APPENDIX D: HAND AUGER LOGS

HAND AUGER BOREHOLE LOG - HA25-01

Client: Maven Associates Ltd
Project: Station Road
Site Location: Station Road, Matamata
Project No.: HAM2023-0124
Date: 30/09/2025
Borehole Location: Refer to Site Plan Logged by: LA Checked by: BM Scale: 1:25 Sheet 1 of 1

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Position: 486817.2mE; 694818.6mN Projection: Mount Eden 2000
Datum: Moturiki 1953 Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit))	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
				0		OL: Organic SILT: dark brown. No plasticity. (Topsoil)	M		1, 1
	0.3	Peak = 63kPa				ML: Silty CLAY: brown. High plasticity, quick. (Recent Alluvium)	S	St	1
	0.6	Peak = 63kPa							1, 1, 1
	0.9	Peak = 94kPa Residual = 3kPa					M		2, 2
				1		ML: SILT : light brownish grey streaked orange brown. Low plasticity, sensitive. (Recent Alluvium)		St to VSt	3, 4, 5
	1.2	Peak = 94kPa Residual = 22kPa							4
▼	1.5	Peak = 125kPa Residual = 22kPa				*... at 1.40m, becoming fine sandy silt*	S		5, 7
						Borehole terminated at 1.6 m			8, 8, 9, 13
				2					11, 9, 11, 10, 11, 13, 17, 17, 20
				3					
				4					
				5					

Termination Reason: Equiment refusal.
Shear Vane No: 1911 DCP No: 27
Remarks: Groundwater encountered at 1.5m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

HAND AUGER BOREHOLE LOG - HA25-02

Client: Maven Associates Ltd
Project: Station Road
Site Location: Station Road, Matamata
Project No.: HAM2023-0124
Date: 30/09/2025
Borehole Location: Refer to Site Plan Logged by: LA Checked by: BM Scale: 1:25 Sheet 1 of 1

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Position: 486830.9mE; 694767.3mN Projection: Mount Eden 2000
Datum: Moturiki 1953 Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
				0		OL: Organic SILT: dark brown. No plasticity. (Topsoil)			1
									1
									1
									2
	0.5	Peak = 97kPa Residual = 3kPa				CH: Silty CLAY: with trace sand. Light greyish brown. High plasticity, quick. (Recent Alluvium)		St	1
									2
						ML: SILT: with minor fine sand. Light brownish grey streaked light greyish brown. Low plasticity, quick. (Recent Alluvium)	M		2
									1
	0.9	Peak = 157kPa Residual = 9kPa							3
				1					2
								VSt to H	6
	1.2	Peak = UTP							5
									5
						... at 1.30m, becoming fine sandy silt.	W		5
▼									4
						SP: Silty fine SAND: light grey. Pòorly graded, subrounded. (Hinuera Formation)	S	MD	6
									7
						Borehole terminated at 1.7 m			6
									6
									7
				2					10
									11
									11
									16
									13
									13
									16
									13
									17
									7
				3					11
									7
									9
									10
									10
									12
									14
									12
									15
									9
				4					16
									12
									10
									13
									13
									16
				5					

Termination Reason: Hole collapse
Shear Vane No: 1911 DCP No: 27
Remarks: Groundwater encountered. at 1.5m

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

HAND AUGER BOREHOLE LOG - HA25-03

Client: Maven Associates Ltd
Project: Station Road
Site Location: Station Road, Matamata
Project No.: HAM2023-0124
Date: 30/09/2025
Borehole Location: Refer to Site Plan Logged by: LA Checked by: BM Scale: 1:25 Sheet 1 of 1

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Position: 486813.8mE; 694711.5mN Projection: Mount Eden 2000
Datum: Moturiki 1953 Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit))	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
						OL: Organic SILT: dark brown. No plasticity. (Topsoil)			1, 2, 2
	0.3	Peak = 31kPa				ML: Clayey SILT: brown. Low plasticity, sensitive to extra sensitive. (Recent Alluvium)	M		
	0.6	Peak = 78kPa Residual = 6kPa							1, 1, 1
	0.9	Peak = 66kPa Residual = 16kPa		1			W	St	1, 1, 3
▼	1.2	Peak = 100kPa Residual = 19kPa					S		5, 6, 7
						SP: Silty fine SAND: light brownish grey streaked light orange brown. Poorly graded, subrounded. (Hinuera Formation)		MD	7, 7, 7, 5, 7, 6
	2.0	Peak = UTP		2		ML: SILT: light grey. Low plasticity. (Hinuera Formation)		H	9, 13, 13
						Borehole terminated at 2.2 m			8, 8, 8, 7, 5, 4, 4, 7
				3					8, 7, 8, 9, 11, 10, 10, 6, 4, 9
				4					10, 11, 8, 10, 11, 10, 12, 8, 6
				5					

Termination Reason: Hole collapse
Shear Vane No: 1911 DCP No: 34
Remarks: Groundwater encountered encountered at 1.1m

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

HAND AUGER BOREHOLE LOG - HA25-04

Client: Maven Associates Ltd
Project: Station Road
Site Location: Station Road, Matamata
Project No.: HAM2023-0124
Date: 01/10/2025
Borehole Location: Refer to Site Plan Logged by: LA Checked by: BM Scale: 1:25 Sheet 1 of 1

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Position: 487051.5mE; 695042.2mN Projection: Mount Eden 2000
Datum: Moturiki 1953 Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
				0		OL: Organic SILT: dark brown. No plasticity. (Topsoil)			1, 1
	0.3	Peak = 66kPa Residual = 3kPa				ML: SILT: with minor sand. Light brownish grey streaked light orange brown. Low plasticity, sensitive to quick. (Recent Alluvium)	M	St	1, 1
	0.6	Peak = 97kPa Residual = 13kPa							2, 2
	0.9	Peak = 85kPa Residual = 13kPa							3, 4, 5
				1		... at 1.00m, becoming fine sandy silt	W		5, 5
▼						SW: Fine to coarse SAND: with minor silt and trace fine gravel. Light brown. Well graded, subangular. (Hinuera Formation)	S	MD to D	8, 4, 6
	1.6	Peak = 125kPa Residual = 19kPa				ML: Fine sandy SILT: light brownish grey streaked light orange brown. Low plasticity, sensitive. (Hinuera Formation)		VSt to H	6, 7, 7, 7, 5
	1.9	Peak = UTP		2					4
	2.2	Peak = 110kPa Residual = 13kPa				ML: SILT: light orange brown streaked orange brown. Low plasticity, extra sensitive. (Hinuera Formation)		VSt	6, 4
						ML: Clayey SILT: light grey. Low plasticity, moderately sensitive to sensitive. (Hinuera Formation)		St	5, 3, 6, 6, 4, 5, 4
	2.5	Peak = 66kPa Residual = 22kPa							6, 8
	2.8	Peak = 81kPa Residual = 16kPa		3					
						Borehole terminated at 3.2 m			10, 7, 6, 6, 8, 9, 9, 11, 11, 11, 13, 13, 7, 6, 7, 6, 7
				4					
				5					

Termination Reason: Equipment refusal.
Shear Vane No: 1911 DCP No: 34
Remarks: Groundwater encountered at 1.2m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

HAND AUGER BOREHOLE LOG - HA25-05

Client: Maven Associates Ltd
Project: Station Road
Site Location: Station Road, Matamata
Project No.: HAM2023-0124
Date: 30/09/2025
Borehole Location: Refer to Site Plan Logged by: LA Checked by: BM Scale: 1:25 Sheet 1 of 2

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Position: 487103.7mE; 694813.2mN Projection: Mount Eden 2000
Datum: Moturiki 1953 Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
						OL: Organic SILT: dark brown. Low plasticity. (Topsoil)			1
	0.3	Peak = 88kPa Residual = 13kPa				ML: SILT: light orange brown. Low plasticity, sensitive to extra sensitive. (Recent Alluvium)			2
									2
	0.6	Peak = 85kPa Residual = 13kPa							2
									2
									1
	0.9	Peak = 138kPa Residual = 16kPa						St to VSt	2
									1
				1			M		2
									2
									4
	1.2	Peak = UTP				... at 1.10m, containing some coarse sand and trace fine gravel.		H	4
									5
						SW: Fine to coarse SAND: with minor fine to medium gravel and silt. Orange brown. Well graded, subangular. (Hinuera Formation)			5
									6
									8
									7
									8
								MD to D	8
									8
				2					8
						... at 2.10m, containing trace fine pumcious gravel	W		7
▼									8
							S		10
						Borehole terminated at 2.4 m			8
									9
									8
									8
									7
									6
				3					5
									9
									7
									6
									6
									7
									7
									7
									7
				4					6
									6
									7
									8
									7
									9
									7
									7
									9
									10
				5					

Termination Reason: Hole collapse.
Shear Vane No: 1911 DCP No: 34
Remarks: Groundwater encountered at 2.3m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

HAND AUGER BOREHOLE LOG - HA25-06

Client: Maven Associates Ltd
Project: Station Road
Site Location: Station Road, Matamata
Project No.: HAM2023-0124
Date: 30/09/2025
Borehole Location: Refer to Site Plan Logged by: LA Checked by: BM Scale: 1:25 Sheet 1 of 1

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Position: 487191.2mE; 694844.8mN Projection: Mount Eden 2000
Datum: Moturiki 1953 Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
						OL: Organic SILT: dark brown. No plasticity. (Topsoil)			1, 2
	0.3	Peak = 97kPa Residual = 13kPa				ML: Fine sandy SILT: light brownish grey streaked light orange brown. Low plasticity, sensitive to extra sensitive. (Recent Alluvium)		St	1, 2
	0.6	Peak = 207kPa Residual = 25kPa					M		4, 5
						... at 0.70m, becoming silt		H	6, 7, 7
	0.9	Peak = 207kPa Residual = 19kPa		1					
▼						SP: Silty fine SAND: light grey. Poorly graded, subrounded. (Hinuera Formation)	W		6, 5
						... from 1.30m to 1.50m, becoming light grey mottled orange brown and containing some fine to medium pumcious gravel		MD	5, 6, 7
	1.7	Peak = UTP				ML: SILT: light bluish grey, Low plasticity, moderately sensitive. (Hinuera Formation)		H	7, 9
						... at 1.80m, containing minor rootlets			6, 5
	2.0	Peak = 100kPa Residual = 28kPa		2					
						... at 2.10m, becoming grey mottled brownish grey. No longer containing rootlets.	S		6, 6
	2.3	Peak = 94kPa Residual = 47kPa						VSt to H	4, 4
									6, 7
	2.6	Peak = 110kPa Residual = 31kPa							12, 12, 13
	3.0	Peak = UTP		3				H	11, 10
						Borehole terminated at 3.1 m			10, 5, 7, 13, 12, 13, 16, 14, 15
				4					17, 17, 15, 15, 15, 15, 13, 15, 12
				5					

Termination Reason: Equipment refusal
Shear Vane No: 1911 DCP No: 34
Remarks: Groundwater encountered at 1.3m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

HAND AUGER BOREHOLE LOG - HA25-07

Client: Maven Associates Ltd
Project: Station Road
Site Location: Station Road, Matamata
Project No.: HAM2023-0124
Date: 01/10/2025
Borehole Location: Refer to Site Plan Logged by: LA Checked by: BM Scale: 1:25 Sheet 1 of 1

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Position: 487262.8mE; 694868.4mN Projection: Mount Eden 2000
Datum: Moturiki 1953 Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
				0		OL: Organic SILT: dark brown. No plasticity. (Topsoil)			1, 3
	0.3	Peak = 154kPa Residual = 19kPa				ML: SILT: light orange brown. Low plasticity, sensitve to quick. (Recent Alluvium)		St to VSt	2, 1, 1, 1, 1, 2, 1, 1, 1, 1
	0.6	Peak = 91kPa Residual = 13kPa							
	0.9	Peak = 60kPa Residual = 3kPa		1					
	1.2	Peak = UTP				... at 1.10m, containing some fine to coarse sand.		H	5, 4
						SW: Fine to coarse SAND: with trace fine gravel. Light brown. Well graded, subangular. (Hinuera Formation)	M		5, 2, 3, 2, 3, 3, 2
				2				L to MD	4, 5, 4, 5, 5, 4
▼							W		3
							S		4, 4
						Borehole terminated at 2.9 m			4
				3					3, 6, 5, 6, 4, 6, 4, 4, 4, 7
				4					5, 9, 10, 9, 9, 7, 5, 6, 8
				5					

Termination Reason: Hole collapse.
Shear Vane No: 1911 DCP No: 34
Remarks: Groundwater encountered at 2.7m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

HAND AUGER BOREHOLE LOG - HA25-08

Client: Maven Associates Ltd
Project: Station Road
Site Location: Station Road, Matamata
Project No.: HAM2023-0124
Date: 01/10/2025
Borehole Location: Refer to Site Plan Logged by: LA Checked by: BM Scale: 1:25 Sheet 1 of 1

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Position: 487472.9mE; 694424.3mN Projection: Mount Eden 2000
Datum: Moturiki 1953 Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
	0.3	Peak = 63kPa Residual = 9kPa				OL: Organic SILT: dark brown. No plasticity. (Topsoil)			2, 2, 1, 1
	0.6	Peak = 110kPa Residual = 13kPa				ML: SILT: brown. Low plasticity, sensitive. (Recent Alluvium)		St to VSt	2, 2, 2, 3, 2, 4
	0.9	Peak = 94kPa Residual = 53kPa		1		... at 0.90m, containing some coarse pumcious sand.			6
						SW: Fine to coarse SAND : with some fine lithic gravel and trave fine pumiceous gravel. Light orange brown (Hinuera Formation)			6, 7, 6, 8
						... from 1.50m to 1.60m, lens of fine sand with minor silt.	M		5, 7, 7, 6, 4
				2		... at 2.20m, containing some silt		MD to D	8, 8, 4, 5, 8, 7, 7, 6, 4, 4
▼				3		... at 3.10m, becoming light grey, no longer containing lithic gravel.	W		8, 8, 5
							S		7
						Borehole terminated at 3.4 m			5, 7, 5, 7, 4, 4, 7, 7, 7, 7, 5, 5, 6, 5, 4
				4					
				5					

Termination Reason: Hole collapse
Shear Vane No: 1911 DCP No: 34
Remarks: Groundwater encountered at 3.3m

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

HAND AUGER BOREHOLE LOG - HA25-09

Client: Maven Associates Ltd
Project: Station Road
Site Location: Station Road, Matamata
Project No.: HAM2023-0124
Date: 01/10/2025
Borehole Location: Refer to Site Plan Logged by: LA Checked by: BM Scale: 1:25 Sheet 1 of 1

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Position: 487588.6mE; 694480.4mN Projection: Mount Eden 2000
Datum: Moturiki 1953 Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
						OL: Organic SILT: dark brown. No plasticity. (Topsoil)			2, 1
	0.3	Peak = 78kPa Residual = 6kPa				ML: SILT: brown Low plasticity, moderately sensitive to sensitive. (Pakiri Formation)			1
	0.6	Peak = 78kPa Residual = 6kPa						St	1, 1, 1, 1, 1
	0.9	Peak = 78kPa Residual = 6kPa		1		*... from 0.80m to 1.70m, becoming clayey silt.*			1, 2
	1.2	Peak = 141kPa Residual = 16kPa							3, 3
	1.5	Peak = UTP							2, 2, 2, 5
	1.8	Peak = UTP							11, 9, 12, 12
	2.1	Peak = UTP		2					9, 9
	2.4	Peak = 219kPa Peak = >219kPa				*... at 2.20m, containing some fine gravel.*	M		8, 9, 9
	2.7	Peak = 204kPa Residual = 28kPa				*... at 2.50m, containing some fine to coarse sand.*		VSt to H	6, 10, 9, 10, 11
	3.0	Peak = 219kPa Peak = >219kPa		3		*... at 3.10m, containing minor fine pumcious gravel.*			10, 11
	3.3	Peak = 154kPa Residual = 41kPa							8, 8, 9
	3.6	Peak = 219kPa Peak = >219kPa							7, 9, 8, 8
	3.9	Peak = 201kPa Residual = 47kPa		4					11, 10, 9
						SW: Silty fine to coarse SAND: with minor fine lithic and pumiceous gravel. Orange brown Well graded, subrounded. (Pakiri Formation)			8
						... at 4.40m, becoming fine to medium lithic gravel.		MD to D	10, 7
						Borehole terminated at 4.5 m			10, 12, 12, 14
				5					

Termination Reason: Refusal on gravel.
Shear Vane No: 1911 DCP No: 34
Remarks: Groundwater not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

APPENDIX E: MACHINE AUGER LOGS

BOREHOLE LOG - BH25-01

Client: Maven Associates Ltd
Project: Station Road
Site Location: Station Road, Matamata
Project No.: HAM2023-0124
Date: 03/10/2025
Borehole Location: Refer to Site Plan Logged by: LA Checked by: BM Scale: 1:50 Sheet 1 of 2
Position: 487615.0mE; 695140.2mN Projection: Mount Eden 2000
Datum: Moturiki 1953 Survey Source: Hand-held GPS

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Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Weathering: RS CW HW MW SW UW	Recovery	RQD	Estimated Strength: EW VW W MS S VS ES	Defect Spacing (mm): <20 20-60 60-200 200-600 600-2000 >2000	Drilling Method/ Support	Structure & Other Observations
					0		OL: Organic SILT: dark brown. No plasticity. (Topsoil)									
							ML: SILT: orange brown. Low plasticity. (Recent Alluvium)									
					1		CH: Silty CLAY: light brown mottled orange brown. High plasticity. (Hinuera Formation)				100					
		1.5	SPT: = 3 (0, 1 / 0, 1, 1, 1)				SW: Silty fine to medium SAND: brown mottled orange brown. Well graded, subrounded. (Hinuera Formation)									
							... at 1.10m, containing some fine to coarse pumiceous sand.									
					2		CH: Silty CLAY: light brownish grey mottled orange brown. High plasticity. (Hinuera Formation)				72					
							SP: Fine SAND: with some fine to coarse pumiceous sand. Grey. Poorly graded. (Hinuera Formation)									
		3.0	SPT: = 2 (2, 1 / 1, 0, 0, 1)		3		SW: Fine to coarse SAND: with some fine to coarse pumiceous sand and trace fine pumiceous gravel. grey mottled orange brown. Well graded,subrounded. (Hinuera Formation)									
							ML: SILT: light brownish grey streaked light brown.Low plasticity. (Hinuera Formation)				84					
					4		*... from 3.45m to 3.50m, lens of fine to coarse sand*									
							... from 3.80m to 4.15m, containig some fine sand									
		4.5	SPT: = 4 (1, 0 / 1, 1, 1, 1)				*... at 4.30m, cntaining minor fine to coarse sand*									
					5		SW: Fine to coarse SAND: with minor silt and trace carse pumcious sand. Grey. Well graded, subrounded. (Hinuera Formation)				91				HQ	
							SW: Fine to coarse SAND: with some fine to coarse pumiceous sand and fine pumiceous gravel. Dark grey streaked orange brown. Well graded, subrounded. (Hinuera Formation)									
		6.0	SPT: = 12 (1, 1 / 2, 3, 3, 4)		6		*... at 5.60m, containing some fine to medium pumcious gravel.*									
					7		*... at 7.10m, becoming some fine pumcious gravel.*				79					
		7.5	SPT: = 15 (3, 2 / 3, 4, 4, 4)													
					8						71					
		9.0	SPT: = 15 (3, 3 / 3, 6, 5, 1)		9											
											52					
					10											

Termination Reason: Target depth reached.
Shear Vane No: - DCP No: -
Remarks: Groundwater not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 4 - April 2023.

