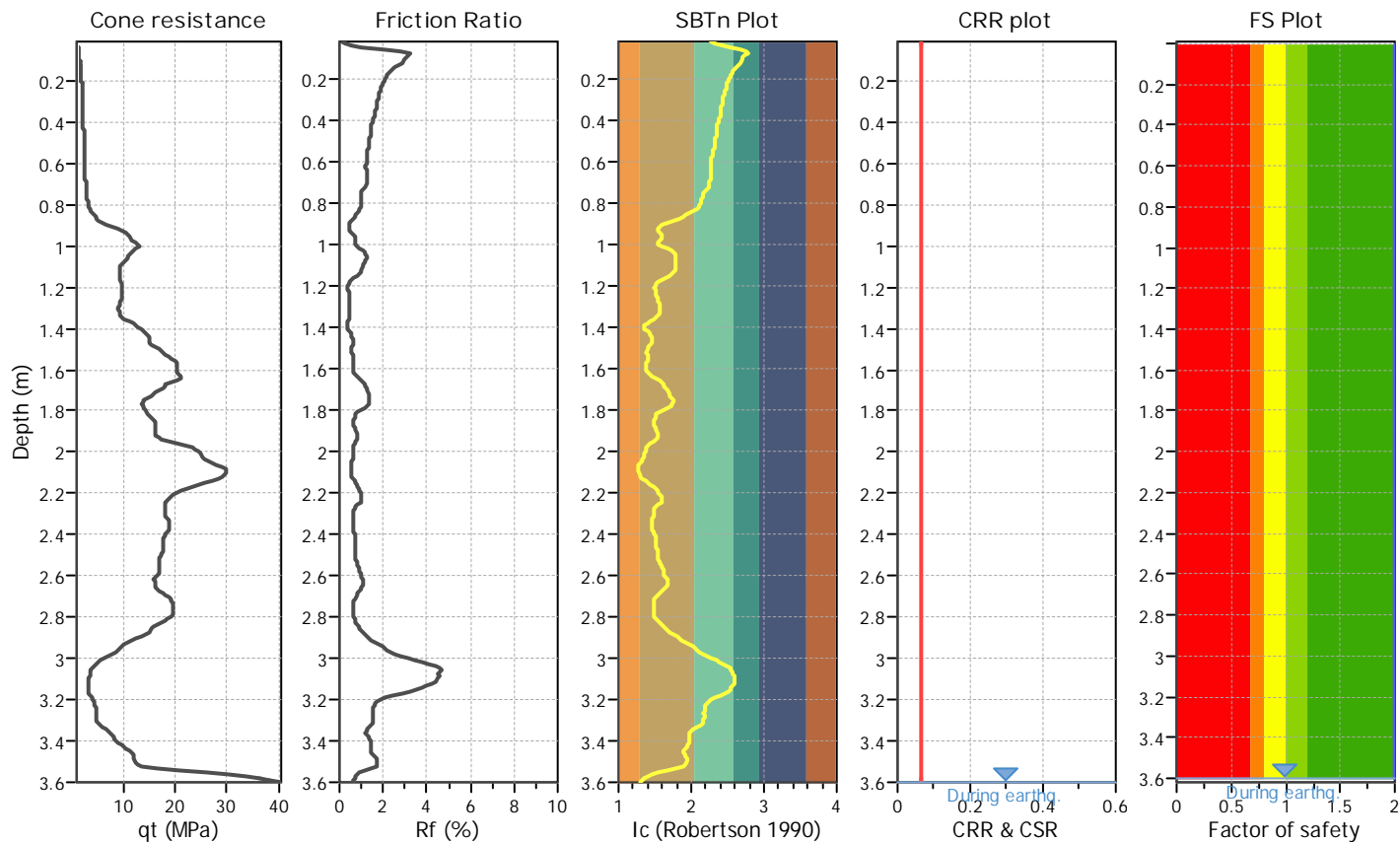
Project title :

Location :

CPT file : 8270-020_CPT005

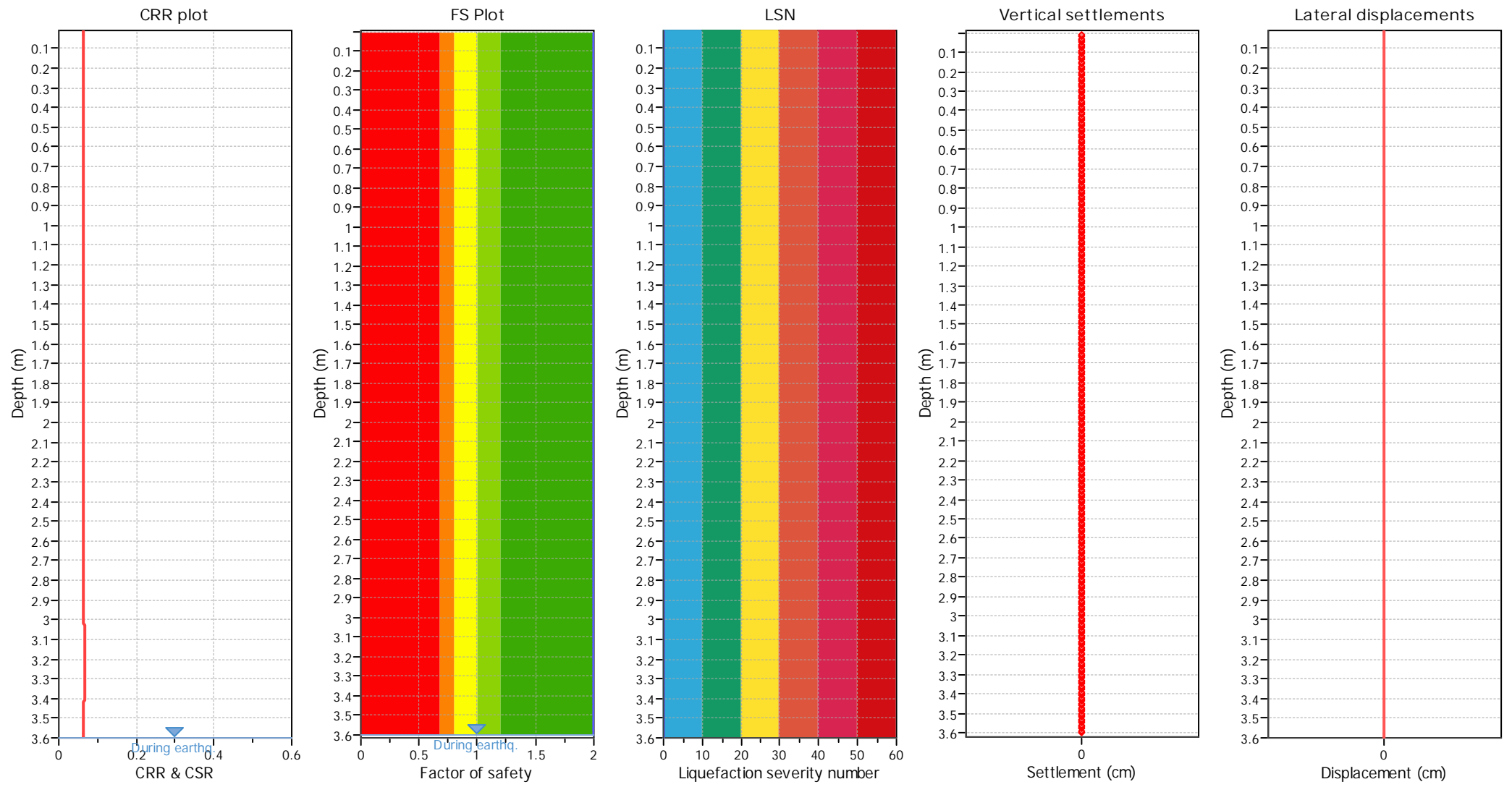
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.60 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.60 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	3.60 m	Fill weight:	N/A	F.S. color scheme		LSN color scheme	
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No	<div></div> Almost certain it will liquefy	<div></div> Severe damage	<div></div> Major expression of liquefaction	
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_f applied:	Yes	<div></div> Very likely to liquefy	<div></div> Moderate to severe exp. of liquefaction	<div></div> Moderate expression of liquefaction	
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only	<div></div> Liquefaction and no liq. are equally likely	<div></div> Moderate expression of liquefaction	<div></div> Minor expression of liquefaction	
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	No	<div></div> Unlike to liquefy	<div></div> Minor expression of liquefaction	<div></div> Little to no expression of liquefaction	
Depth to water table (insitu):	3.60 m	Fill height:	N/A	Limit depth:	N/A	<div></div> Almost certain it will not liquefy			

LIQUEFACTION ANALYSIS REPORT

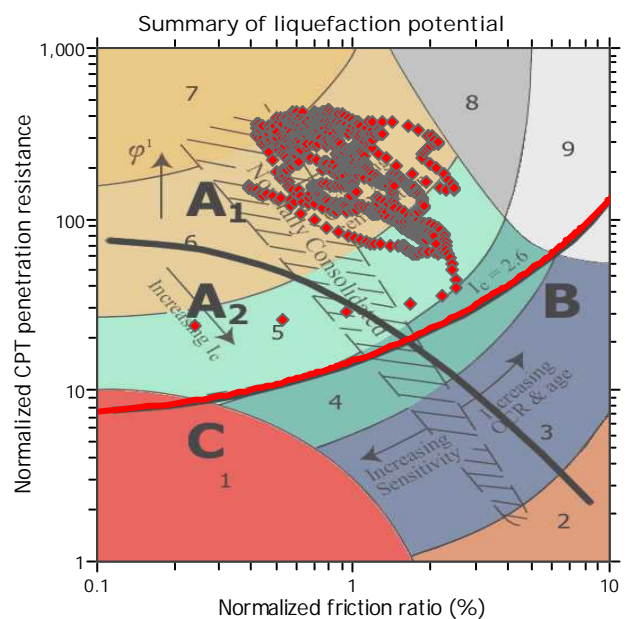
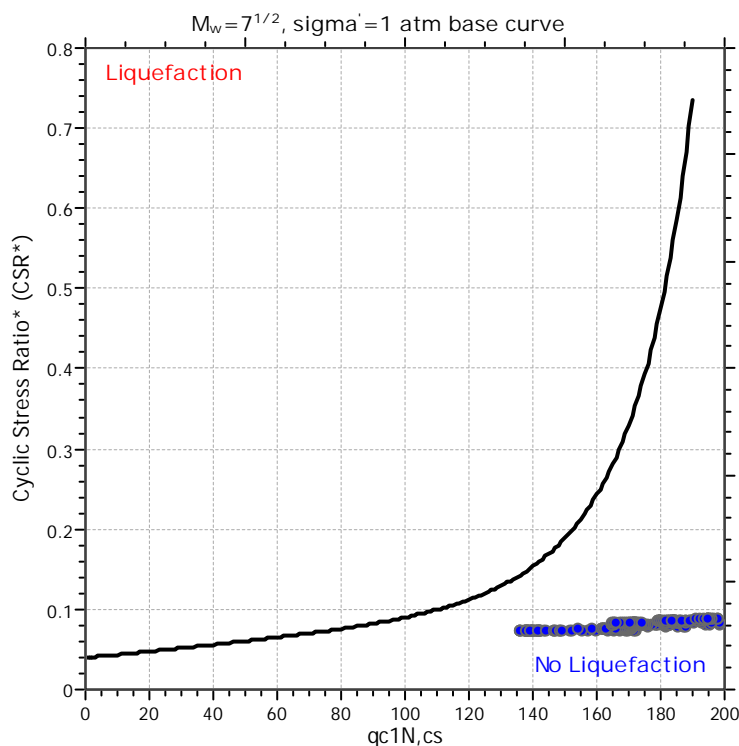
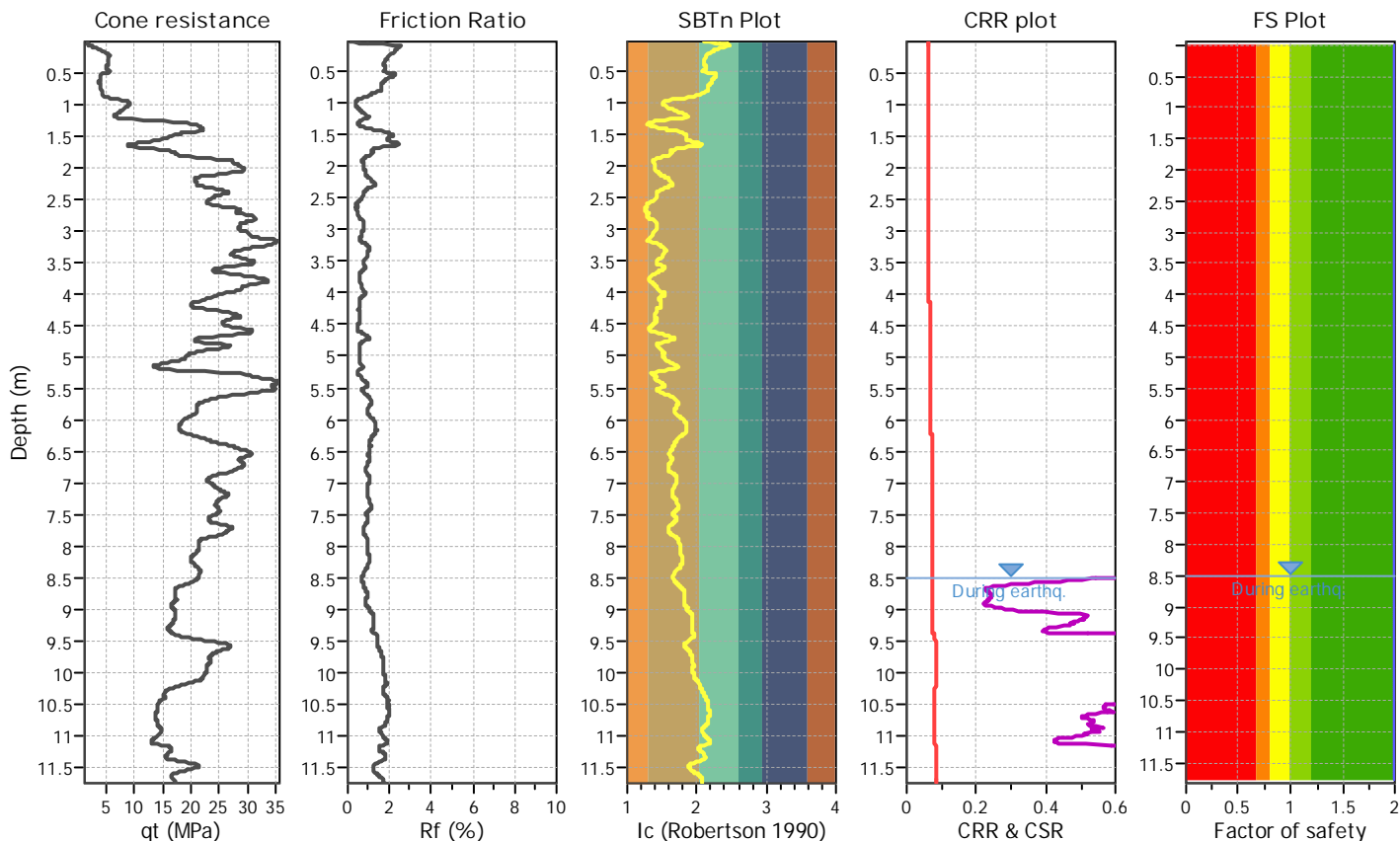
Project title :

Location :

CPT file : 8270-020_CPT006

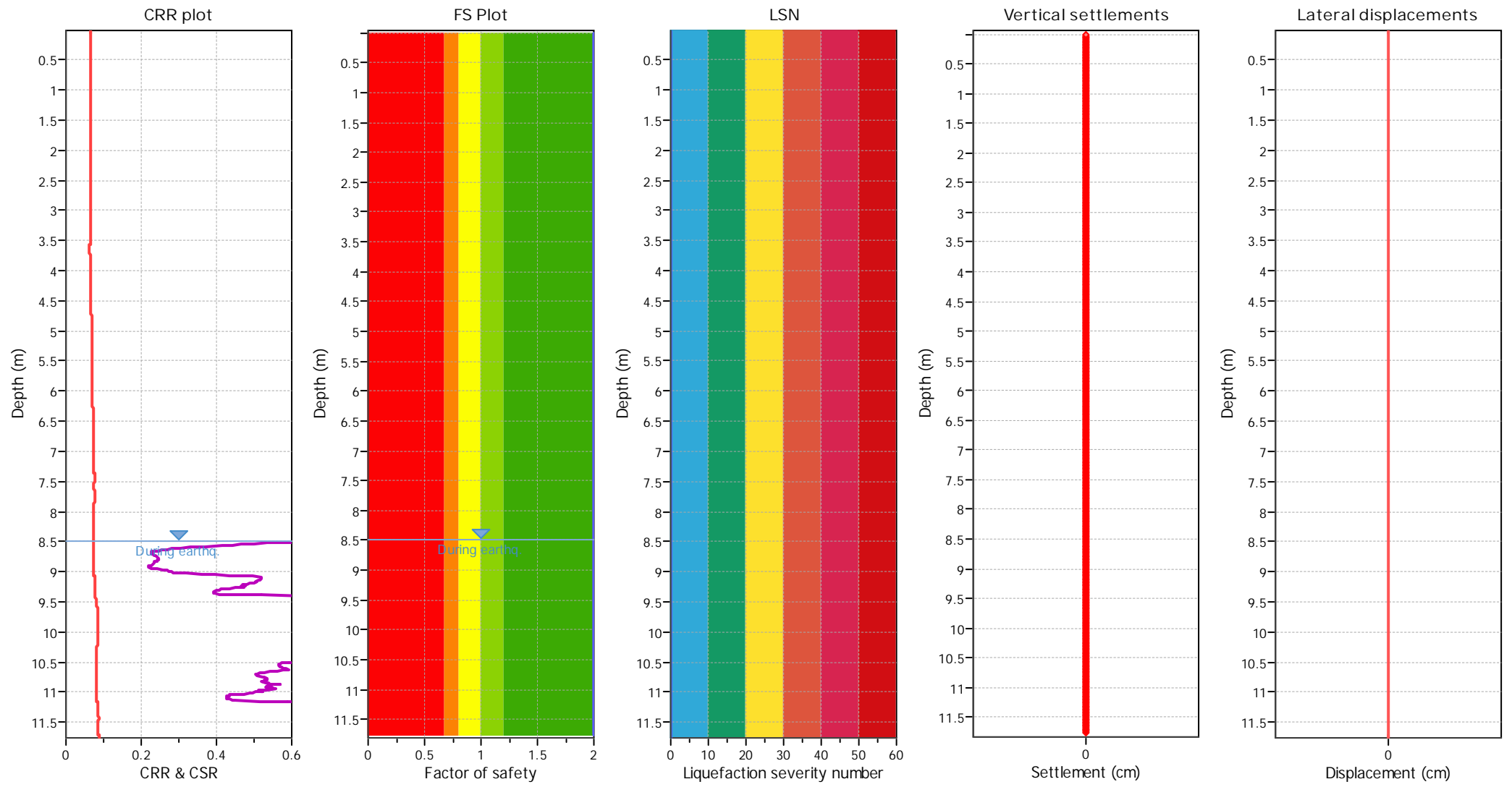
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (earthq.):	8.50 m	Fill weight:	N/A	F.S. color scheme		LSN color scheme	
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No	<div></div> Almost certain it will liquefy	<div></div> Severe damage	<div></div> Major expression of liquefaction	
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_0 applied:	Yes	<div></div> Very likely to liquefy	<div></div> Moderate to severe exp. of liquefaction	<div></div> Moderate expression of liquefaction	
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only	<div></div> Liquefaction and no liq. are equally likely	<div></div> Minor expression of liquefaction	<div></div> Little to no expression of liquefaction	
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	No	<div></div> Unlike to liquefy			
Depth to water table (insitu):	8.50 m	Fill height:	N/A	Limit depth:	N/A	<div></div> Almost certain it will not liquefy			

LIQUEFACTION ANALYSIS REPORT

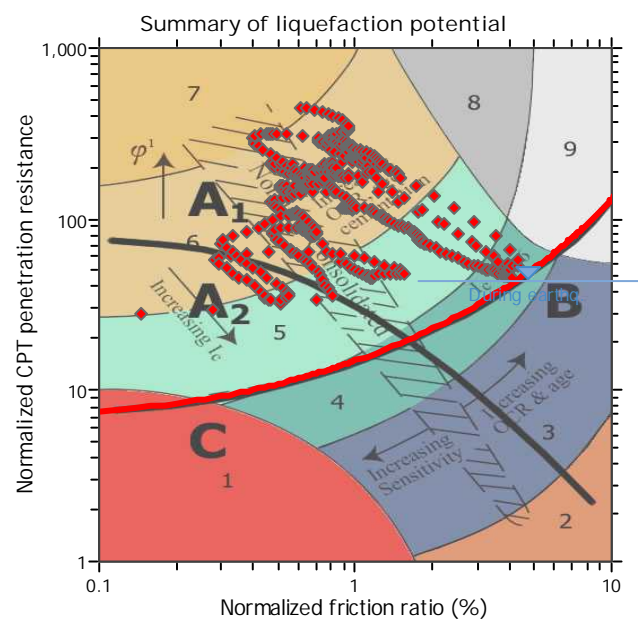
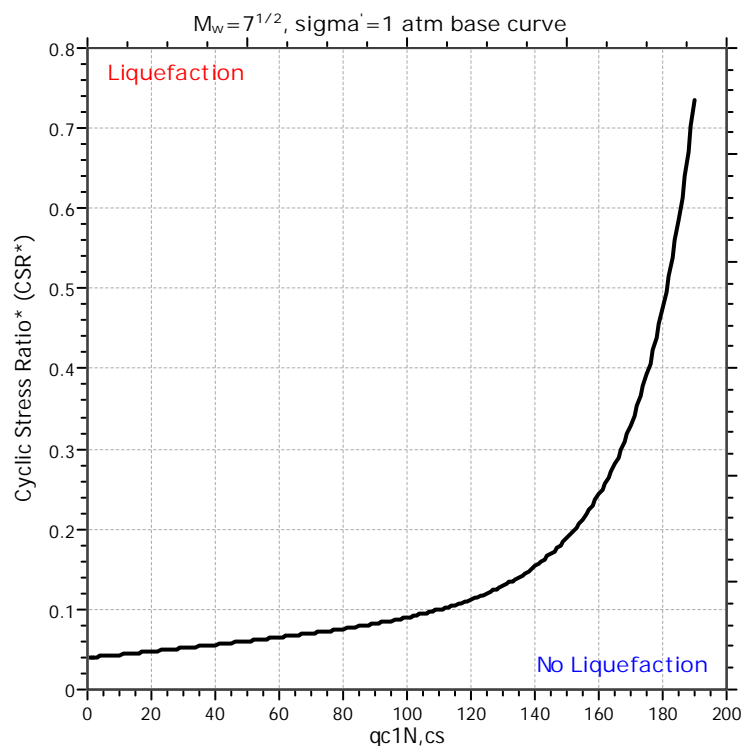
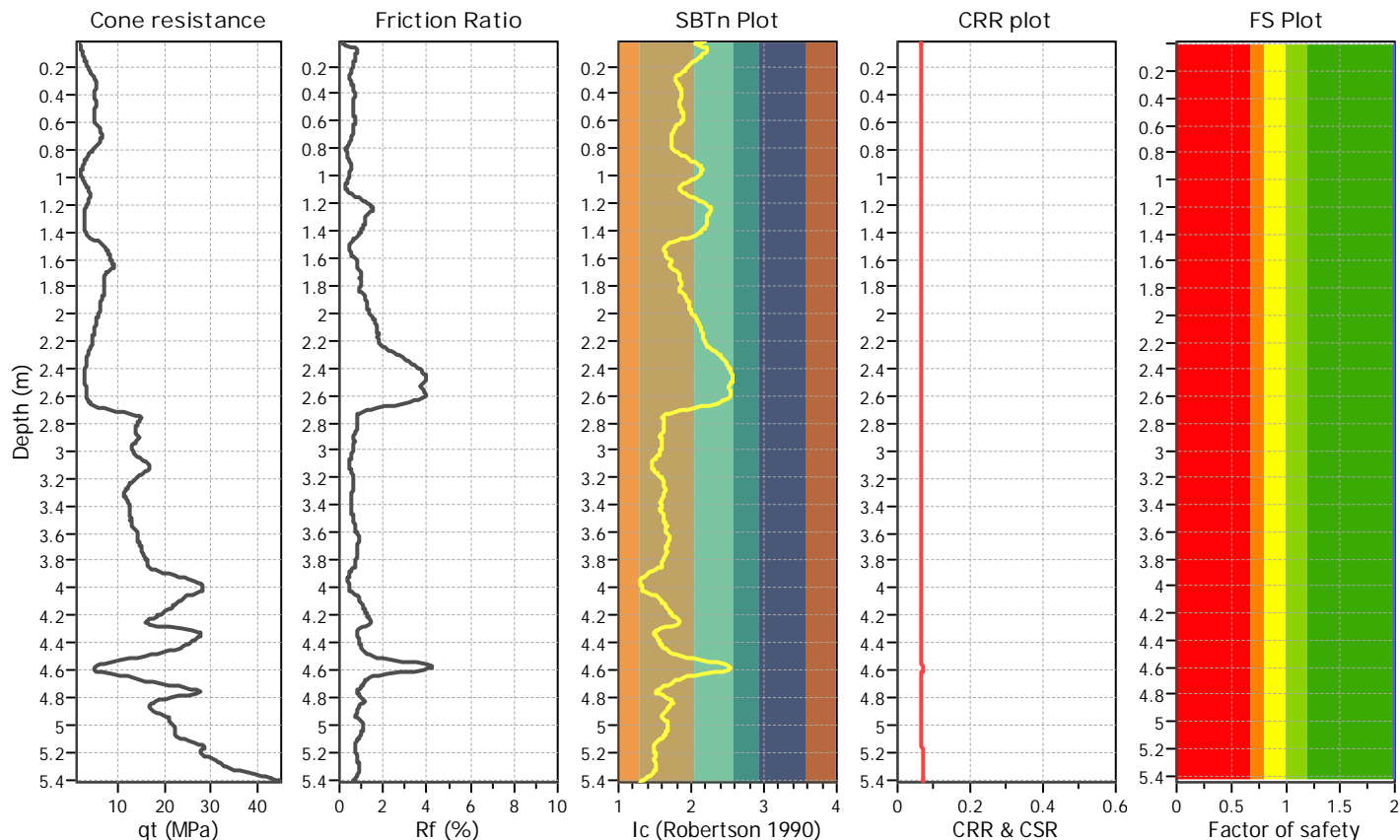
Project title :

Location :

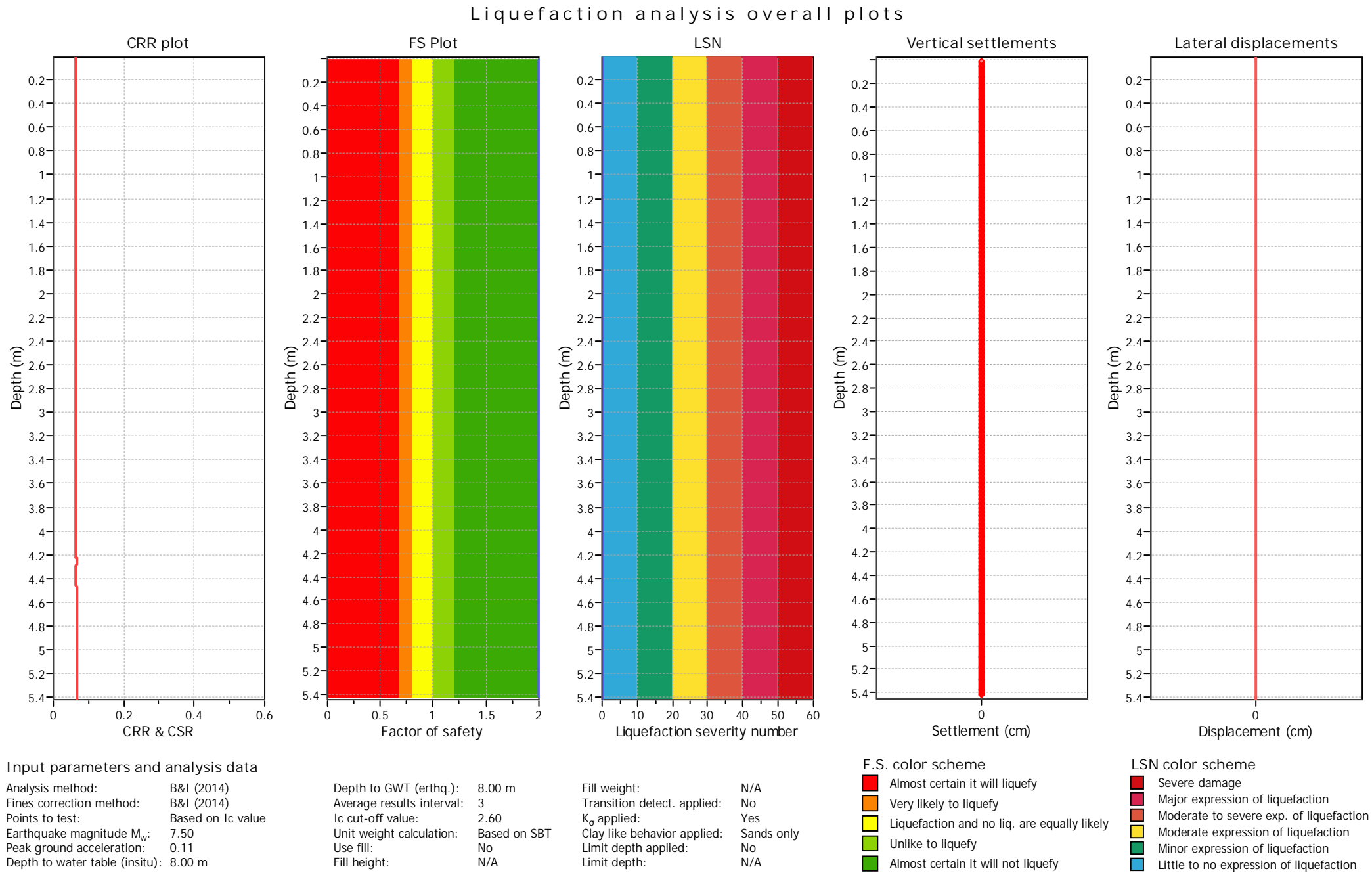
CPT file : 8270-020_CPT007

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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 REPORT