BOREHOLE LOG - BH25-01

Client: Maven Associates Ltd
Project: Station Road
Site Location: Station Road, Matamata
Project No.: HAM2023-0124
Date: 03/10/2025
Borehole Location: Refer to Site Plan Logged by: LA Checked by: BM Scale: 1:50 Sheet 2 of 2
Position: 487615.0mE; 695140.2mN Projection: Mount Eden 2000
Datum: Moturiki 1953 Survey Source: Hand-held GPS

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Depth	Type & Results	Depth (m)	Material Description	Recovery	RQD
10.5	SPT: = 16 (2, 2 / 3, 4, 5, 4)	11	CH: CLAY: with some fine to coarse sand. light brownish grey. High plasticity. (Hinuera Formation) ... at 10.35m, becoming trace fine to coarse sand	61	
			SW: Fine to coarse SAND: with some fine to coarse pumcious sand, and trace fine pumiceous gravel. Grey. Well graded, subrounded. (Hinuera Formation)		
12.0	SPT: = 19 (2, 4 / 3, 5, 5, 6)	12	SP: Fine SAND: with some silt and trace pumicious sand. Light orange brown. Poorly graded. (Hinuera Formation) ... from 11.85m to 11.95m, contaning some medium pumiceous gravel.	77	
		13	SW: Fine to coarse SAND: with minor fine coarse pumiceous sand. Grey. Well graded, subrounded. (Hinuera Formation) ... at 12.90m, becoming grey streaked orange brown.		
13.5	SPT: = 7 (2, 2 / 1, 2, 2, 2)		SP: Silty fine SAND: dark grey. Poorly graded. (Hinuera Formation)		
		14	ML: SILT: dark grey. Low plasticity (Hinuera Formation)	74	
			ML: SILT: with minor fine sand. Light brownosh grey. Low plasticity (Hinuera Formation)		
			CH: Silty CLAY: dark grey. High plasticity. (Hinuera Formation)		
15.0	SPT: = 3 (1, 0 / 0, 1, 1, 1)	15	SW: Fine to coase SAND: with some silt and minor fine pumiceous gravel. Light grey. Well graded. (Hinuera Formation)	63	
		16	... at 16.15m, becoming dark greenish grey		
16.5	SPT: = 33 (6, 6 / 7, 9, 10, 7)		CH: Silty CLAY: light grey. High plasticity. (Hinuera Formation)		
		17	SP: Silty fine SAND: light grey. Poorly graded, subrounded. (Hinuera Formation) ... at 17.45m, becoming light grey streaked light greyish blue.	66	
18.0	SPT: = 10 (2, 2 / 1, 2, 3, 4)	18	ML: SILT: light brown streaked bluish grey. Low plasticity. (Hinuera Formation)		
			SP: Silty fine SAND: light grey streaked busih grey and light brown. Poory graded subrounded. (Hinuera Formation) ... from 18.50m to 18.70m, containing some fine to coarse pumiceous sand and fine pumiceous gravel.	81	
19.5	SPT: = 18 (1, 2 / 3, 3, 6, 6)	19	... at 19.10m, becoming light grey.		
		20	Borehole terminated at 19.95 m		

Termination Reason: Target depth reached.
Shear Vane No: - DCP No: -
Remarks: Groundwater not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 4 - April 2023.

PHOTOGRAPH SHEET - BH25-01

Client: Maven Associates Ltd
Project: Station Road
Location: Station Road, Matamata
Project ID: HAM2023-0124
Date:03/10/2025

CMW Geosciences
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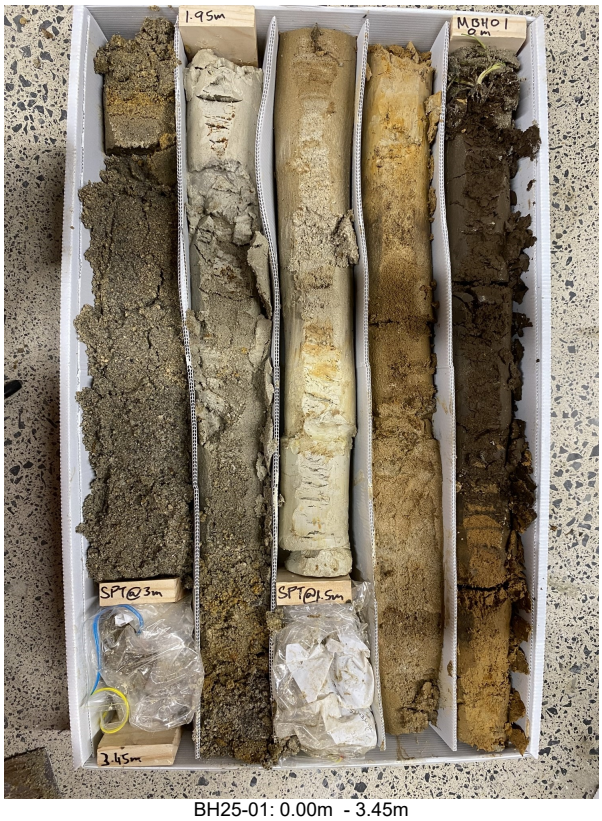

BH25-01: 0.00m - 3.45m

BH25-01: 3.45m - 6.45m

PHOTOGRAPH SHEET - BH25-01

Client: Maven Associates Ltd
Project: Station Road
Location: Station Road, Matamata
Project ID: HAM2023-0124
Date:03/10/2025

CMW Geosciences
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BH25-01: 6.45m - 9.75m

BH25-01: 9.75m - 12.90m

PHOTOGRAPH SHEET - BH25-01

Client: Maven Associates Ltd
Project: Station Road
Location: Station Road, Matamata
Project ID: HAM2023-0124
Date:03/10/2025

CMW Geosciences
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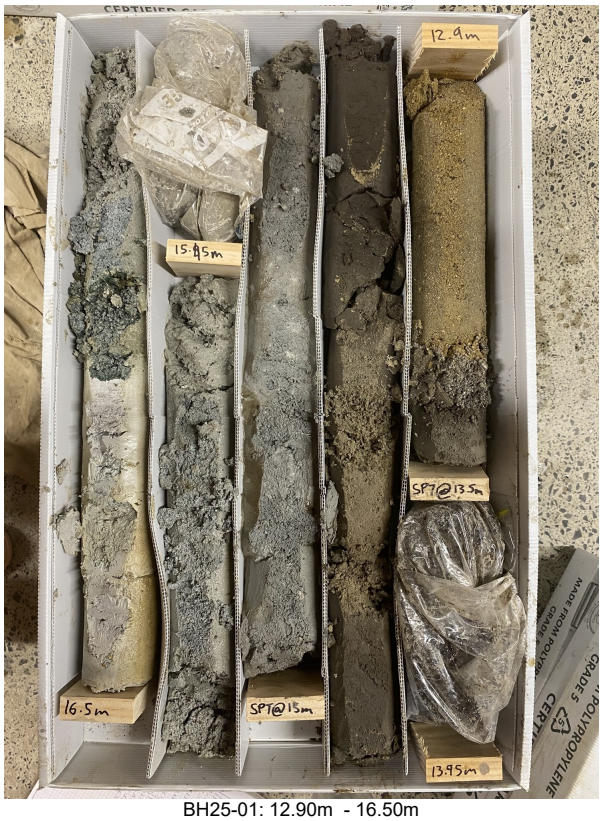

BH25-01: 12.90m - 16.50m

BH25-01: 16.50m - 19.95m

This borehole report must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

BOREHOLE LOG - BH25-02

Client: Maven Associates Ltd
Project: Station Road
Site Location: Station Road, Matamata
Project No.: HAM2023-0124
Date: 01/10/2025
Borehole Location: Refer to Site Plan Logged by: LA Checked by: BM Scale: 1:50 Sheet 1 of 2
Position: 486662.0mE; 695107.5mN Projection: Mount Eden 2000
Datum: Moturiki 1953 Survey Source: Hand-held GPS

CMW Geosciences
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Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Weathering: RS CW HW MW SW UW	Recovery	RQD	Estimated Strength: EW VW W MS S VS ES	Defect Spacing (mm): <20 20-60 60-200 200-600 600-2000 >2000	Drilling Method/ Support	Structure & Other Observations
					0		OL: Organic SILT: dark brown. No plasticity. (Topsoil)									
							ML: SILT: light brown. Low plasticity. (Recent Alluvium)				99					
					1		SW: Fine to coarse SAND: with some silt and trace fine to medium pumiceous sands. Greyish brown. Well graded, subrounded to subangular. (Recent Alluvium)									
		1.5	SPT: = 1 (1, 0 / 0, 0, 0, 1)		2		*... at 2.30m, becoming light greyish brown.* *... at 2.50m, containing trace fine to medium pumiceous gravel.*				73					
		3.0	SPT: = 2 (1, 1 / 1, 1, 0, 0)		3		SP: Silty fine SAND: with trace medium to coarse pumcious sand. Light greyish brown. Poorly graded, subrounded. (Hinuera Formation)				57					
					4		CH: Silty CLAY: with minor fine sand. Light orange brown. High plasticity. (Hinuera Formation) *... at 4.10m, becoming dark grey.*									
		4.5	SPT: = 7 (1, 1 / 1, 2, 2, 2)		5		SW: Silty fine to coarse SAND: with some fine to coarse pumiceous sand. Grey. Well graded, subrounded to subangular. (Hinuera Formation) *... from 4.30m to 4.40m, lens of organic silt and clay*				77				HQ	
		6.0	SPT: = 0 (0, 0 / 0, 0, 0, 0)		6		SP: Silty fine SAND: containing some fine to coarse pumicious sand and fine to medium pumiceous gravel. Light grey. Poorly graded. (Hinuera Formation) CH: Silty CLAY: with trace fine pumcious gravel. Dark grey. High plasticity. (Hinuera Formation) ML: SILT: light grey. Low plasticity. (Hinuera Formation)				69					
					7		ML: Clayey SILT: with minor coarse pumcious sand. Grey. Low plasticity. (Hinuera Formation)									
		7.5	SPT: = 5 (1, 0 / 1, 1, 2, 1)				ML: Fine to coarse sandy SILT: with some coarse pumiceous sand. Grey. Low plasticity. (Hinuera Formation)									
					8		ML: SILT: interbedded with fine to coarse sand. Light brownish grey streaked dark grey and brown. High plasticity. (Hinuera Formation)				72					
		9.0	SPT: = 2 (1, 0 / 1, 0, 1, 0)		9		CH: CLAY: light greyish green motted light grey. High plasticity. (Hinuera Formation)									
							ML: SILT: interbedded with fine sand. Light grey streaked grey. Low plasticity. (Hinuera Formation)				70					
					10		*... at 10.00m, becoming clayey silt*									

Termination Reason: Target depth reached.
Shear Vane No: - DCP No: -
Remarks: Groundwater not encountered.

BOREHOLE LOG - BH25-02

Client: Maven Associates Ltd
Project: Station Road
Site Location: Station Road, Matamata
Project No.: HAM2023-0124
Date: 01/10/2025
Borehole Location: Refer to Site Plan Logged by: LA Checked by: BM Scale: 1:50 Sheet 2 of 2
Position: 486662.0mE; 695107.5mN Projection: Mount Eden 2000
Datum: Moturiki 1953 Survey Source: Hand-held GPS

CMW Geosciences
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Depth	Type & Results	Depth (m)	Material Description	Recovery	RQD
			ML: Fine sandy SILT: light brownish grey. Low plasticity. (Hinuera Formation)		
10.5	SPT: = 4 (1, 0 / 1, 0, 1, 2)				
		11	*... at 11.00m, becoming light brownish grey streaked dark greenish blue.*	77	
			SW: Fine to coarse SAND: with some fine pumcious gravels and minor silt. Dark greyish blue mottled light grey. Well graded, subrounded. (Hinuera Formation)		
12.0	SPT: = 11 (2, 2 / 2, 3, 3, 3)	12	*... at 11.70m, becoming light grey.*		
			... at 11.75m, containing some fine to medium pumcious gravel.		
			SW: Find to coarse SAND: with minor fine pumcious gravel. Dark grey. Well graded, subrounded. (Hinuera Formation)	75	
		13	ML: SILT: light grey mottled dark green. Low plasticity (Hinuera Formation)		
13.5	SPT: = 19 (1, 2 / 4, 5, 5, 5)		*... at 12.70m, becoming fine sandy silt*		
			SW: Fine to coarse SAND: with some fine to coarse pumicious sand and minor silt. Grey. Well graded, subrounded. (Hinuera Formation)		
		14	ML: Clayey SILT: light grey. Low plasticity. (Hinuera Formation)	80	
			SW: Fine to medium SAND: with some fine to coarse pumiceous sand. Grey. Well graded, subrounded. (Hinuera Formation)		
15.0	SPT: = 22 (3, 2 / 5, 5, 6, 6)	15	SP: Silty fine SAND: with trace pumiceous sand. Grey. Poorly graded, subrounded. (Hinuera Formation)		
			ML: SILT: ligt grey. Low plasticity. (Hinuera Formation)	78	
		16	SW: Fine to medium SAND: with trace pumiceous sand. Grey. Well graded, subrounded. (Hinuera Formation)		
16.5	SPT: = 17 (3, 2 / 3, 4, 5, 5)		ML: SILT: with some clay. Light grey. Low plasticity. (Hinuera Formation)		
			SW: Fine to coarse SAND: with some fine to coarse pumiceous sand,, minor fine pumiceous gravel and silt. Grey. Well graded, subrounded. (Hinuera Formation)		
		17	*... from 15.80m to 15.85m, containing some fine to medium pumiceous gravel.*	69	
			... from 15.90m to 16.00m, lens of silt.		
18.0	SPT: = 14 (2, 3 / 3, 3, 4, 4)	18	*... at 16.05m, no longer containing silt*		
			... from 16.20m to 16.30m, containing some fine to medium pumiceous gravel.		
			... from 16.40m to 16.50m, containing some fine to medium pumiceous gravel.	75	
		19	*... from 18.65m to 19.00m, containing some fine to medium pumiceous gravel.*		
19.5	SPT: = 14 (2, 3 / 3, 5, 3, 3)		*... from 19.10m to 19.50m, containing some fine to medium pumiceous gravel.*		
		20	Borehole terminated at 20.00 m		

Termination Reason: Target depth reached.
Shear Vane No: - DCP No: -
Remarks: Groundwater not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 4 - April 2023.

PHOTOGRAPH SHEET - BH25-02

Client: Maven Associates Ltd
Project: Station Road
Location: Station Road, Matamata
Project ID: HAM2023-0124
Date:01/10/2025

CMW Geosciences
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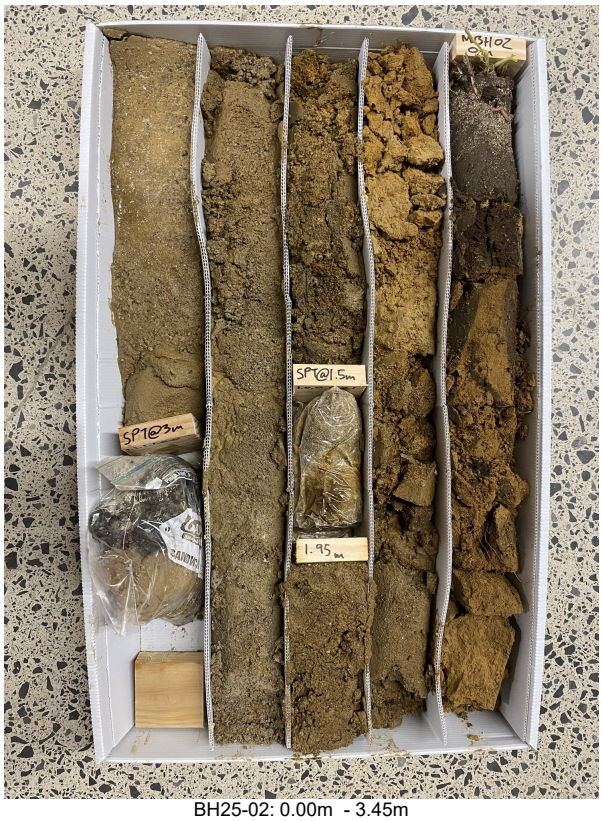

BH25-02: 0.00m - 3.45m

BH25-02: 3.45m - 7.05m

This borehole report must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

PHOTOGRAPH SHEET - BH25-02

Client: Maven Associates Ltd
Project: Station Road
Location: Station Road, Matamata
Project ID: HAM2023-0124
Date:01/10/2025

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BH25-02: 7.05m - 10.95m

BH25-02: 10.95m - 14.45m

This borehole report must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination.

PHOTOGRAPH SHEET - BH25-02

Client: Maven Associates Ltd
Project: Station Road
Location: Station Road, Matamata
Project ID: HAM2023-0124
Date:01/10/2025

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BH25-02: 14.45m - 17.55m

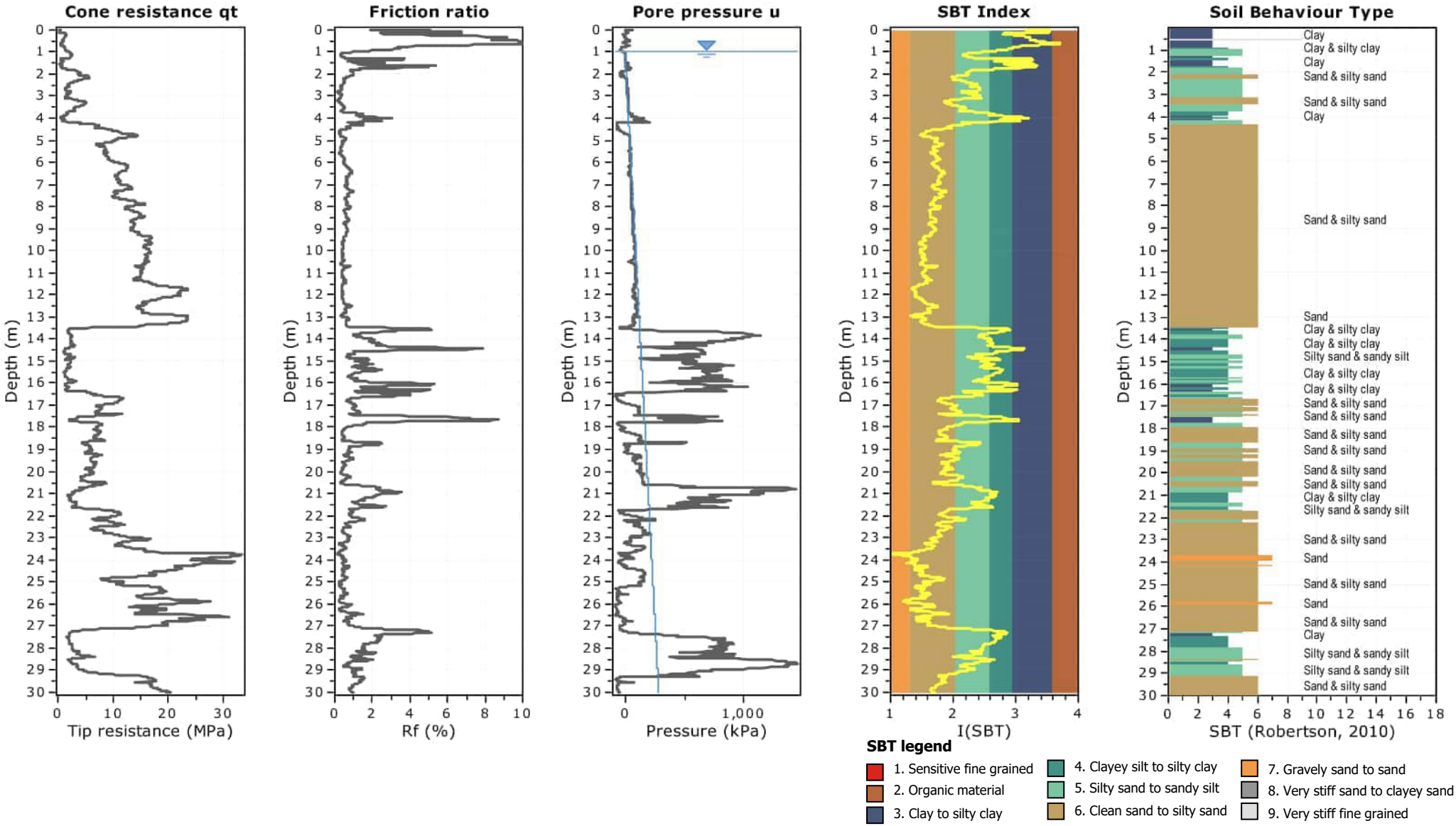
BH25-02: 17.55m - 19.95m

APPENDIX F: CPT LOGS

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT23-01
Total depth: 30.01 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

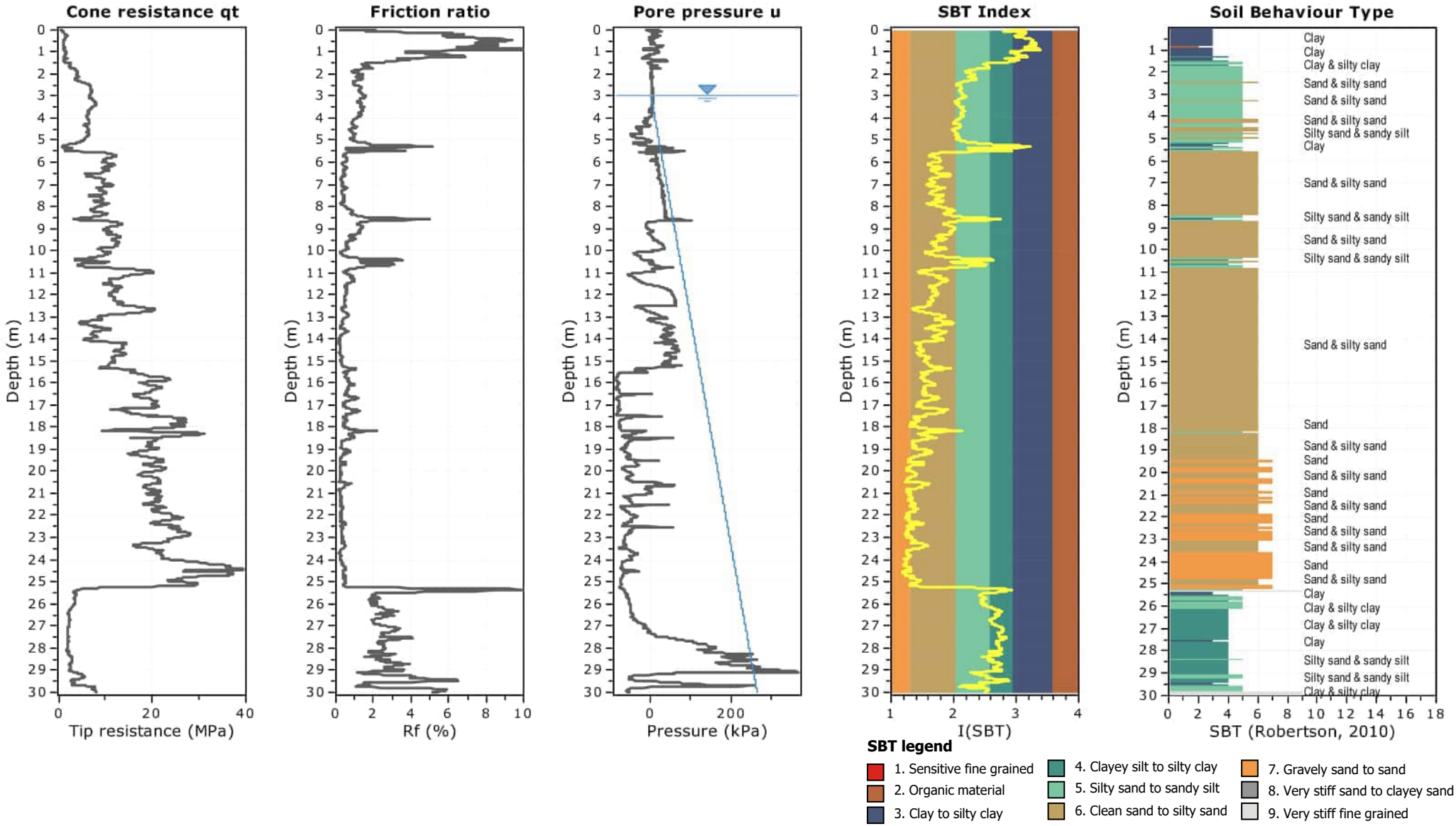
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT23-02
Total depth: 30.02 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 3.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

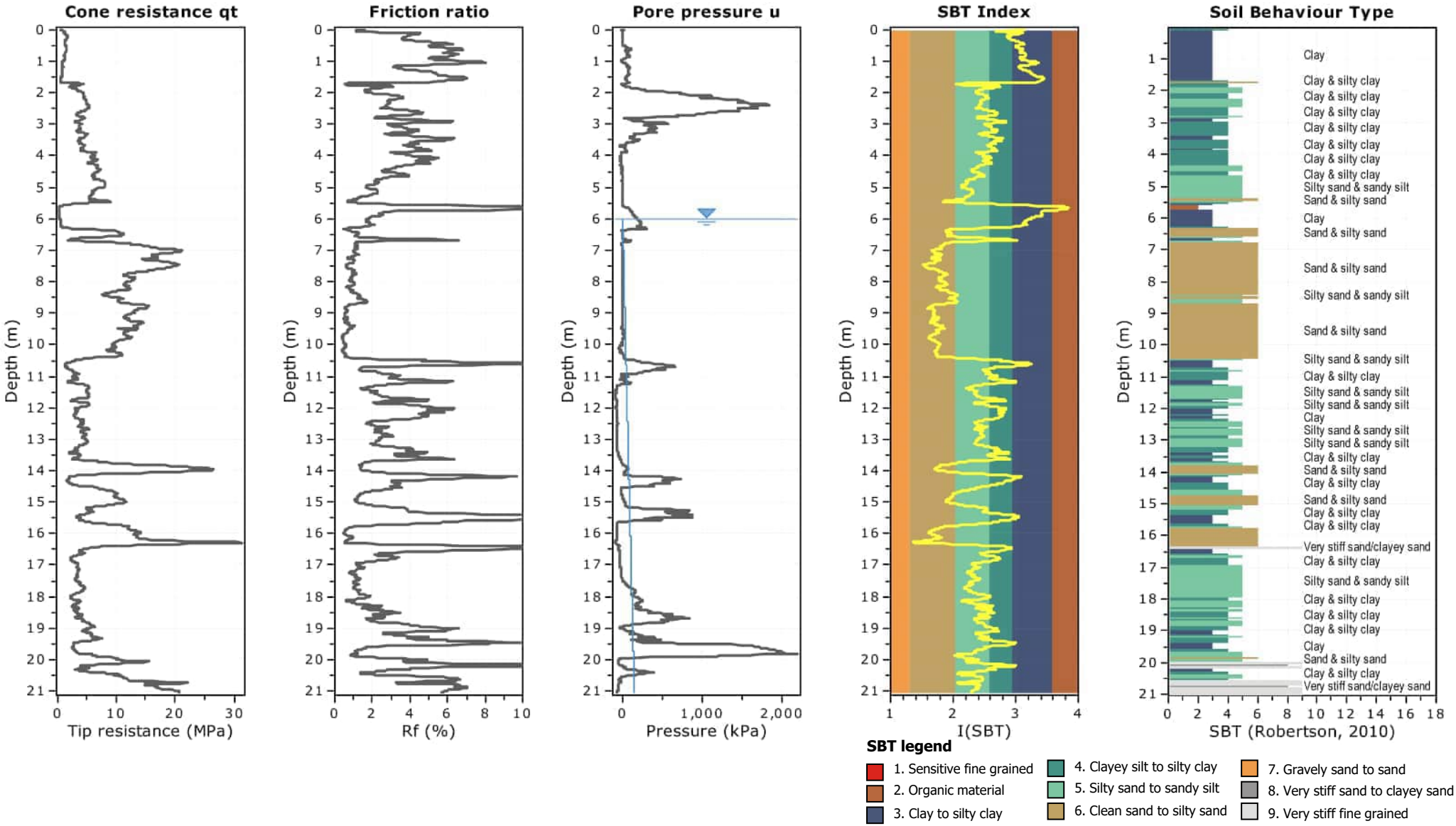
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT23-03b
Total depth: 21.04 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 6.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

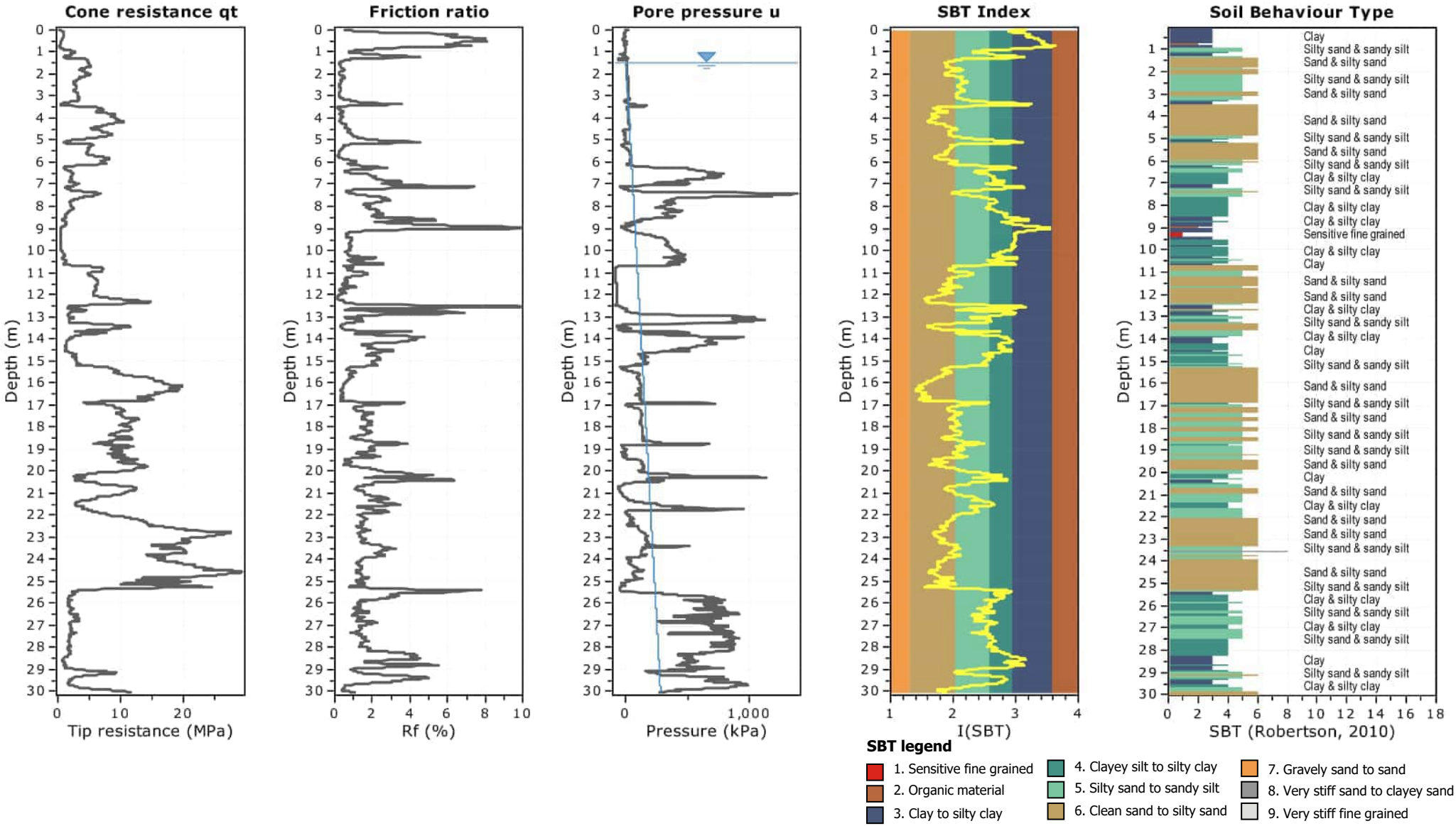
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-04
Total depth: 30.04 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 1.50 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

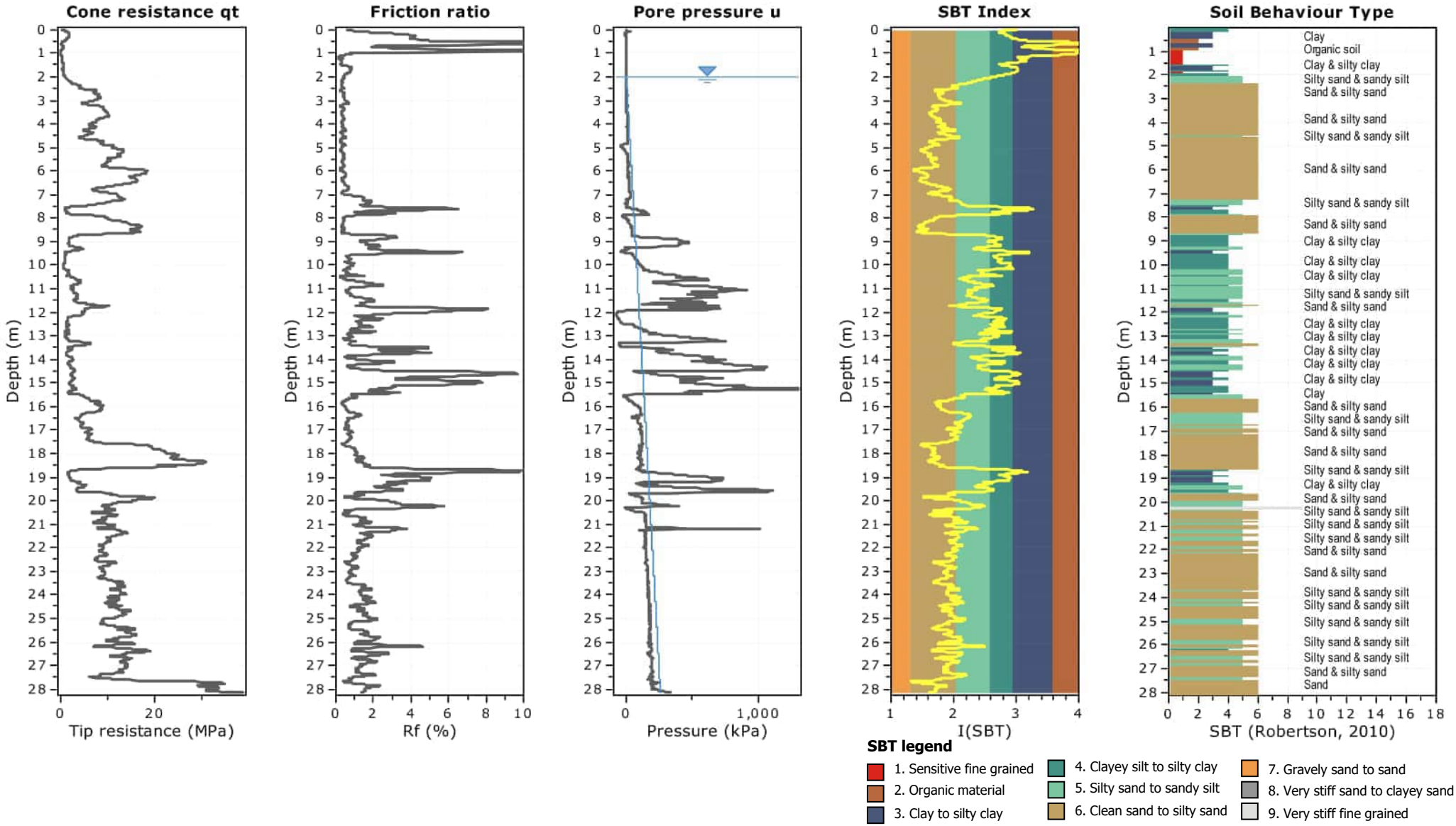
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-05
Total depth: 28.14 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 2.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