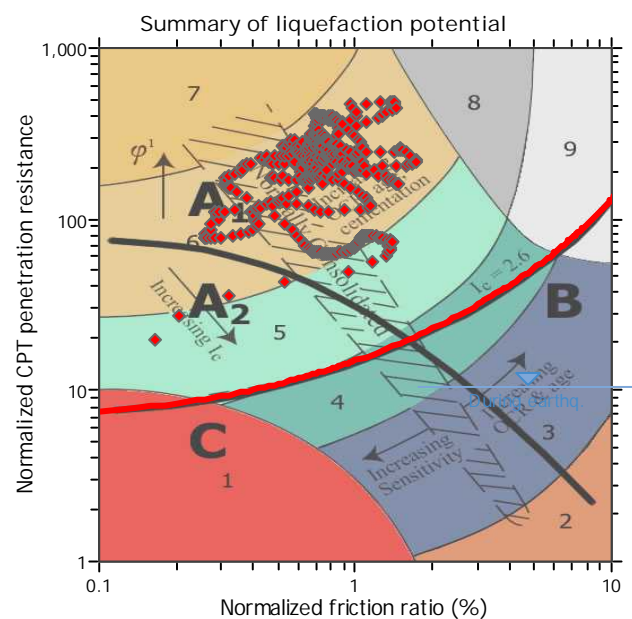
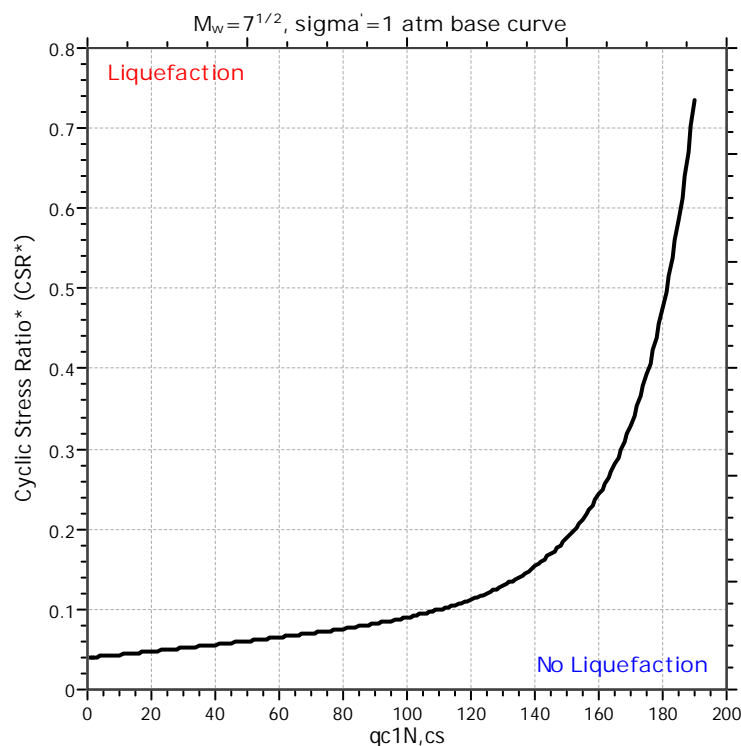
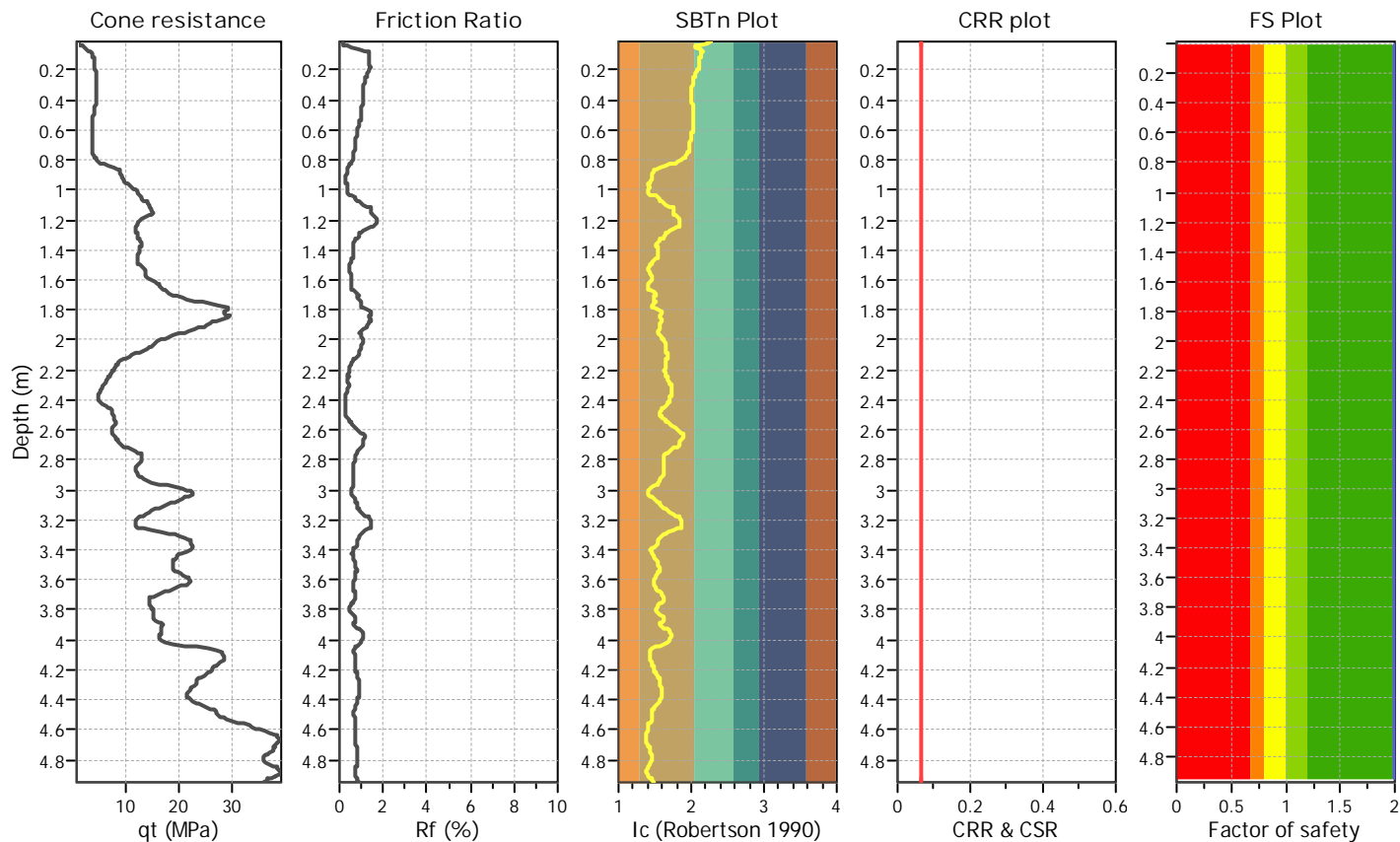
Project title :

Location :

CPT file : 8270-020_CPT008

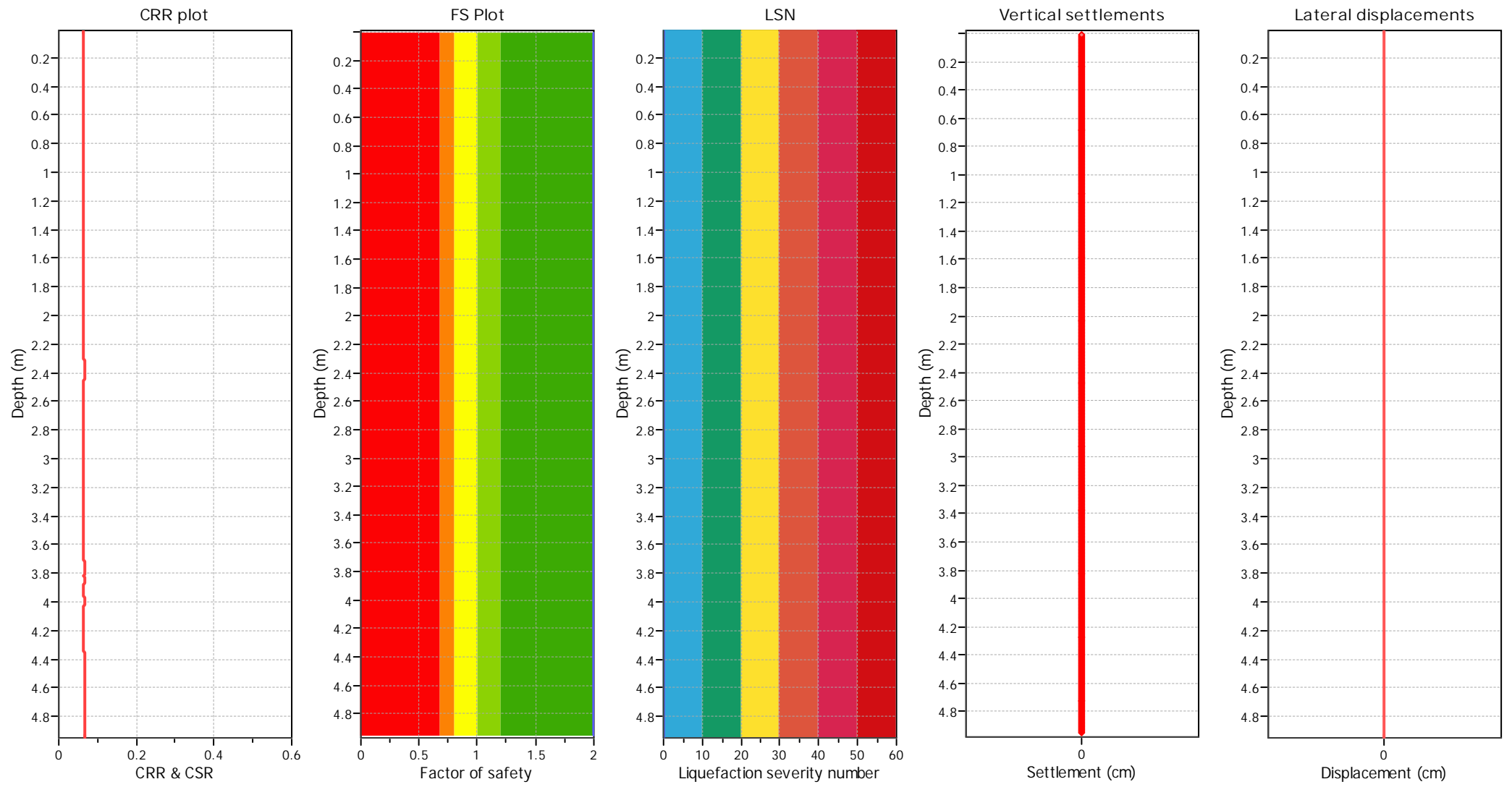
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	8.00 m	Fill weight:	N/A	F.S. color scheme		LSN color scheme	
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No	<div></div> Almost certain it will liquefy		<div></div> Severe damage	
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes	<div></div> Very likely to liquefy		<div></div> Major expression of liquefaction	
Earthquake magnitude M _w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only	<div></div> Liquefaction and no liq. are equally likely		<div></div> Moderate to severe exp. of liquefaction	
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	No	<div></div> Unlike to liquefy		<div></div> Moderate expression of liquefaction	
Depth to water table (insitu):	8.00 m	Fill height:	N/A	Limit depth:	N/A	<div></div> Almost certain it will not liquefy		<div></div> Minor expression of liquefaction	
								<div></div> Little to no expression of liquefaction	

LIQUEFACTION ANALYSIS REPORT

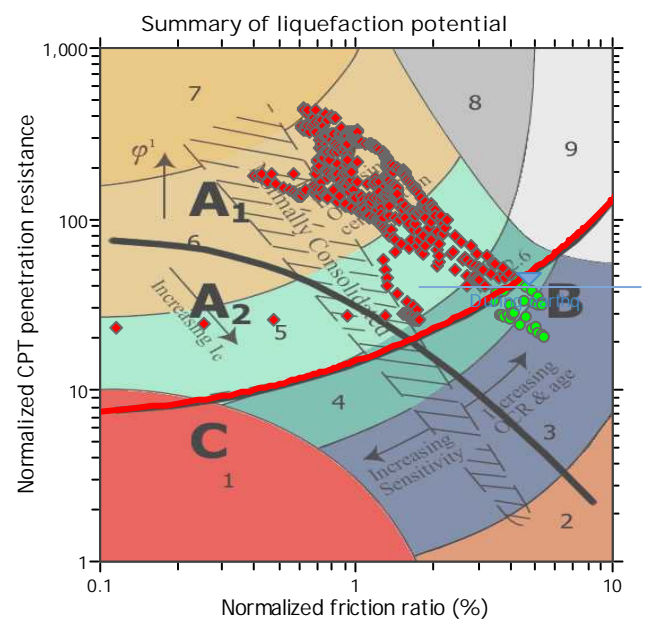
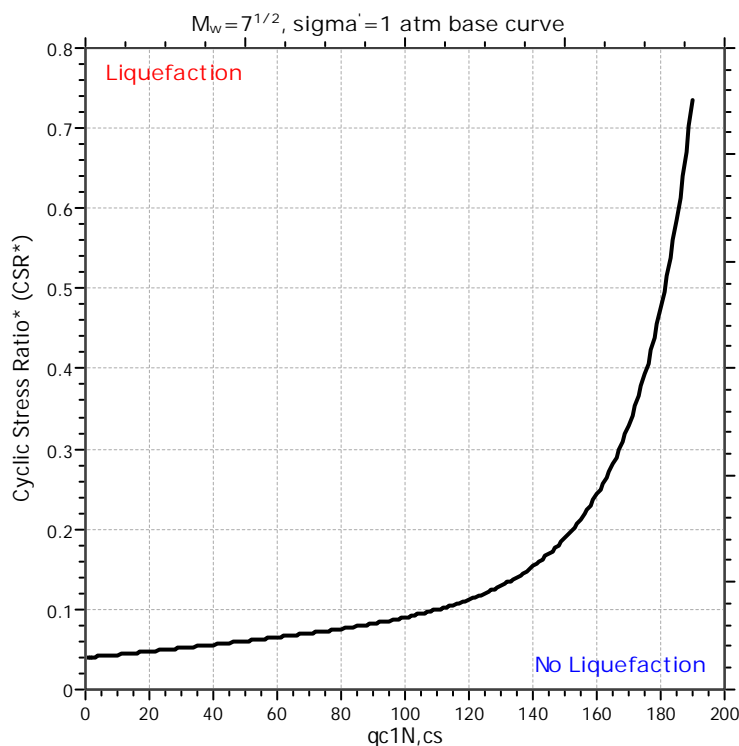
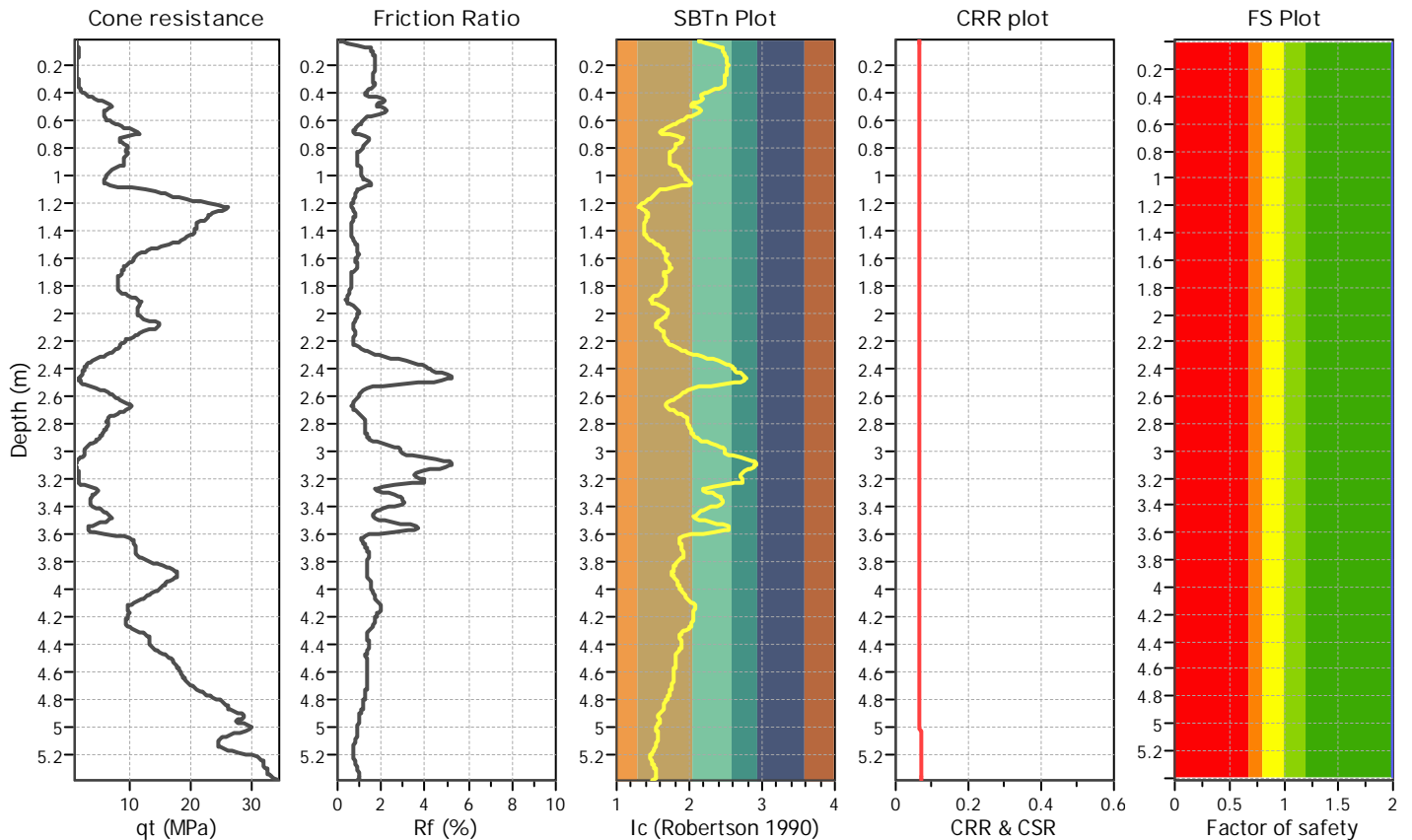
Project title :

Location :

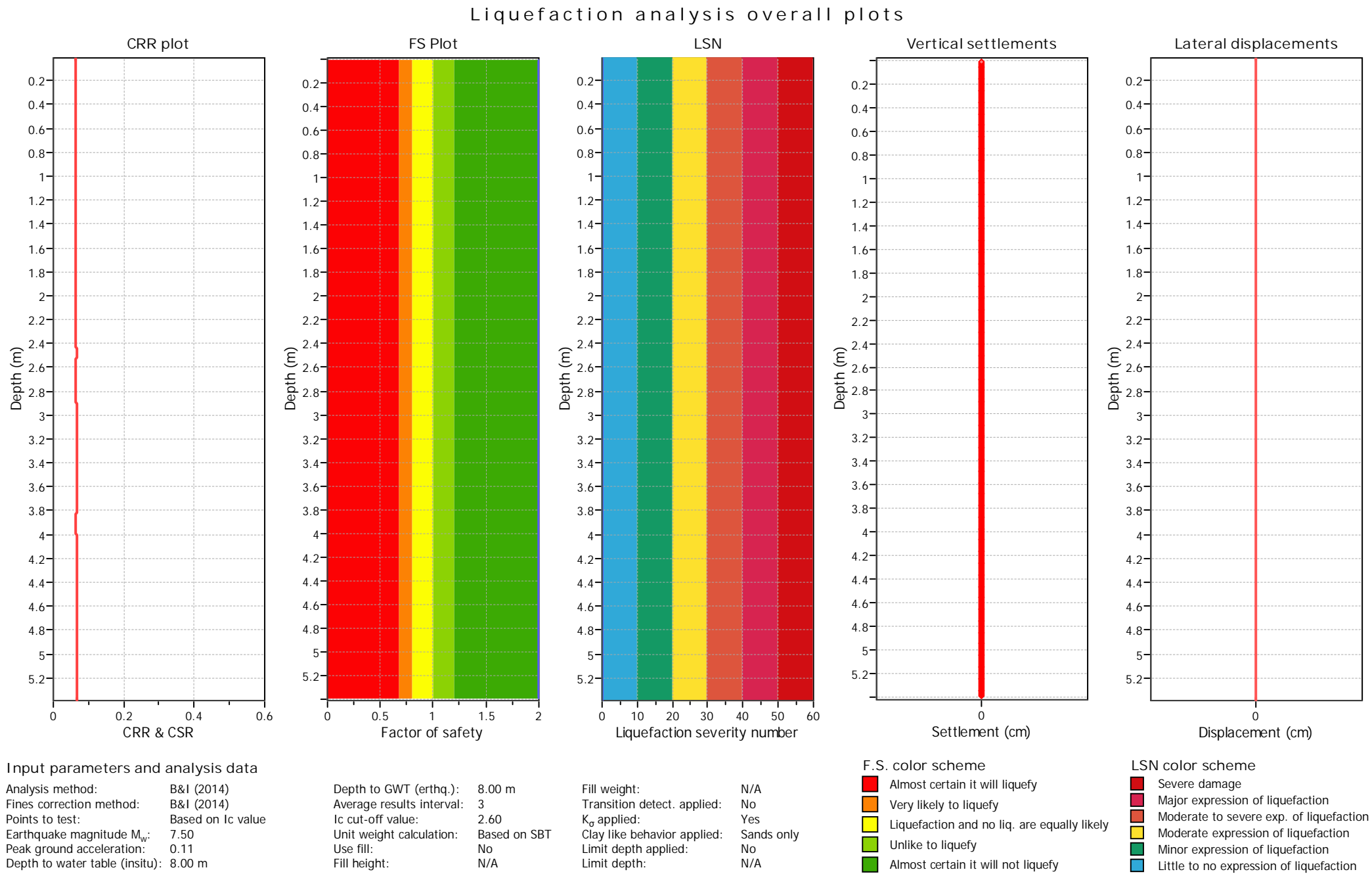
CPT file : 8270-020_CPT009

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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 REPORT

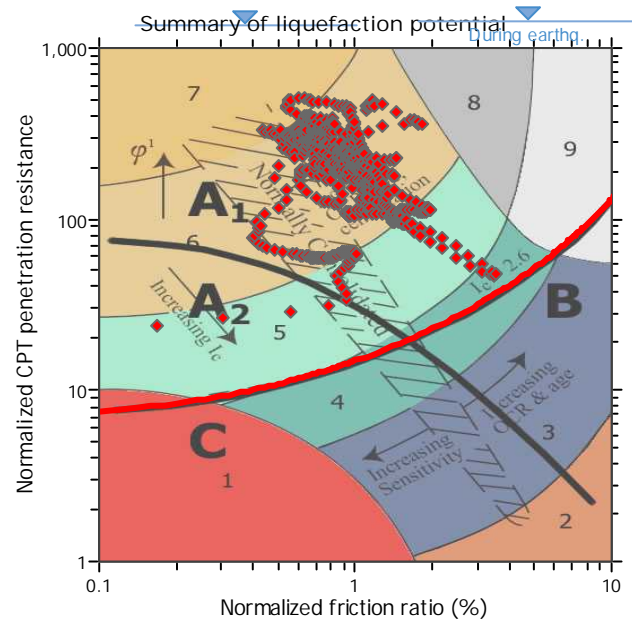
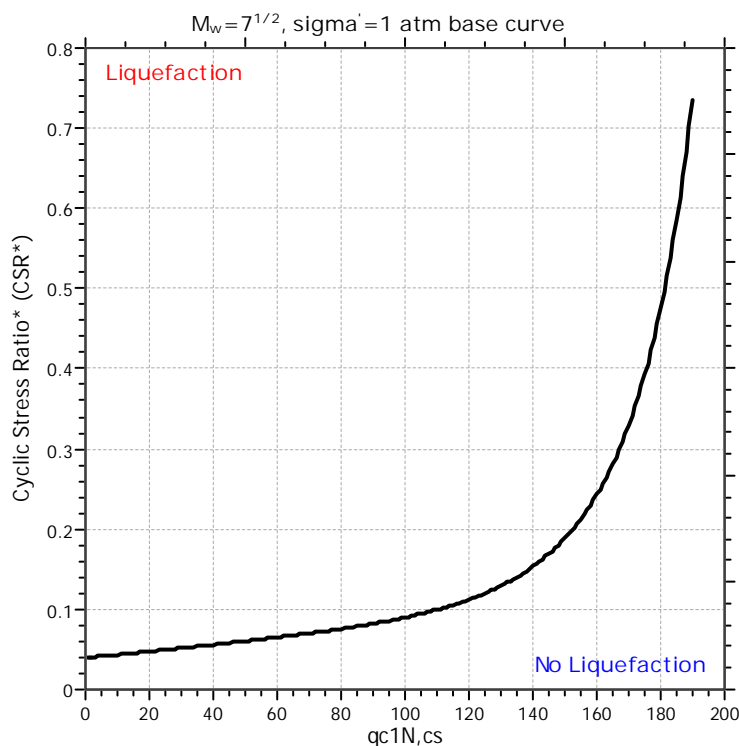
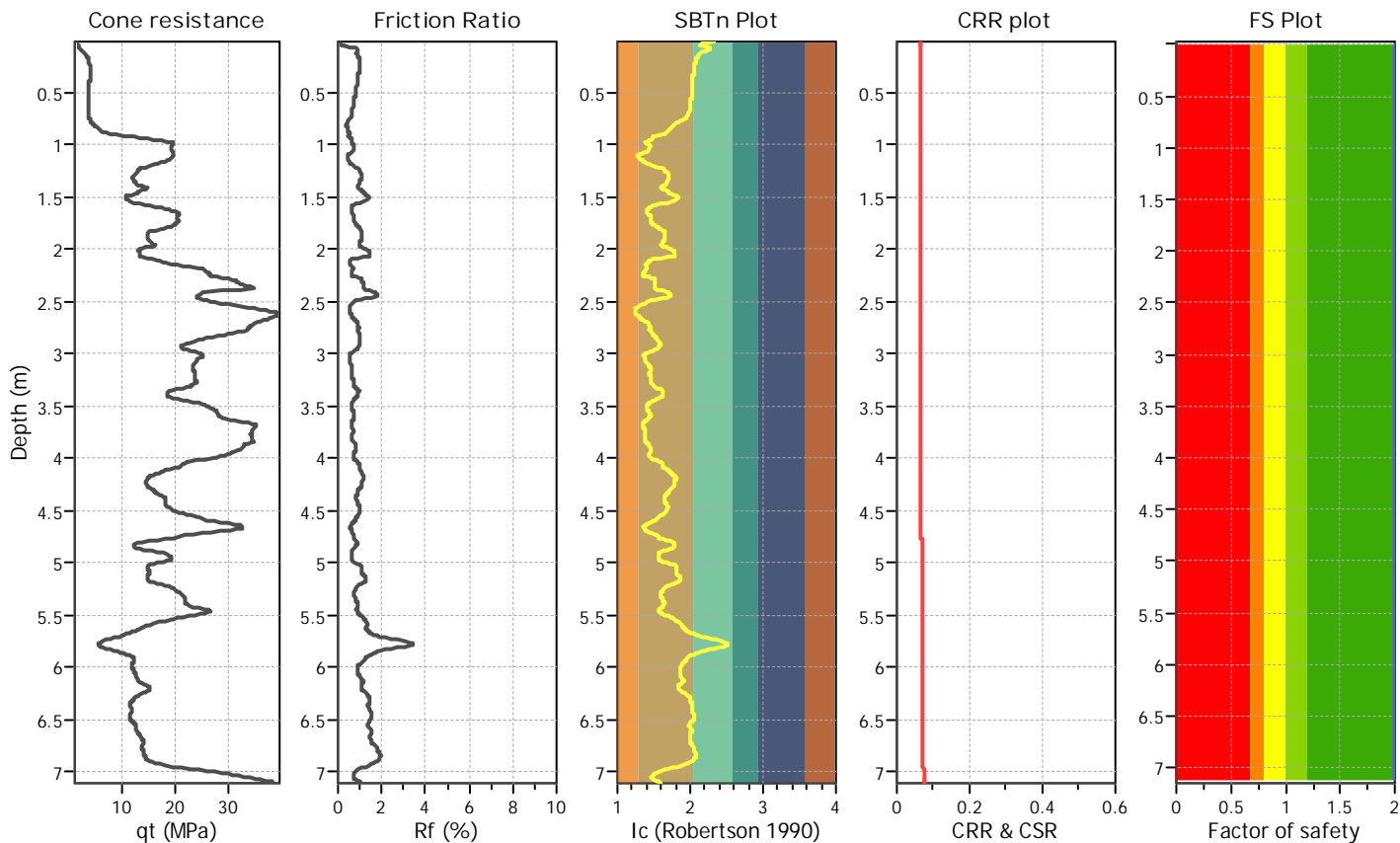
Project title :

Location :

CPT file : 8270-020_CPT010

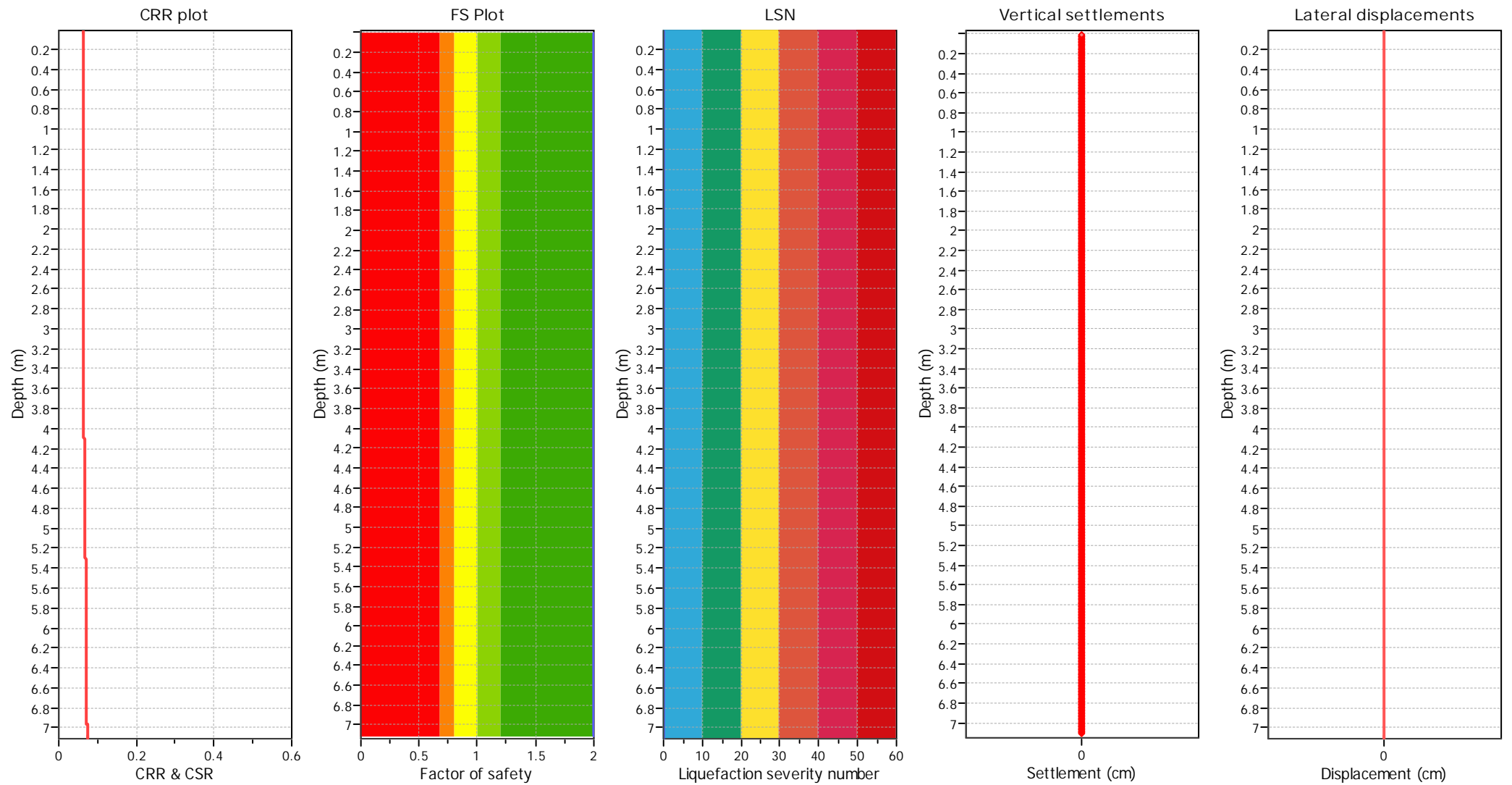
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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: During earthquake B&I (2014)
Fines correction method: B&I (2014)
Points to test: Based on Ic value
Earthquake magnitude M_w : 7.50
Peak ground acceleration: 0.11
Depth to water table (insitu): 8.00 m

Depth to GWT (insitu): 8.00 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_0 applied: Yes
Clay like behavior applied: Sands only
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

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

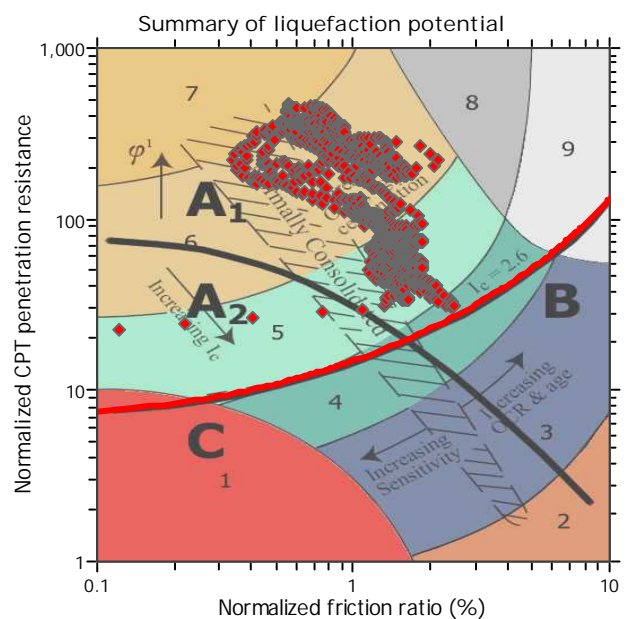
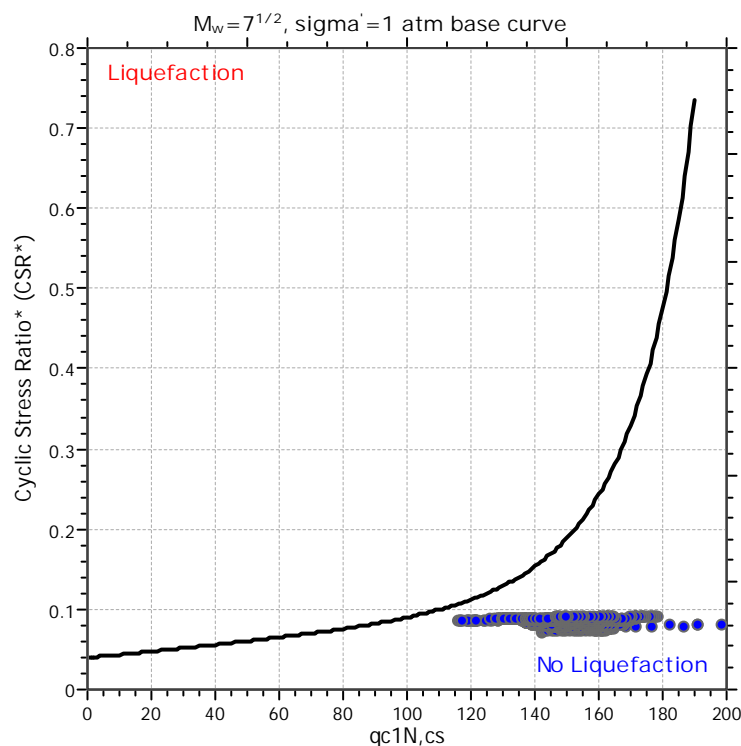
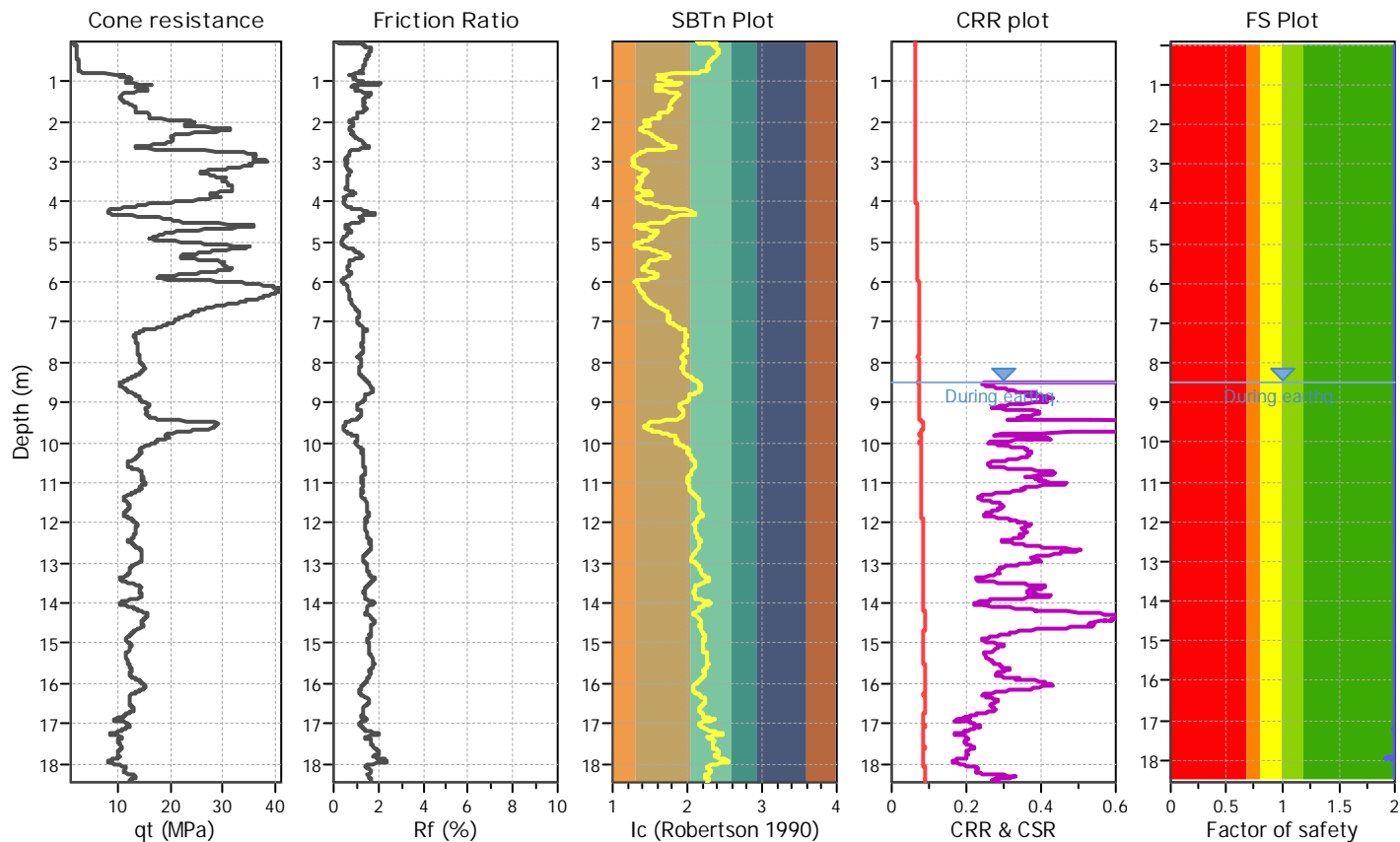
Project title :

Location :

CPT file : 8270-020_CPT011

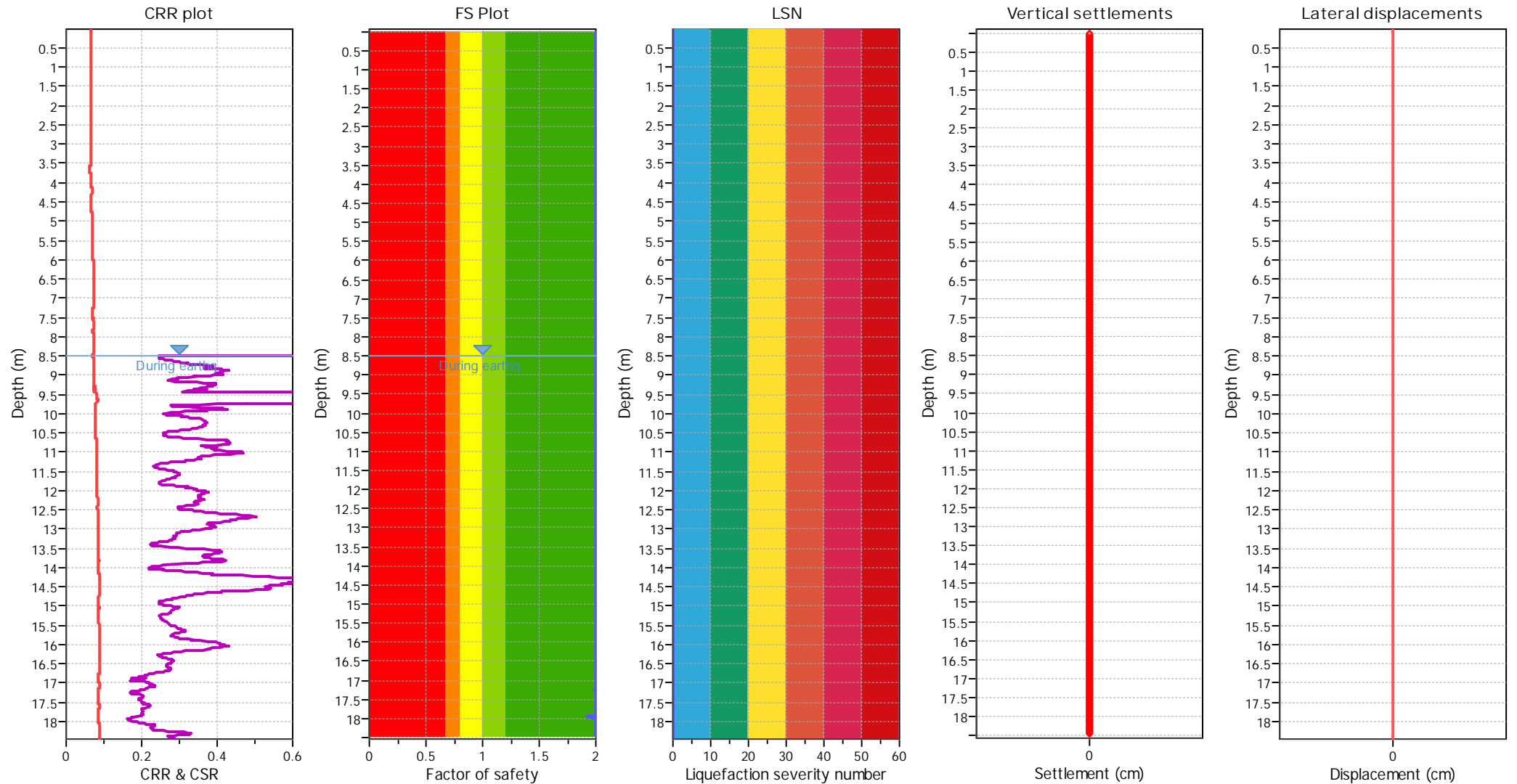
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	8.50 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 ₀ applied:	Yes
Earthquake magnitude M _w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.50 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

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

LSN color scheme

Red	Severe damage
Dark Red	Major expression of liquefaction
Orange	Moderate to severe exp. of liquefaction
Yellow	Moderate expression of liquefaction
Light Green	Minor expression of liquefaction
Blue	Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

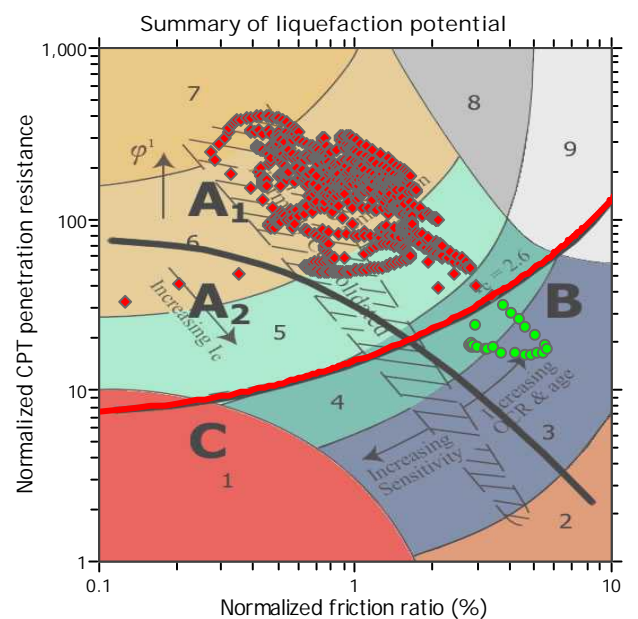
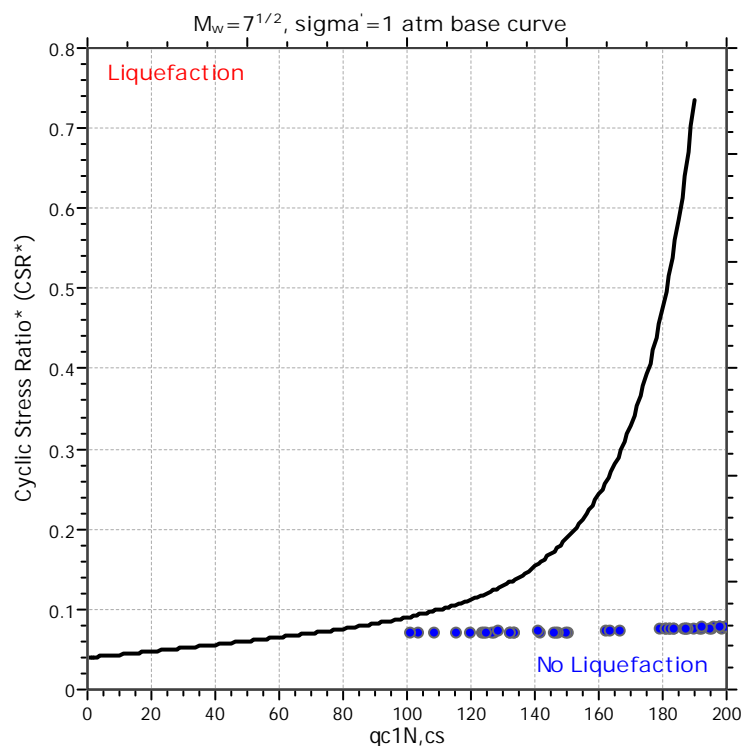
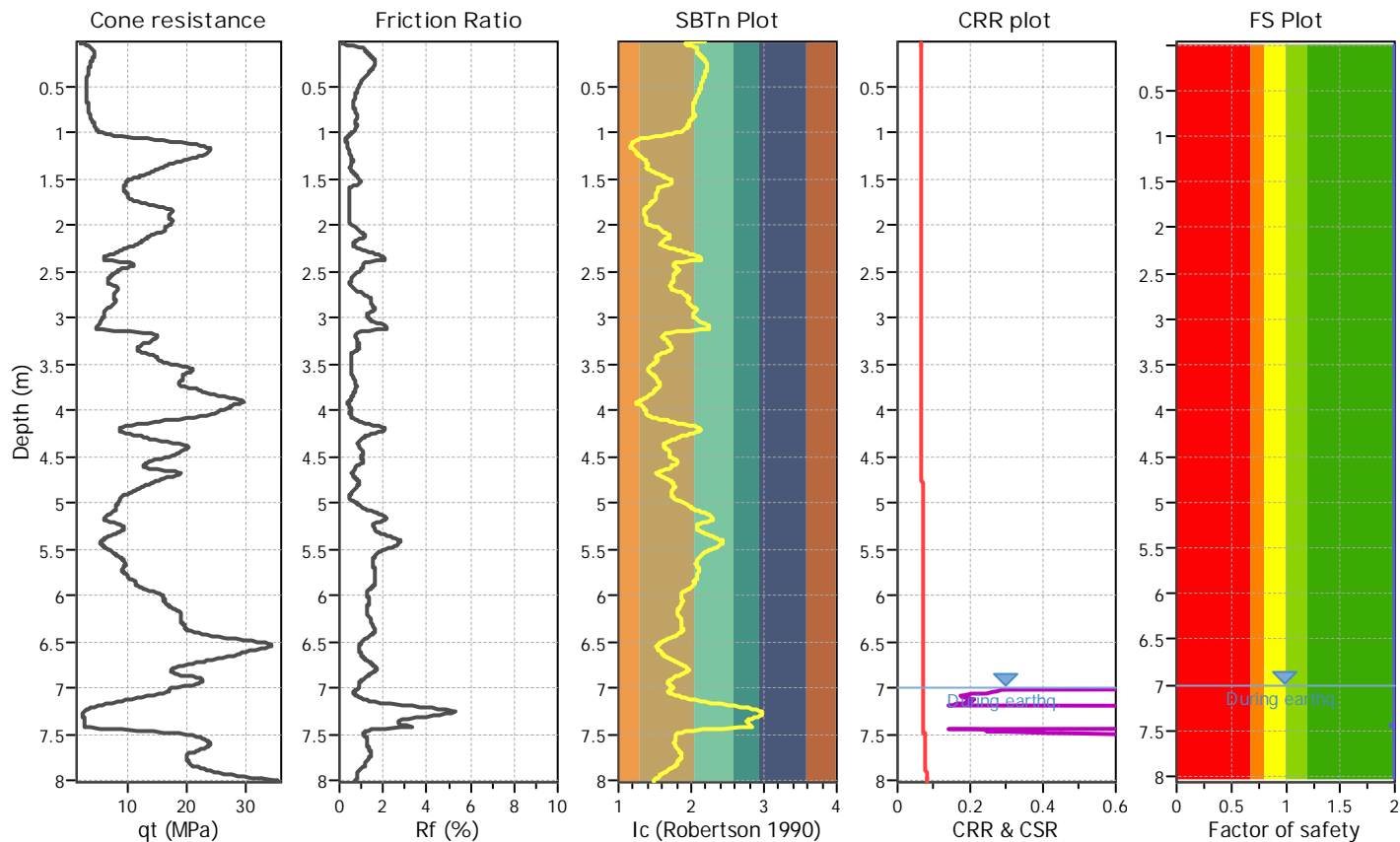
Project title :

Location :

CPT file : 8270-020_CPT012

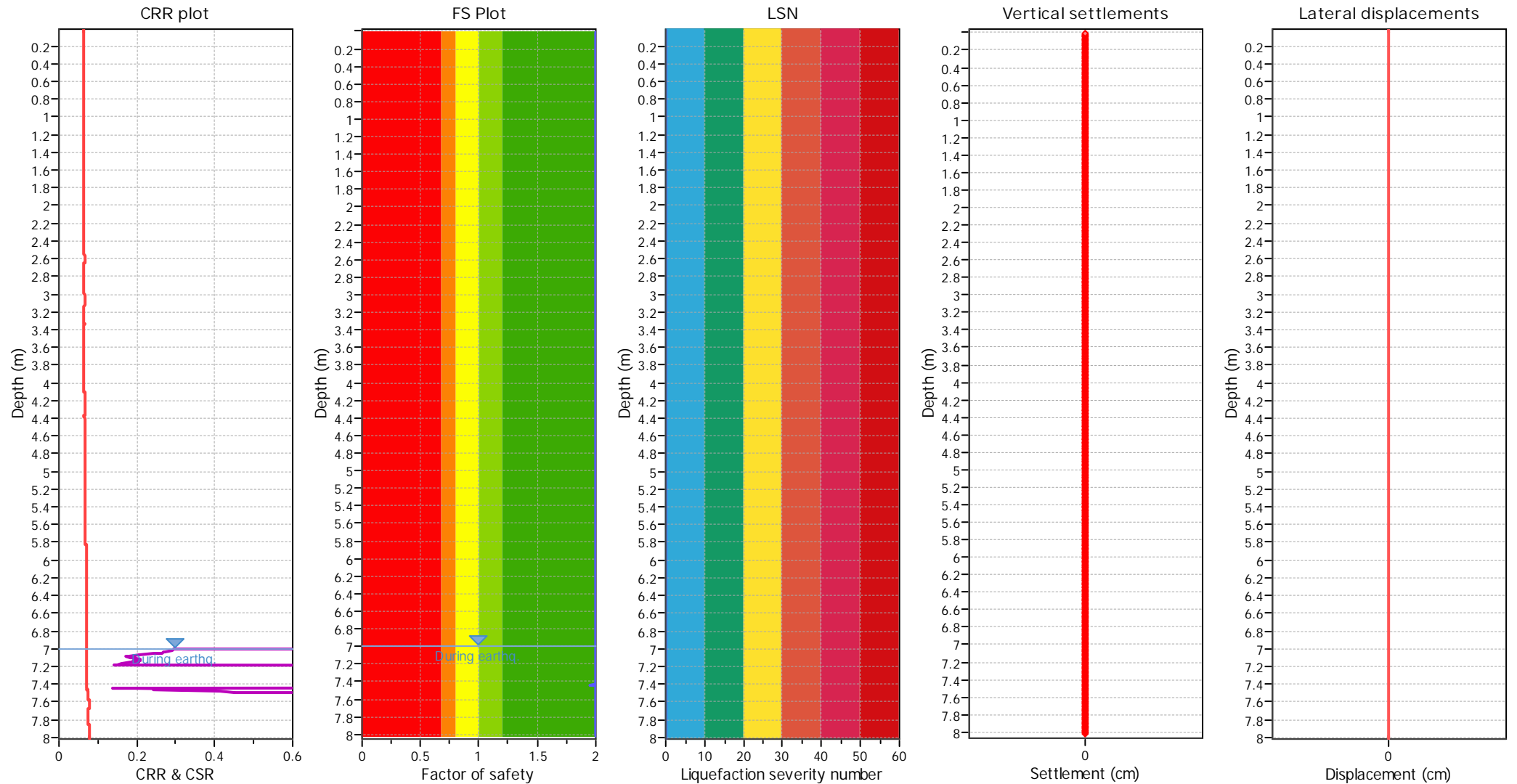
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	7.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	7.00 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 :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 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

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

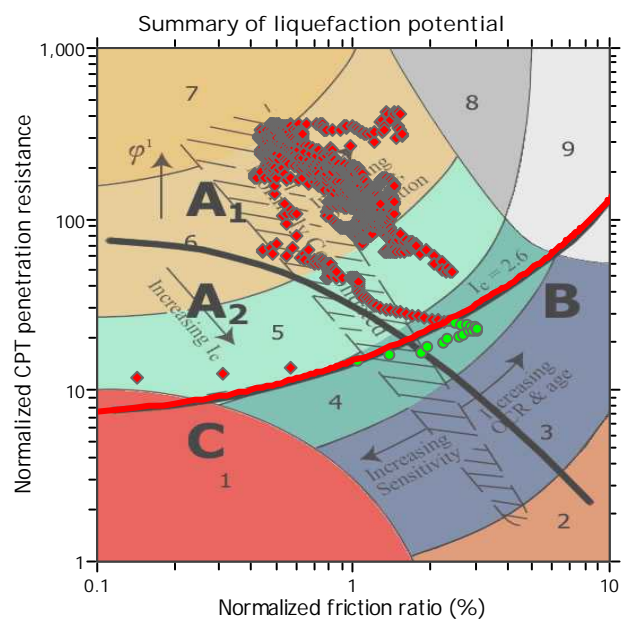
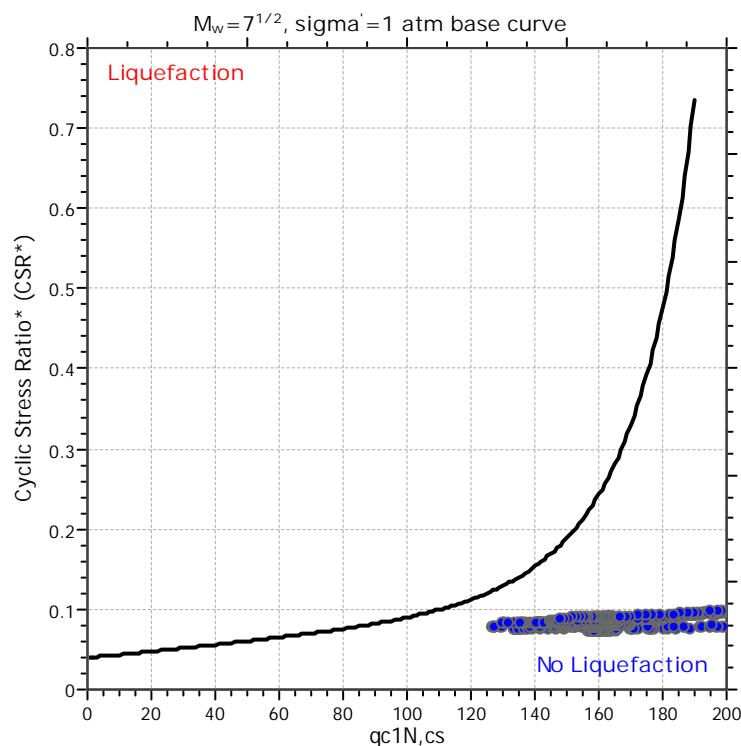
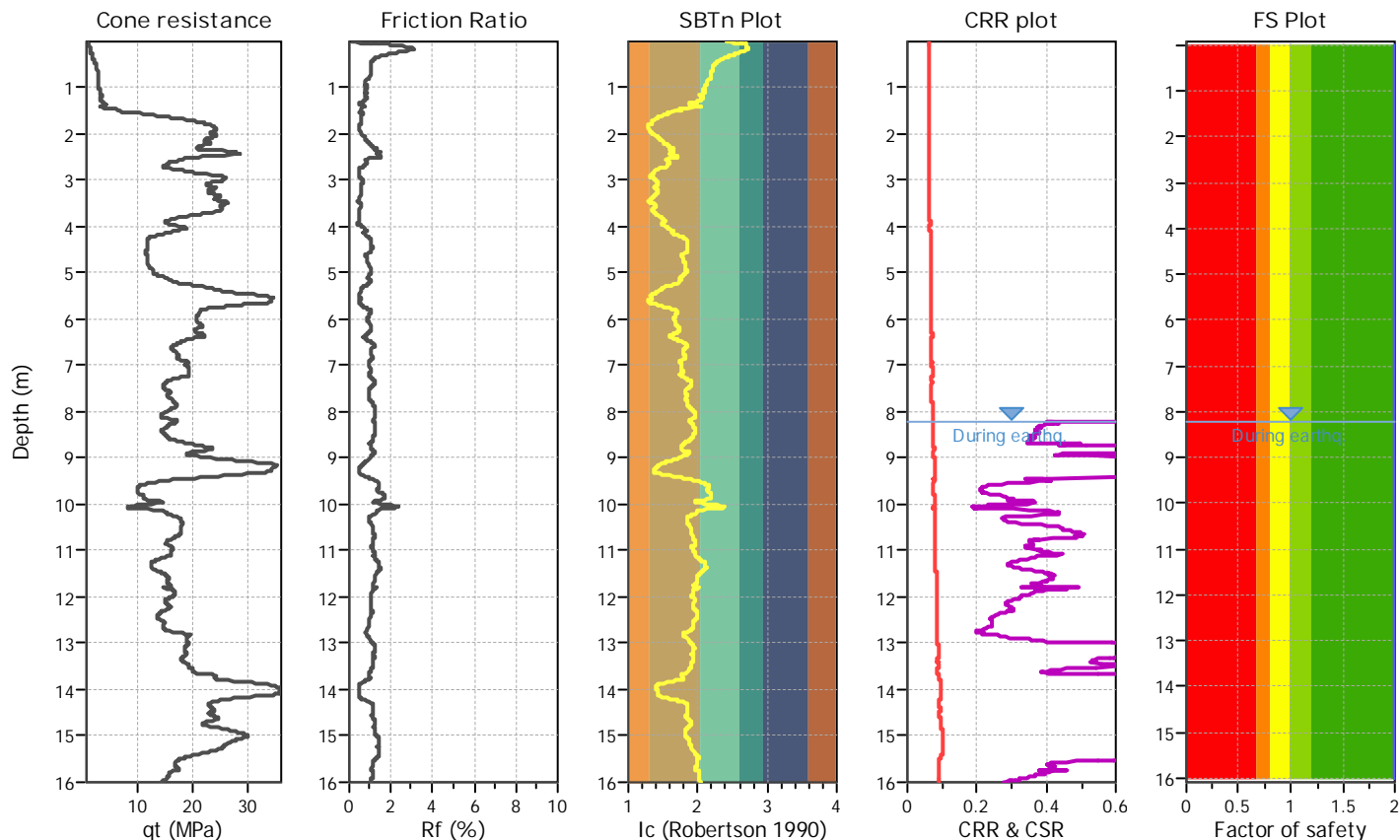
Project title :

Location :

CPT file : 8270-020_CPT013

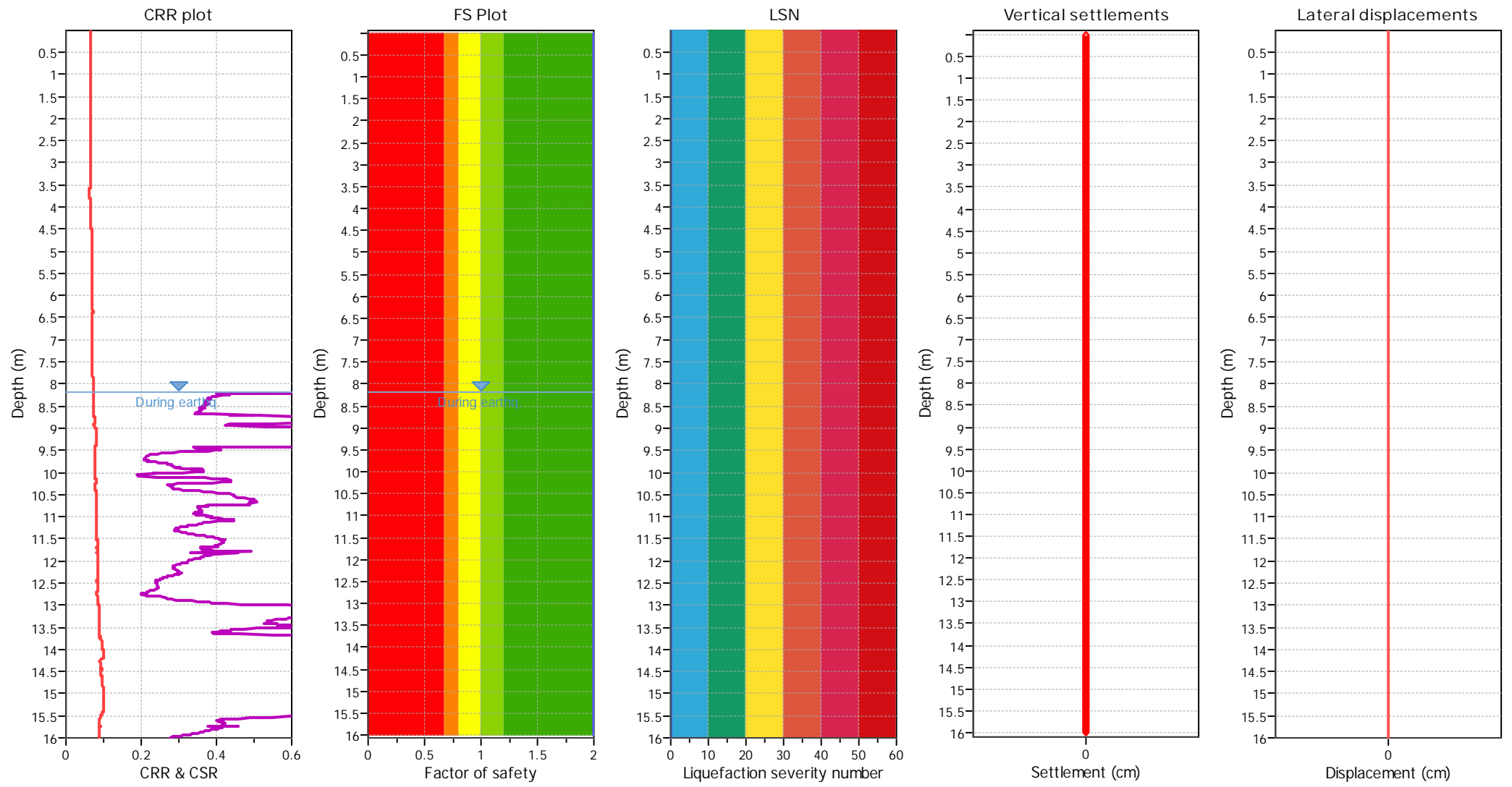
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.20 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (earthq.):	8.20 m	Fill weight:	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	LSN color scheme Severe damage Major expression of liquefaction Moderate to severe exp. of liquefaction Moderate expression of liquefaction Minor expression of liquefaction Little to no expression of liquefaction
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 :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only		
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	No		
Depth to water table (insitu):	8.20 m	Fill height:	N/A	Limit depth:	N/A		