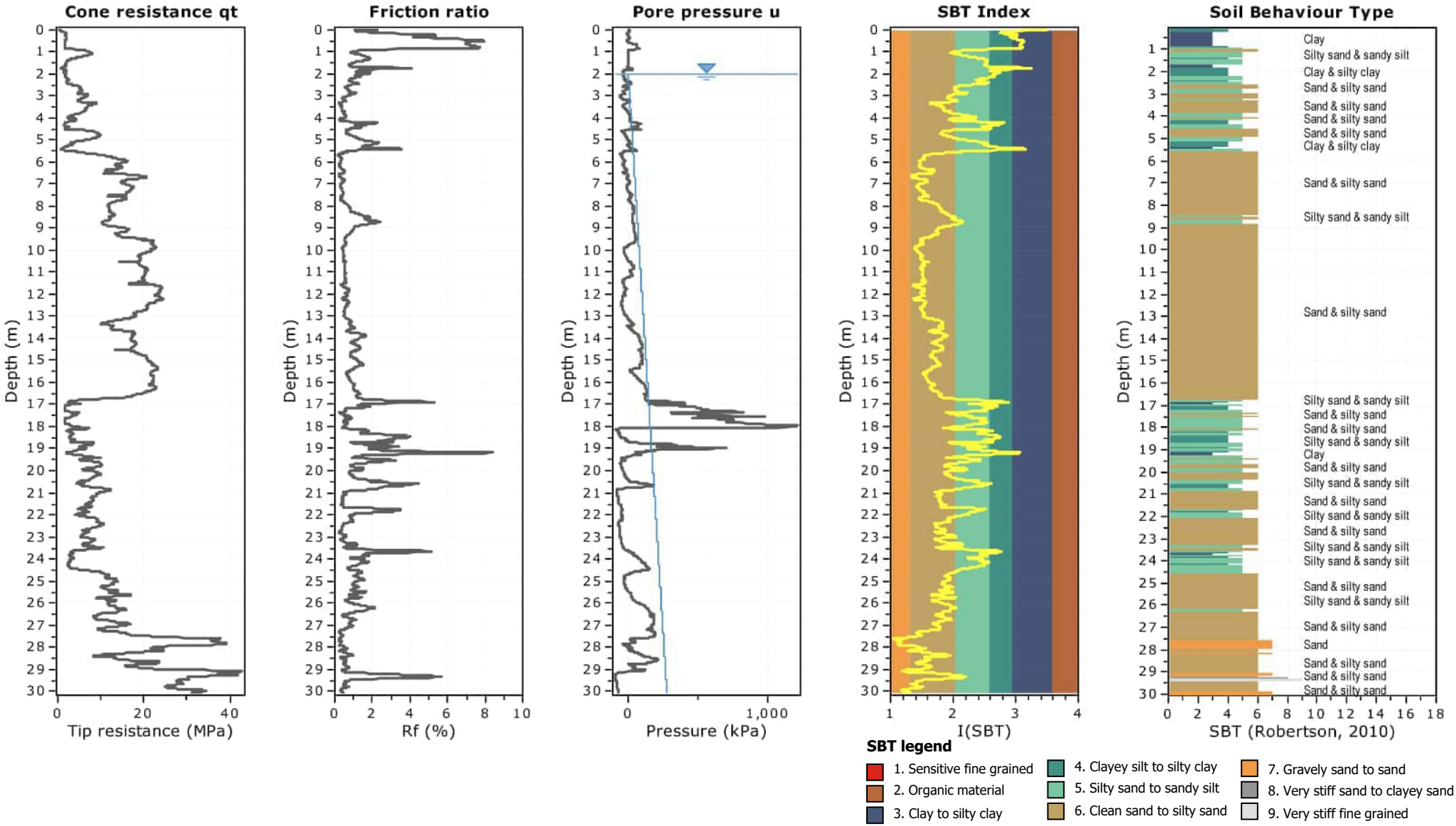
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-06
Total depth: 30.06 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 2.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

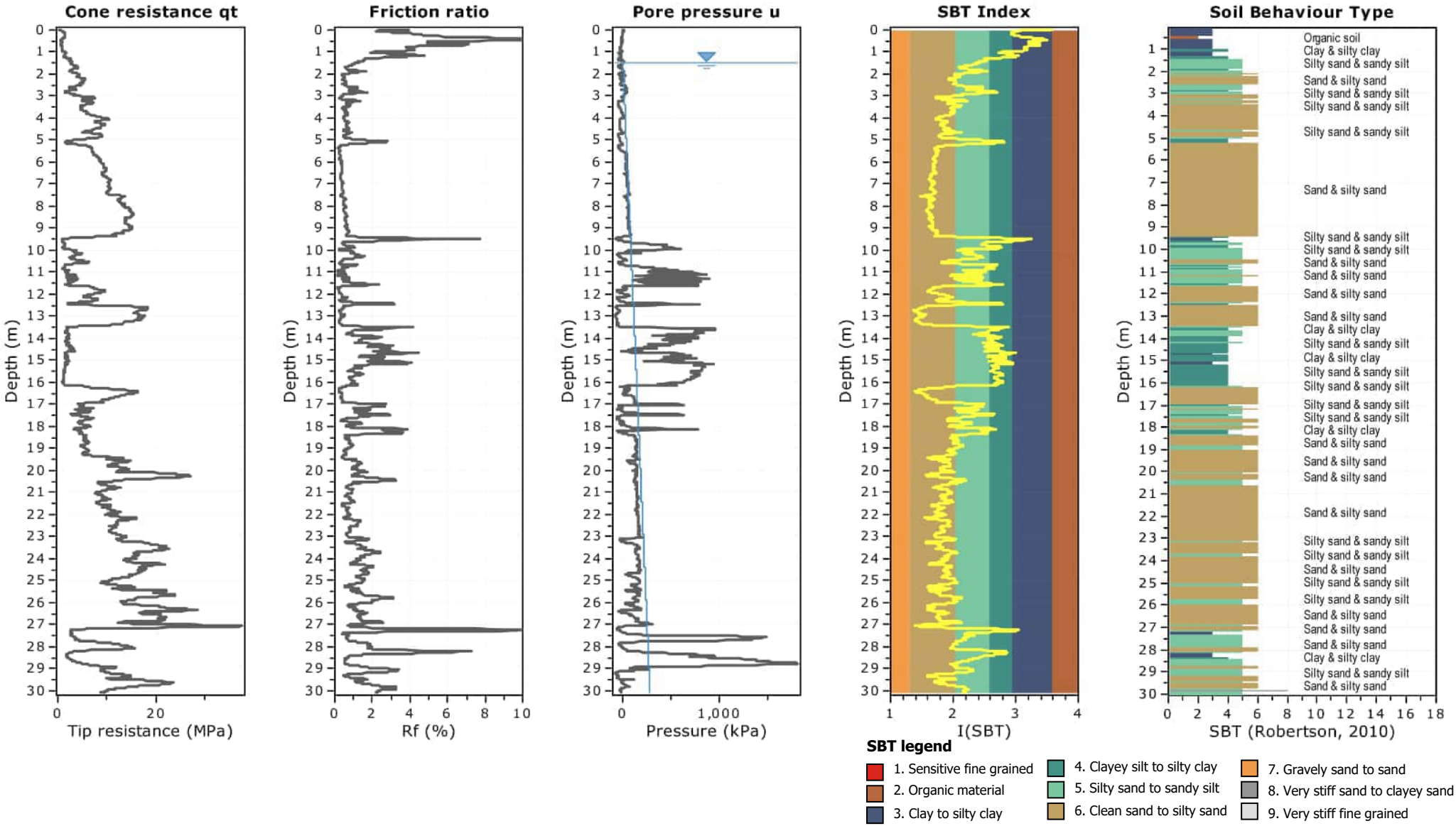
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-07
Total depth: 30.07 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 1.50 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

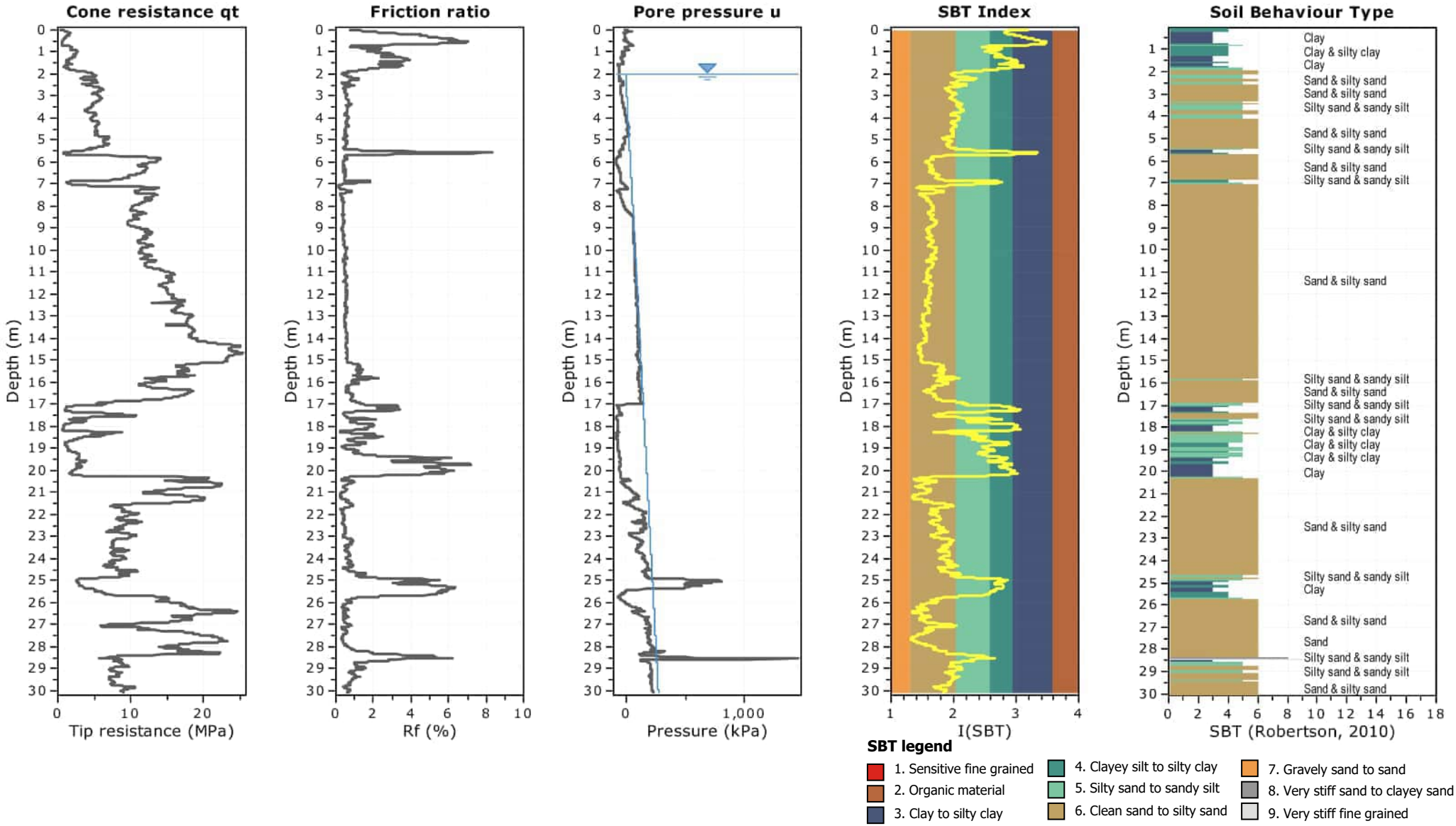
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-08
Total depth: 30.08 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 2.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

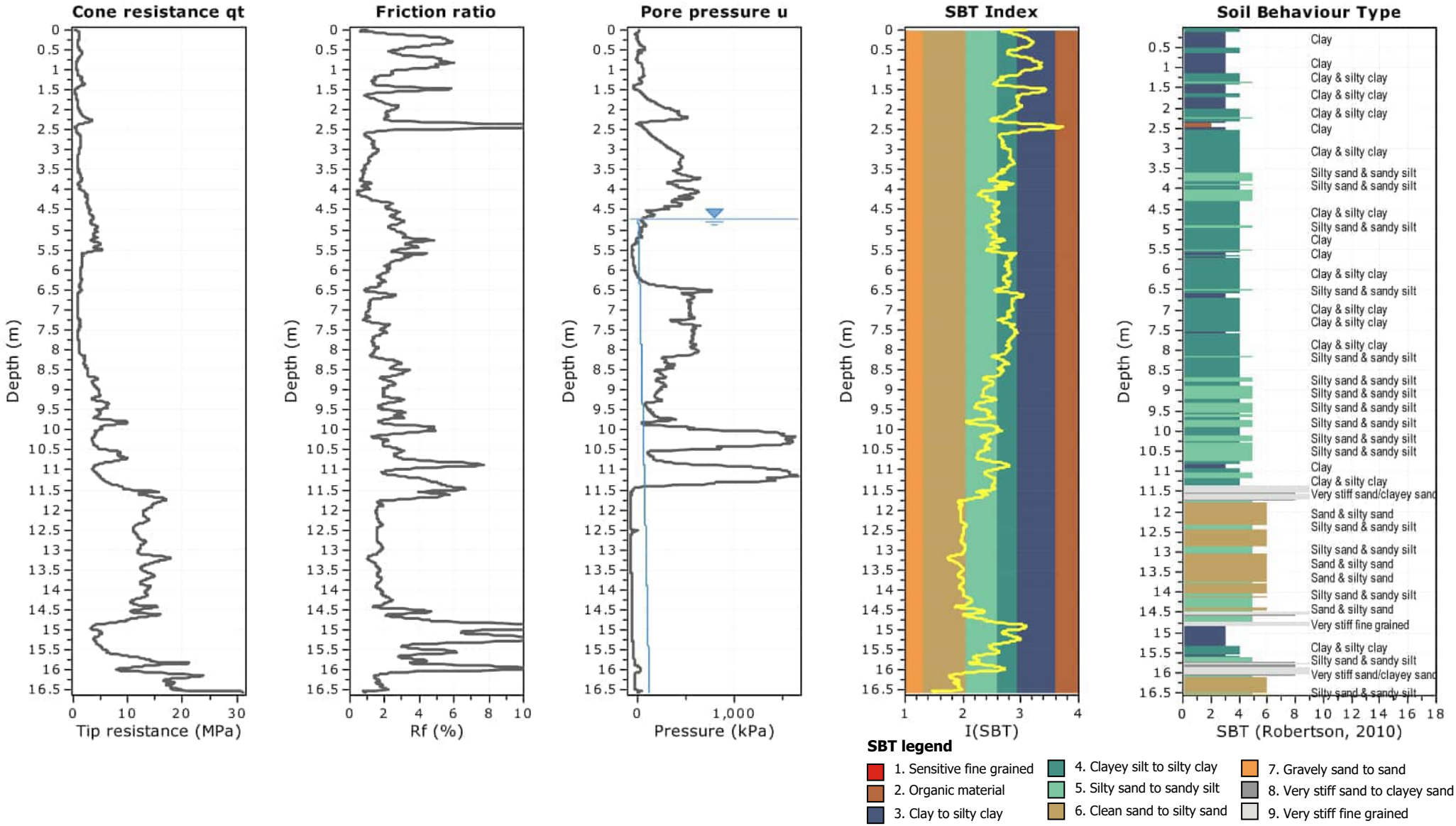
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-09
Total depth: 16.56 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 4.75 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

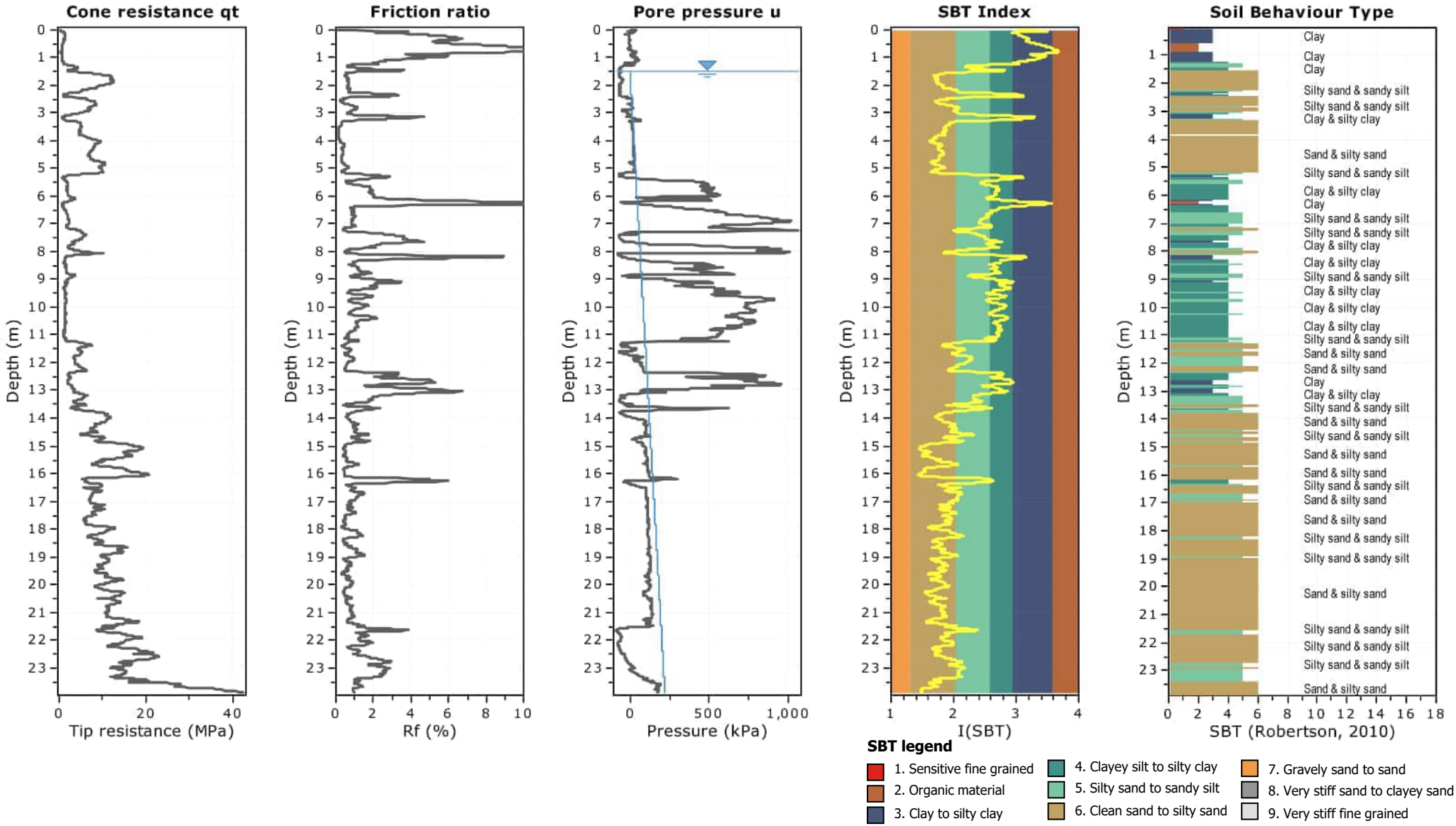
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-10
Total depth: 23.89 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 1.50 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