LIQUEFACTION ANALYSIS REPORT

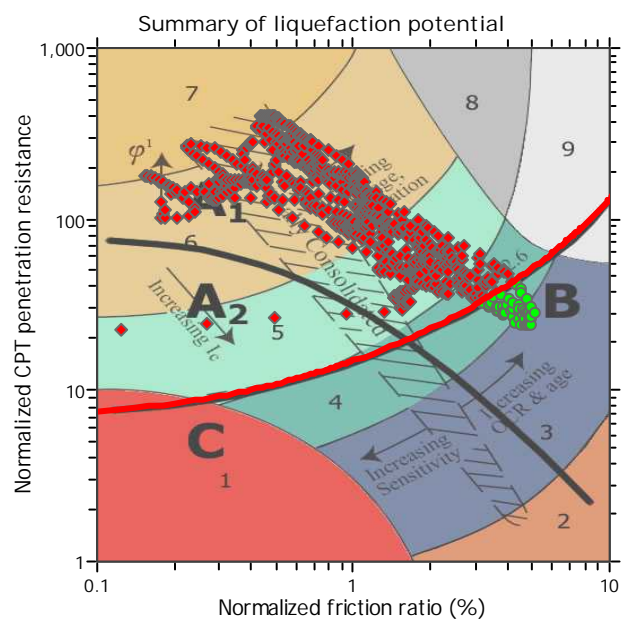
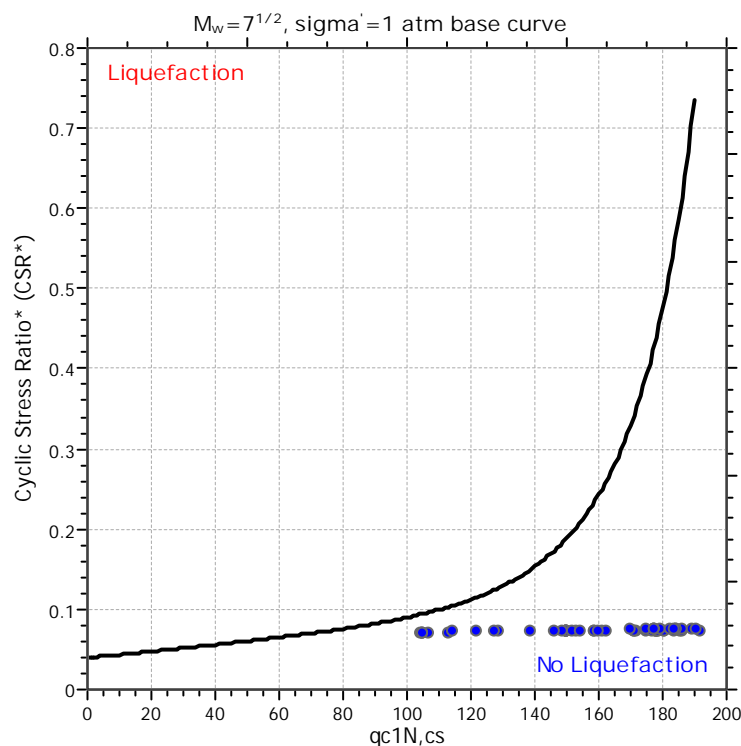
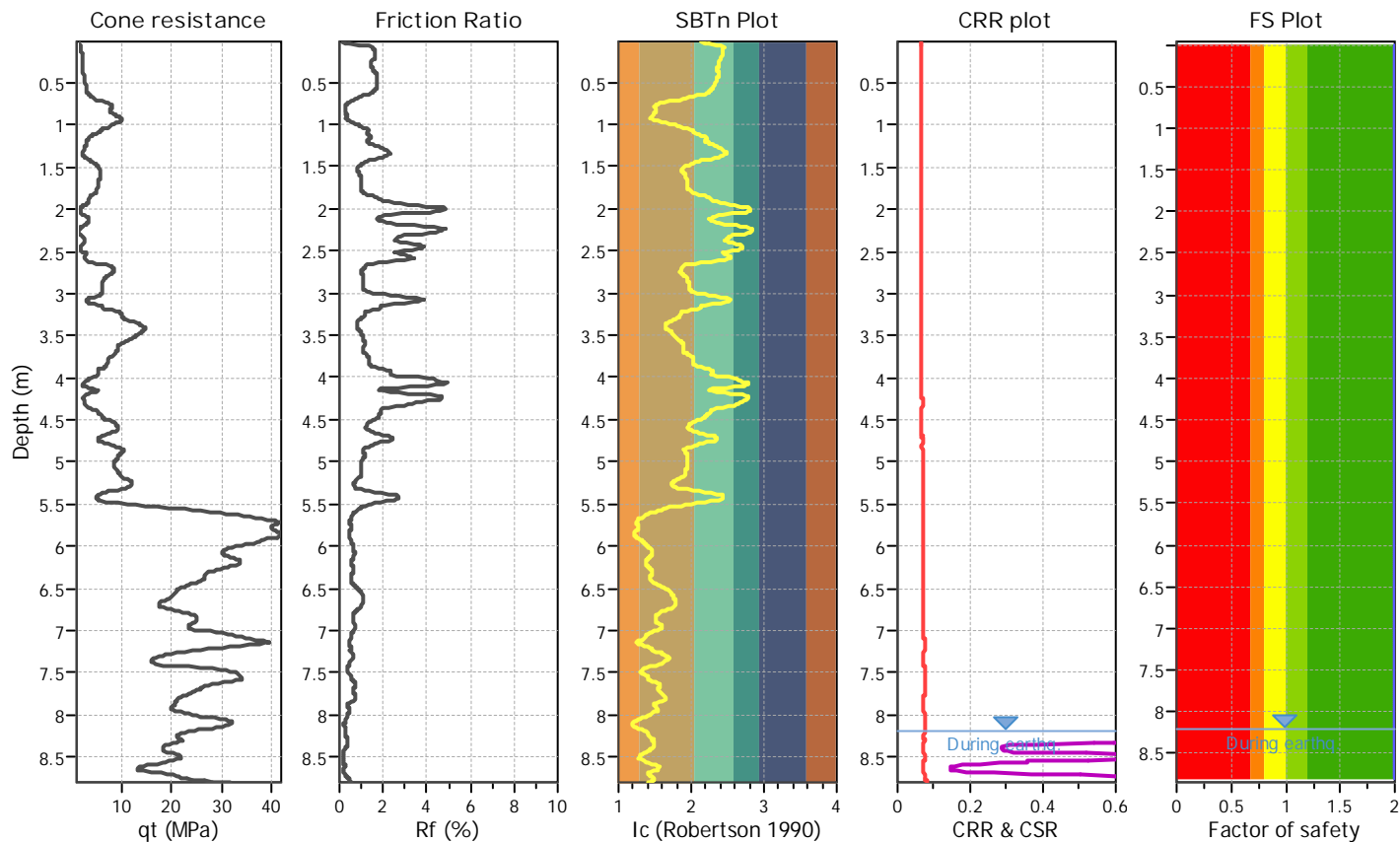
Project title :

Location :

CPT file : 8270-020_CPT014

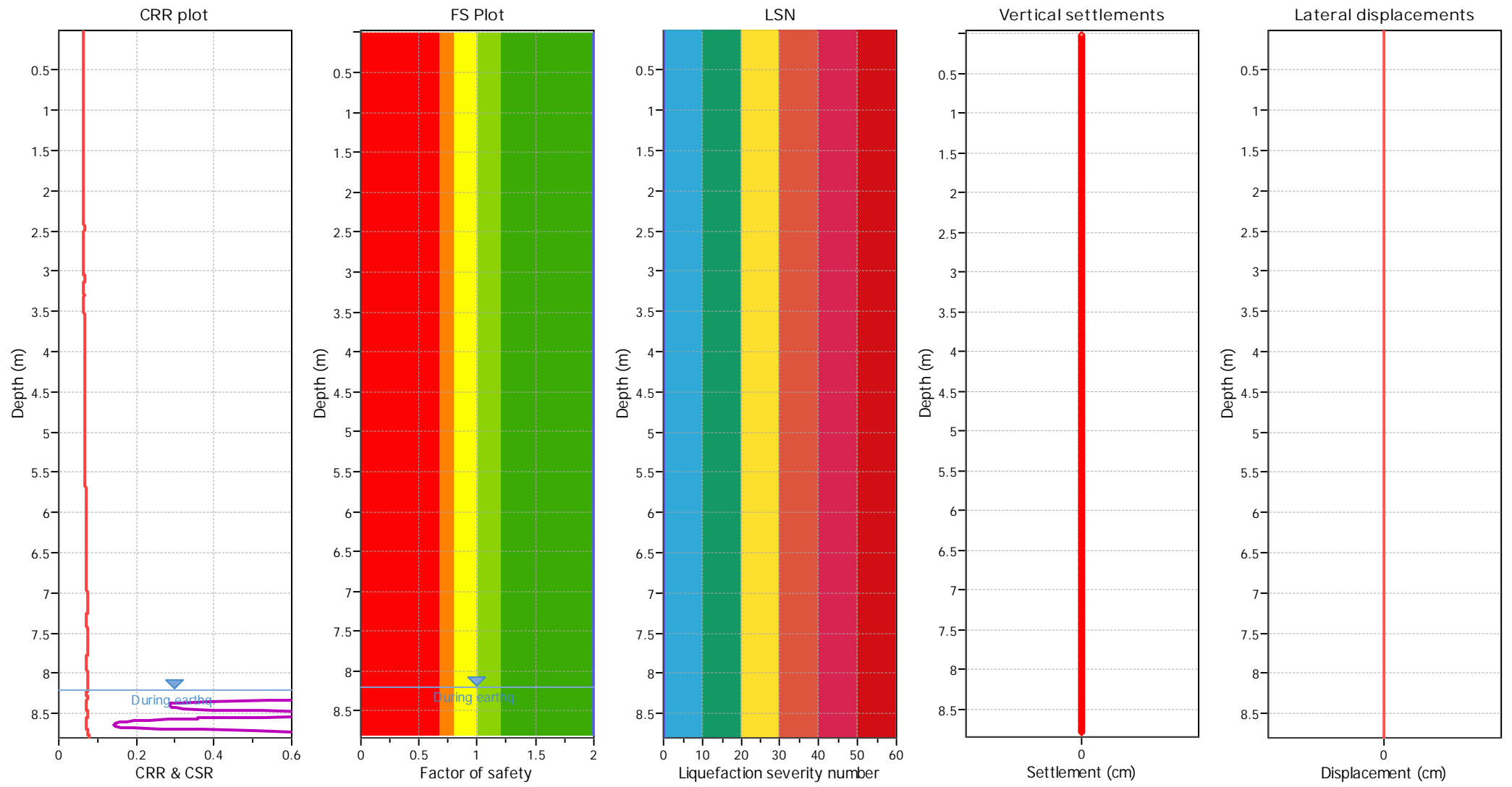
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.20 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (earthq.):	8.20 m	Fill weight:	N/A	F.S. color scheme		LSN color scheme	
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No	Almost certain it will liquefy	Red	Severe damage	Red
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_0 applied:	Yes	Very likely to liquefy	Orange	Major expression of liquefaction	Red
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only	Liquefaction and no liq. are equally likely	Yellow	Moderate to severe exp. of liquefaction	Red
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	No	Unlike to liquefy	Light Green	Moderate expression of liquefaction	Yellow
Depth to water table (insitu):	8.20 m	Fill height:	N/A	Limit depth:	N/A	Almost certain it will not liquefy	Dark Green	Minor expression of liquefaction	Green
								Little to no expression of liquefaction	Blue

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LIQUEFACTION ANALYSIS REPORT

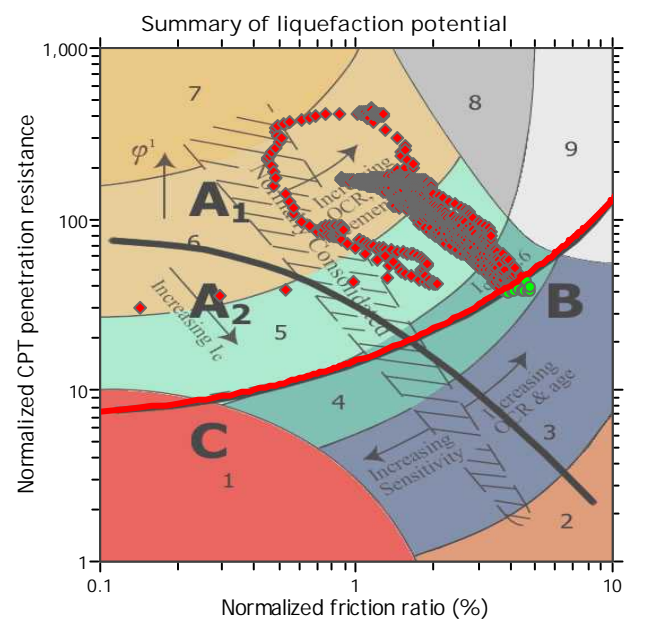
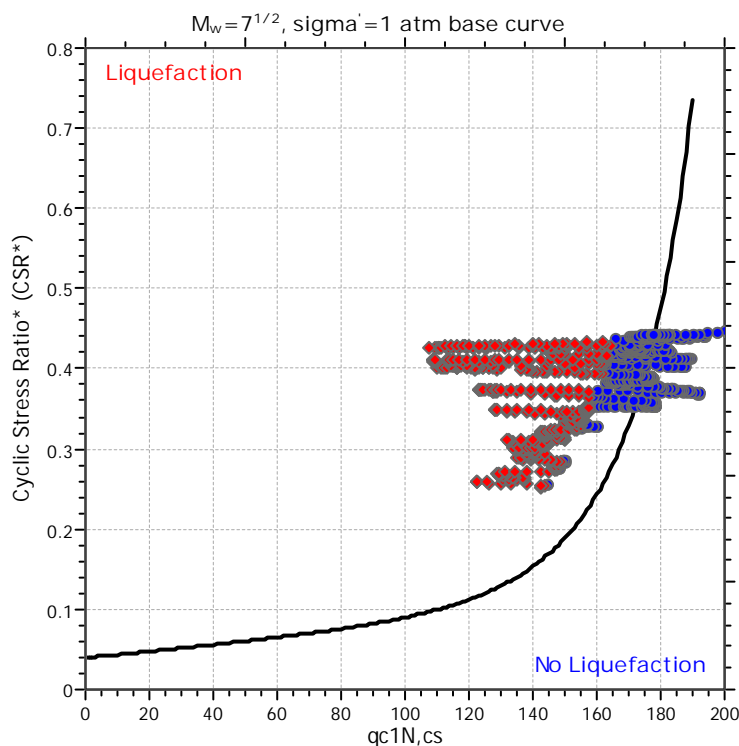
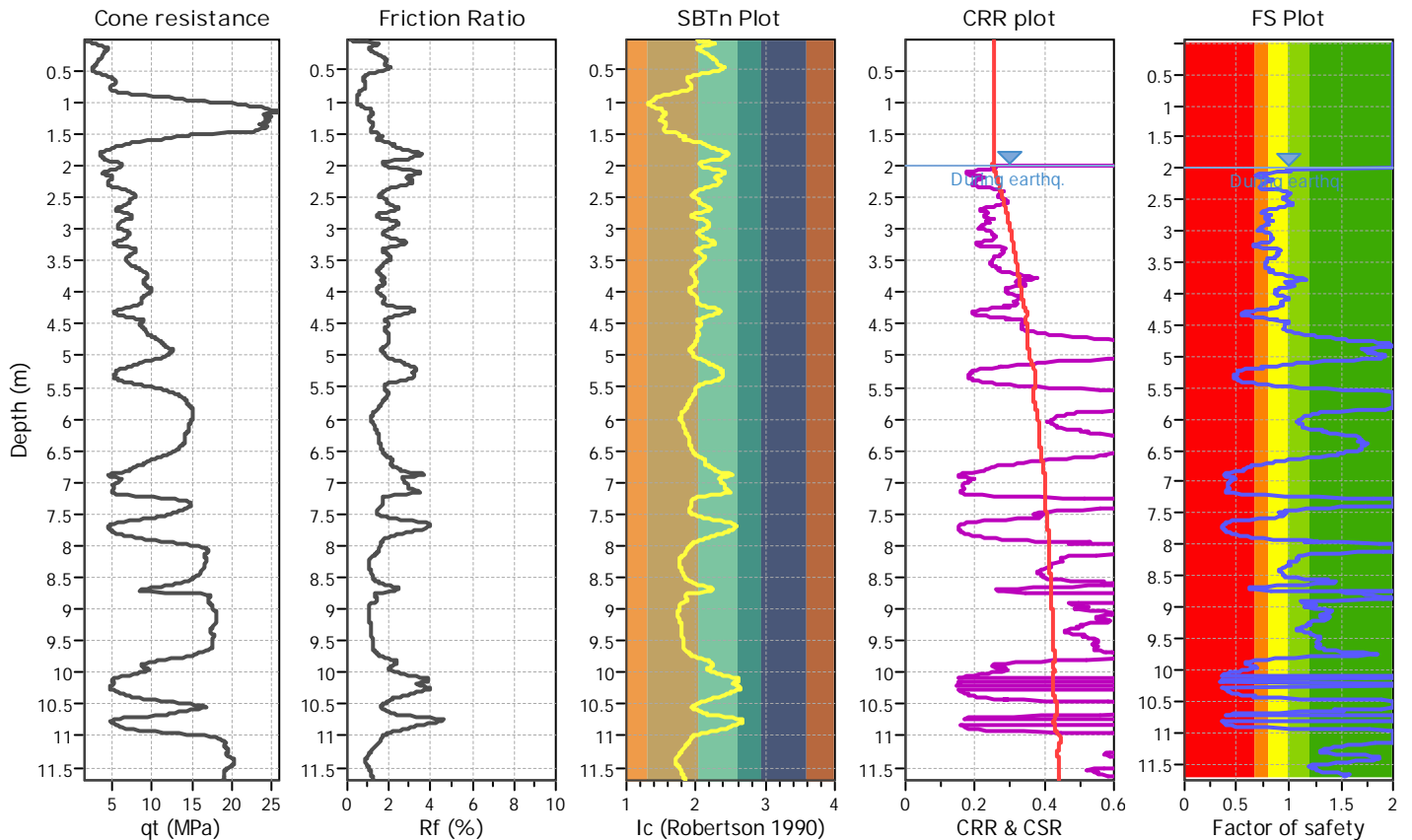
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Location :

CPT file : 8270-020_CPT001

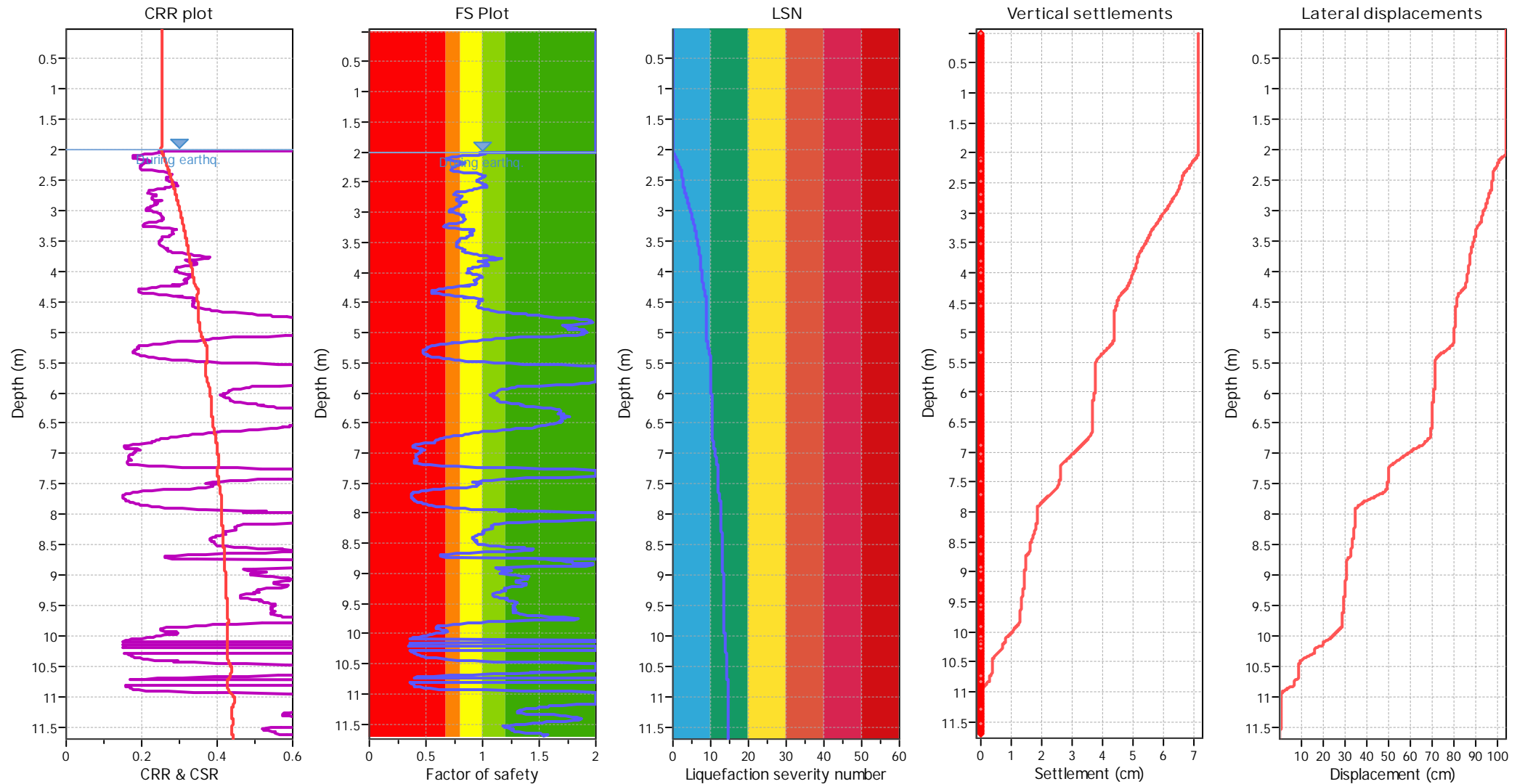
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	2.00 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_0 applied:	Yes
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

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

LSN color scheme

Red	Severe damage
Dark Red	Major expression of liquefaction
Orange	Moderate to severe exp. of liquefaction
Yellow	Moderate expression of liquefaction
Light Green	Minor expression of liquefaction
Dark Green	Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

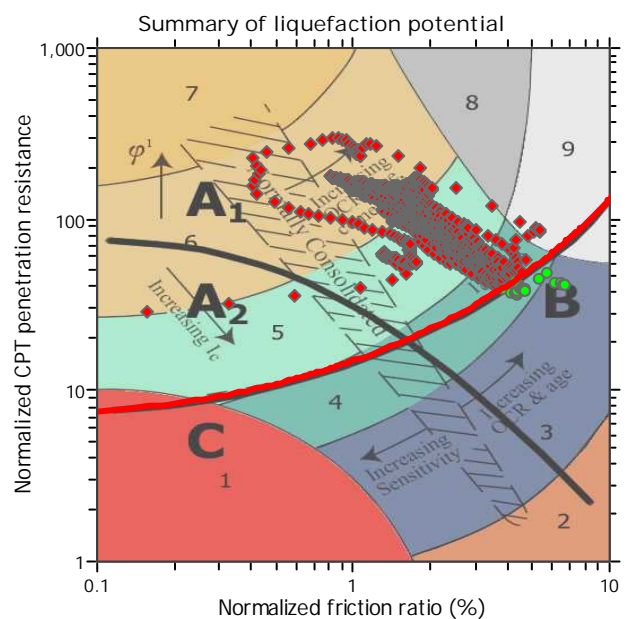
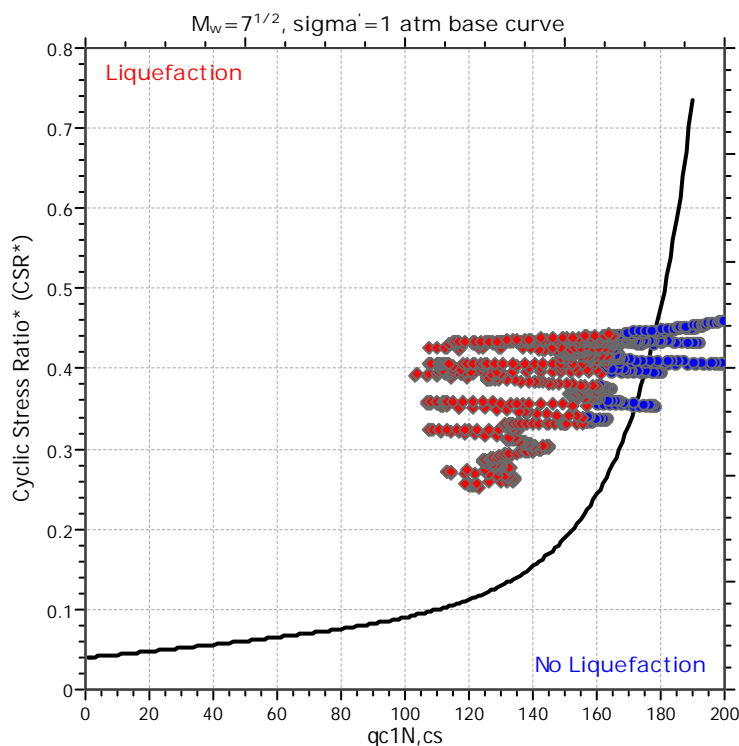
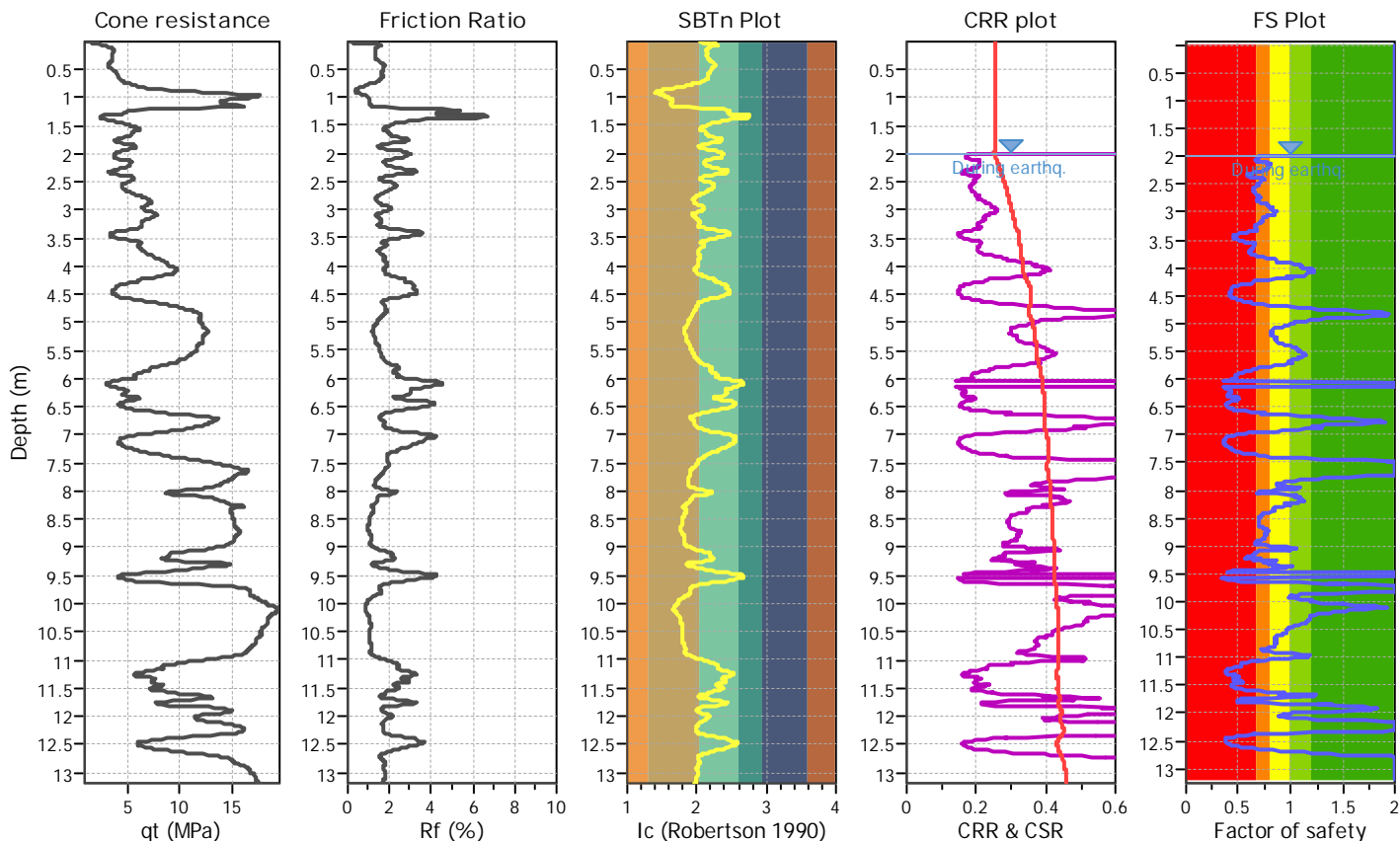
Project title :

Location :

CPT file : 8270-020_CPT002

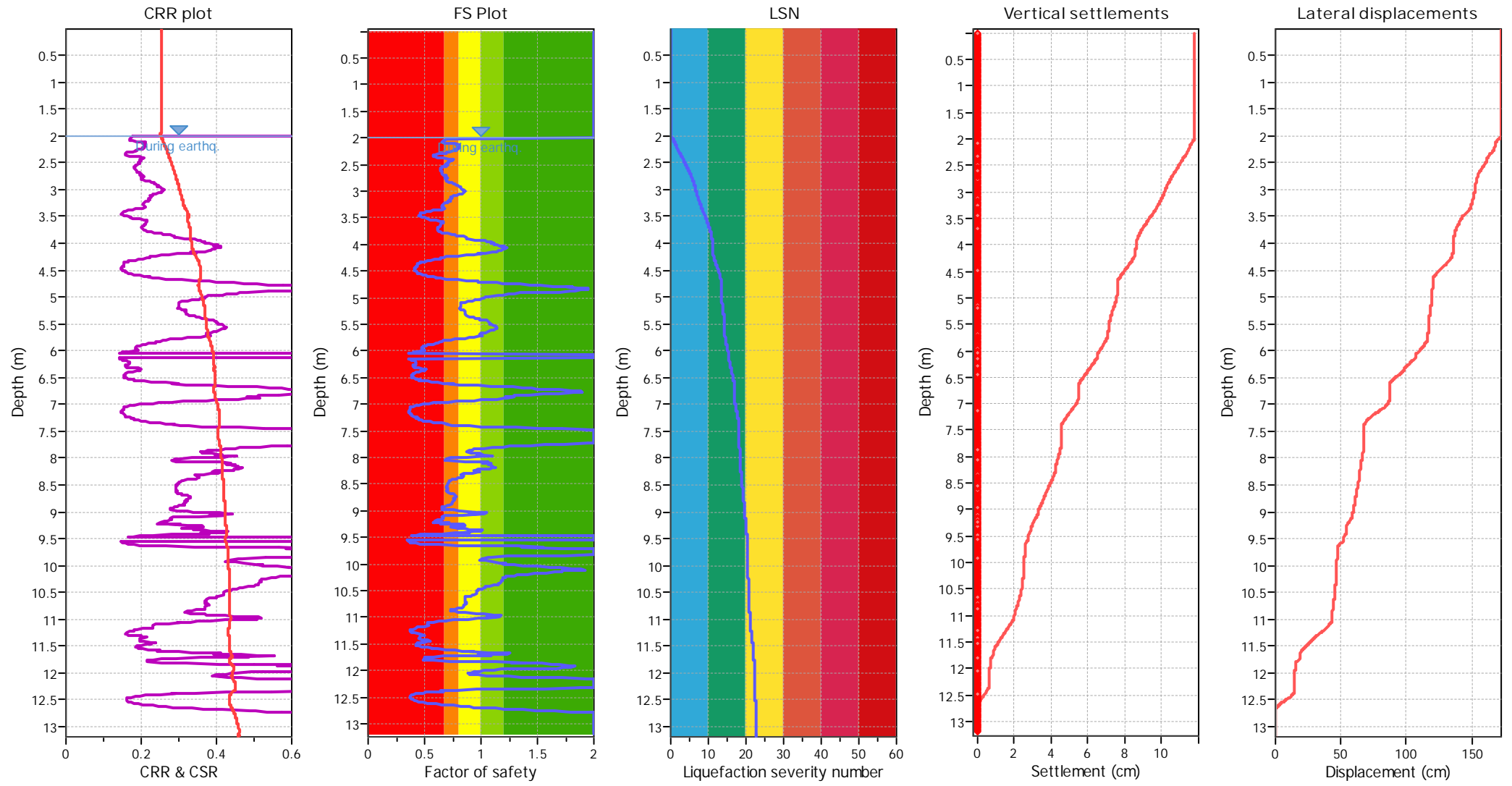
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	2.00 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_0 applied:	Yes
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

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

LSN color scheme

Red	Severe damage
Orange	Major expression of liquefaction
Yellow	Moderate to severe exp. of liquefaction
Green	Moderate expression of liquefaction
Dark Green	Minor expression of liquefaction
Blue	Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

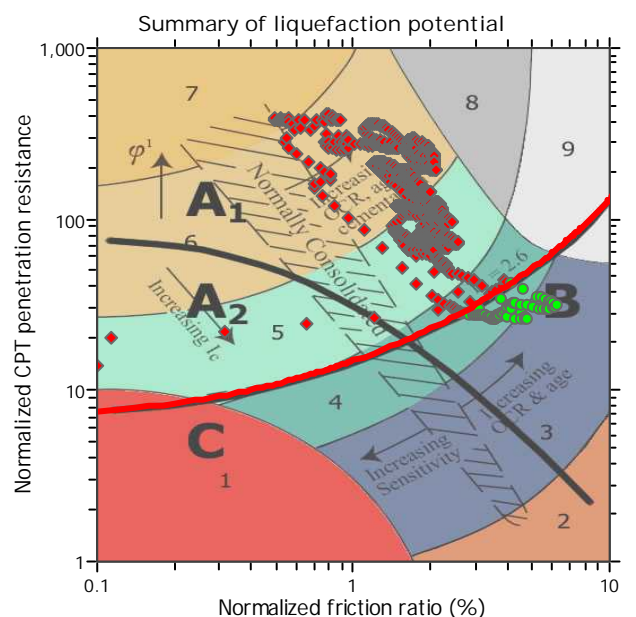
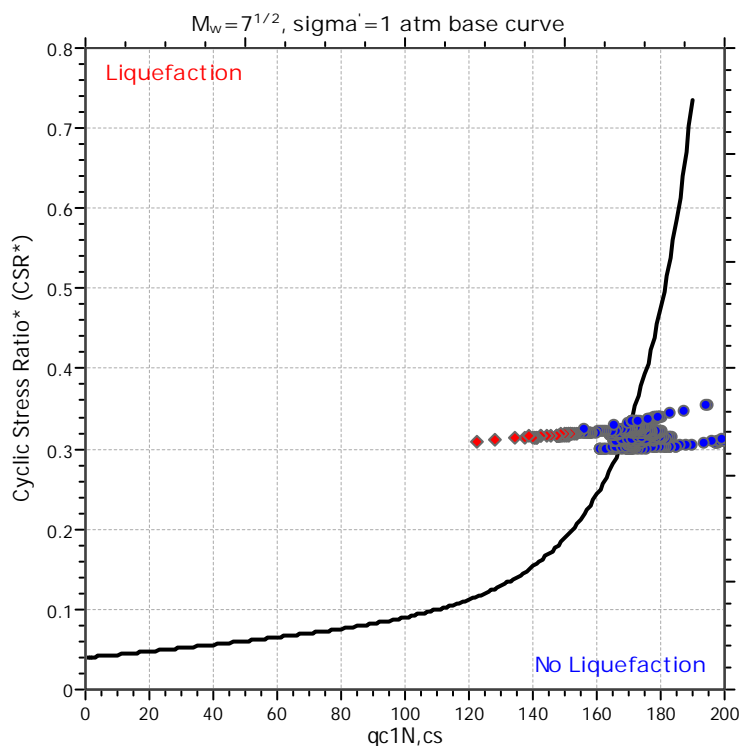
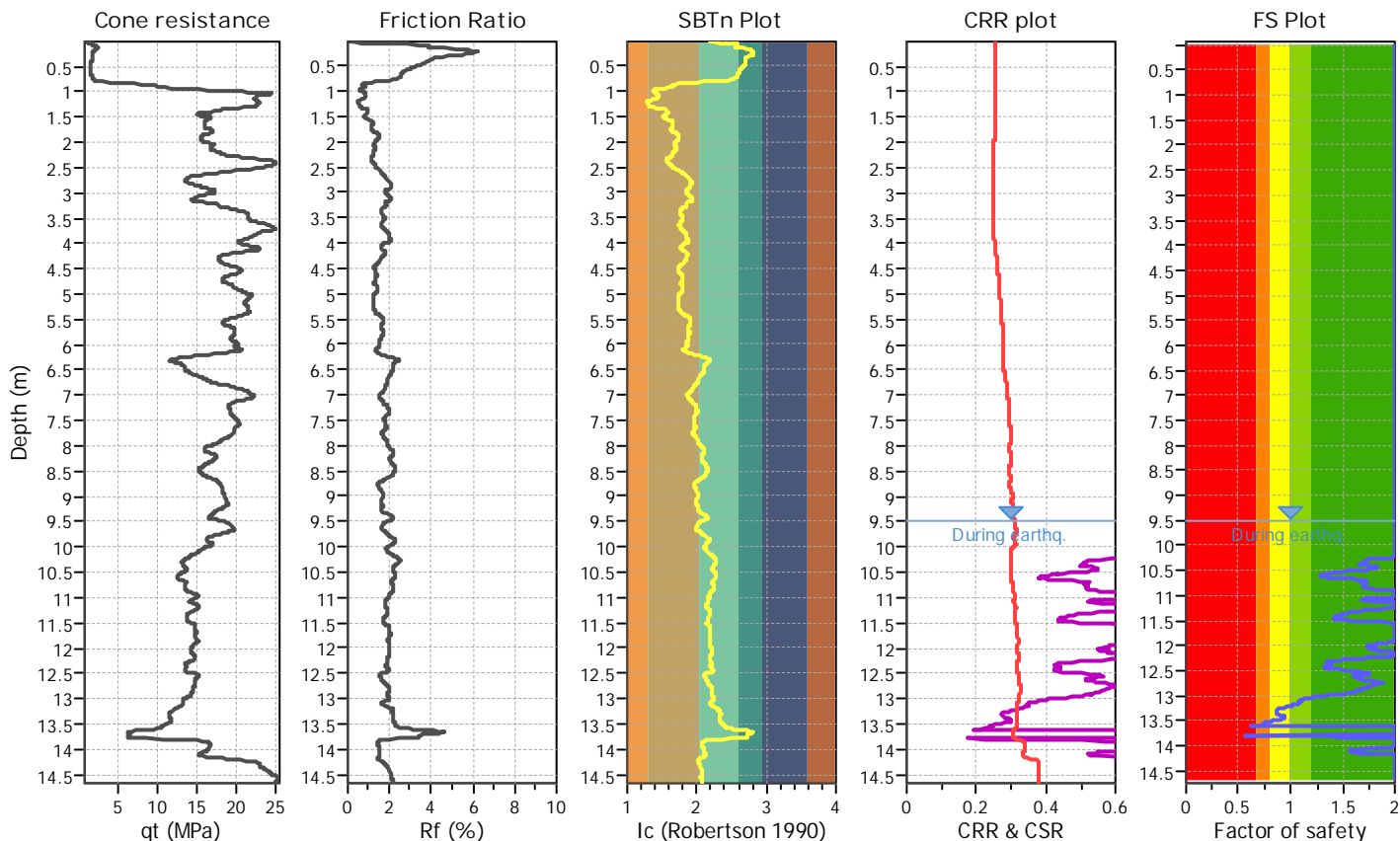
Project title :

Location :

CPT file : 8270-020_CPT003

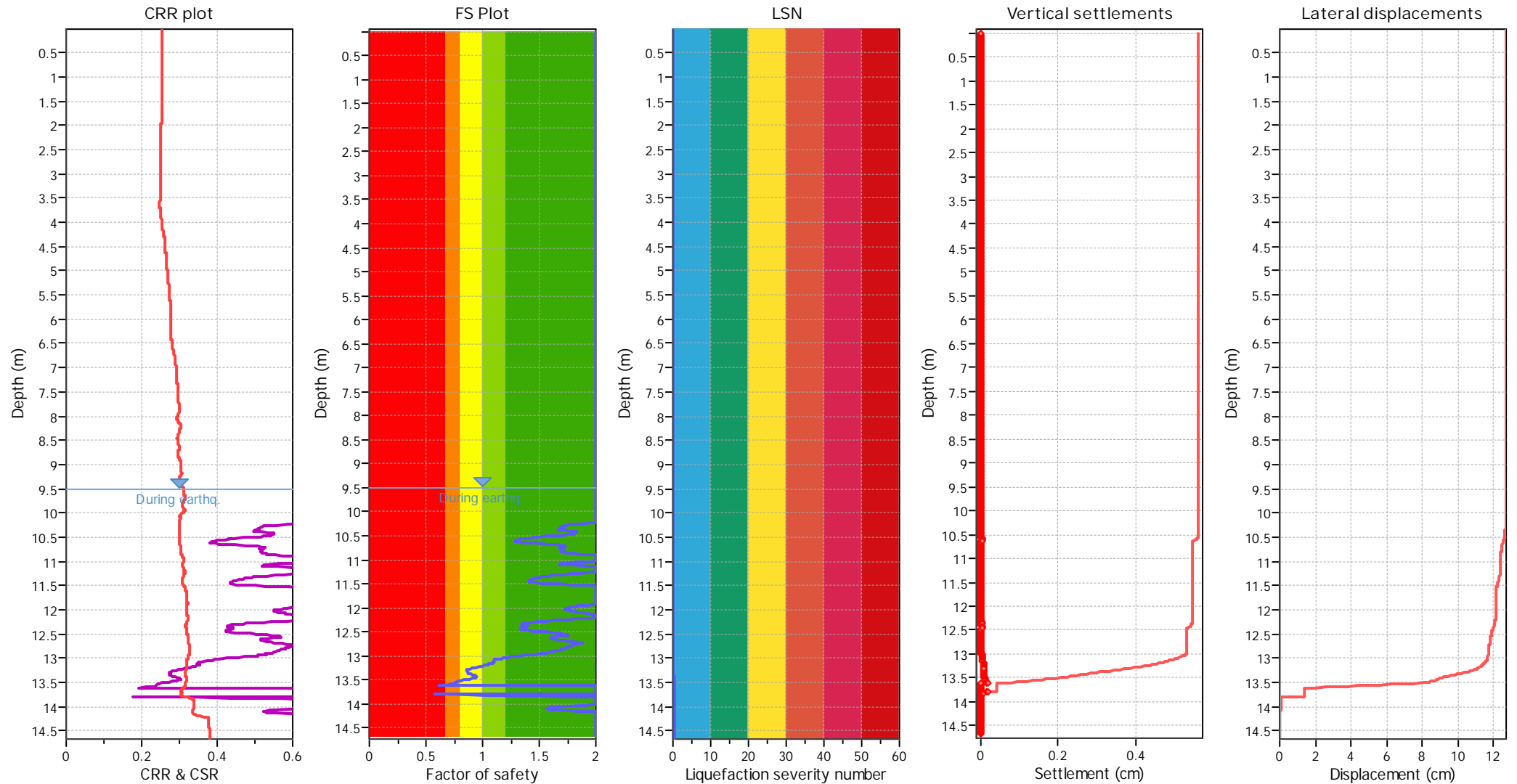
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	9.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	9.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (earthq.):	9.50 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 ₀ applied:	Yes
Earthquake magnitude M _w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	9.50 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

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

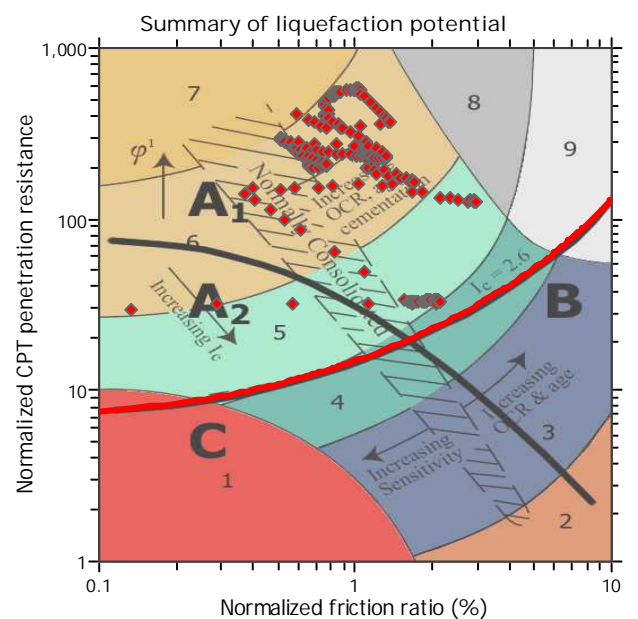
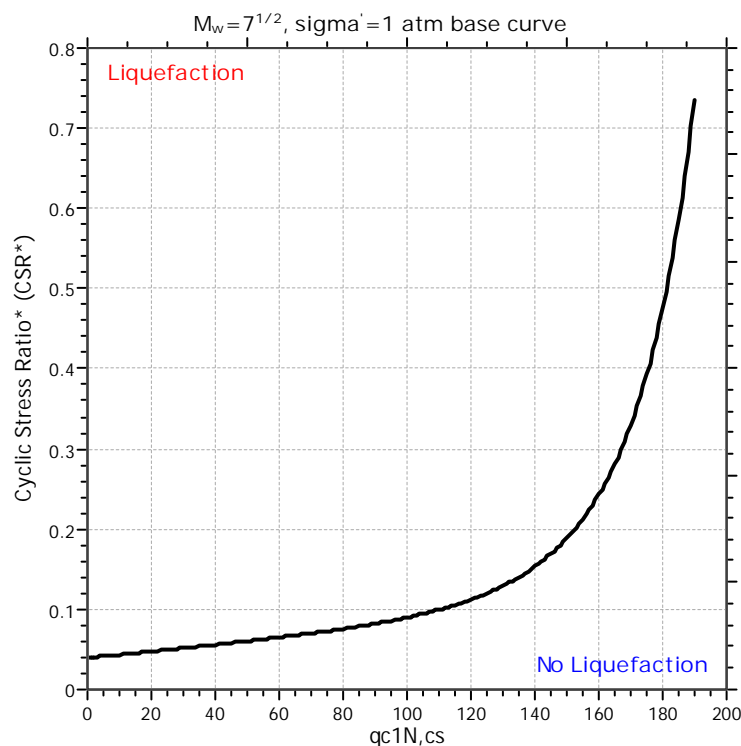
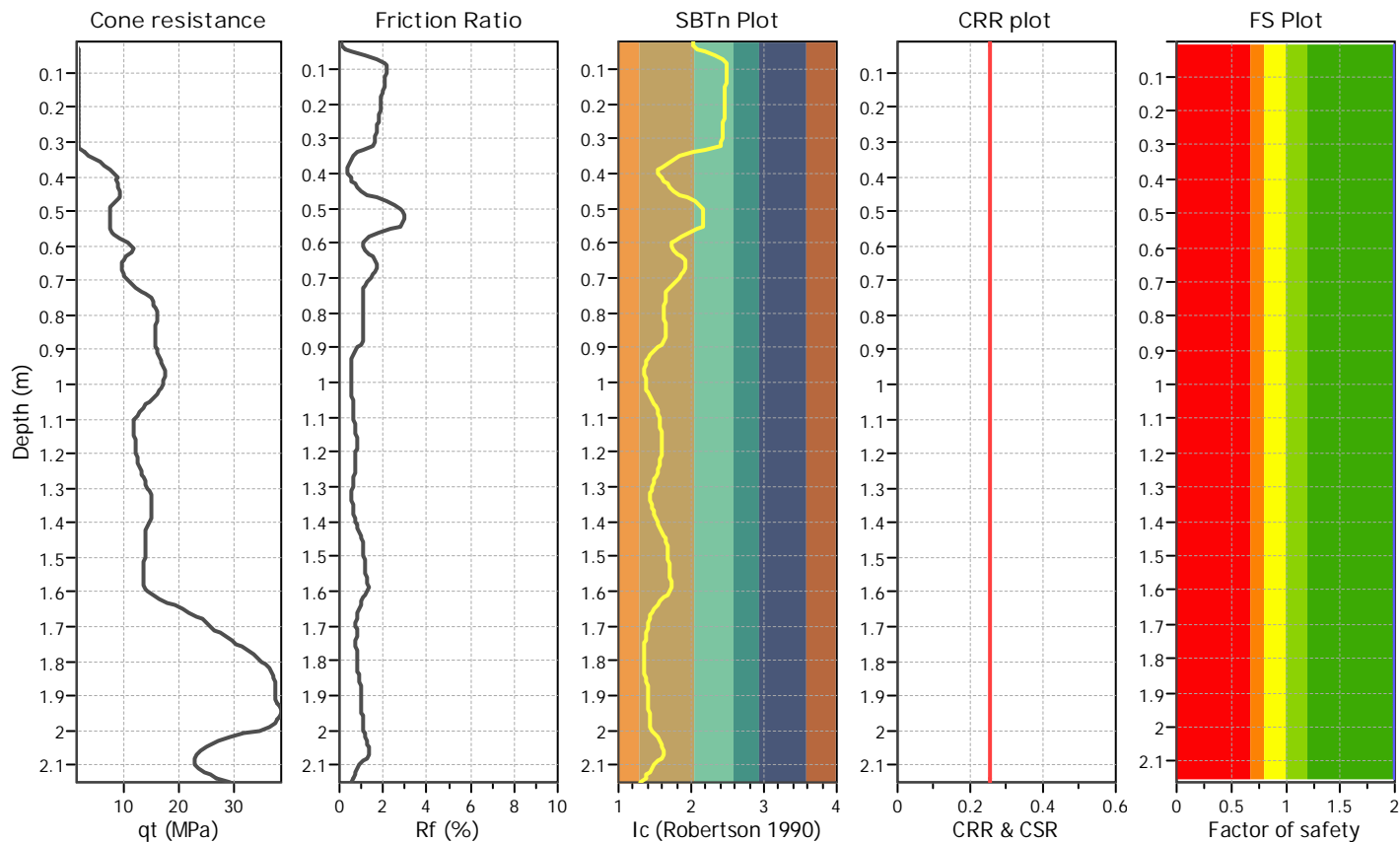
Project title :

Location :

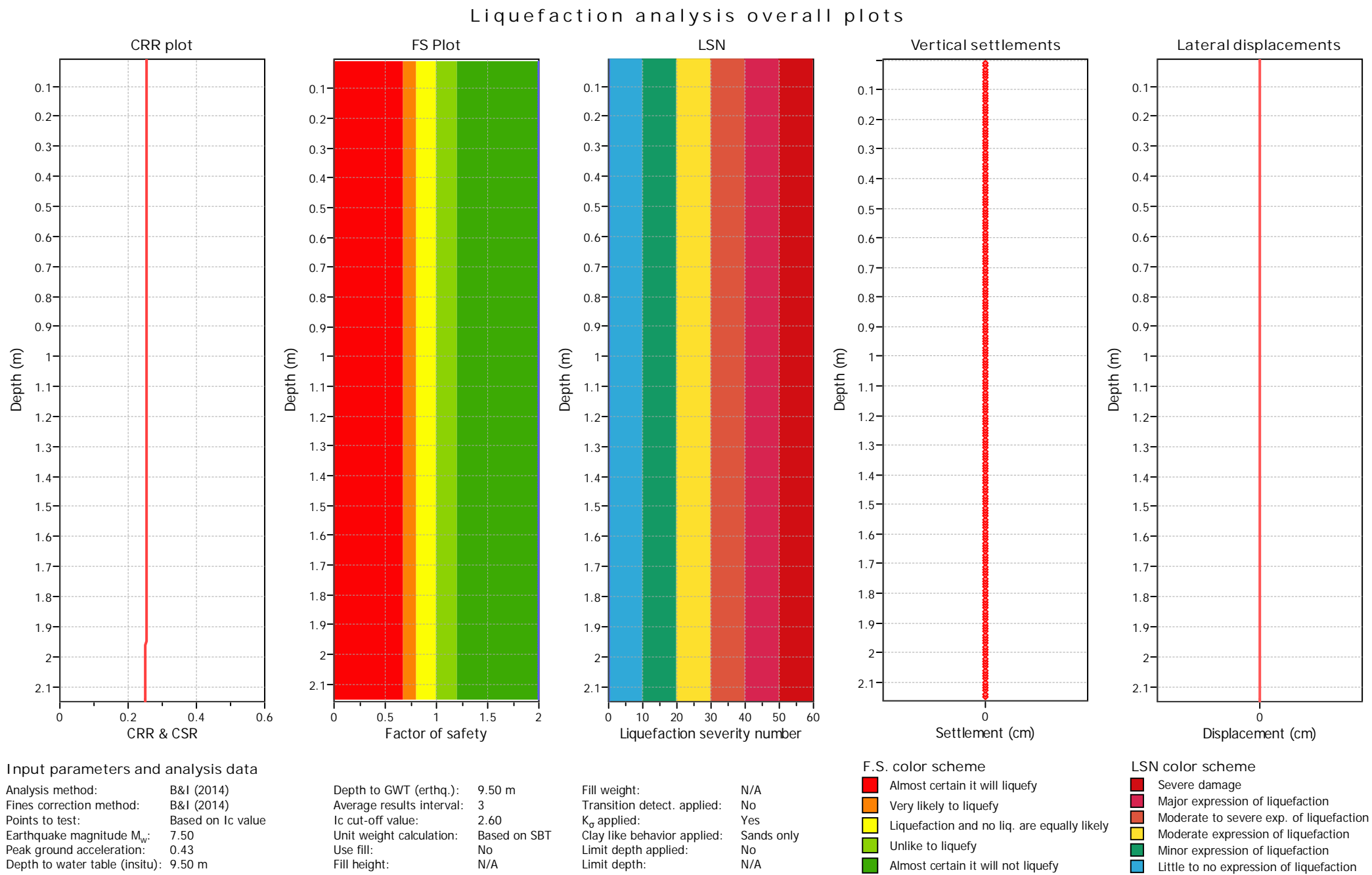
CPT file : 8270-020_CPT004

Input parameters and analysis data

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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	9.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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 REPORT

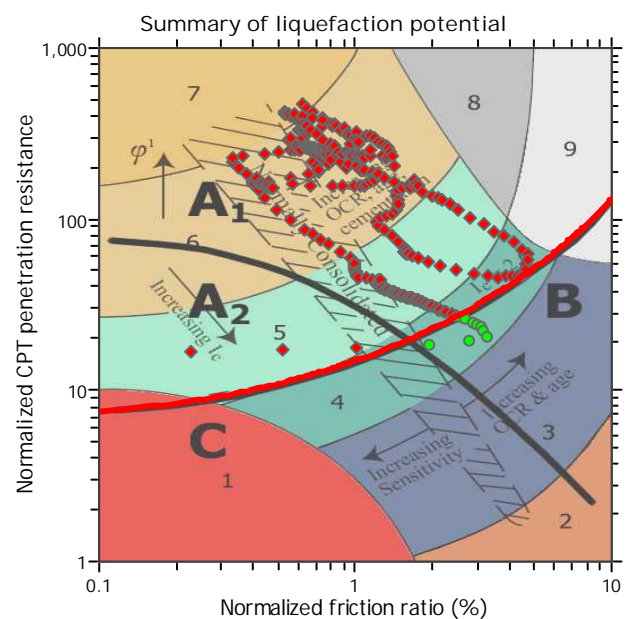
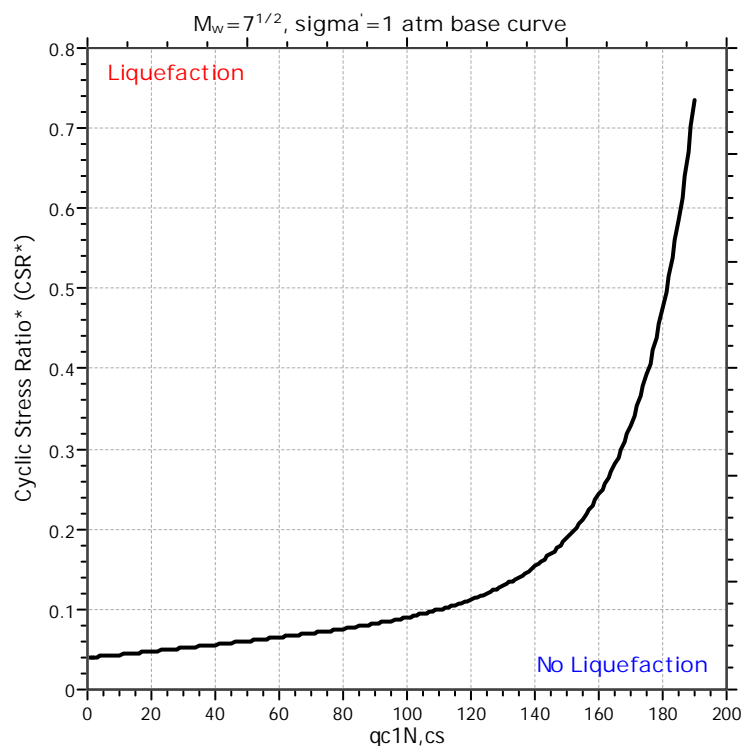
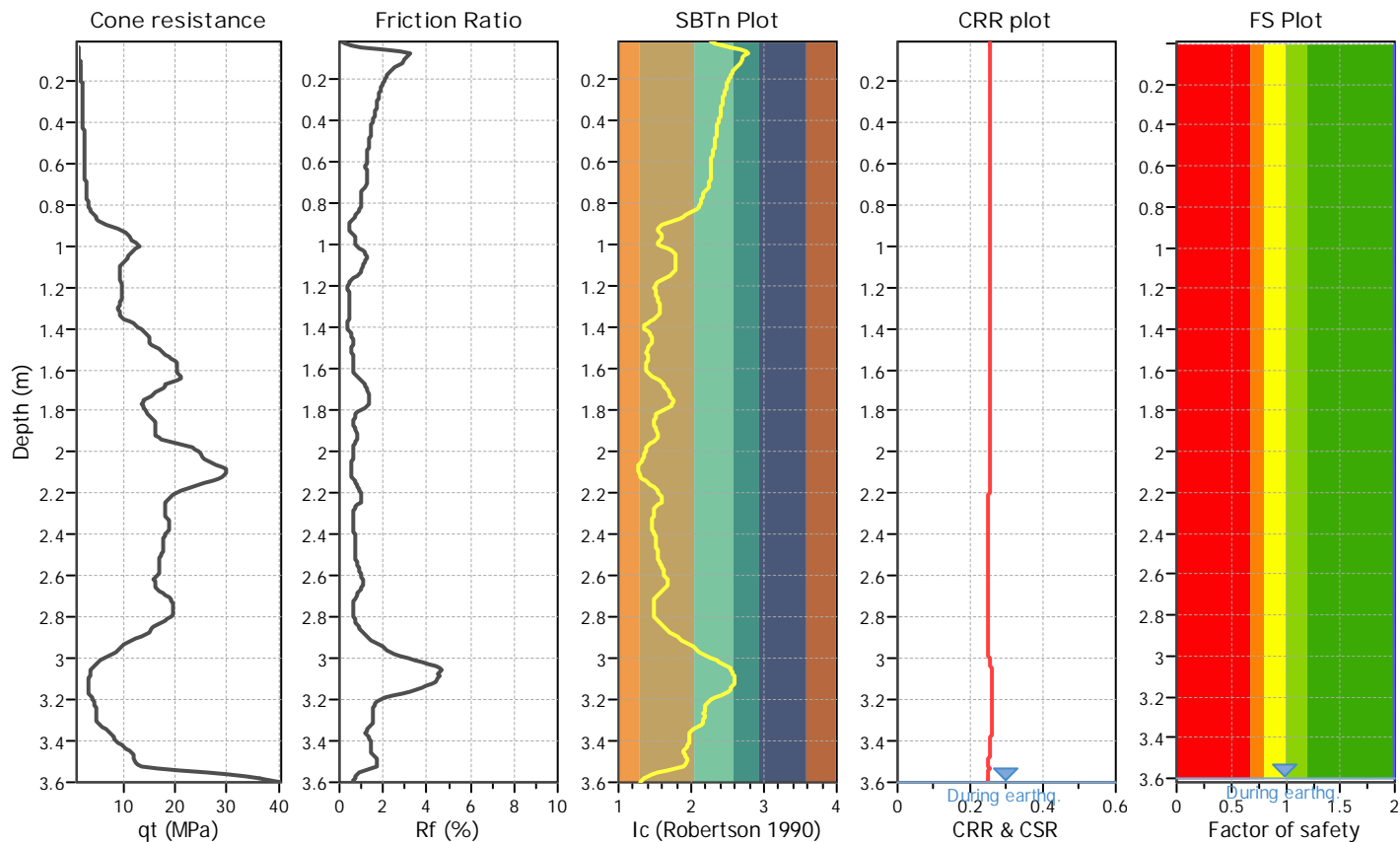
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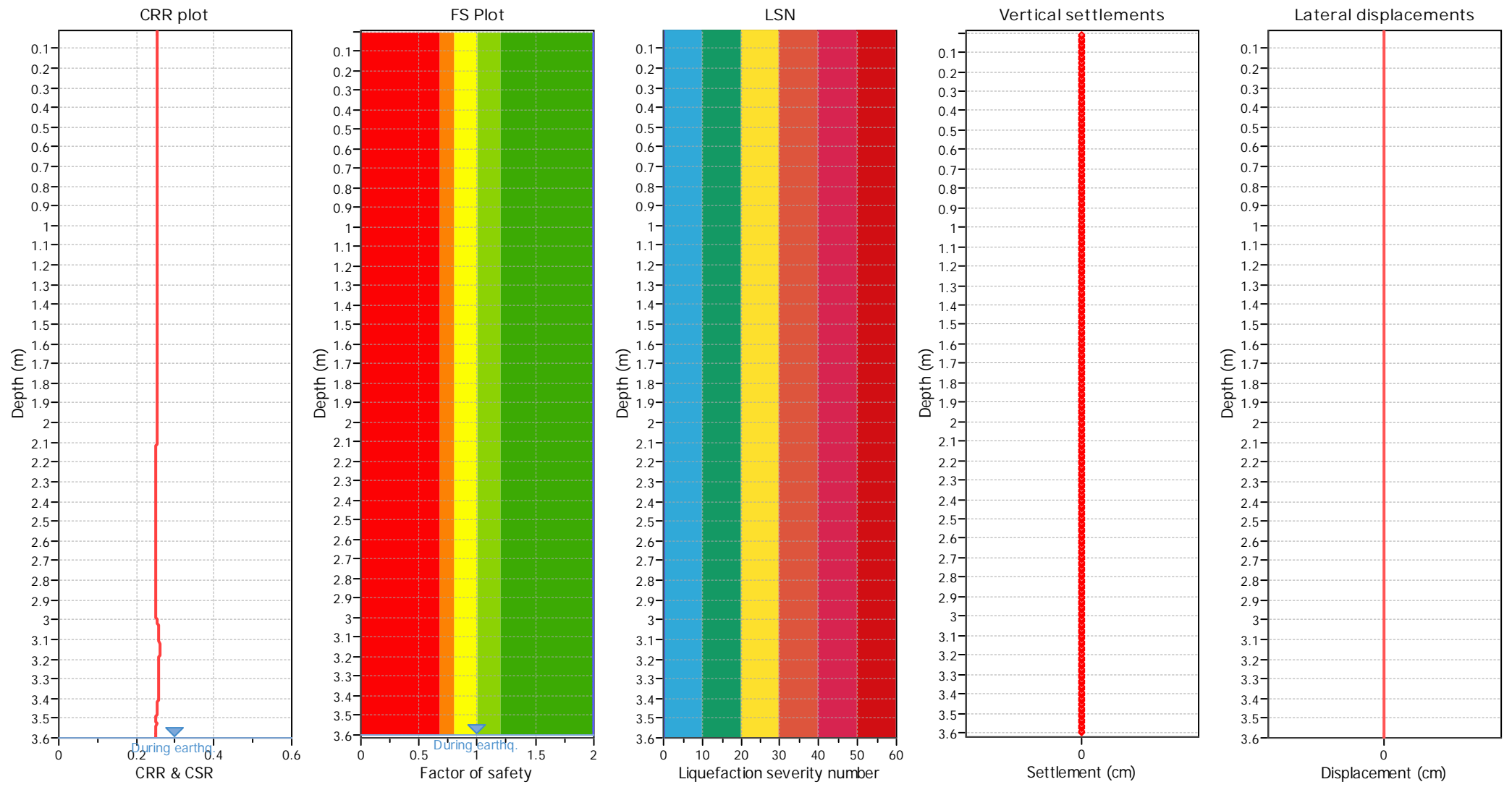
Input parameters and analysis data

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Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (earthq.):	3.60 m	Fill weight:	N/A	F.S. color scheme		LSN color scheme	
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No	<div></div> Almost certain it will liquefy	<div></div> Severe damage	<div></div> Major expression of liquefaction	
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _σ applied:	Yes	<div></div> Very likely to liquefy	<div></div> Moderate to severe exp. of liquefaction	<div></div> Moderate expression of liquefaction	
Earthquake magnitude M _w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only	<div></div> Liquefaction and no liq. are equally likely	<div></div> Moderate expression of liquefaction	<div></div> Minor expression of liquefaction	
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No	<div></div> Unlike to liquefy	<div></div> Minor expression of liquefaction	<div></div> Little to no expression of liquefaction	
Depth to water table (insitu):	3.60 m	Fill height:	N/A	Limit depth:	N/A	<div></div> Almost certain it will not liquefy			