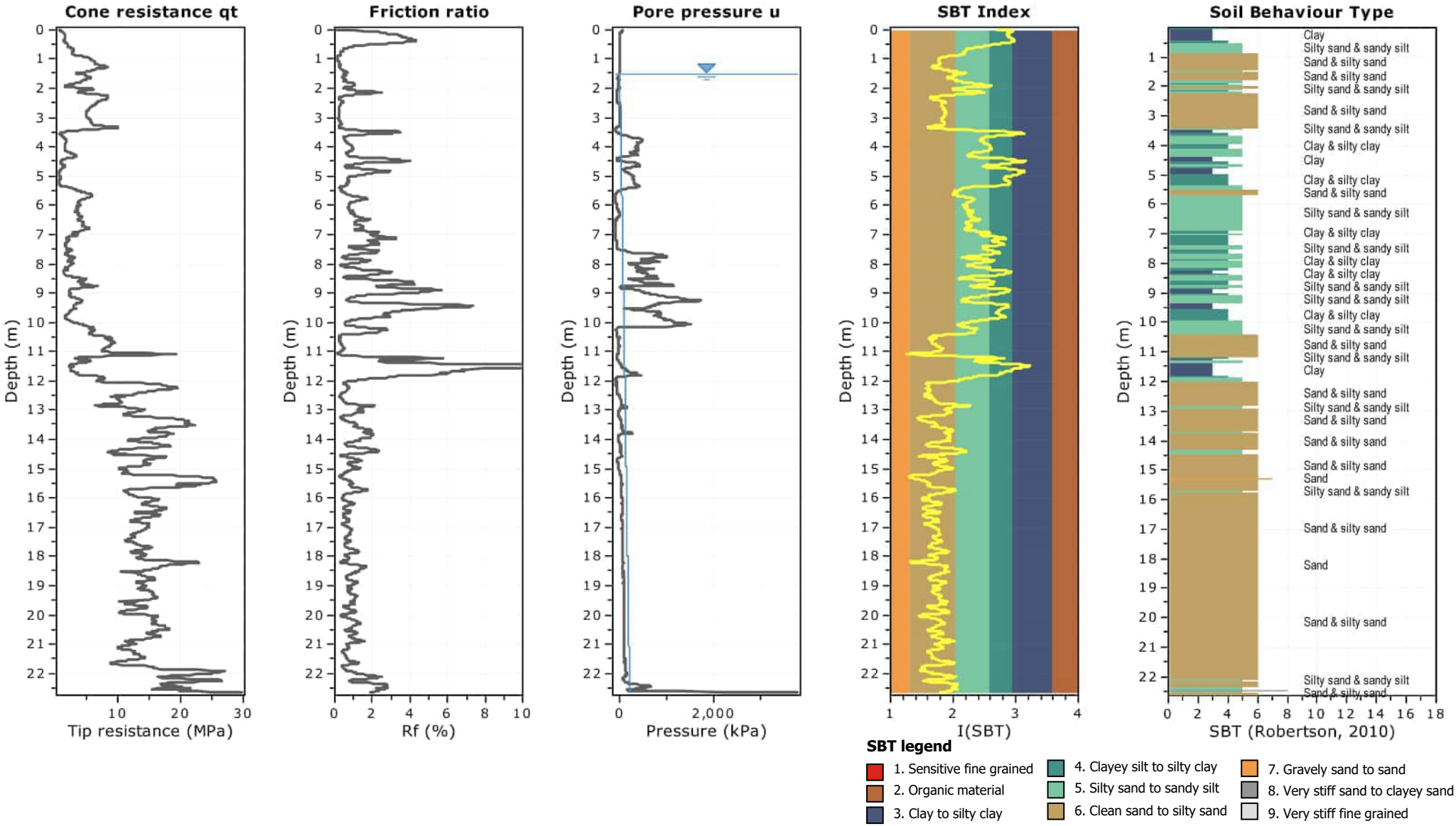
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: SCPT24-01
Total depth: 22.64 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 1.50 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

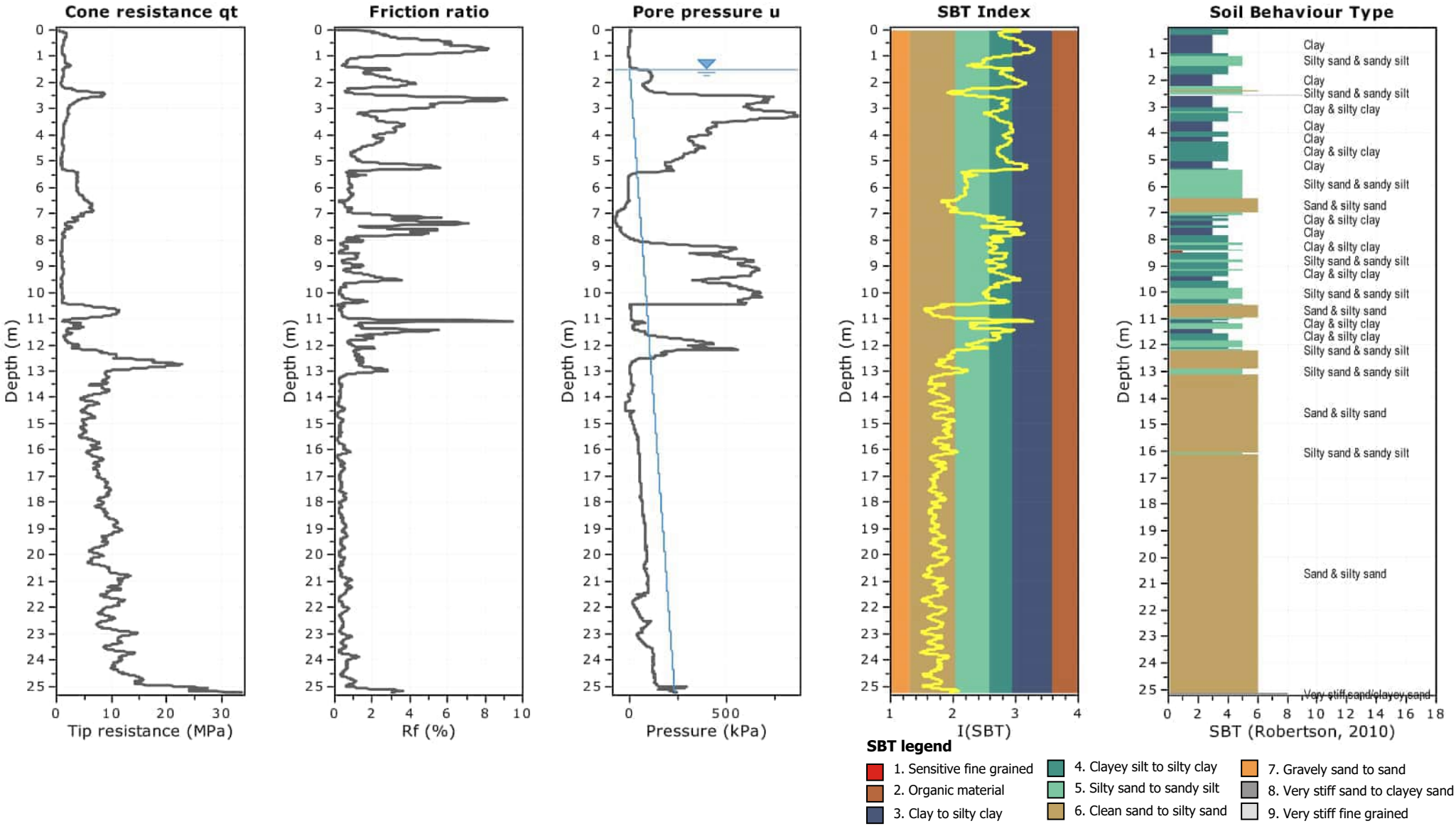
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: SCPT24-02
Total depth: 25.23 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 1.50 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

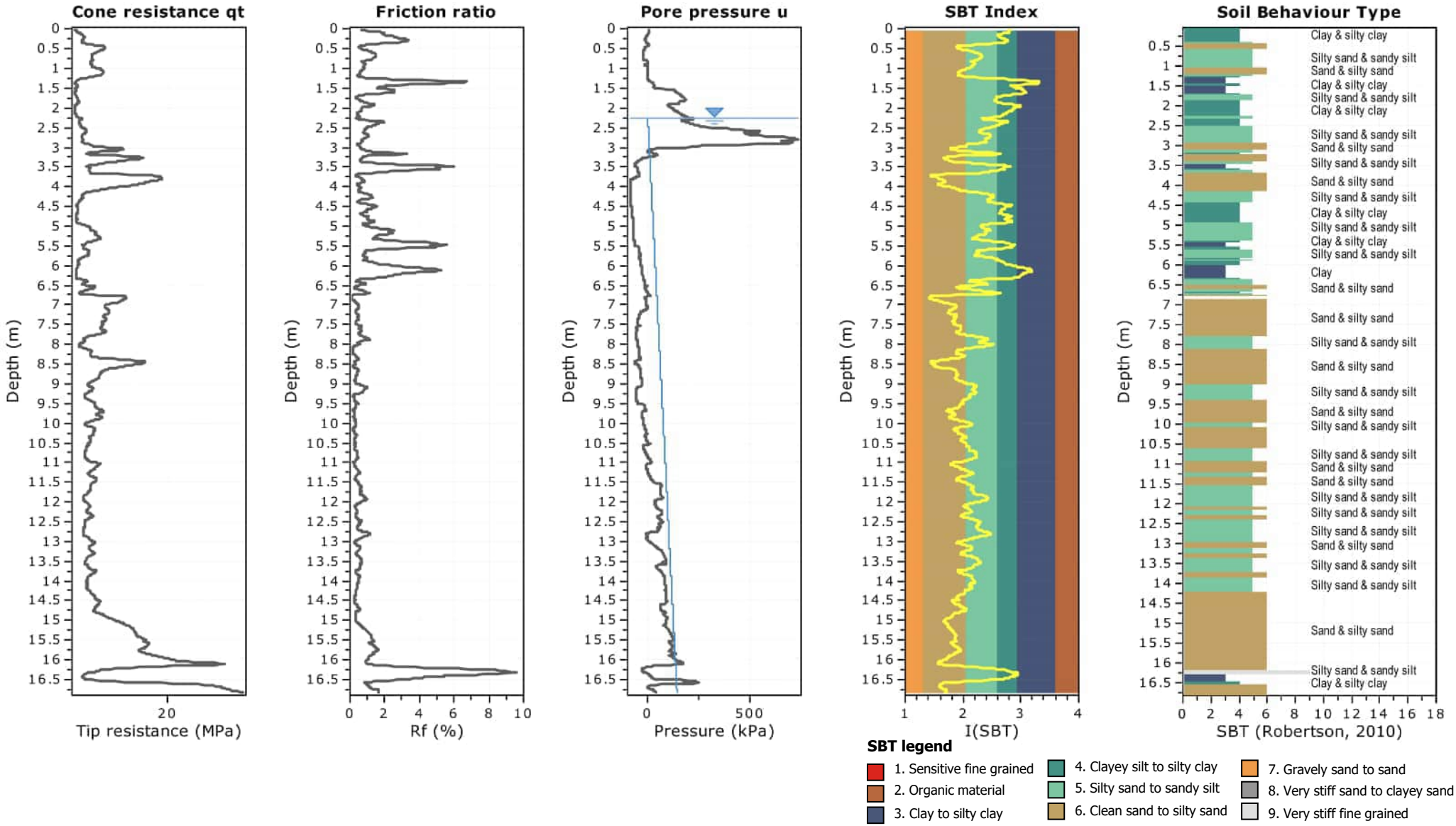
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: SCPT24-03
Total depth: 16.83 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 2.25 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

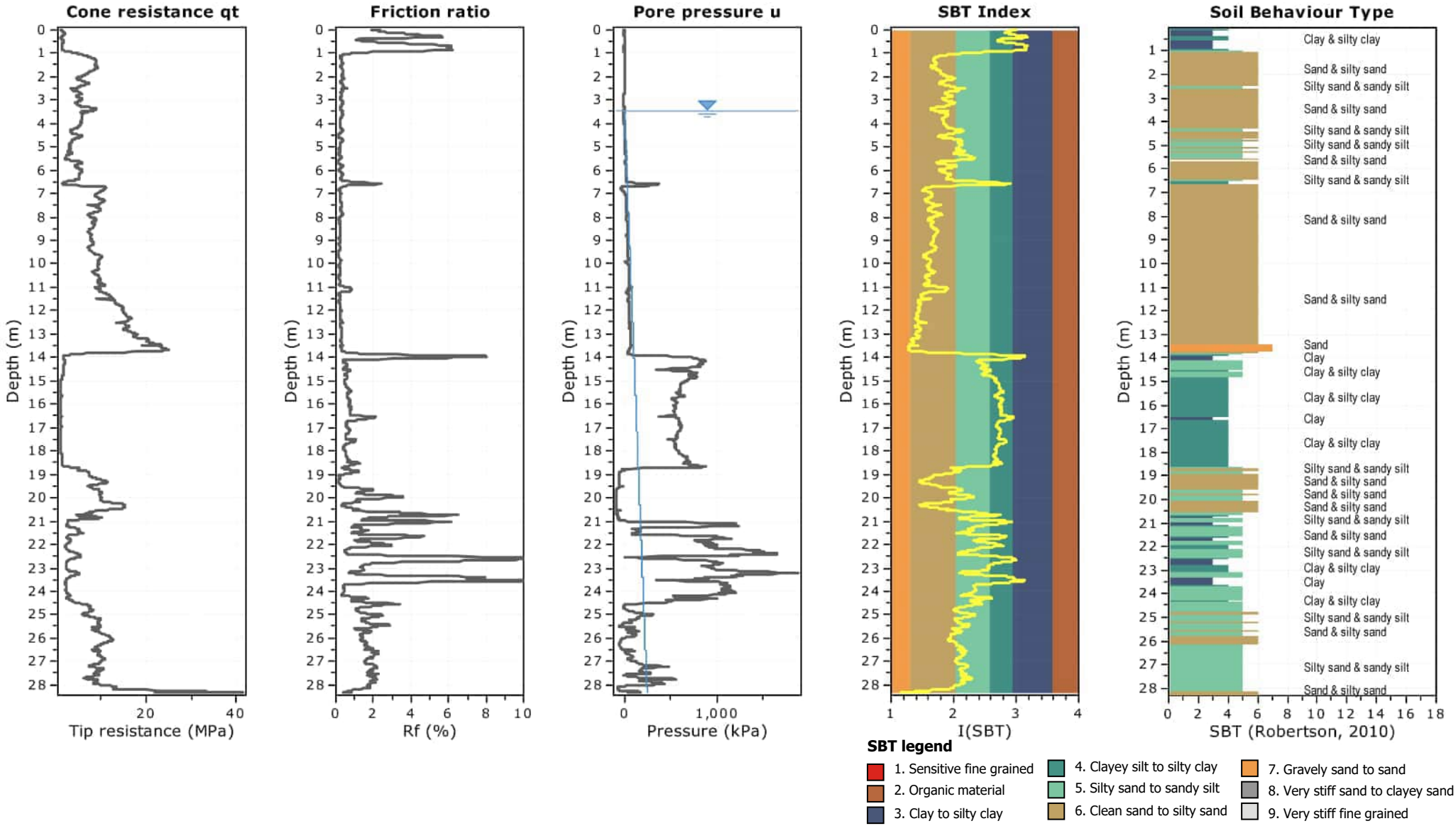
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: SCPT24-04
Total depth: 28.31 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 3.50 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

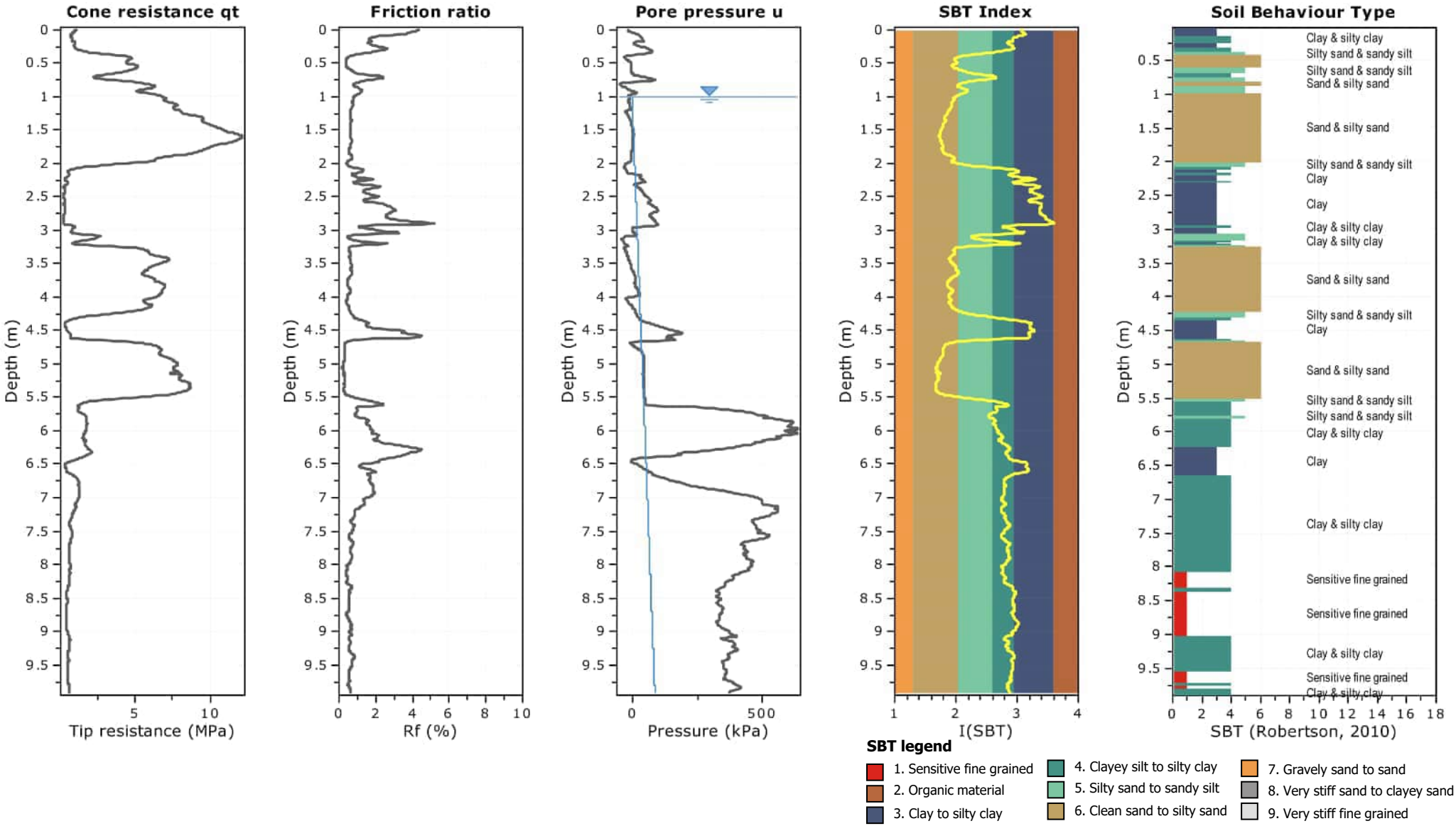
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-01
Total depth: 9.91 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

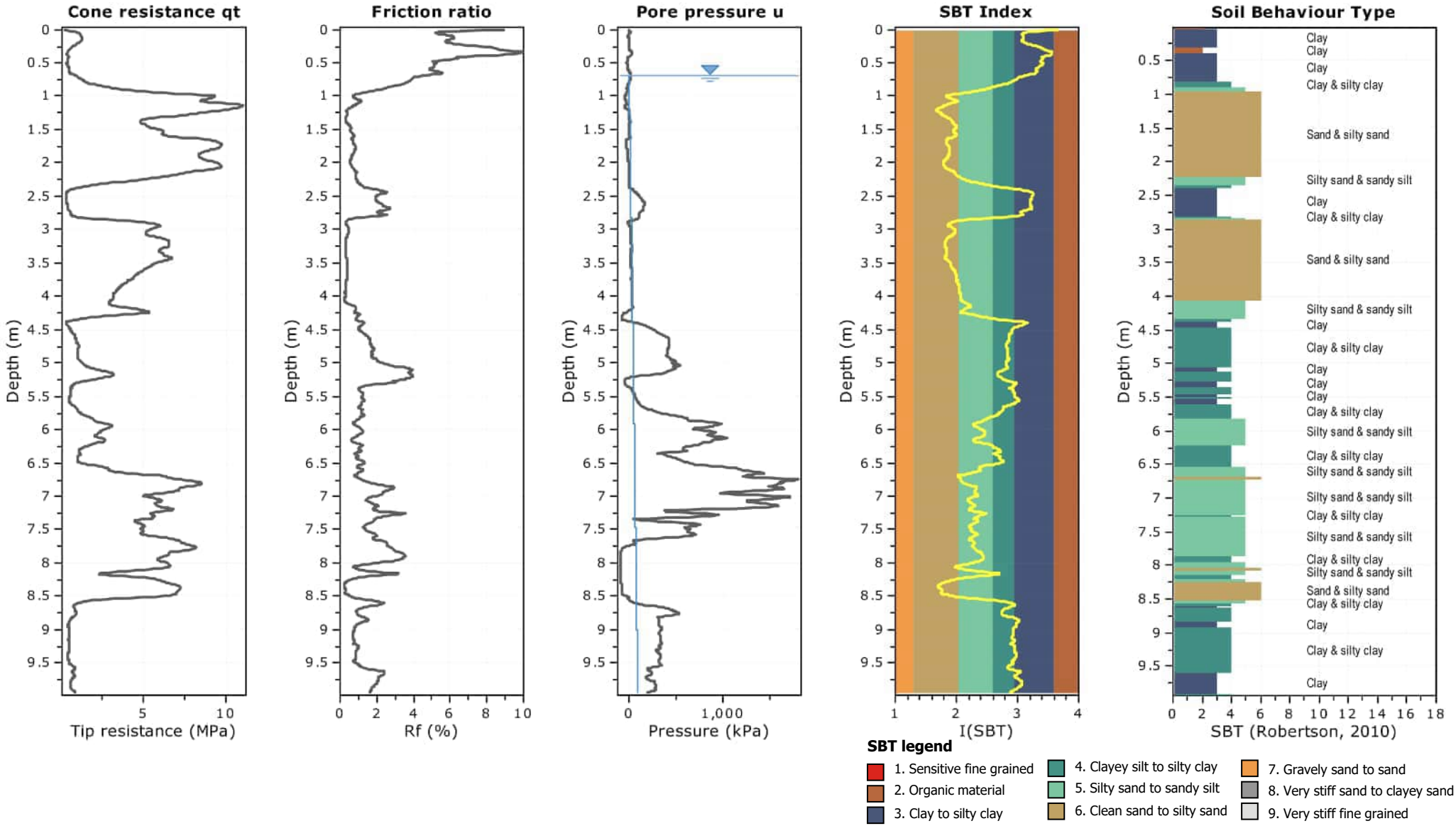
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-02
Total depth: 9.94 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 0.70 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-03
Total depth: 9.92 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 0.75 m
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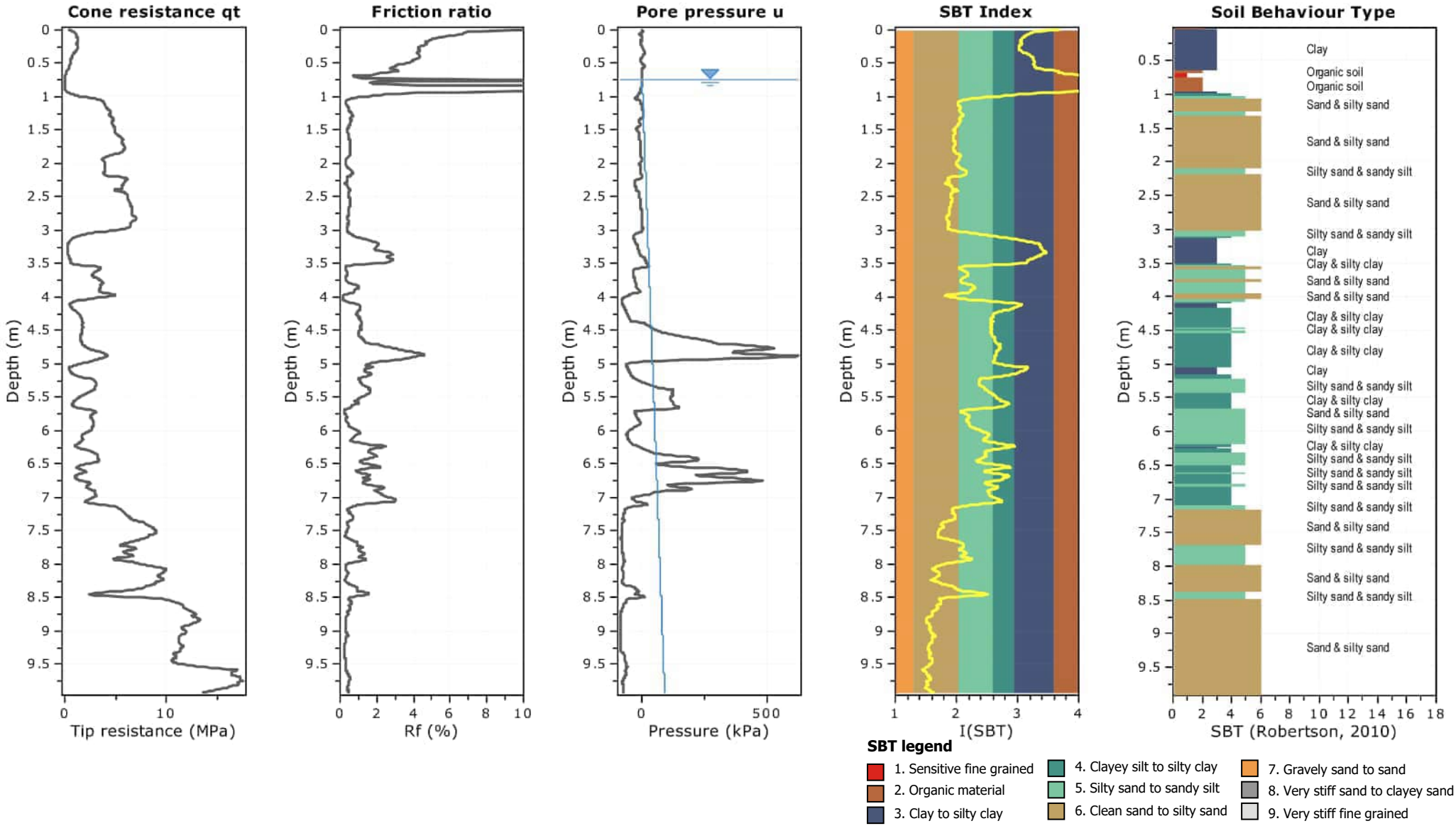
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-04
Total depth: 9.92 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 0.80 m
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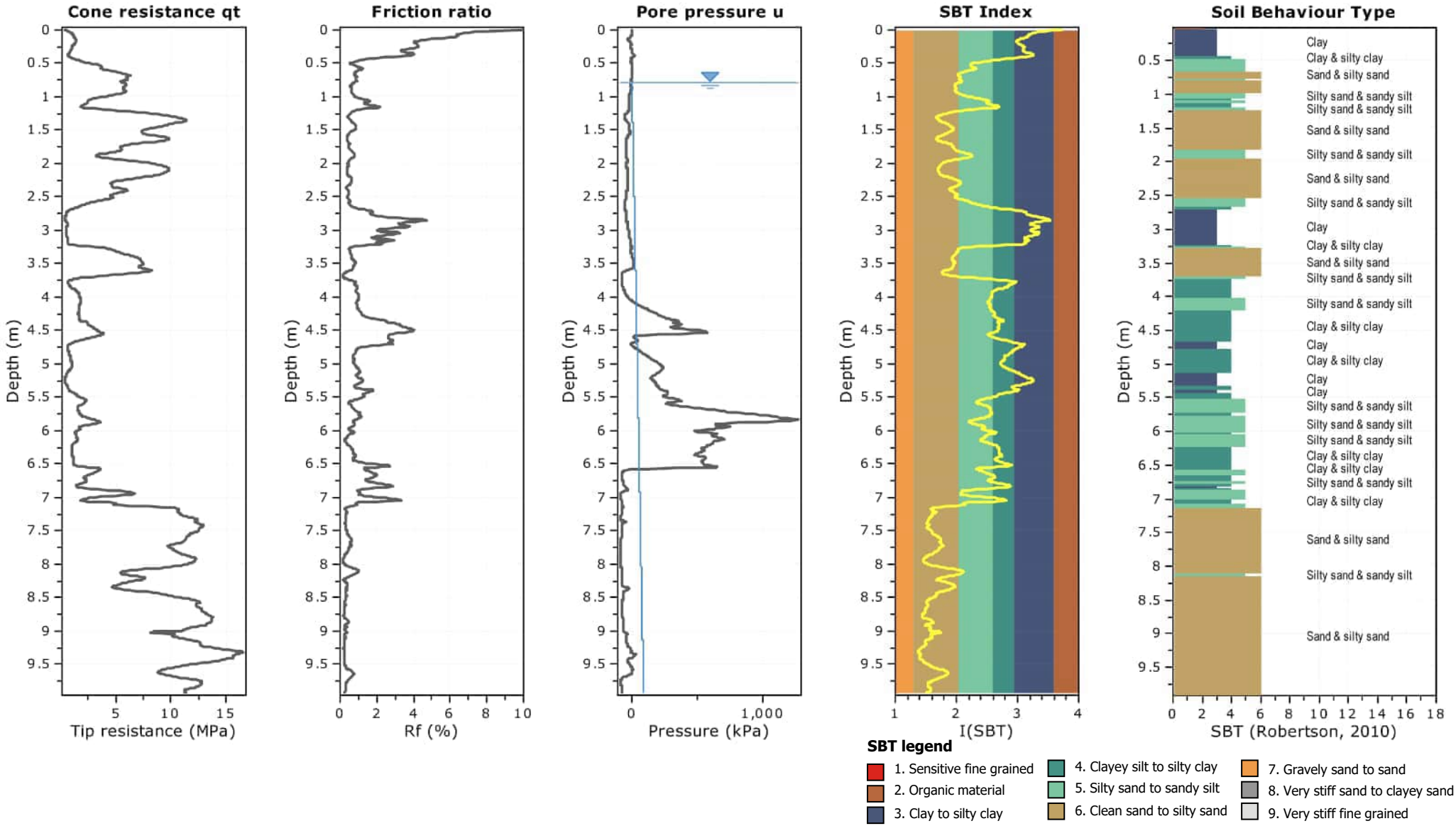
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-05
Total depth: 14.92 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 0.72 m
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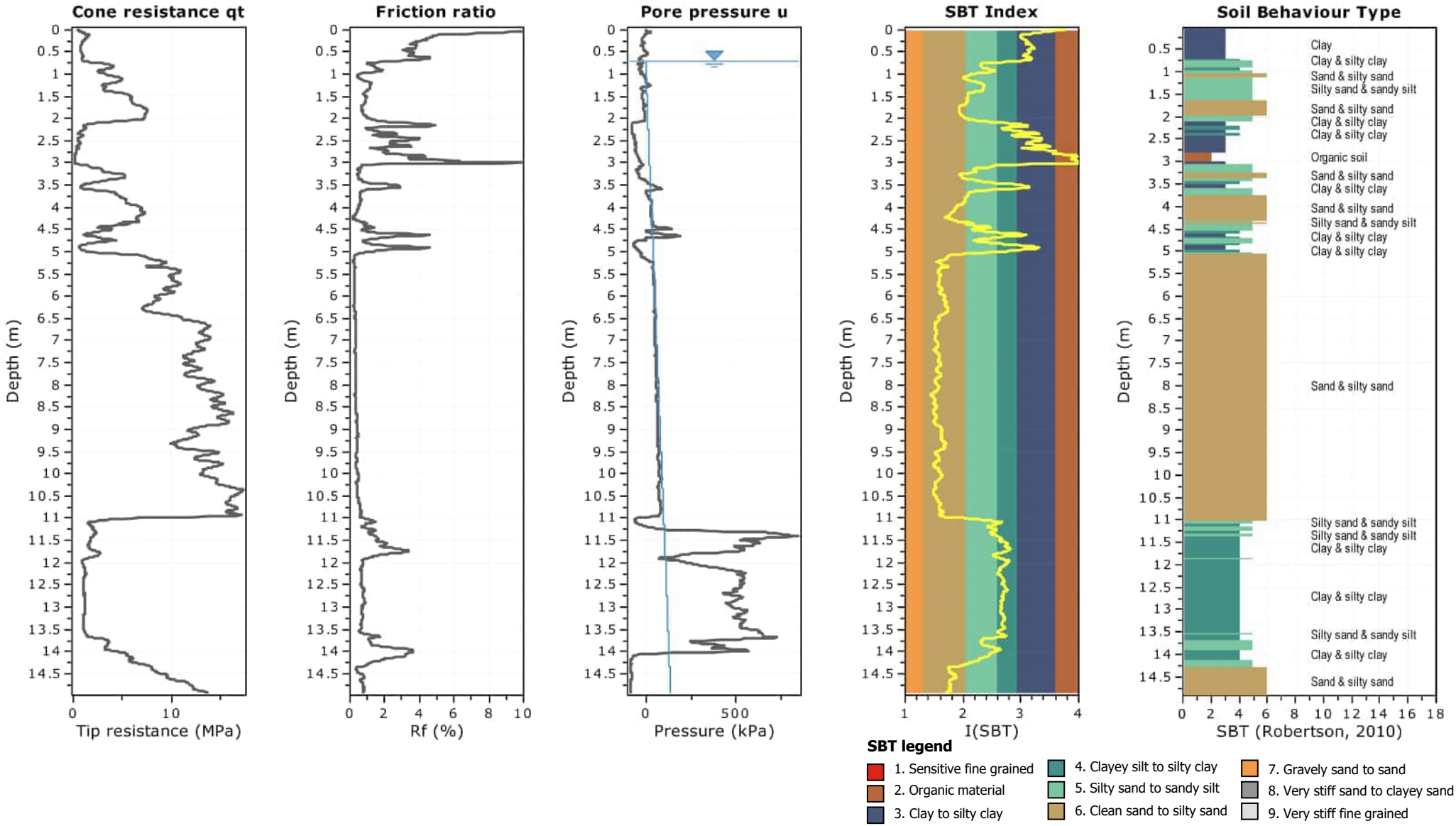
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-06
Total depth: 9.88 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
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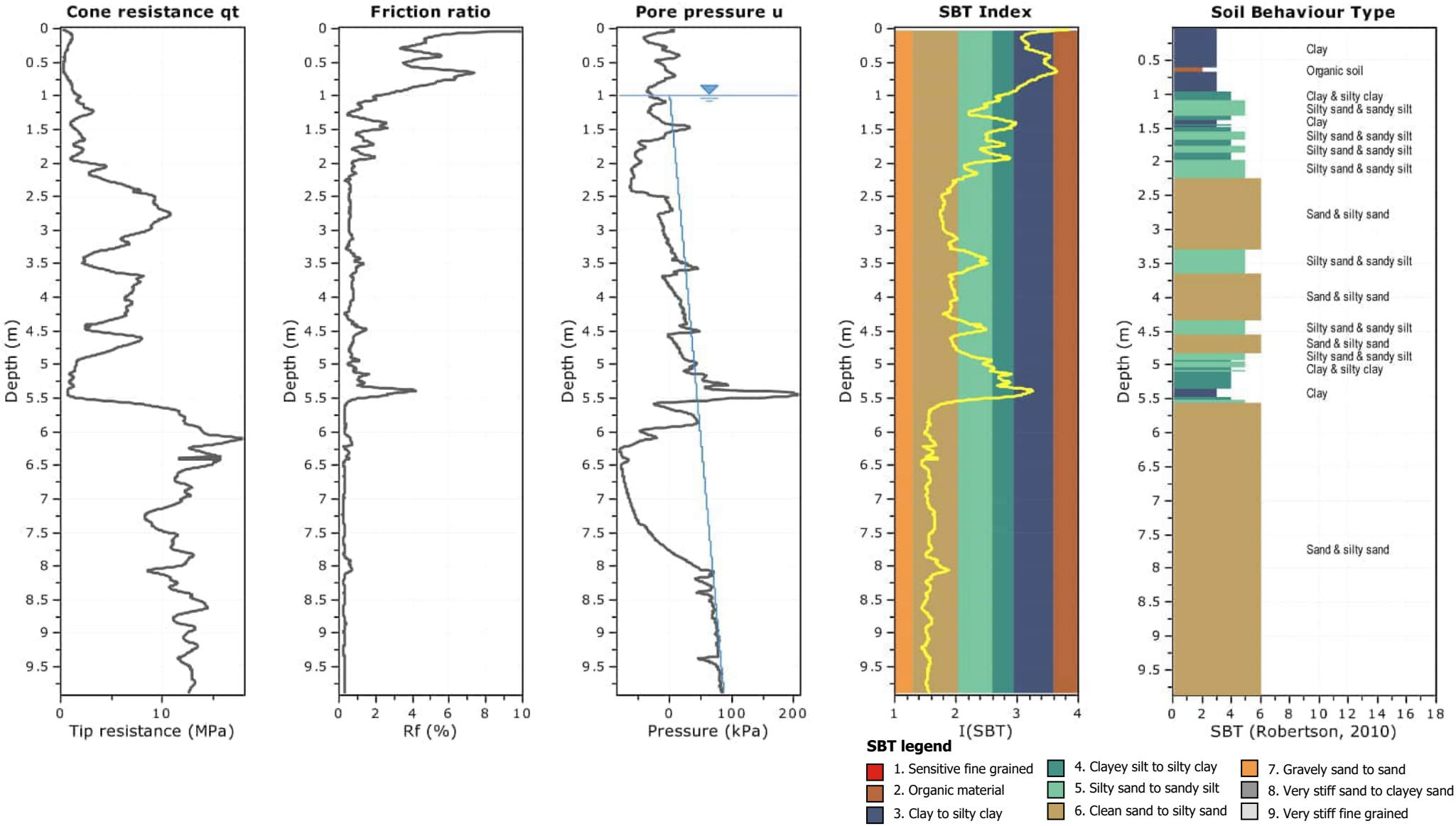
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-07
Total depth: 10.07 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 0.85 m
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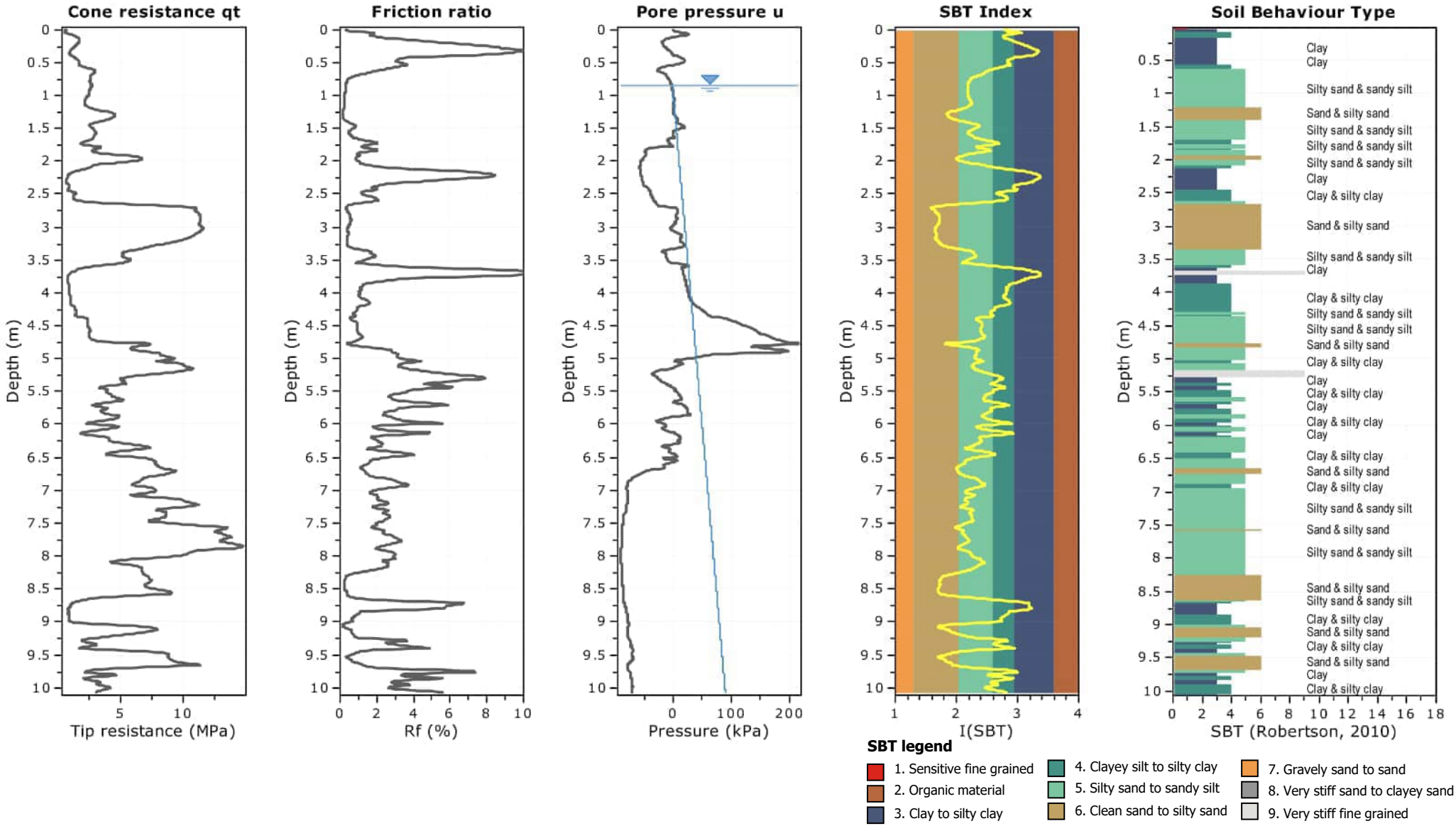
Cone Type:
Cone Operator:

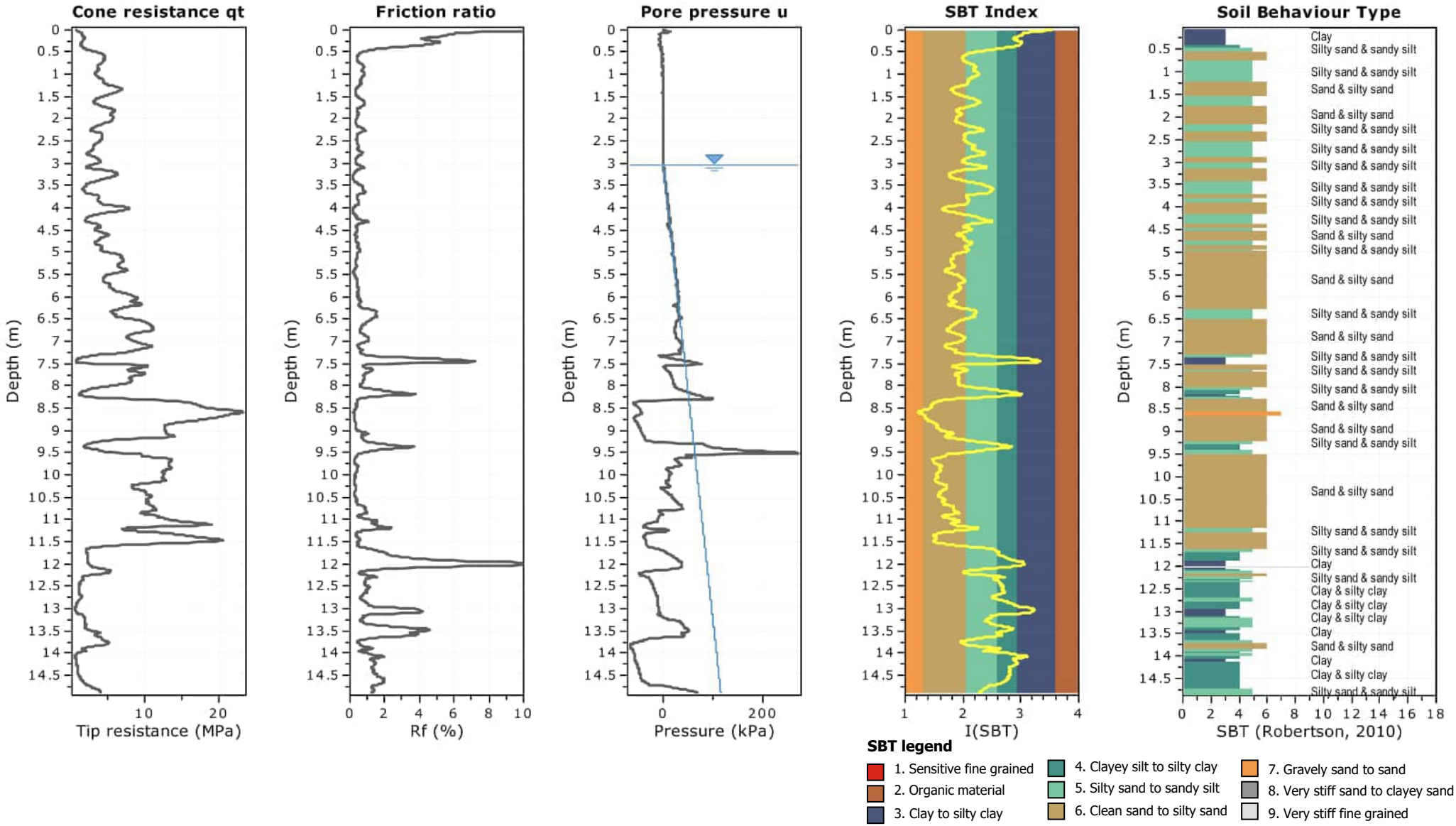
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-08
Total depth: 14.88 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 3.05 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

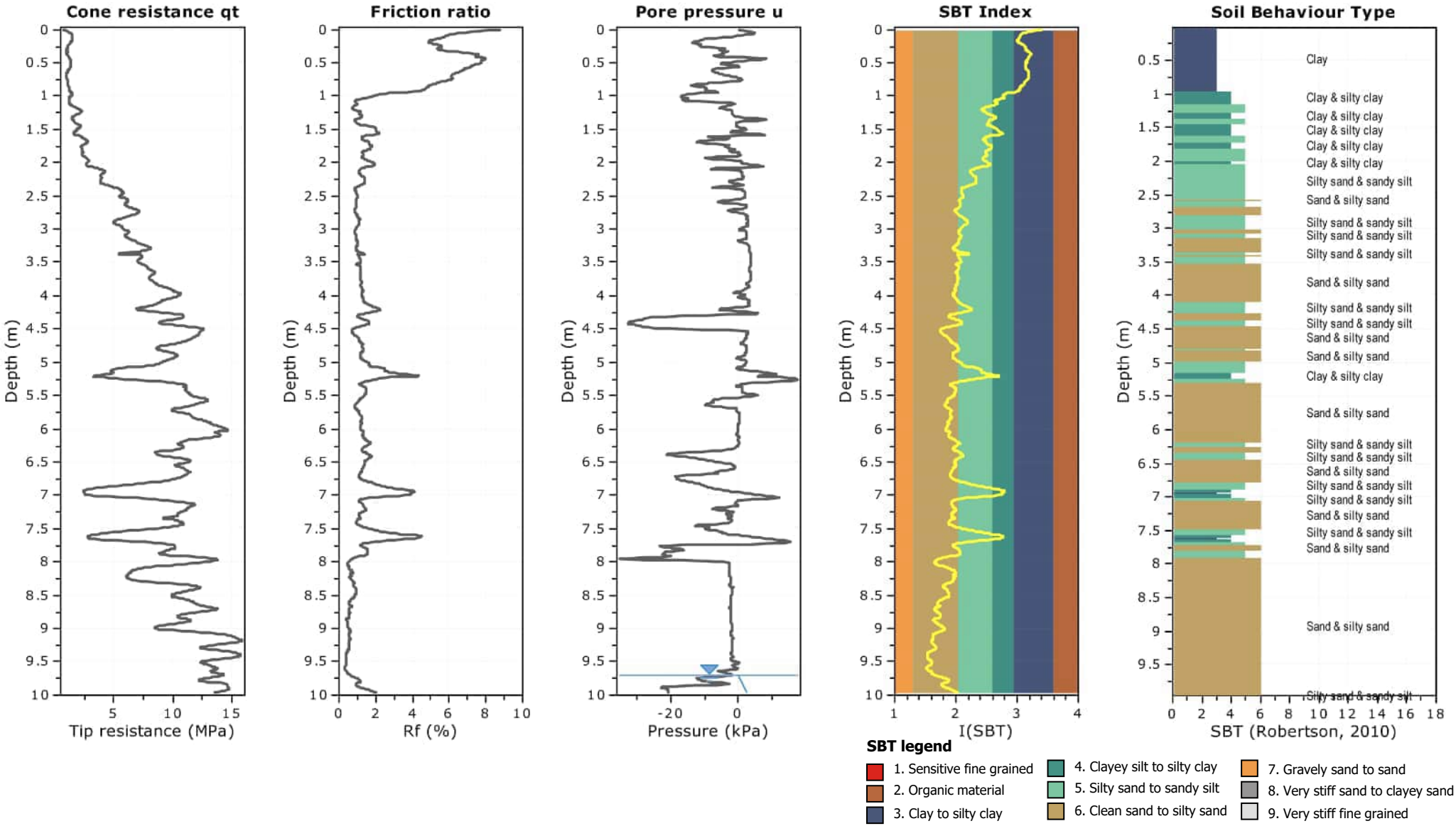
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-09
Total depth: 9.96 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 9.70 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

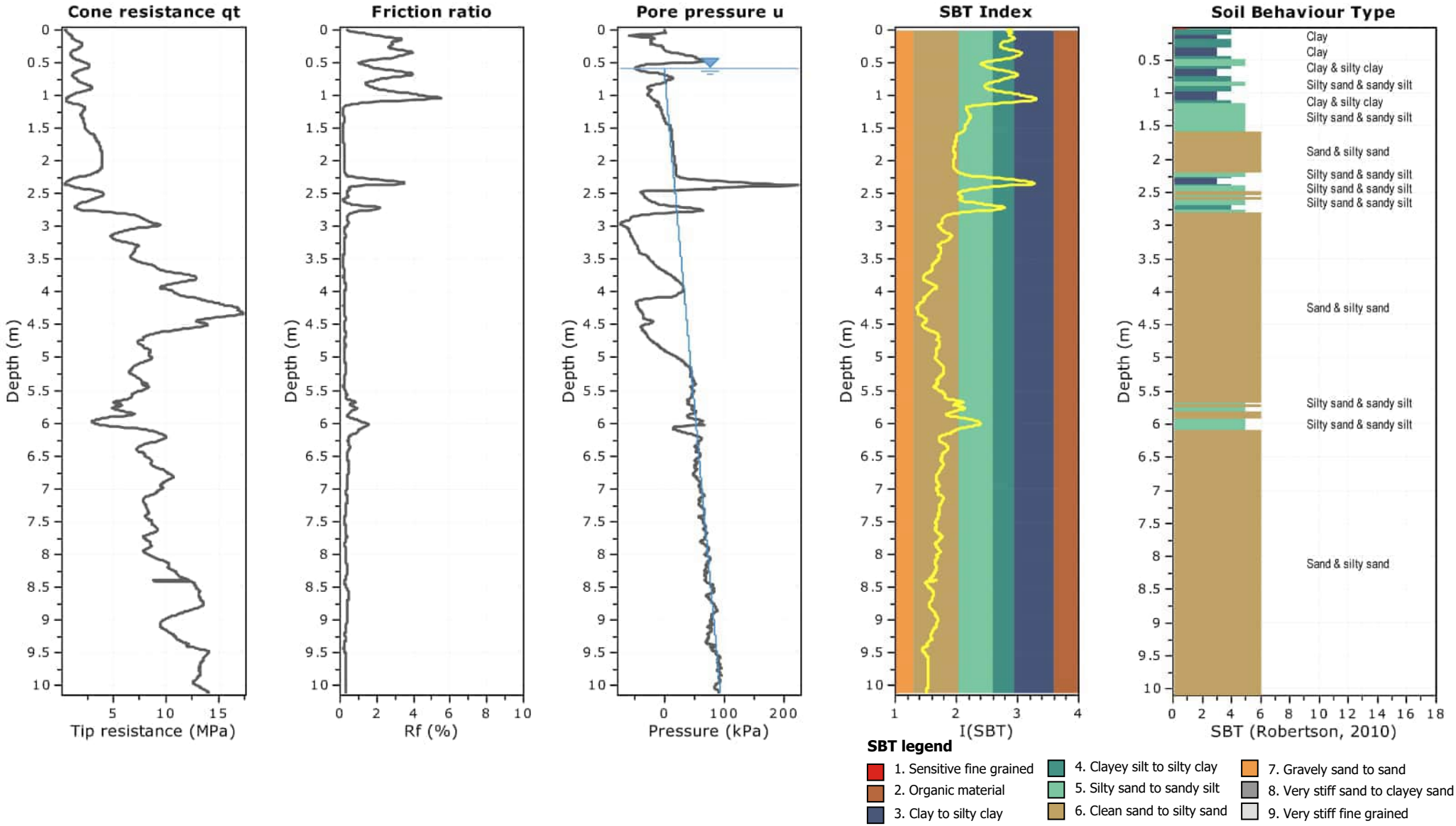
Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



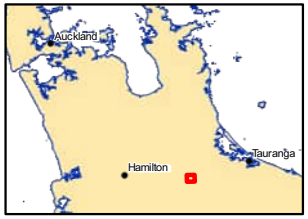
CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-10
Total depth: 10.10 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 0.60 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**



APPENDIX G: GROUNDWATER SURFACE (WGA)



LEGEND

- Piezometer (GWL in m RL)
- Piezometric Surface (m RL)
- Wastewater Disposal Site

N

0 90 180 270 m

Scale 1:9 000 @A4

Coordinate System: NZGD 2000 New Zealand Transverse Mercator

WGA

Figure **A1**

Ashbourne Development

Piezometric Surface

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Any relevance placed on such information shall be at the risk of the user.

Note:The inoformation shown on this map is copyright of WGA 2025

Document Path: \\wga-fs01\projects\2022\221300 - 221399\221352 - Rotokauri Greenway\Data\GIS\Figures\Doc\0006-FigA01-v1-Piezometric- Surface.pdf

APPENDIX H: NATURAL HAZARD RISK ASSESSMENT

NATURAL HAZARDS RISK ASSESSMENT FOR LAND SUBDIVISION

ASHBOURNE DEVELOPMENT, STATION RD, MATAMATA

1 CONTEXT

Section 106 of the Resource Management Act (RMA) requires an assessment of the risk from natural hazards to be carried out when considering the granting of a subdivision consent. S106 RMA specifically states that the assessment must consider the combined effect of the natural hazard likelihood and material damage to land, other land or structures (consequence).

Section 2 of the RMA defines natural hazards as any atmospheric or earth or water related occurrence (including earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire or flooding) the action of which adversely affects or may adversely affect human life, property, or other aspects of the environment.

This appendix to CMW report reference HAM2023-0124 Rev 3 sets out the criteria for and presents the results of an assessment of the geotechnical-related natural hazards associated with this proposed subdivision development. The remaining hazards, i.e. tsunami, wind, drought, fire and flooding hazards are not covered by this assessment.

2 BASIS OF ASSESSMENT

2.1 Risk Classification

The occurrence of natural hazards and their potential impacts on the proposed subdivision development is assessed in terms of risk significance, which is based on likelihood and consequence factors. A risk table is used to help assess the likelihood and consequence factors, the form of which used by CMW for this project is presented in Table B1.

Table B1: Natural Hazard Risk Classification

Risk Matrix		Consequence				
		Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
Likelihood	Almost Certain 5	Medium 5	High 10	Very high 15	Extreme 20	Extreme 25
	Likely 4	Low 4	Medium 8	High 12	Very high 16	Extreme 20
	Moderate 3	Low 3	Medium 6	Medium 9	High 12	Very high 15
	Unlikely 2	Very low 2	Low 4	Medium 6	Medium 8	High 10
	Rare 1	Very low 1	Very low 2	Low 3	Low 4	Medium 5

2.2 Likelihood

With respect to assessing the likelihood or chance of the risk occurring, the qualitative definitions used by CMW for this project are provided in Table B2 for each likelihood classification.

Table B2: Qualitative Natural Hazard Likelihood Definitions		
1	Rare	The natural hazard is not expected to occur during the design life of the project
2	Unlikely	The natural hazard is unlikely, but may occur during the design life
3	Moderate	The natural hazard will probably occur at some time during the life of the project
4	Likely	The natural hazard is expected to occur during the design life of the project
5	Almost Certain	The natural hazard will almost definitely occur during the design life of the project

2.3 Consequence

In terms of determining the consequence or severity of the natural hazard occurring, the qualitative definitions used by CMW for this project are provided in Table B3 for each consequence classification.