LIQUEFACTION ANALYSIS REPORT

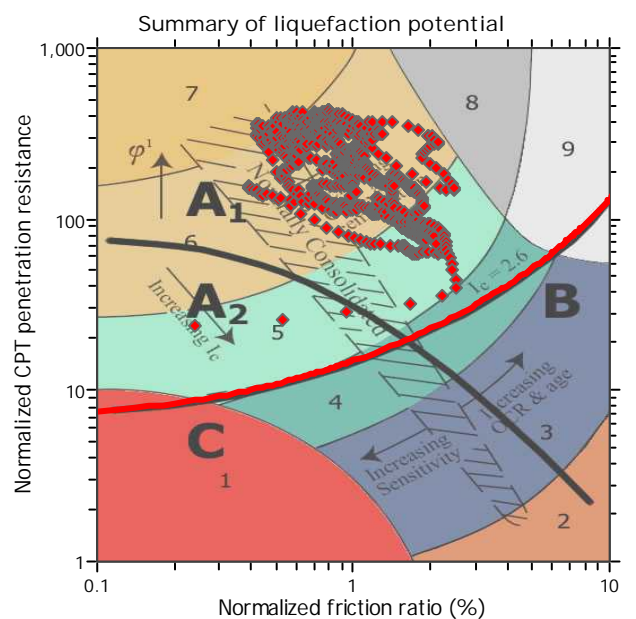
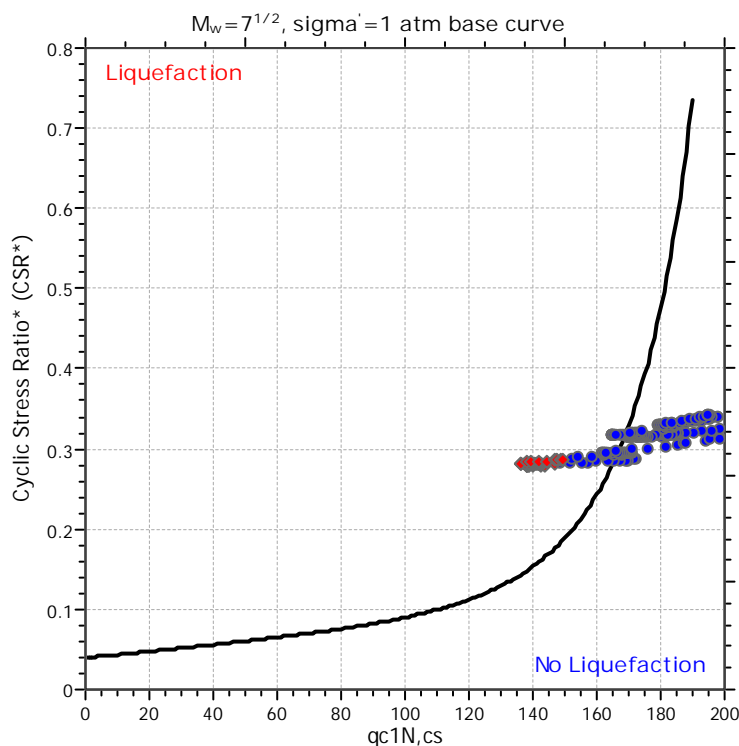
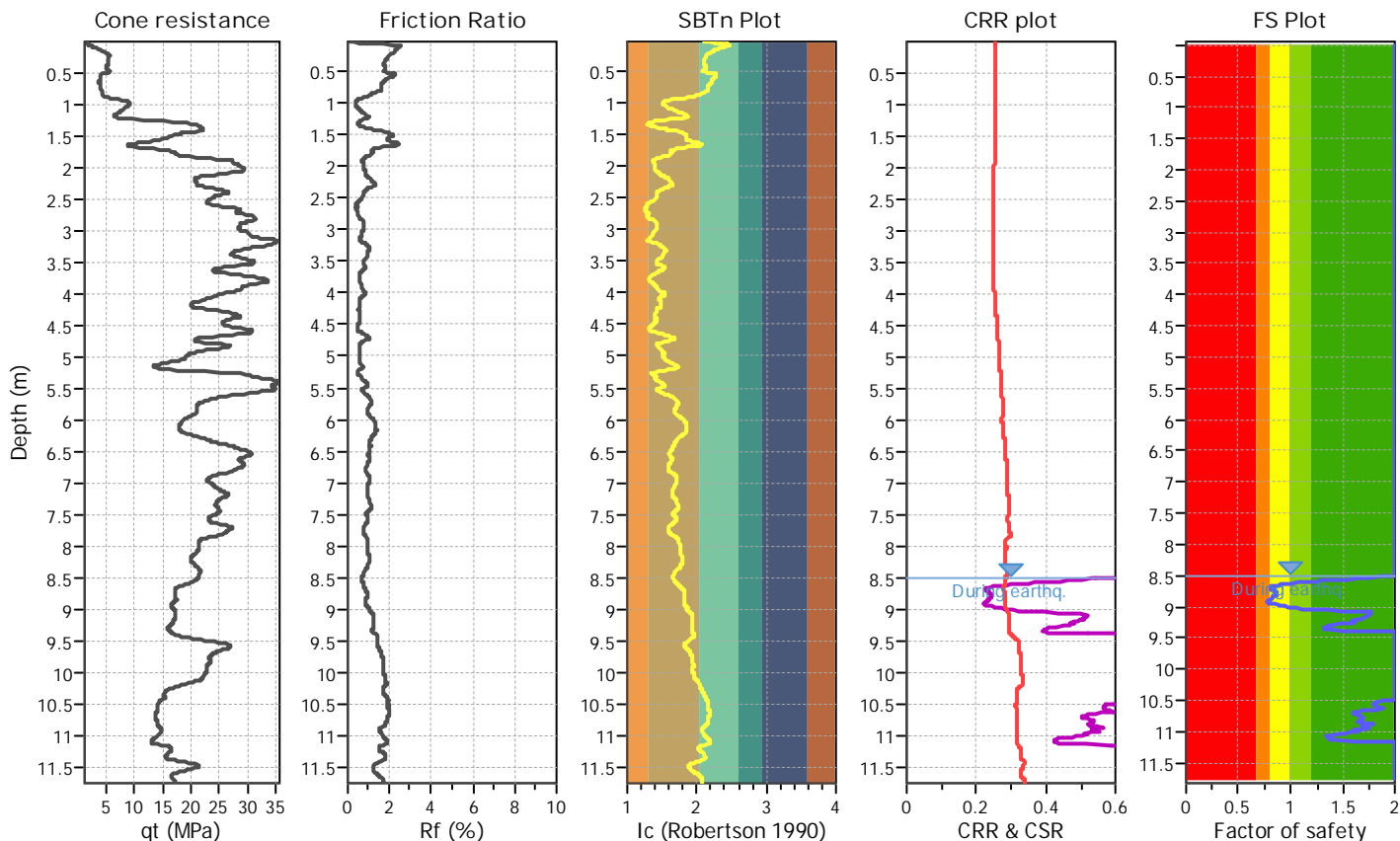
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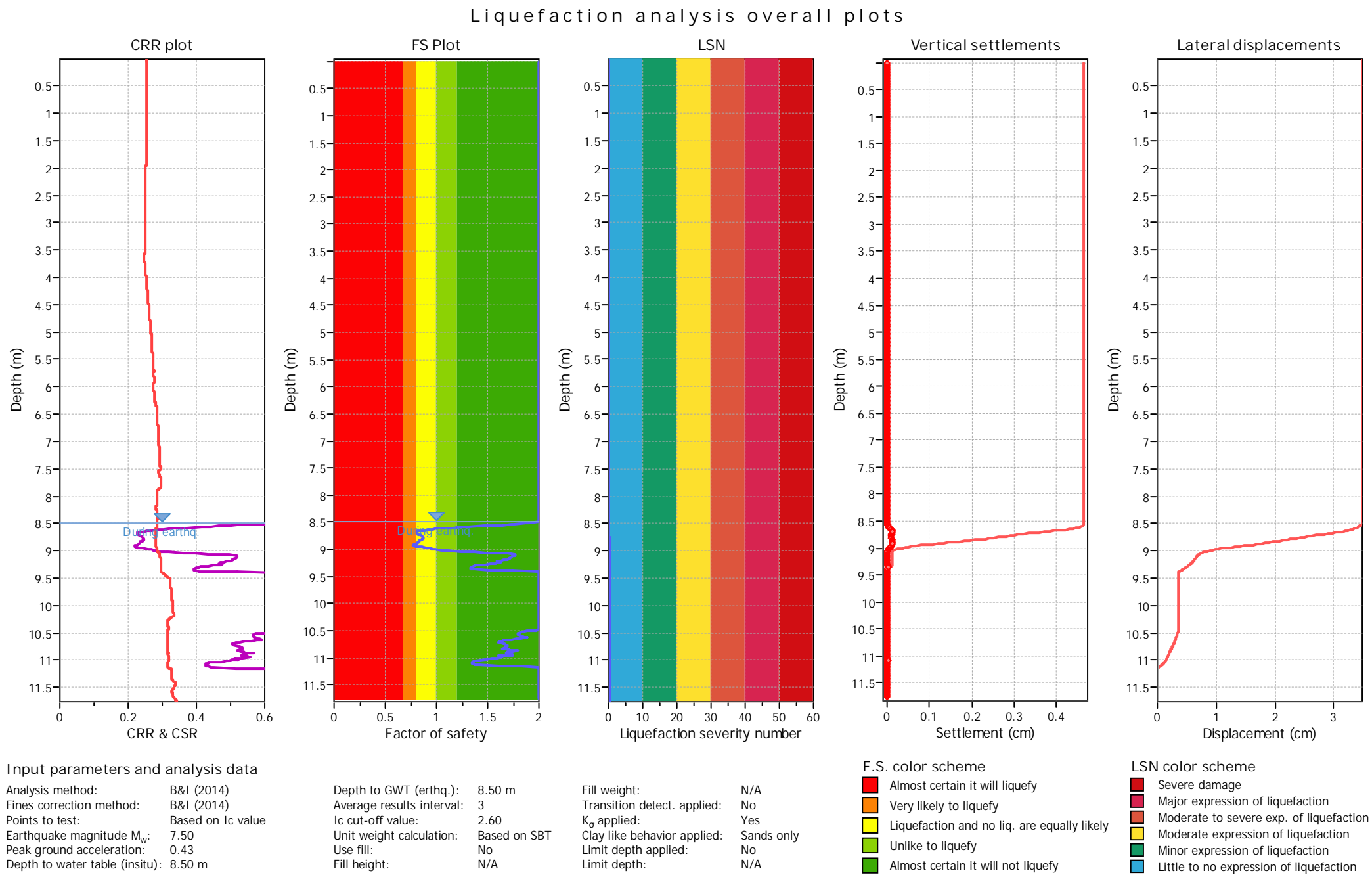
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Input parameters and analysis data

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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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 REPORT

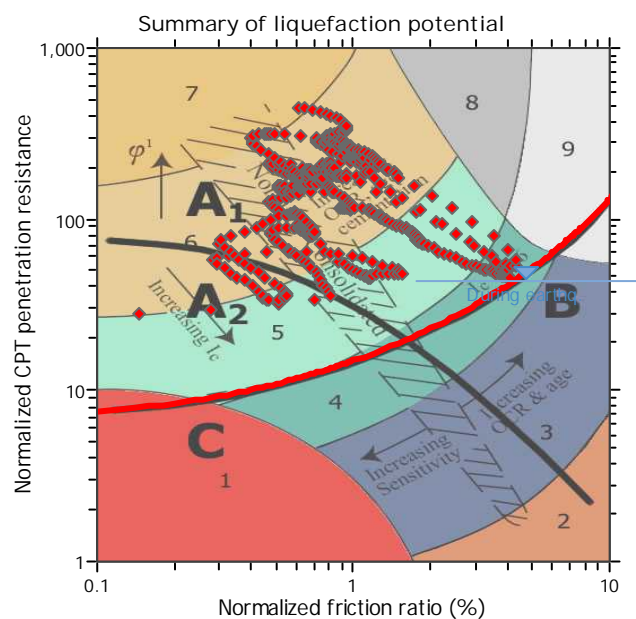
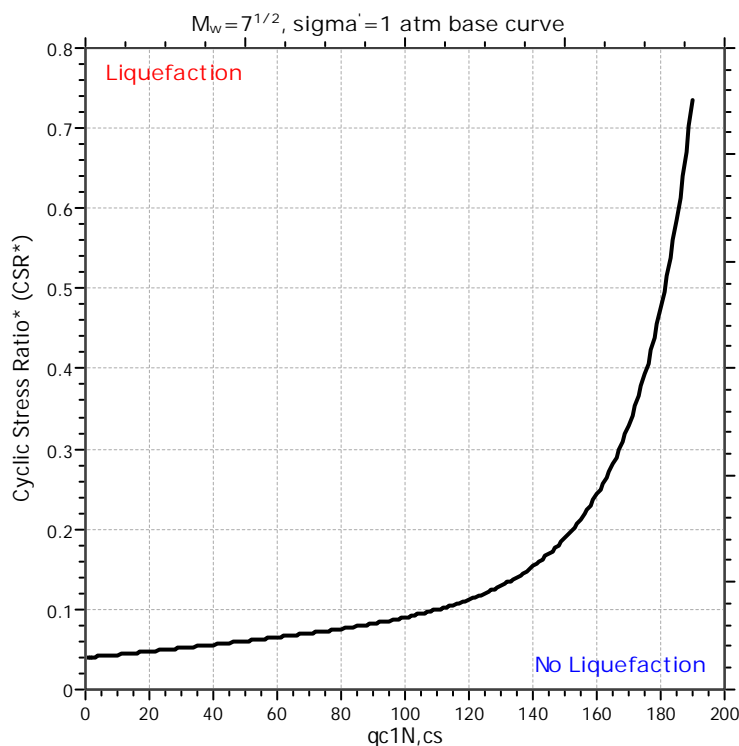
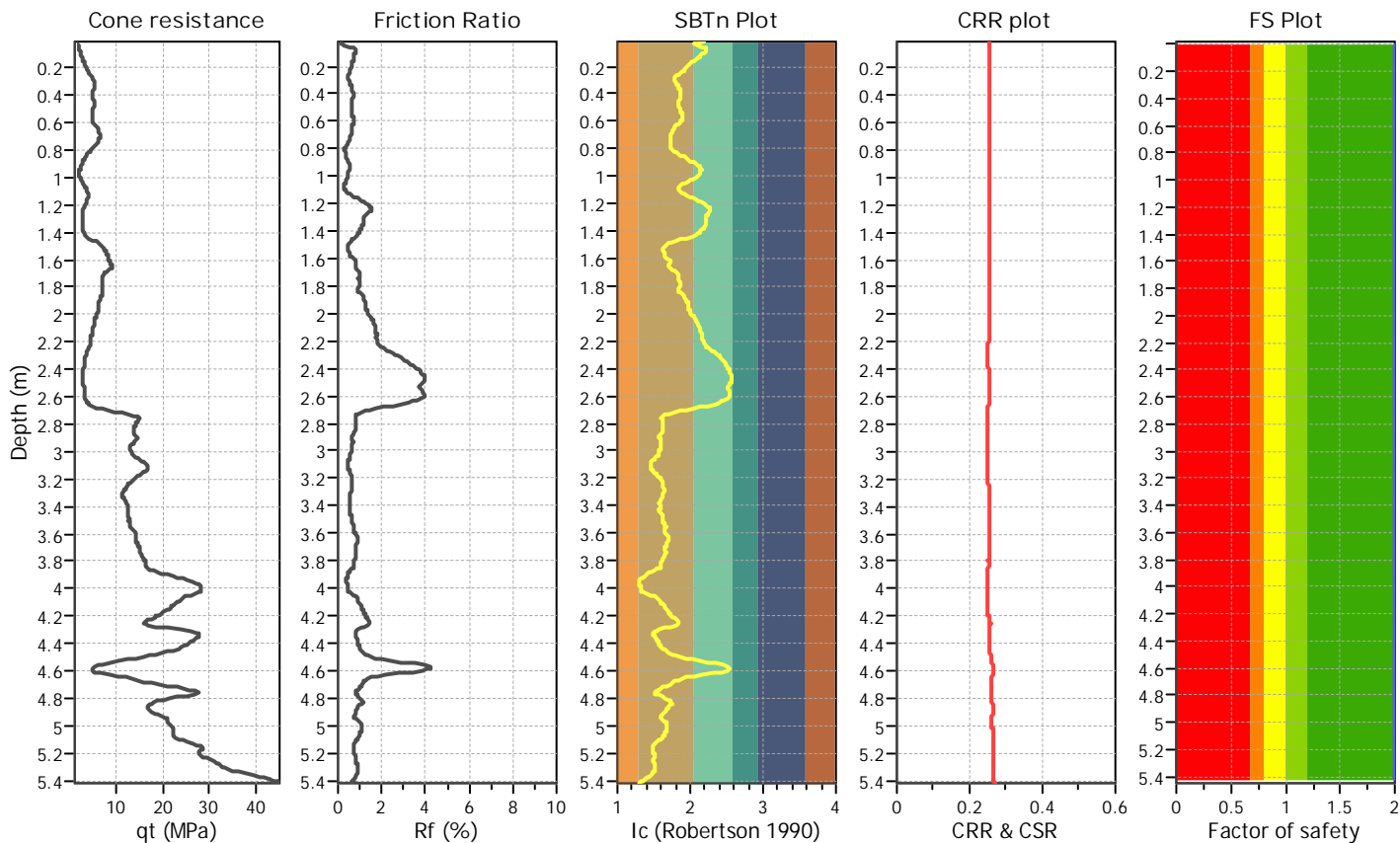
Project title :

Location :

CPT file : 8270-020_CPT007

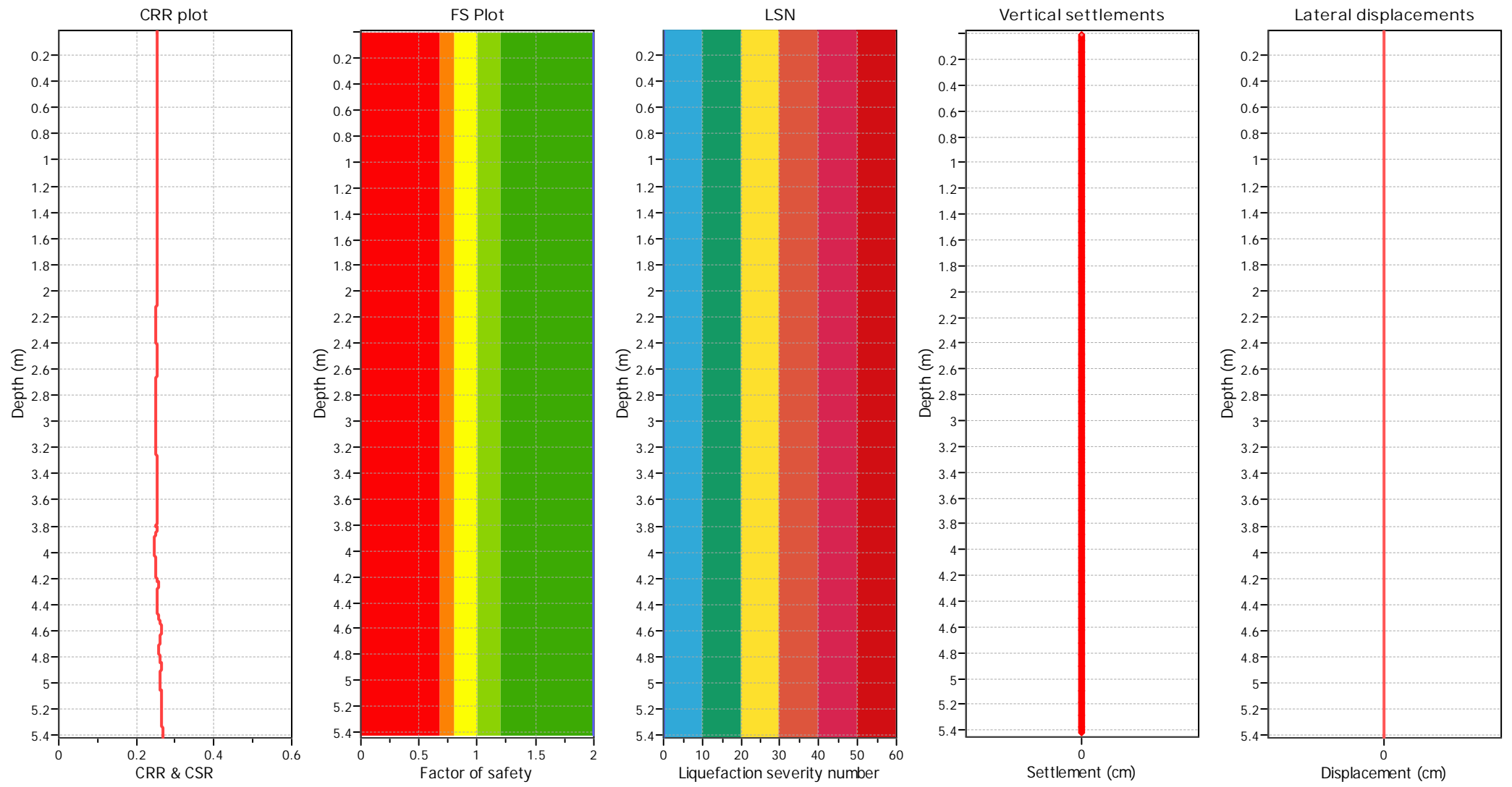
Input parameters and analysis data

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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	8.00 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 :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 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

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

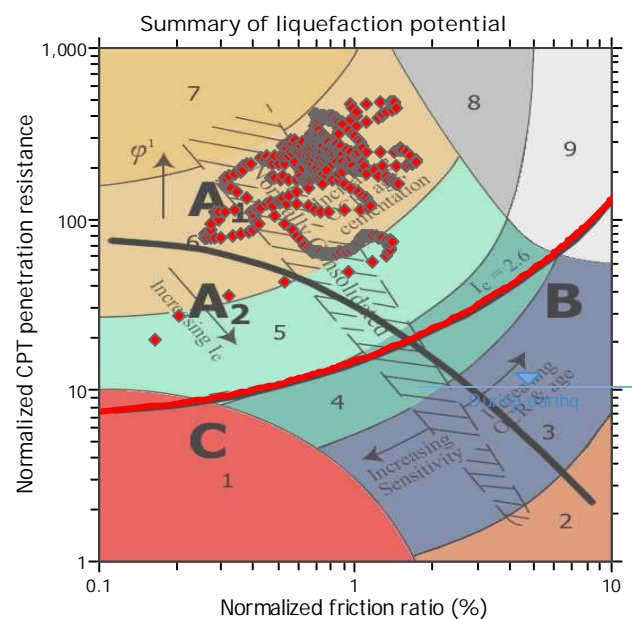
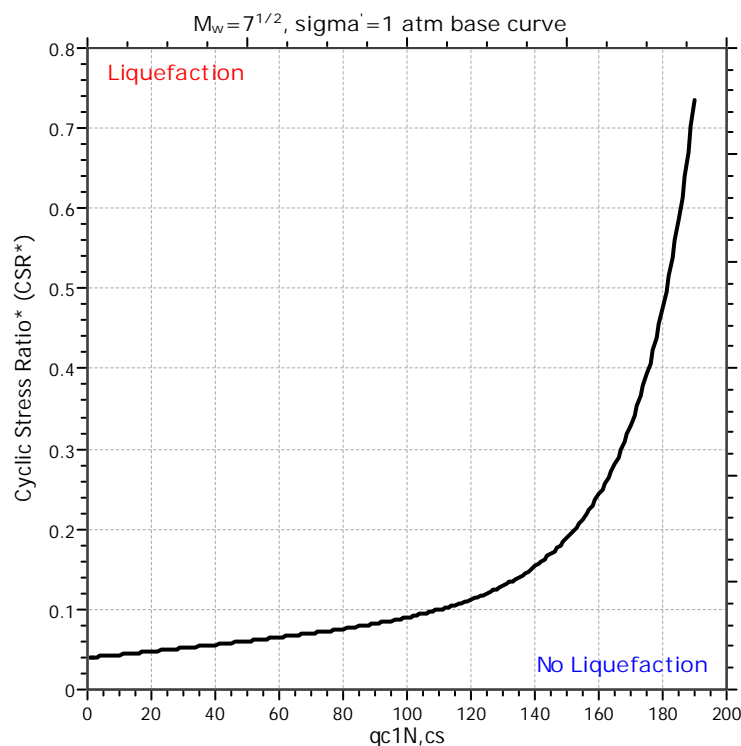
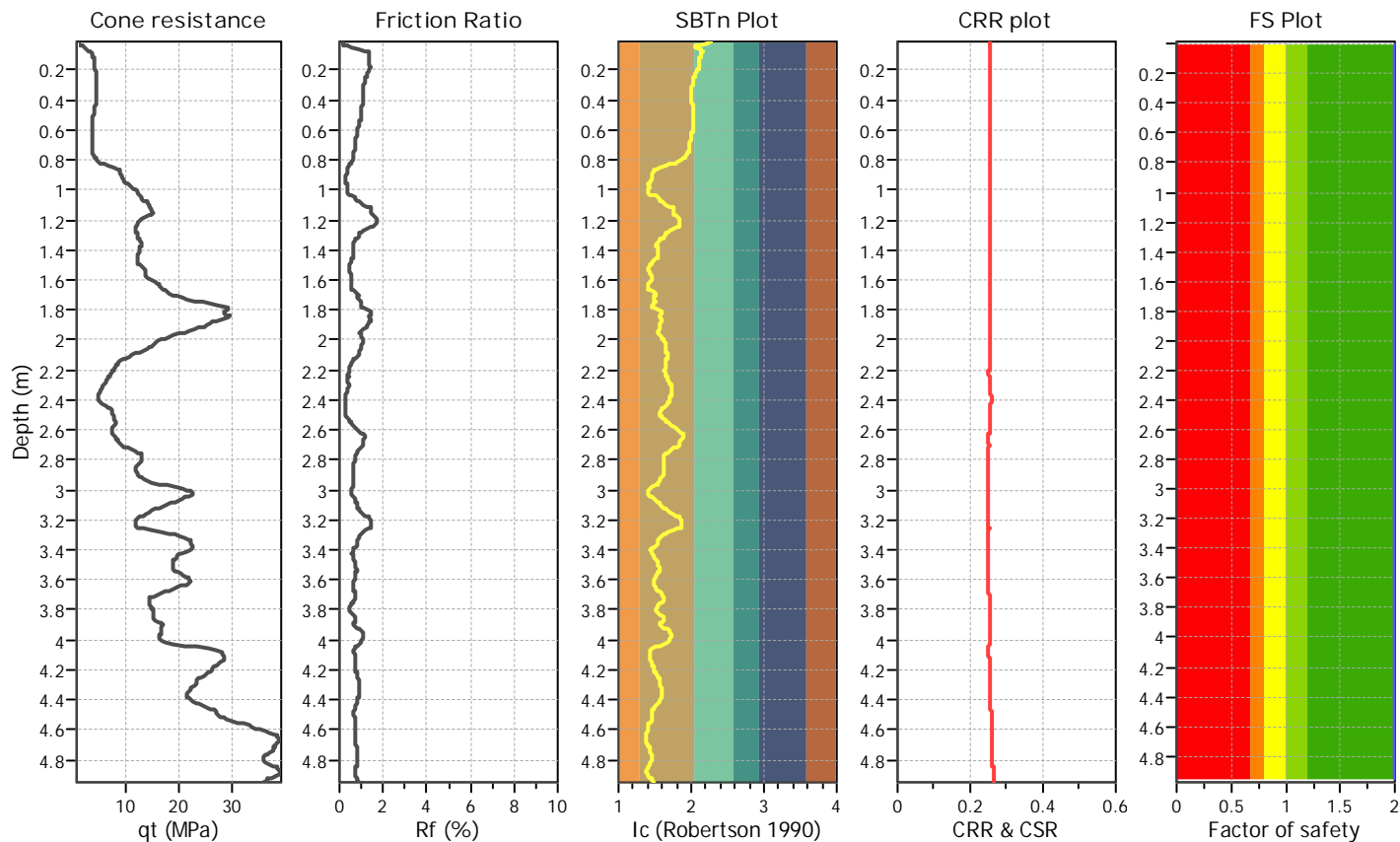
Project title :

Location :

CPT file : 8270-020_CPT008

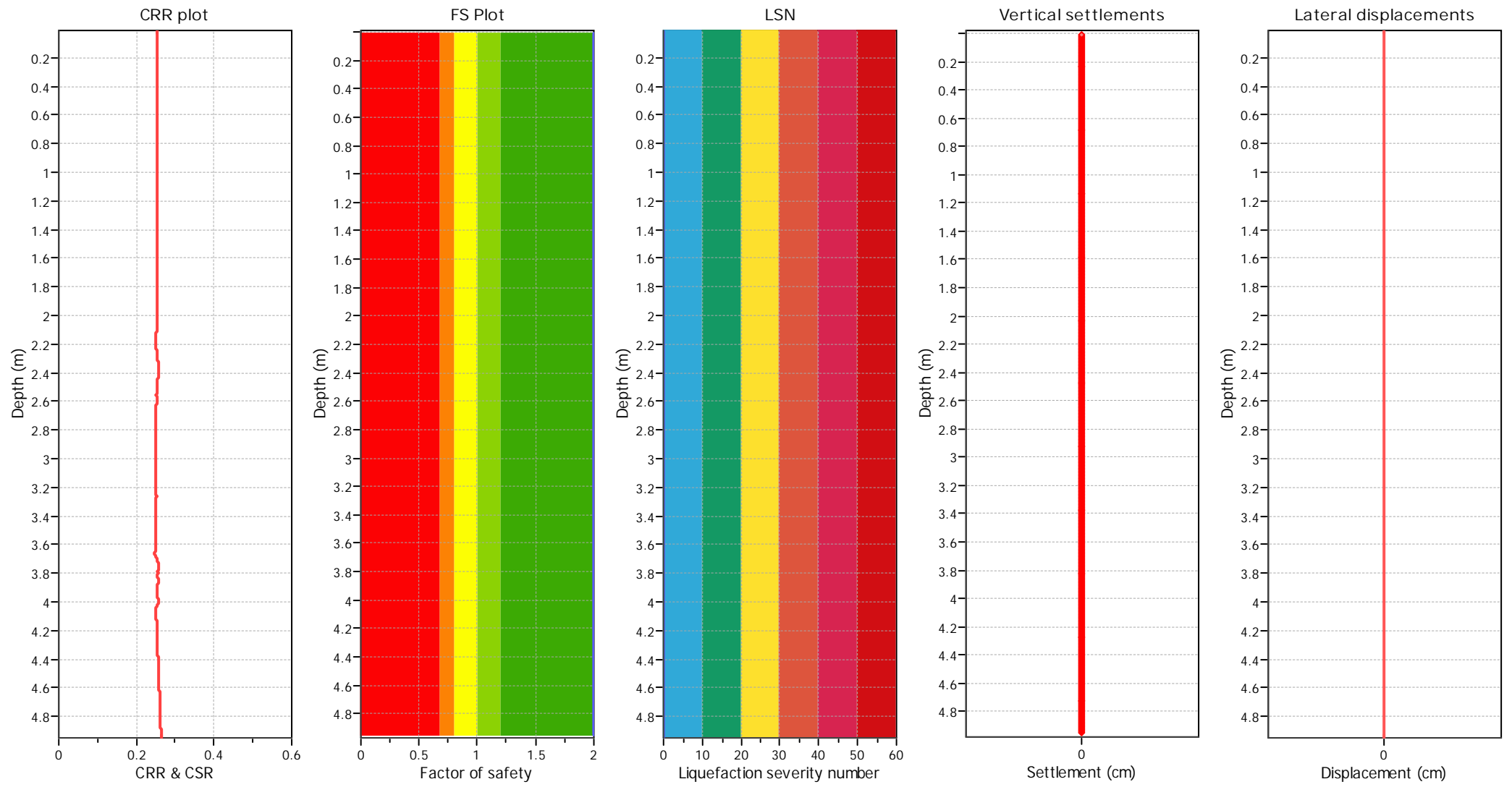
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	8.00 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 :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.00 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme			LSN color scheme		
<div></div>	Almost certain it will liquefy		<div></div>	Severe damage	
<div></div>	Very likely to liquefy		<div></div>	Major expression of liquefaction	
<div></div>	Liquefaction and no liq. are equally likely		<div></div>	Moderate to severe exp. of liquefaction	
<div></div>	Unlike to liquefy		<div></div>	Moderate expression of liquefaction	
<div></div>	Almost certain it will not liquefy		<div></div>	Minor expression of liquefaction	
			<div></div>	Little to no expression of liquefaction	

LIQUEFACTION ANALYSIS REPORT

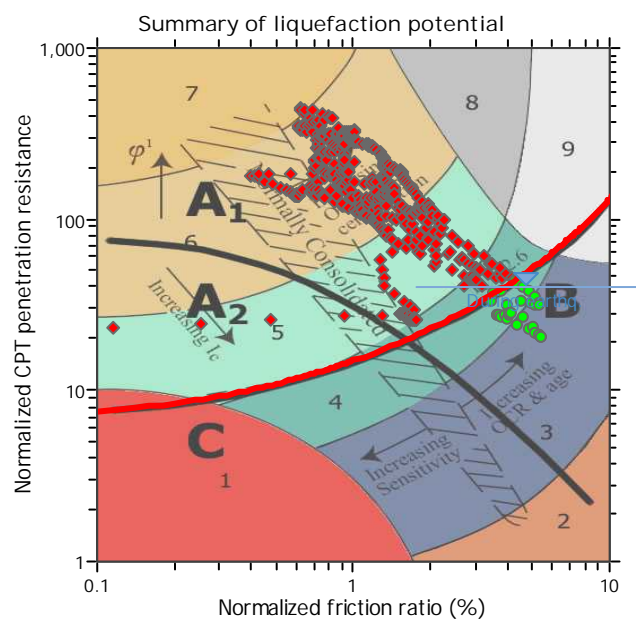
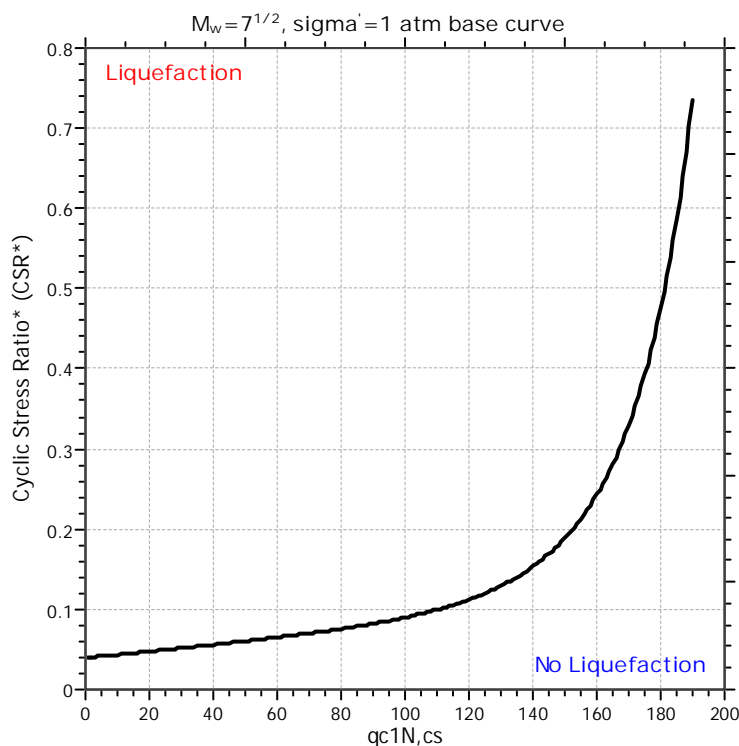
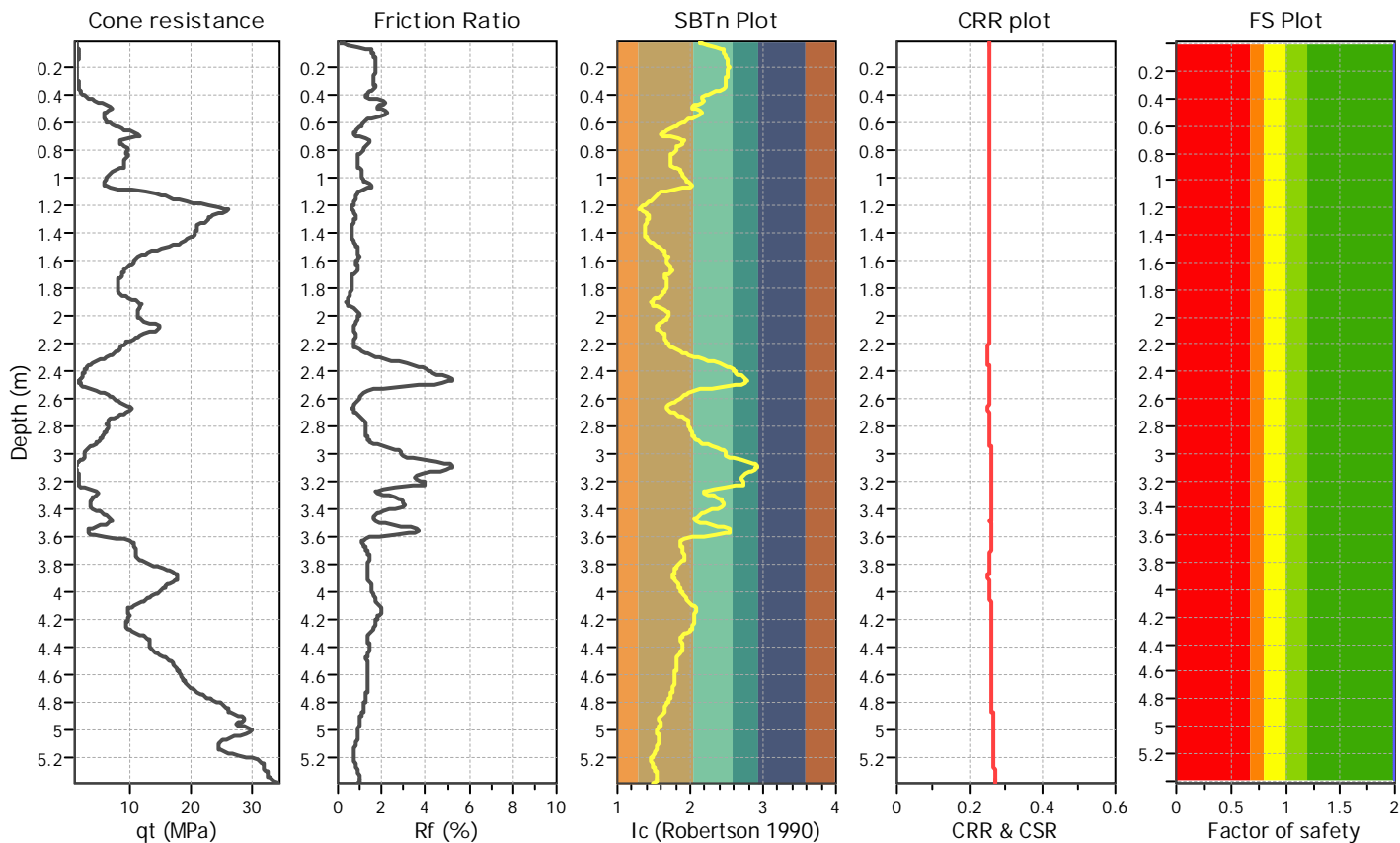
Project title :

Location :

CPT file : 8270-020_CPT009

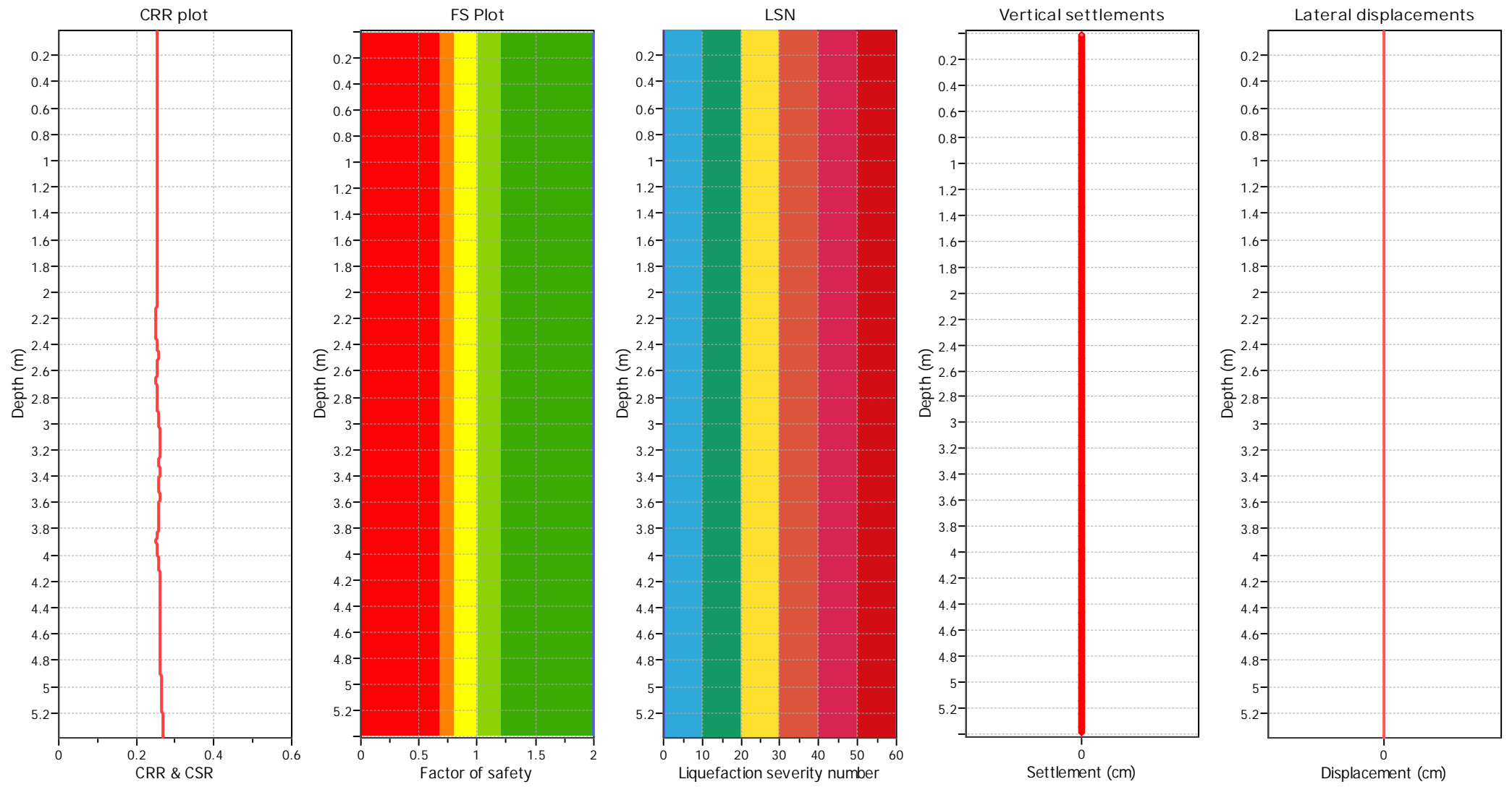
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	8.00 m	Fill weight:	N/A	F.S. color scheme		LSN color scheme	
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No	Almost certain it will liquefy	Red	Severe damage	Red
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_0 applied:	Yes	Very likely to liquefy	Orange	Major expression of liquefaction	Red
Earthquake magnitude M_w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only	Liquefaction and no liq. are equally likely	Yellow	Moderate to severe exp. of liquefaction	Red
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No	Unlike to liquefy	Green	Moderate expression of liquefaction	Yellow
Depth to water table (insitu):	8.00 m	Fill height:	N/A	Limit depth:	N/A	Almost certain it will not liquefy	Dark Green	Minor expression of liquefaction	Green
								Little to no expression of liquefaction	Blue

LIQUEFACTION ANALYSIS REPORT

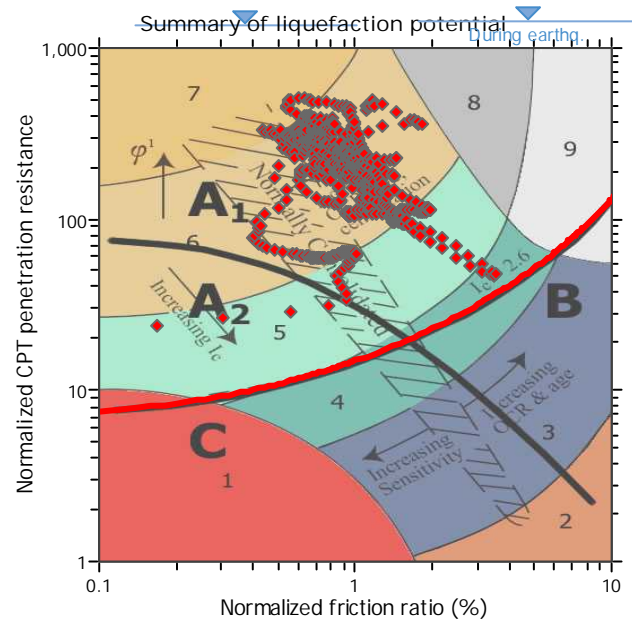
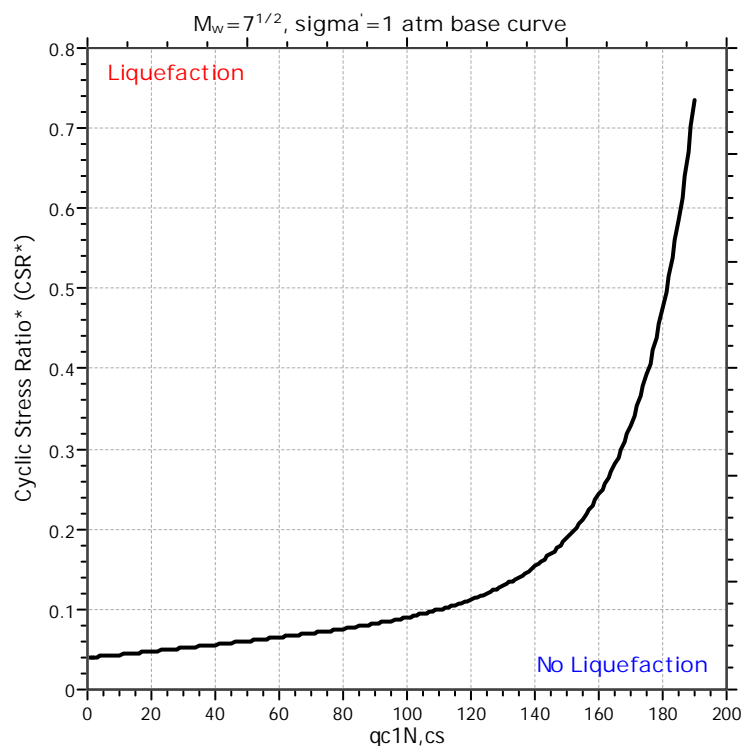
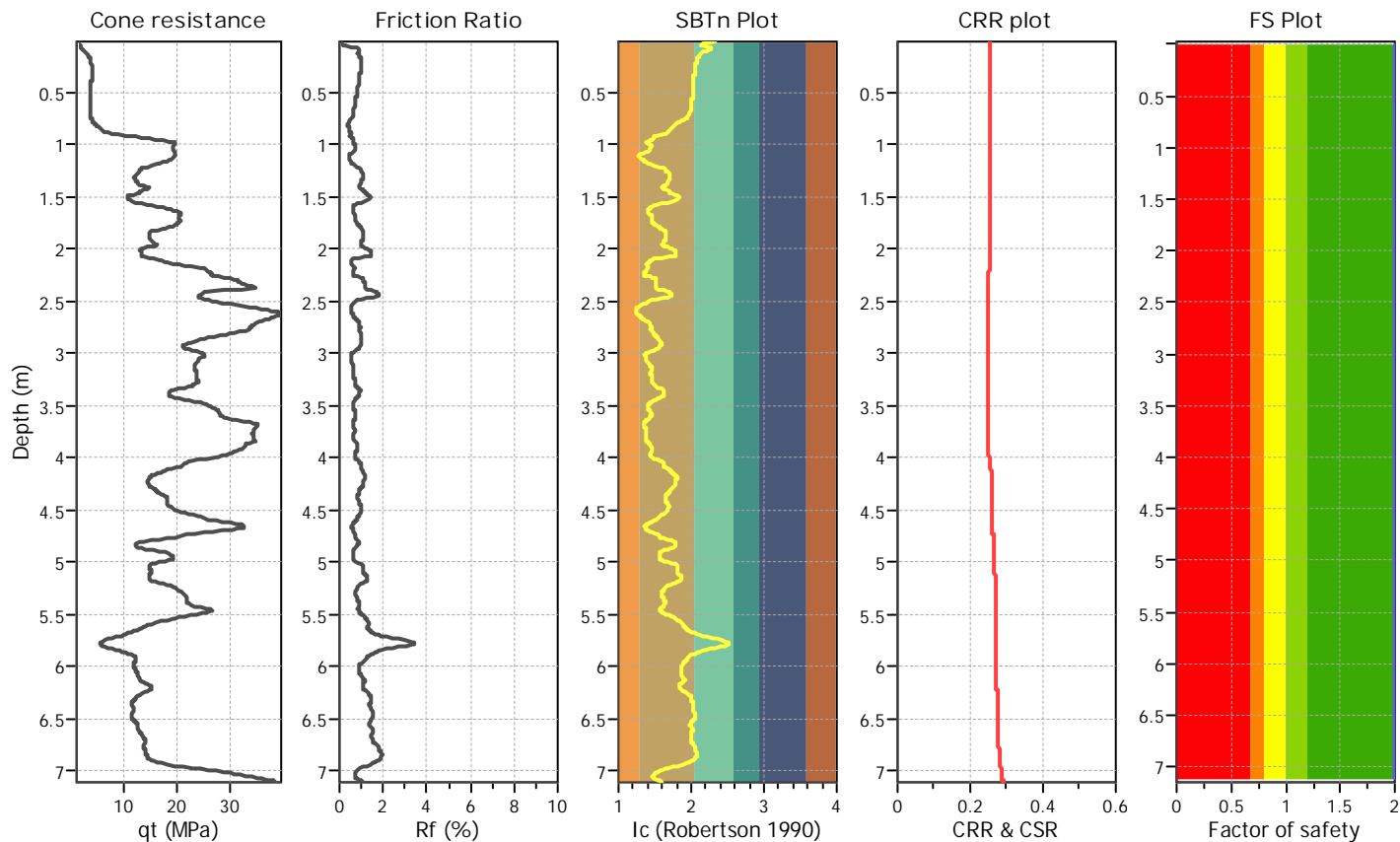
Project title :

Location :

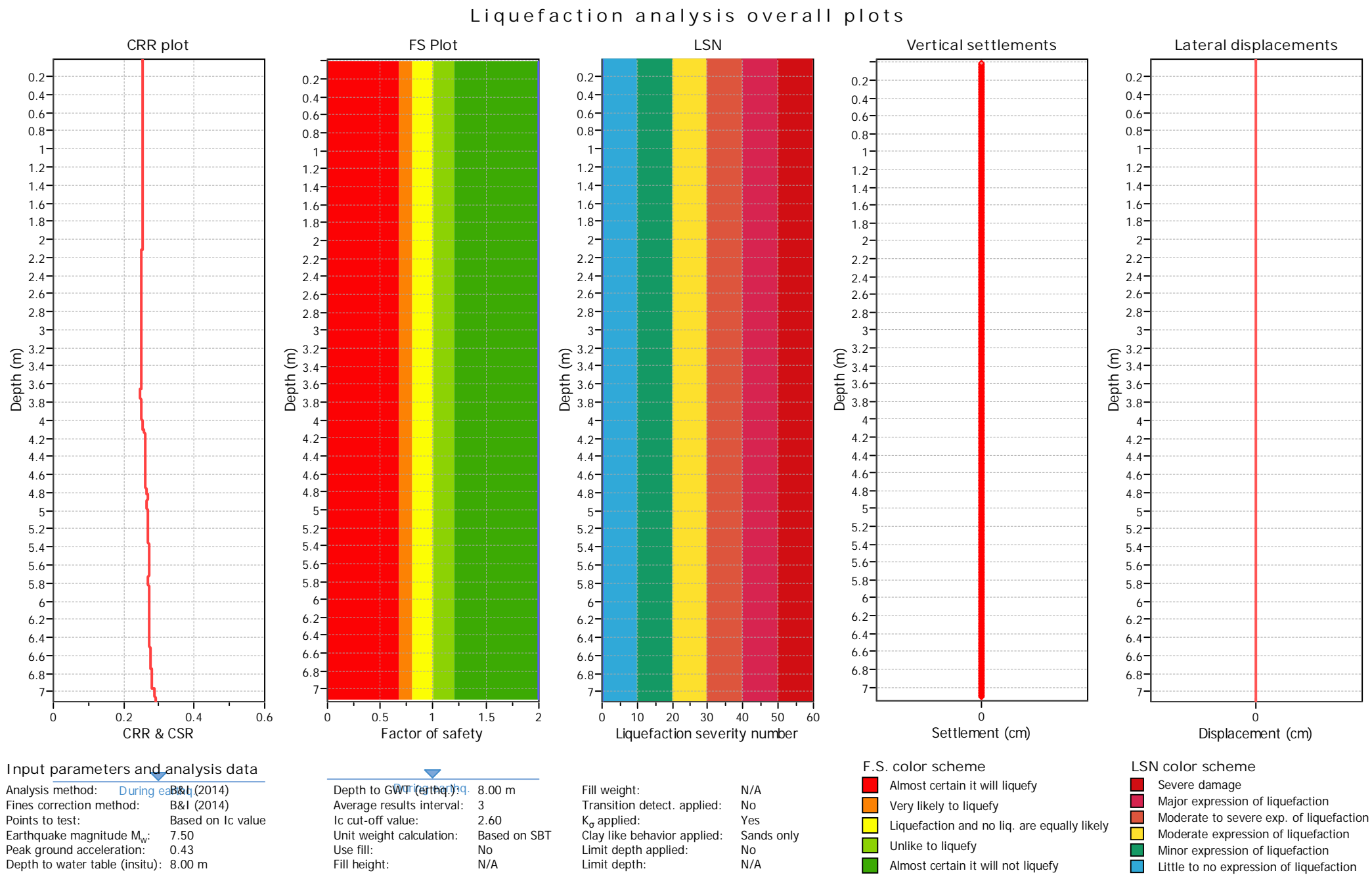
CPT file : 8270-020_CPT010

Input parameters and analysis data

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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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 REPORT

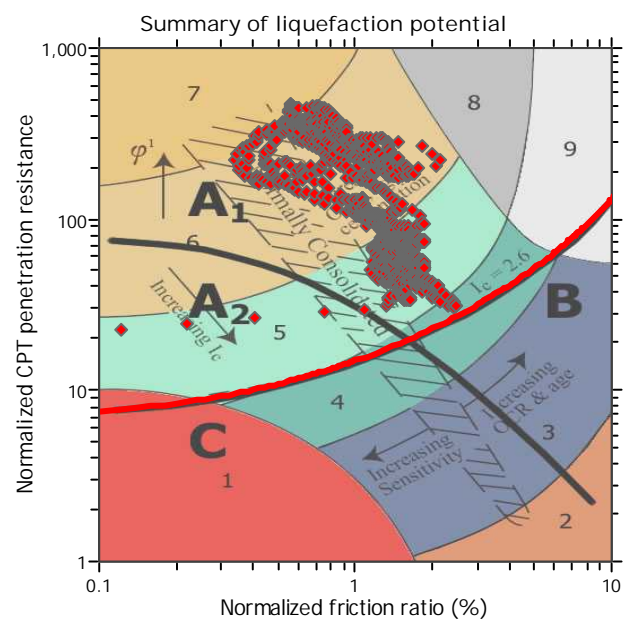
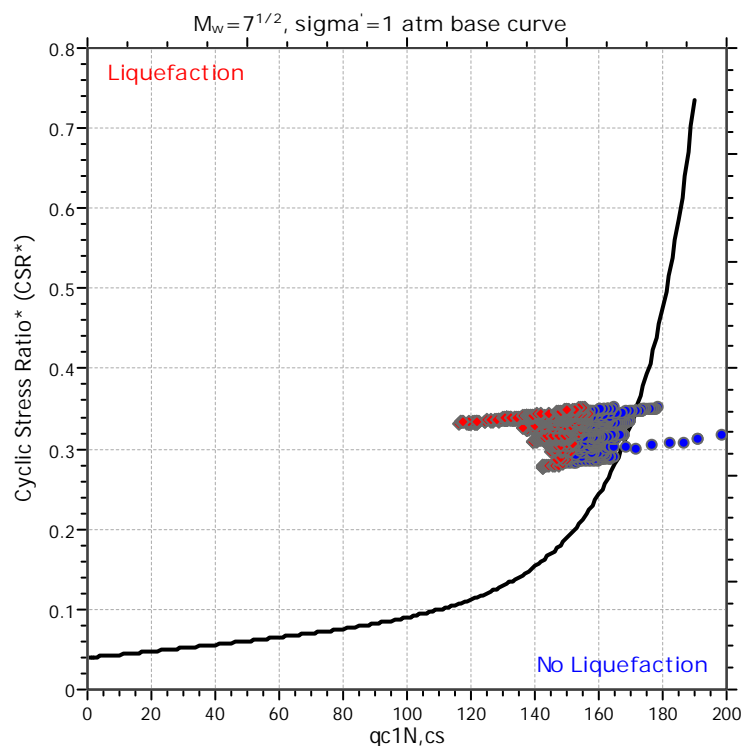
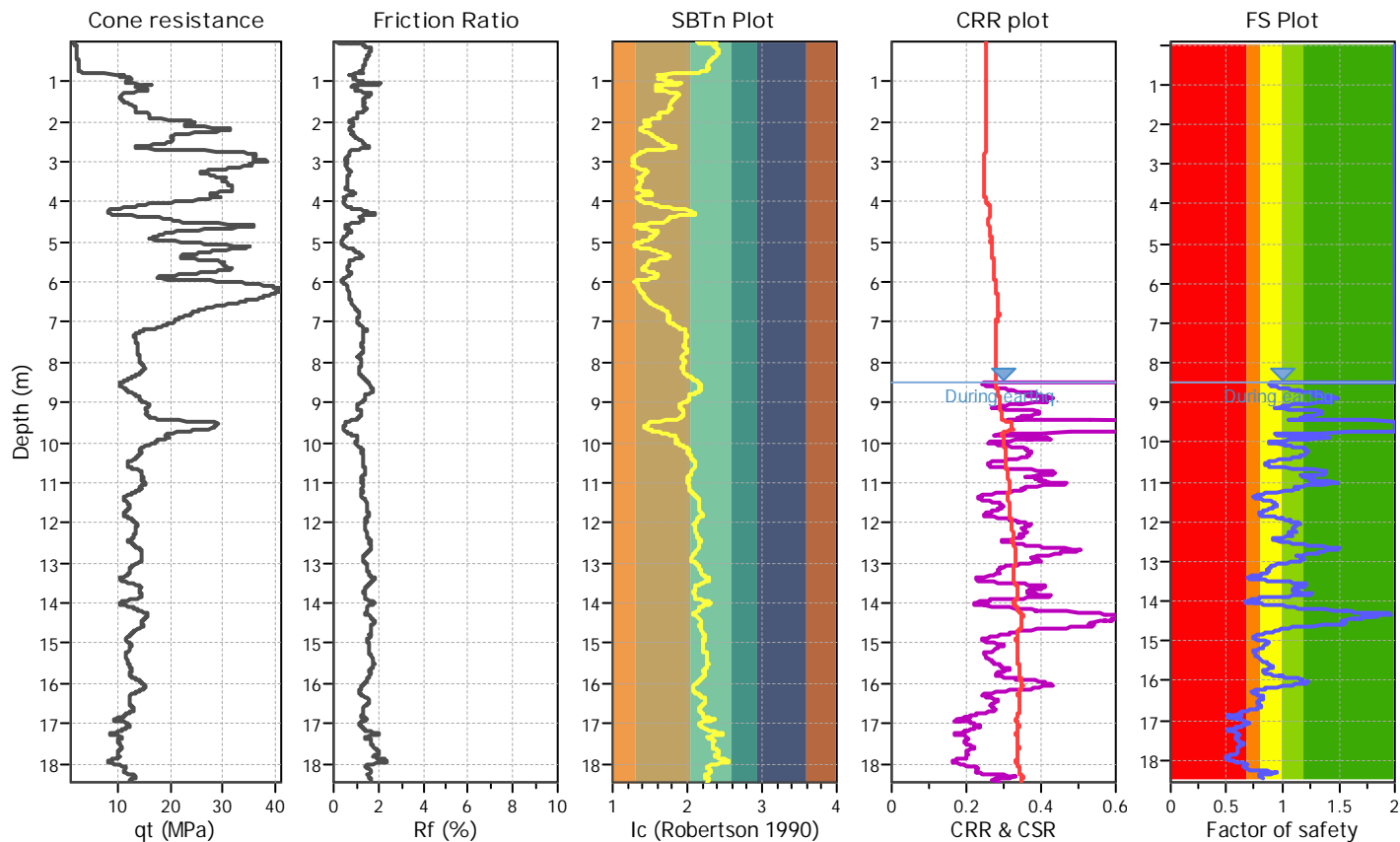
Project title :

Location :

CPT file : 8270-020_CPT011

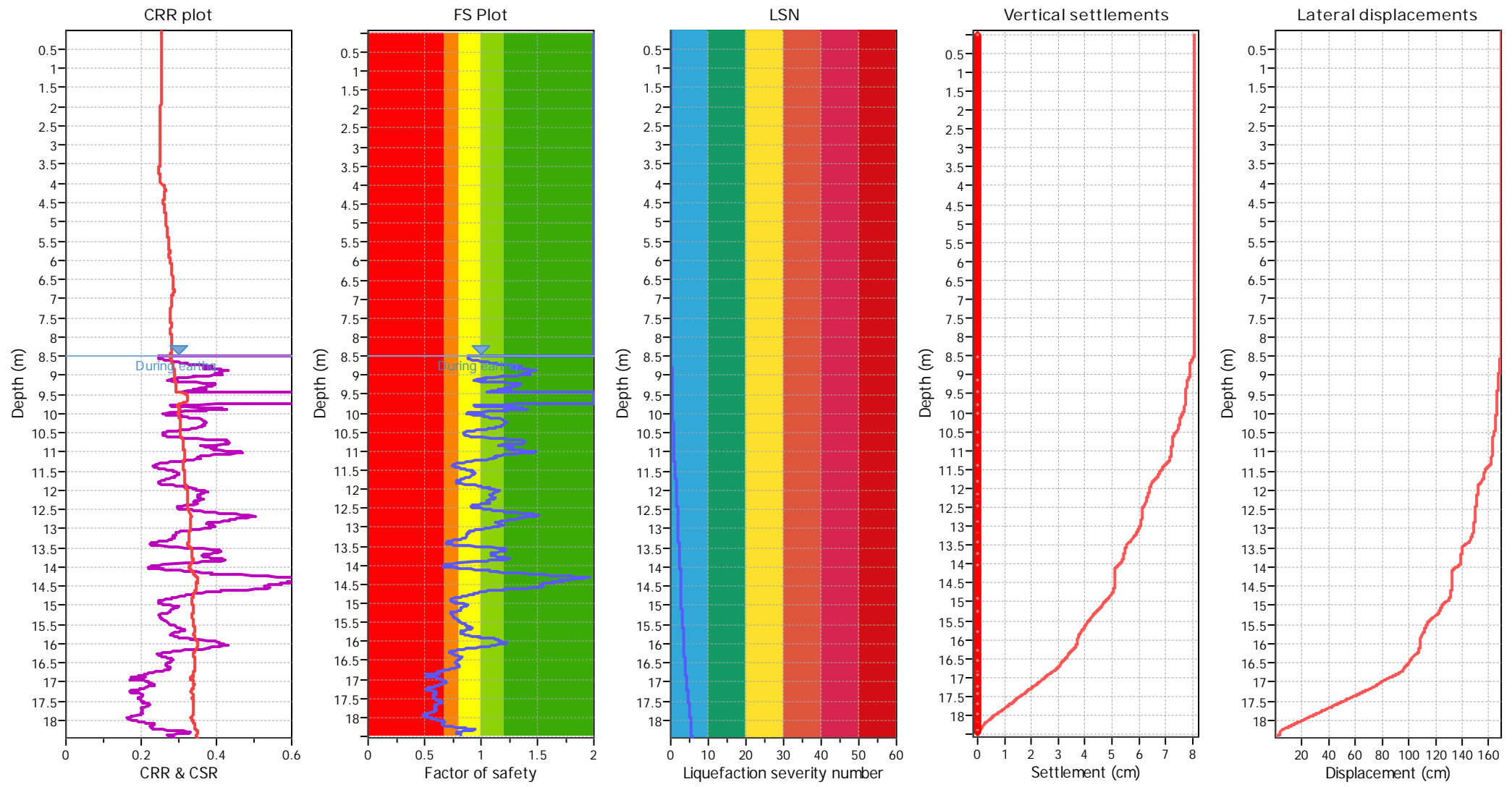
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	8.50 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 :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.50 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

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

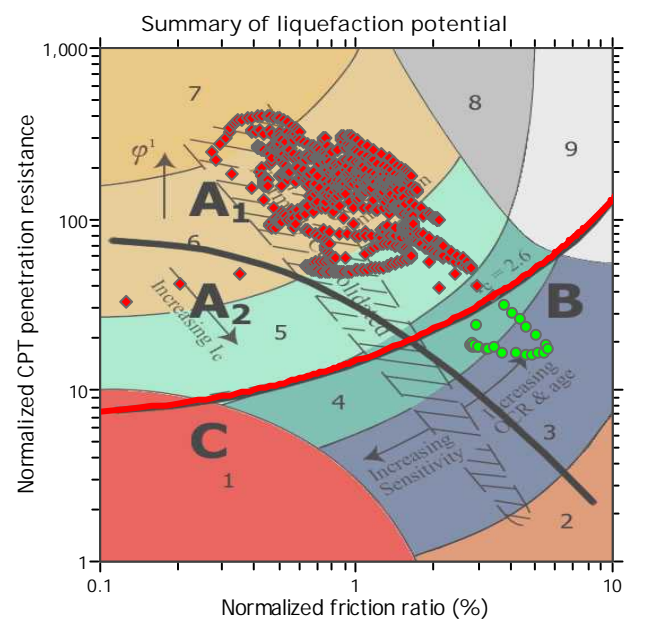
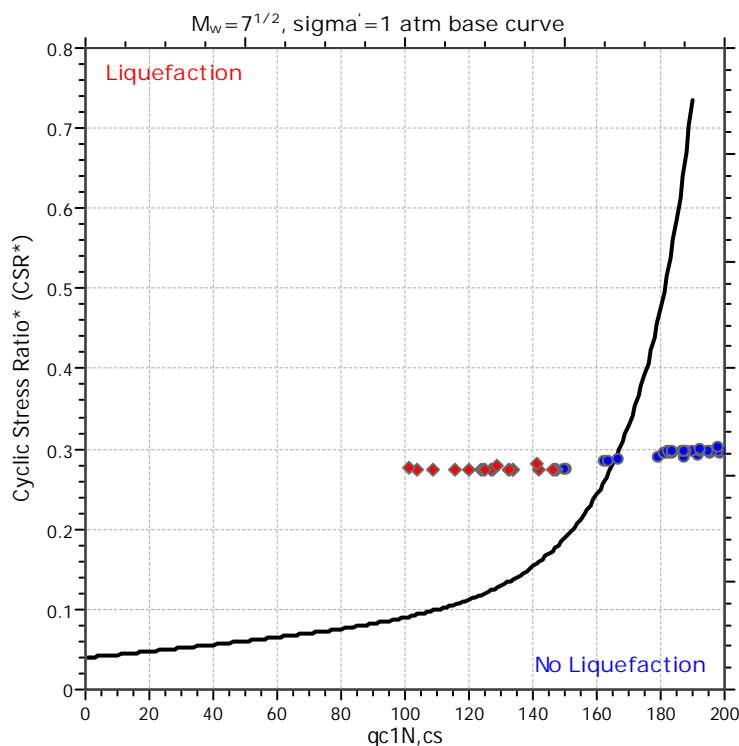
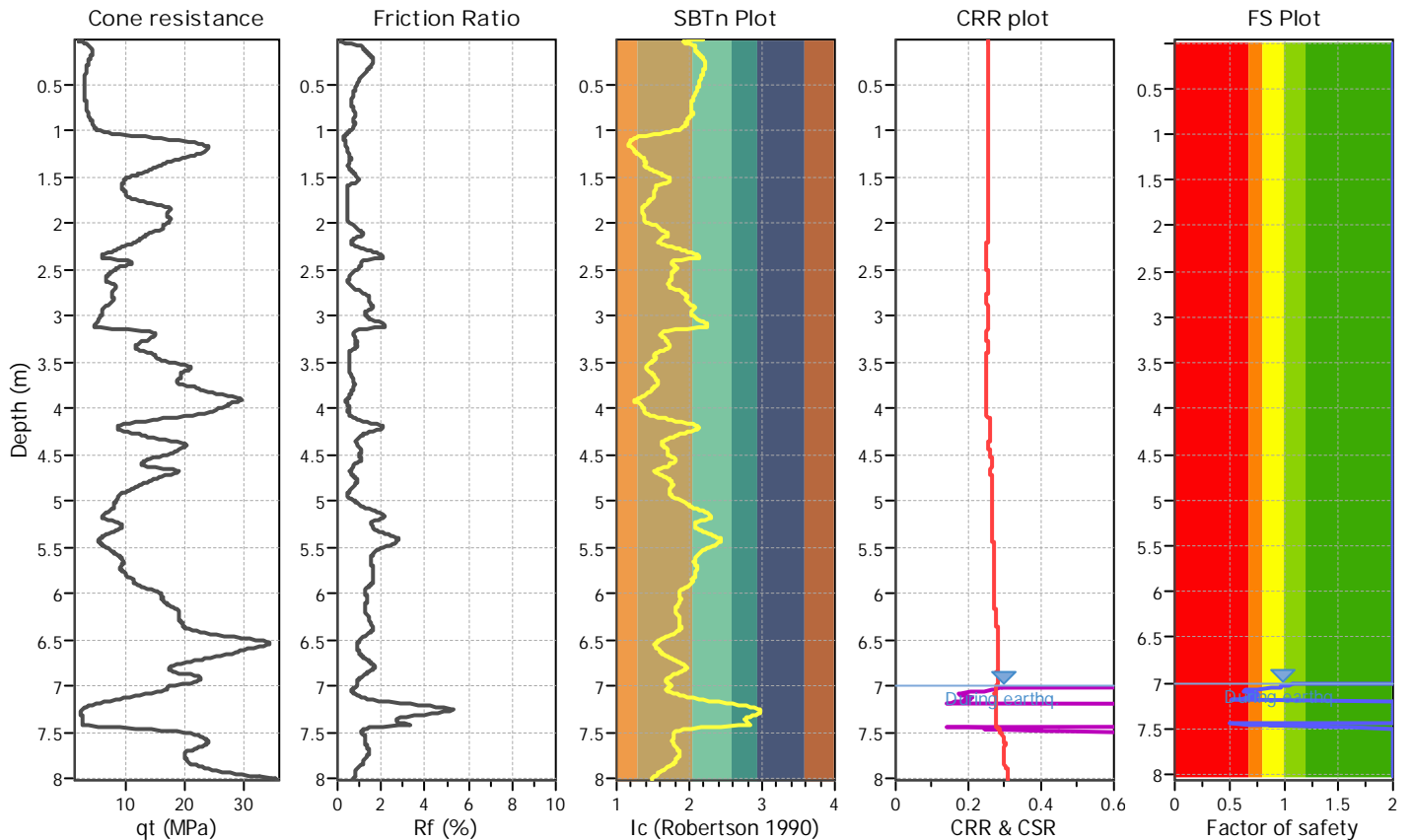
Project title :

Location :

CPT file : 8270-020_CPT012

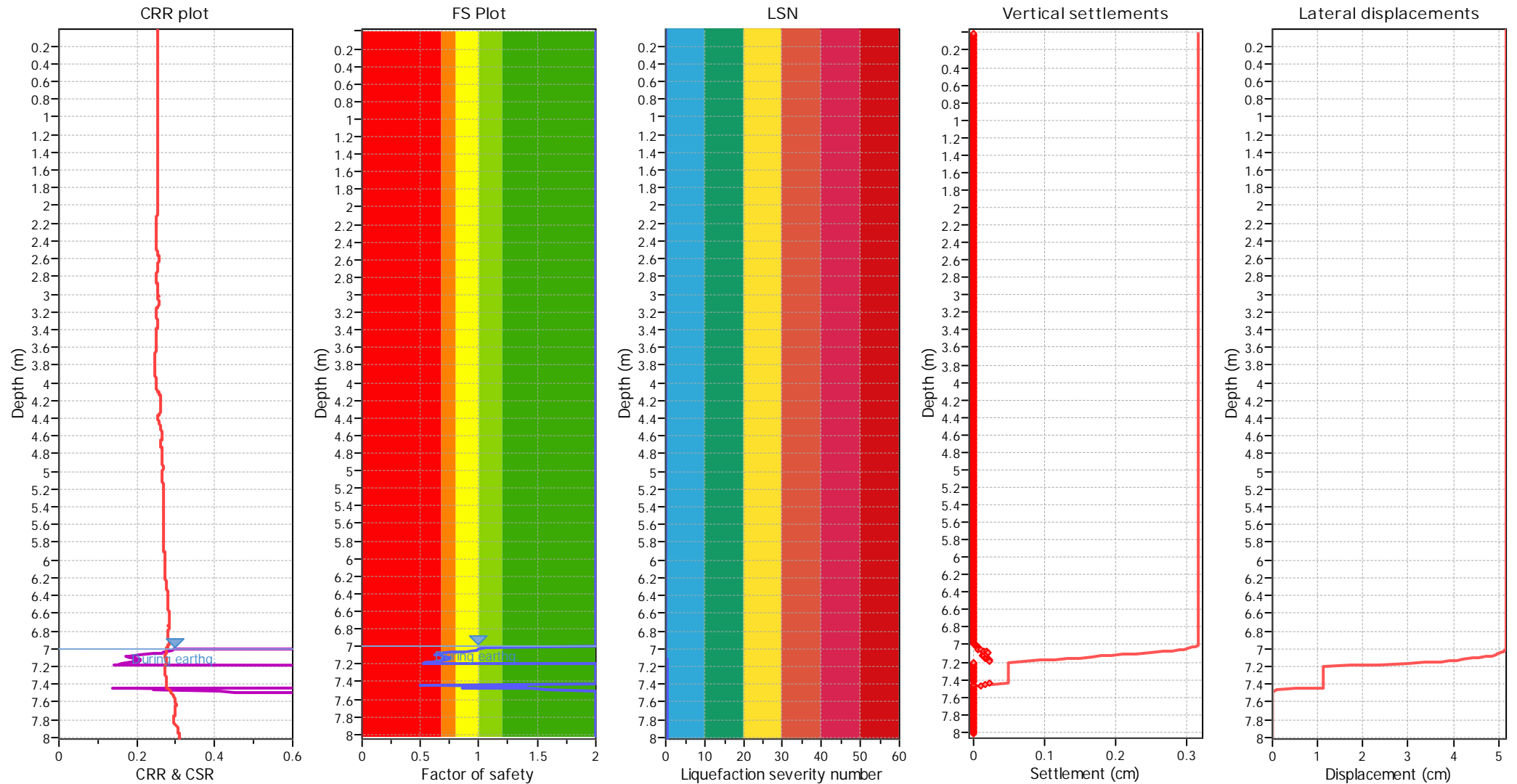
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	7.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	7.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_0 applied:	Yes		



Zone A1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	7.00 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 ₀ applied:	Yes
Earthquake magnitude M _w :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	7.00 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

LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

LIQUEFACTION ANALYSIS REPORT

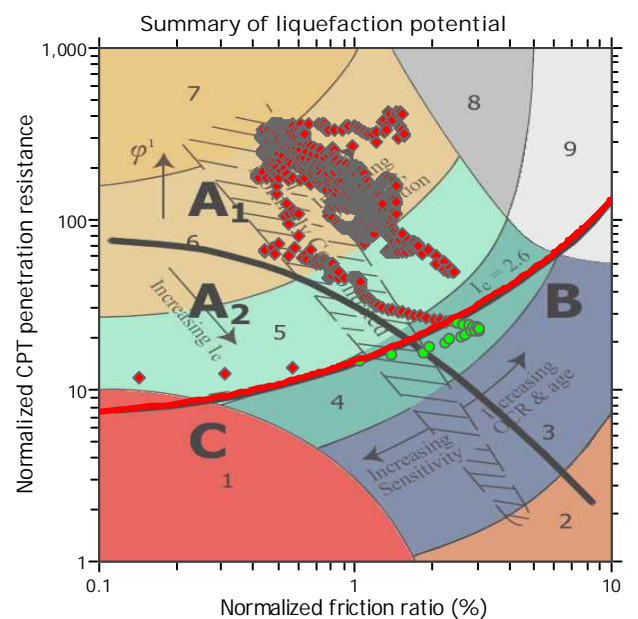
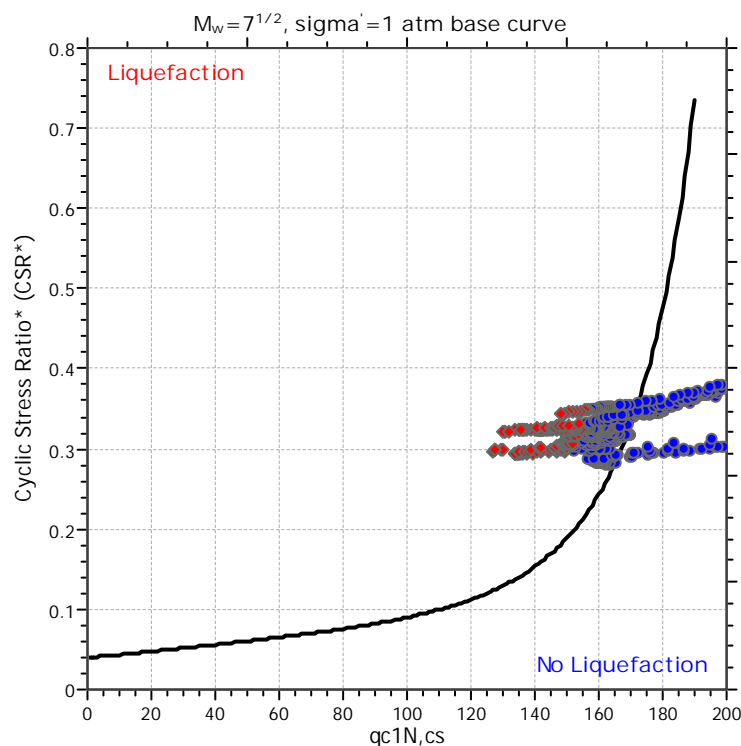
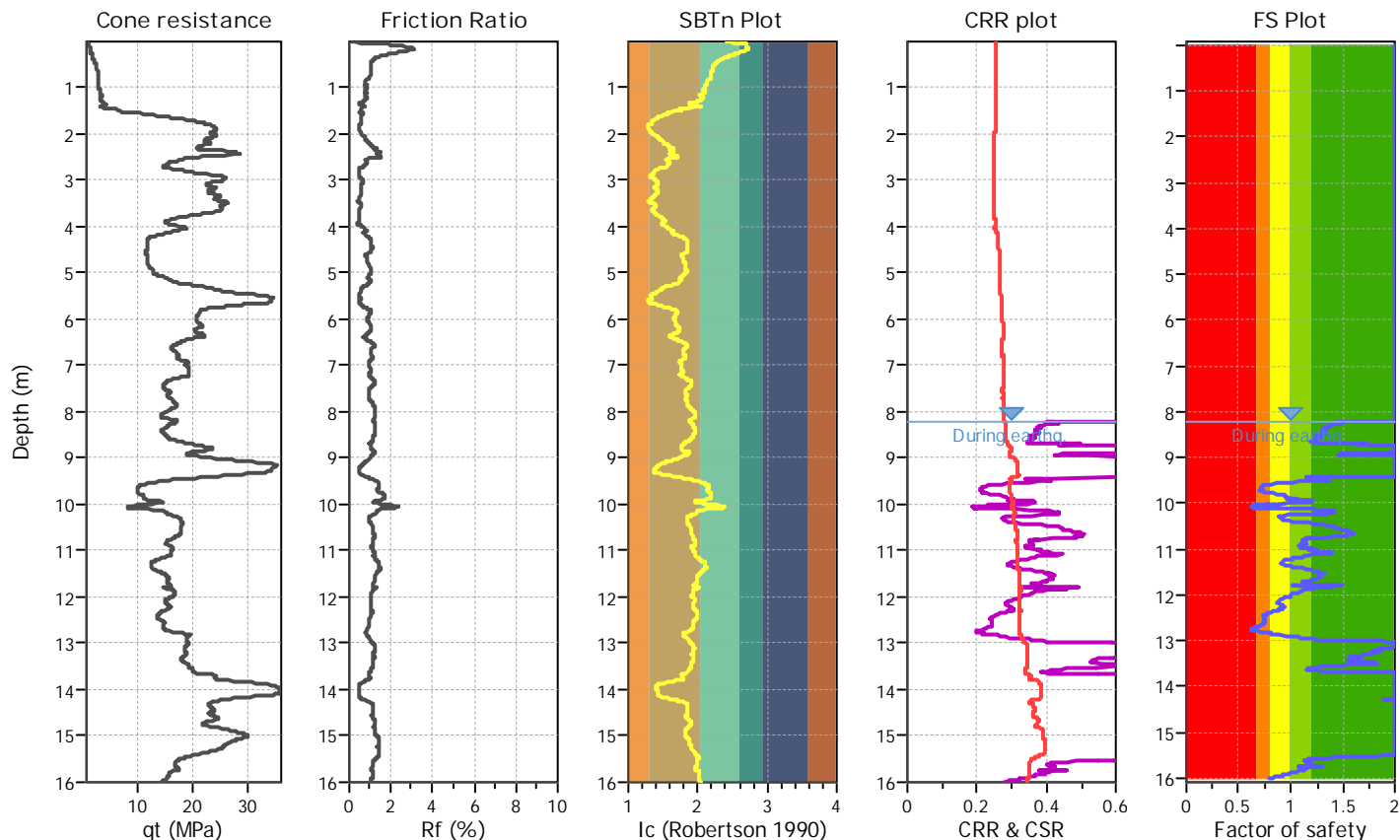
Project title :

Location :

CPT file : 8270-020_CPT013

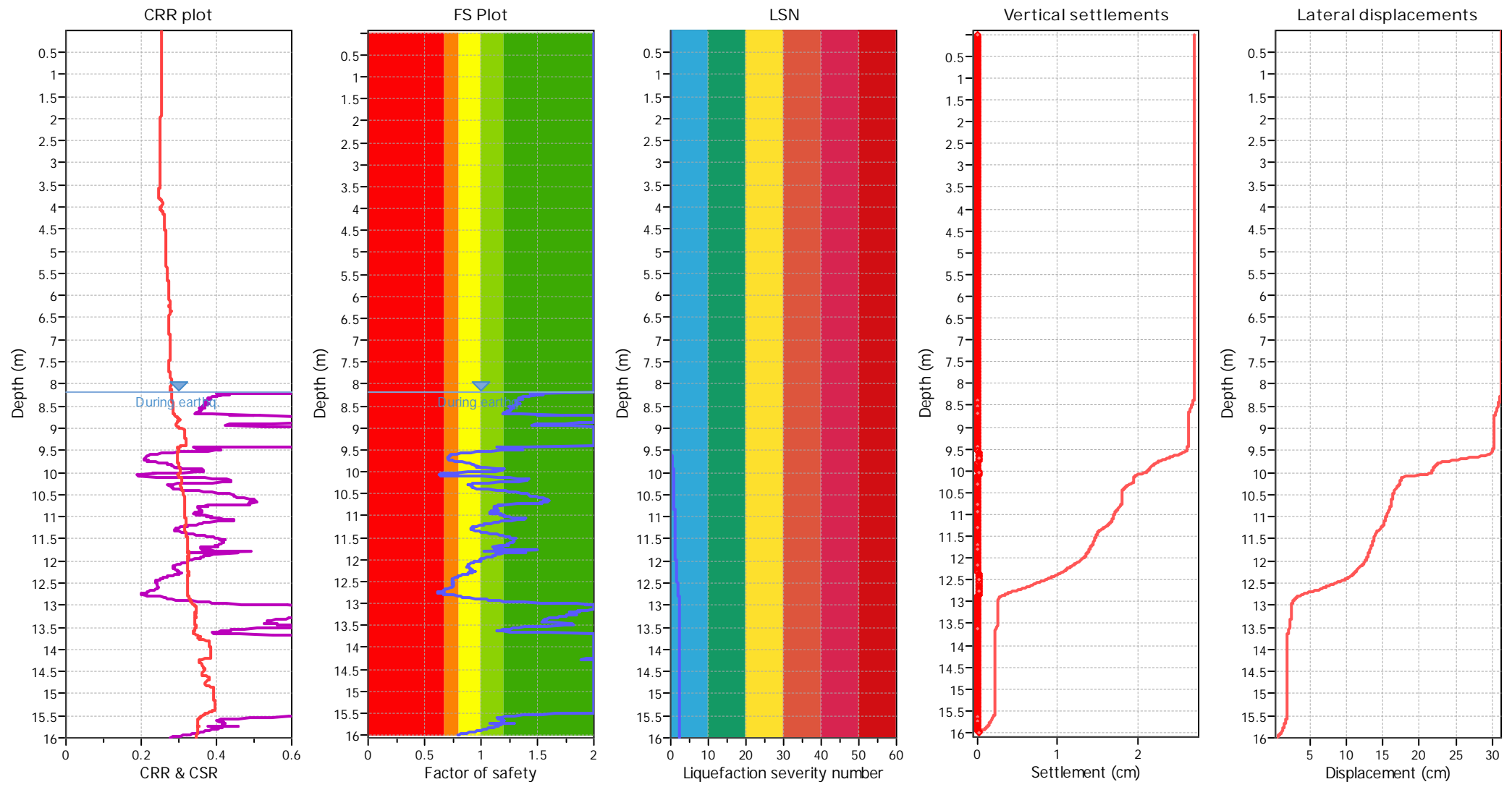
Input parameters and analysis data

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Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 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:	B&I (2014)	Depth to GWT (erthq.):	8.20 m	Fill weight:	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	LSN color scheme ■ Severe damage ■ Major expression of liquefaction ■ Moderate to severe exp. of liquefaction ■ Moderate expression of liquefaction ■ Minor expression of liquefaction ■ Little to no expression of liquefaction
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 :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only		
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No		
Depth to water table (insitu):	8.20 m	Fill height:	N/A	Limit depth:	N/A		

LIQUEFACTION ANALYSIS REPORT

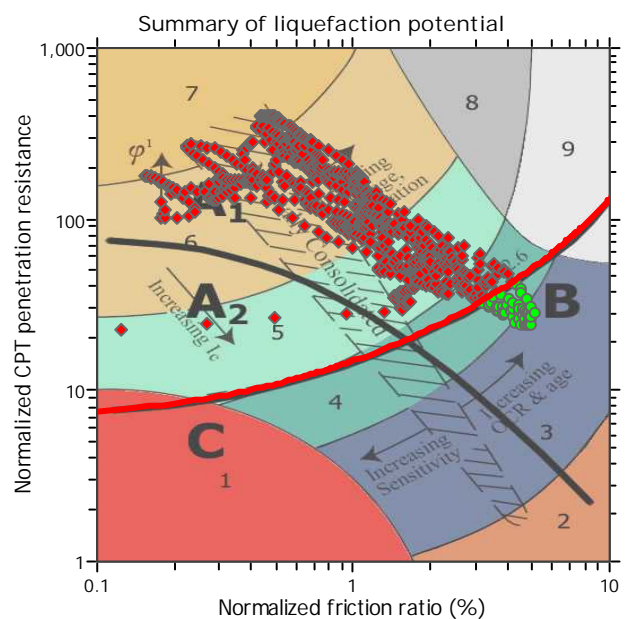
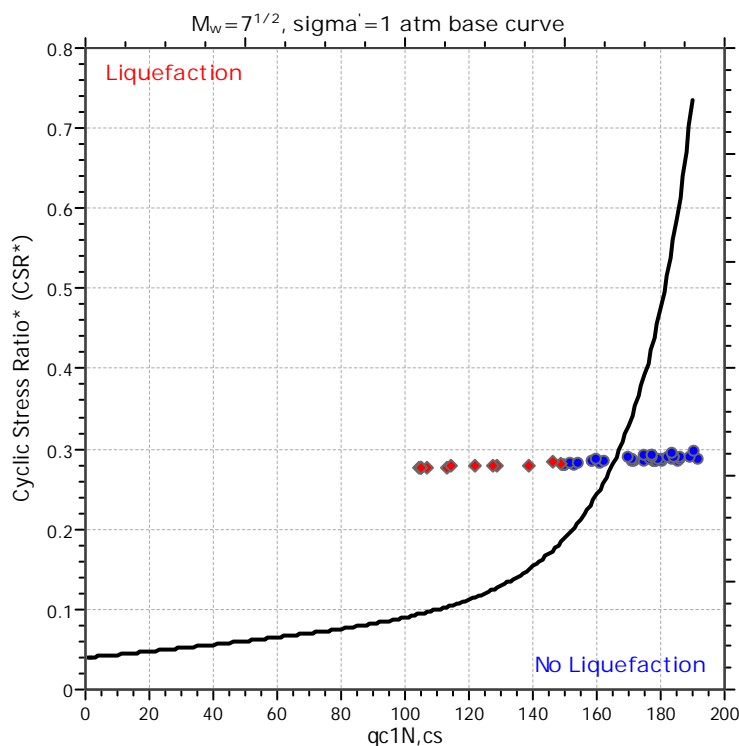
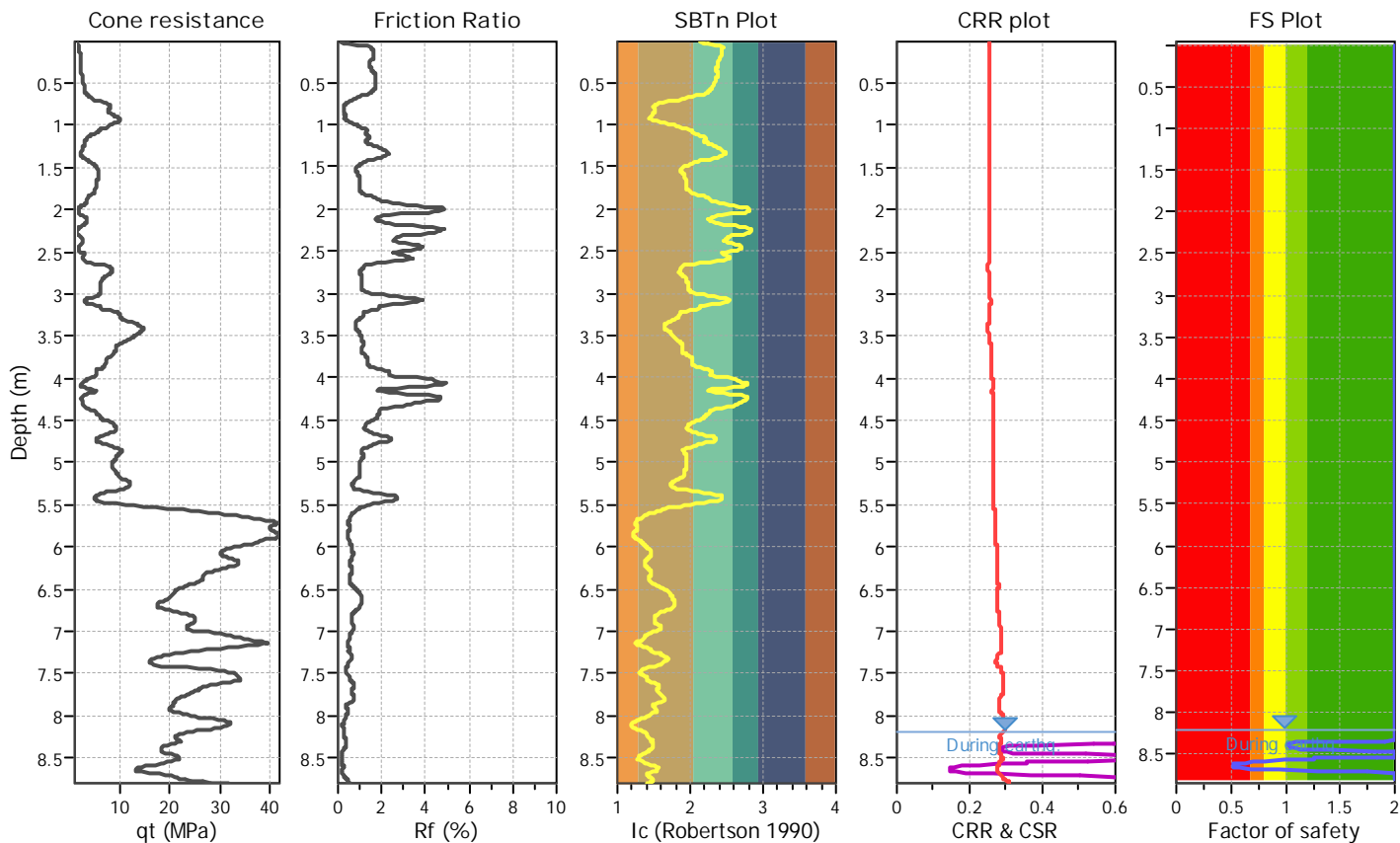
Project title :

Location :

CPT file : 8270-020_CPT014

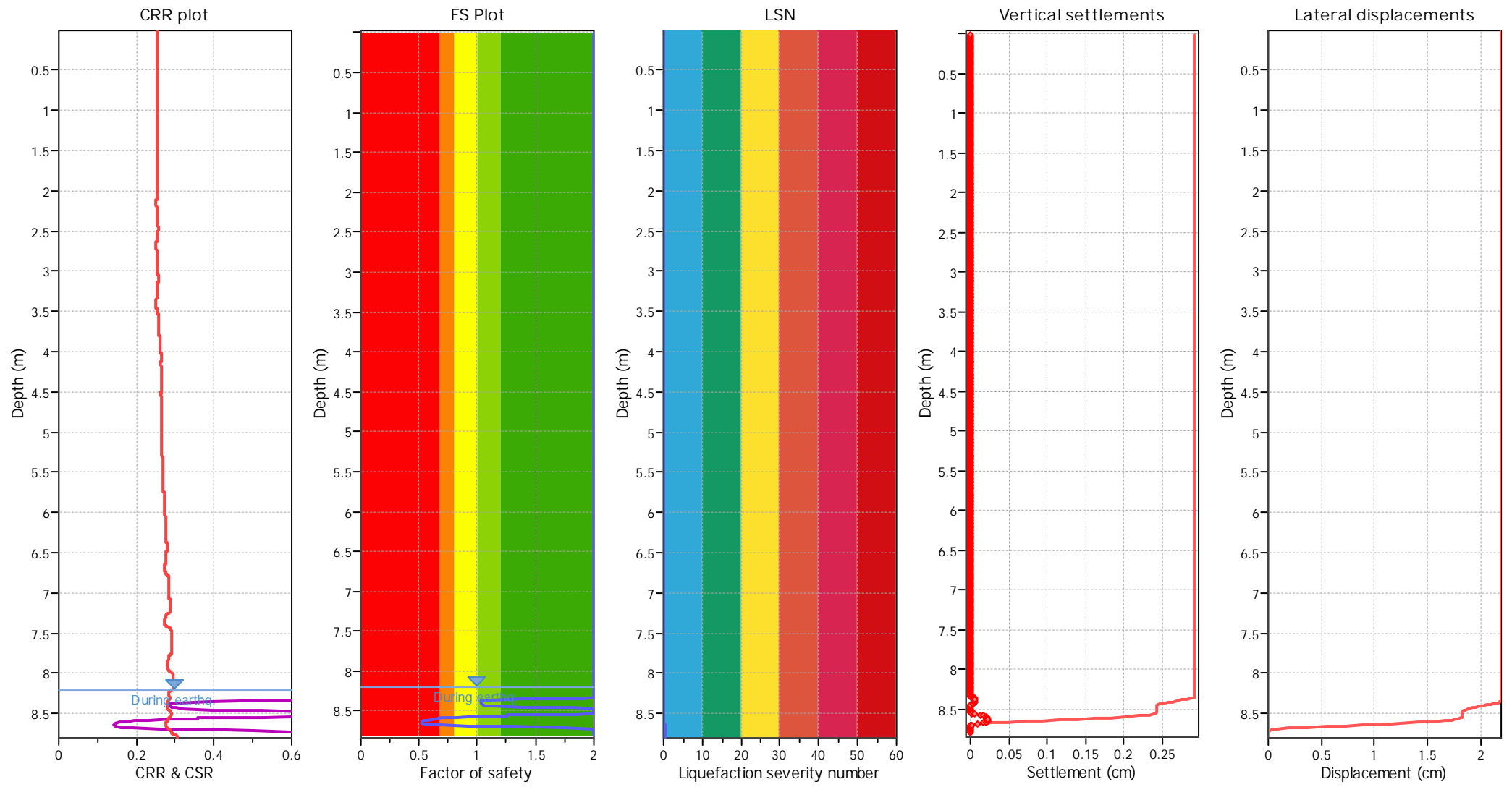
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	8.20 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_g applied:	Yes		



Zone A1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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:	B&I (2014)	Depth to GWT (erthq.):	8.20 m	Fill weight:	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	LSN color scheme Severe damage Major expression of liquefaction Moderate to severe exp. of liquefaction Moderate expression of liquefaction Minor expression of liquefaction Little to no expression of liquefaction
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 :	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only		
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No		
Depth to water table (insitu):	8.20 m	Fill height:	N/A	Limit depth:	N/A		