Table B3: Qualitative Natural Hazard Consequence Definitions		
1	Insignificant	Very minor to no damage, not requiring any repair, no people at risk, no economic effect to landowners.
2	Minor	Minor damage to land only, any repairs can be considered normal property maintenance no people at risk, very minor economic effect.
3	Moderate	Some damage to land requiring repair to reinstate within few months, minor cosmetic damage to buildings being within relevant code tolerances, does not require immediate repair, no people at risk, minor economic effect.
4	Major	Significant damage to land requiring immediate repair, damage to buildings beyond serviceable limits requiring repair, no collapse of structures, perceptible effect to people, no risk to life, considerable economic effect.
5	Catastrophic	Major damage to land and buildings, possible structure collapse requiring replacement, risk to life, major economic effect, or possible site abandonment.

2.4 Risk Acceptance

It is recognised that the natural hazard risk assessment provided herein is qualitative and, due to the wide range of possible geohazards that could occur, is somewhat subjective. Other methods are available to quantitatively assess an acceptable level of geotechnical related natural hazard risk, such as defining an acceptable factor of safety with respect to slope stability or acceptable differential ground settlements with respect to recommended building code limits.

Therefore, to give this qualitative natural hazard risk assessment some relevance to more commonly adopted numerical or quantitative geotechnical assessment techniques, a residual risk rating of very low to medium (risk value = 1 to 9 inclusive) is considered an acceptable result for the proposed subdivision development.

A risk rating of high to extreme (risk value ≥ 10) is considered an unacceptable result for the proposed subdivision development.

3 RISK ASSESSMENT

The natural hazards relevant to this proposed subdivision development and adjacent, potentially affected land have been assessed with respect to the criteria outlined above.

Assessment is based on proposed post development ground conditions with and without any geotechnical controls. The latent risk was first assessed with the site in its proposed developed state to consider the risks to the development and surrounding land, including assessment of land modifications from the pre-existing natural state, without any implemented geotechnical controls. The specific geotechnical mitigation measures and engineering design solutions outlined in the table below and CMW report, where relevant, were then considered to determine the natural hazard residual risk remaining after the proposed controls have been implemented.

Results of this assessment are presented in Table C1 below.

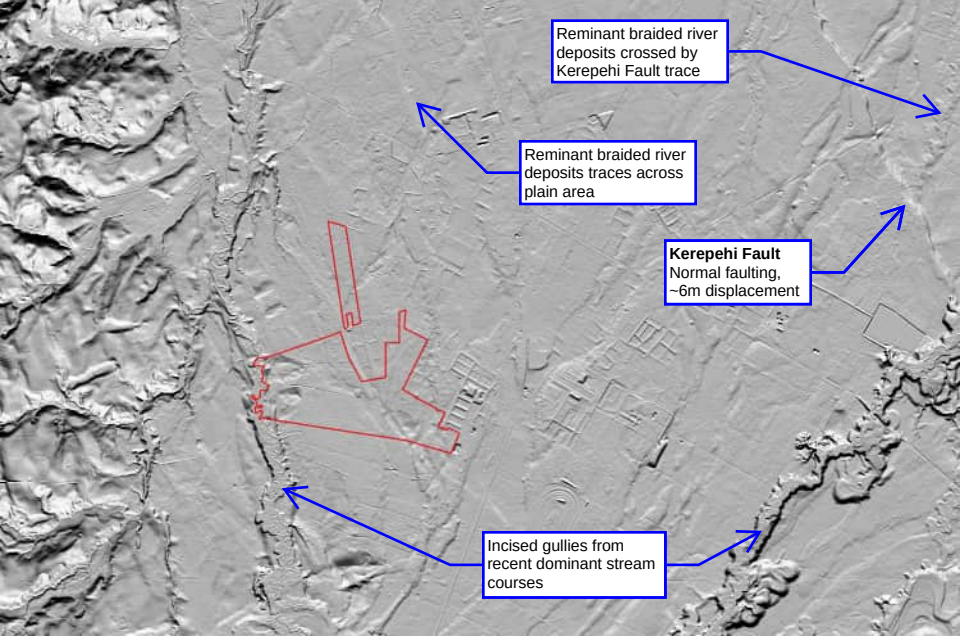
Appendix H - Geohazard Assessment Summary											
Item	Geotechnical Hazard	Description	Area Affected	Assessment Outcome	Existing Risk of Damage to Land / Structures			Mitigation Measure	Residual Risk of Damage to Land / Structures		
					Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
1	Earthquake	Seismicity	Entire Site	Site subsoil class = Class D due to less than dense/ stiff soil profile Importance Level = 2 (Residential Subdivision and Retirement Village) Importance Level = 3 (Solar Farm)	1	5	5	None	1	5	5
		Fault Rupture	Entire Site	Nearest active fault (Kerpehi fault) is approximately 5km from the site. (Refer to section 6.3)	1	5	5	Mitigation not required	1	5	5
		Liquefaction	Whole site	Refer to Section 6.4	3	4	12	Engineered design of ground improvement/ foundation design/ superstructure design required. Refer Section 7.2.	3	2	6
		Cyclic Softening	Entire Site	20% strength loss expected in fine grained soils.	1	4	4	Mitigation not required.	1	4	4
		Lateral Spread	Riverbanks/ greenway banks	Refer to Sections 6.5 & 6.6	3	4	12	Riverbank - Lateral spreading risk should be considered in the design, further	3	4	12

Appendix H - Geohazard Assessment Summary											
Item	Geotechnical Hazard	Description	Area Affected	Assessment Outcome	Existing Risk of Damage to Land / Structures			Mitigation Measure	Residual Risk of Damage to Land / Structures		
					Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
								investigation and analysis will be required. Greenway – building restriction zone of 5m from back of greenway crest batter.			
2	Volcanic Activity	Ash and Pyroclastic Falls	Entire Site	Nearest active volcano is the Rotorua Caldera. Currently at alert level 0.	1	5	5	Mitigation not required.	1	5	5
3	Slope Instability / Landslide	Global Instability	Entire site	Due to the landform being generally near level to gently sloping, slope instability is not anticipated.	1	4	4	Mitigation not required.	1	4	4
4	Problematic Soils	Expansive Soils	Entire Site	Experience in similar soils indicate that the soils on site are non-expansive.	2	3	6	Mitigation not required.	2	3	6
5	Settlement	Compressible Soils	Entire Site	Minor compressible soils were encountered on site.	2	4	8	Trial embankment / preloading has been recommended.	1	4	4
		Fill Induced Settlement	Entire Site	No earthwork plans are available at the time of writing report. Site is primarily underlain with dense to very dense sand and	2	4	8	Trial embankment / preloading has been recommended.	1	4	4

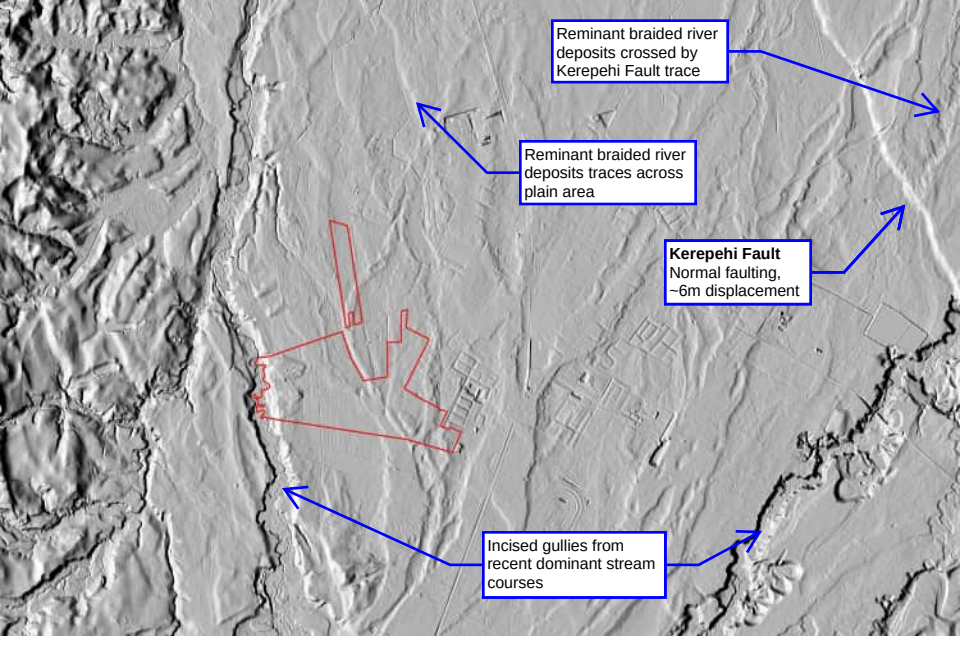
Appendix H - Geohazard Assessment Summary											
Item	Geotechnical Hazard	Description	Area Affected	Assessment Outcome	Existing Risk of Damage to Land / Structures			Mitigation Measure	Residual Risk of Damage to Land / Structures		
					Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
				stiff to very stiff silt. It is anticipated any fill induced settlement would occur immediately and be built out during construction.							
6	Bearing Capacity	Bearing Capacity Failure	Building Platform	Refer to Section 7.6 of the report	2	4	8	A preliminary geotechnical ultimate bearing capacity (GUBC) of 300kPa should be available in the static case. Low ultimate bearing capacity is anticipated in the seismic case. Should be accounted for during Building Consent stage.	2	2	4
7	Construction Risks	Excitability	Building Platform	Given the density of the soil units that will be encountered, excavation is expected to be readily achieved with normal earthworks plant. However, excavations may require temporary support due to high expected groundwater and granular soils leading to 'running sands'.	3	3	9	Consideration to be given to sensitive silts and shallow groundwater table.	3	2	6

Appendix H - Geohazard Assessment Summary											
Item	Geotechnical Hazard	Description	Area Affected	Assessment Outcome	Existing Risk of Damage to Land / Structures			Mitigation Measure	Residual Risk of Damage to Land / Structures		
					Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
		Sediment Retention Ponds	Building Platform	Sediment retention ponds will require geotechnical input at design stage to ensure batter stability is achievable.	2	3	6	Consideration to be given to batter stability of proposed ponds at design and construction phase.	2	2	4
		Stockpile locations	Building Platform	Stockpiles may cause ground movement if placed near riverbanks/slopes.	2	2	4	Stockpiles to be away from the river bank/existing slopes.	1	2	2
		Subgrade Preparation	Building Platforms and Road Alignment	Topsoil and existing vegetation within the building footprints and road alignments will be cleared as part of the proposed development earthworks.	1	2	2	Mitigation not required.	1	2	2
		Service Trenches (trench collapse / long term settlement)	Building Platform and Road Alignment	Trench collapse may occur in surficial soils / if proposed service trenches extend below GW level.	3	3	9	Mitigation should be considered in the form of: - trench support - temporary dewatering, in the form of regularly spaced pumps	3	1	3

APPENDIX I: FAULT STUDY DEM PLOTS



Altitude 45deg
Azimuth 180deg



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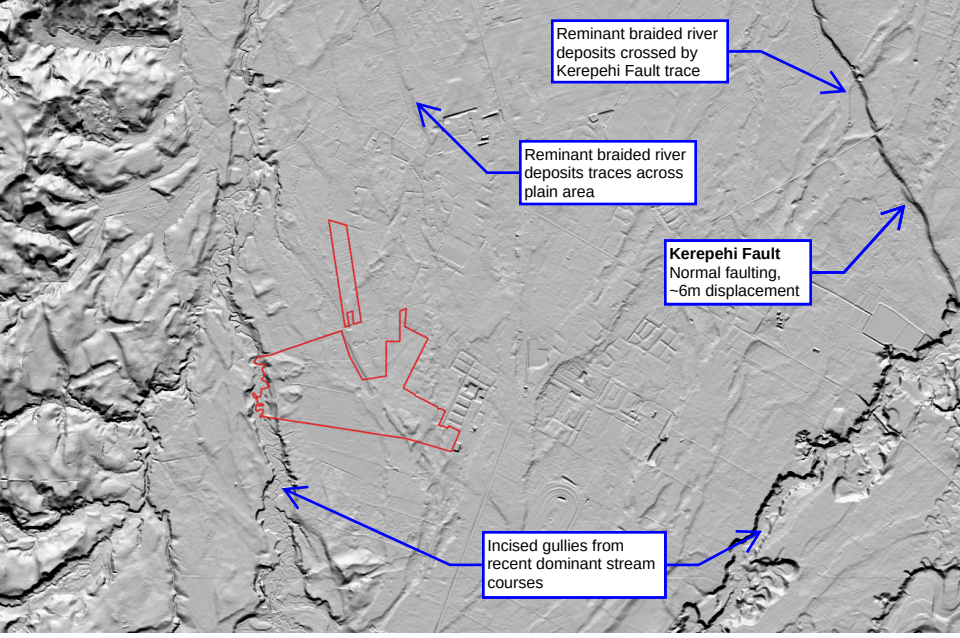
Azimuth 270deg



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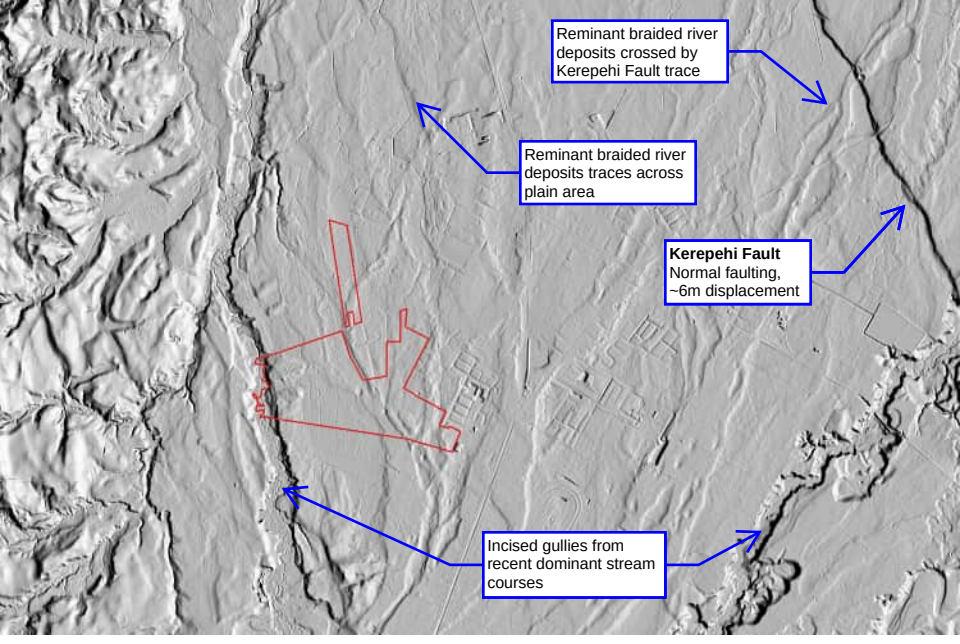


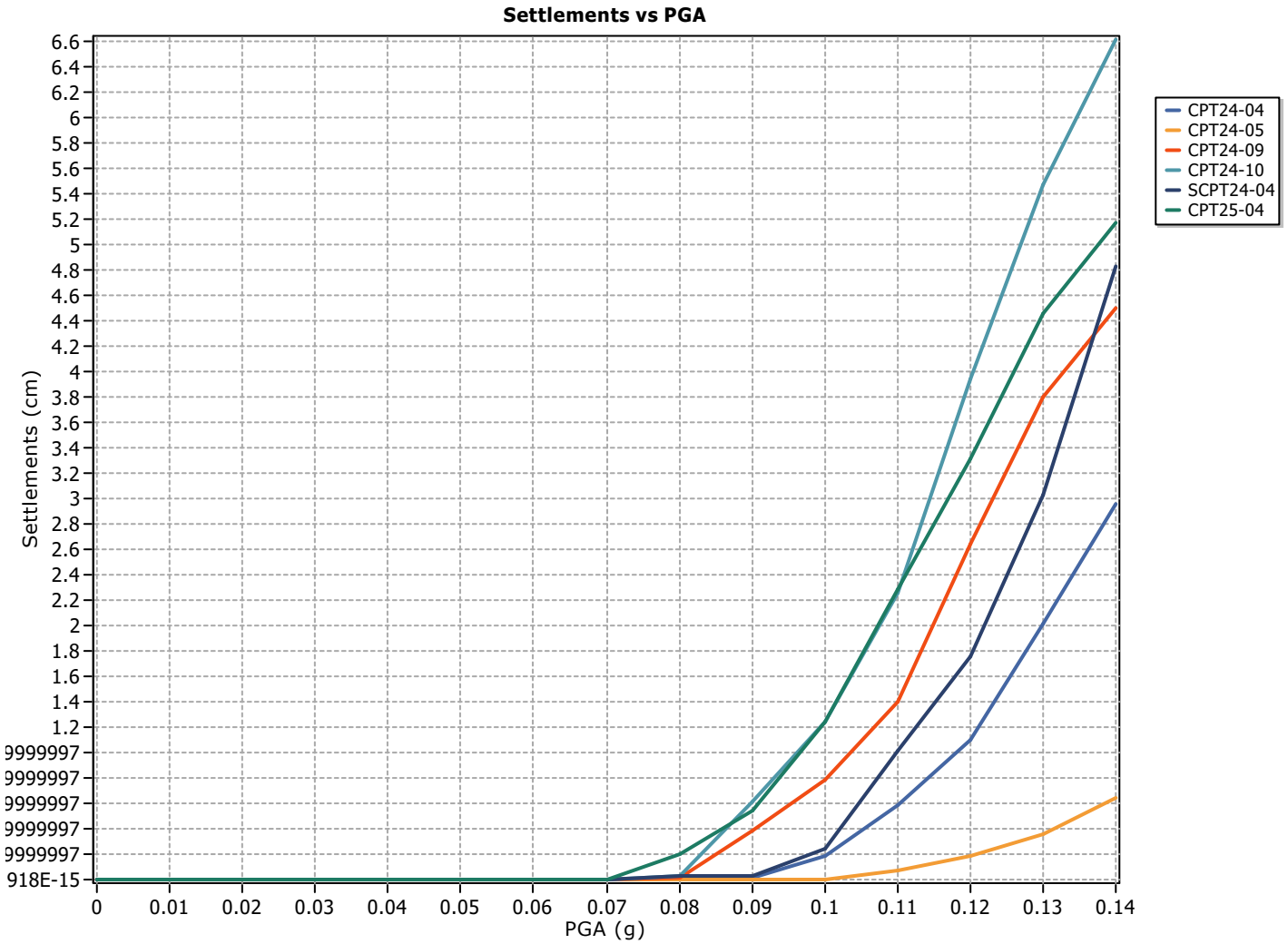
Altitude 45deg
Azimuth 90deg

APPENDIX J: LIQUEFACTION ANALYSIS RESULTS

IL1 FULL DEPTH LIQUFACTION RESULTS

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

PGA Based Parametric Analysis



:: CPT main liquefaction parameters details ::

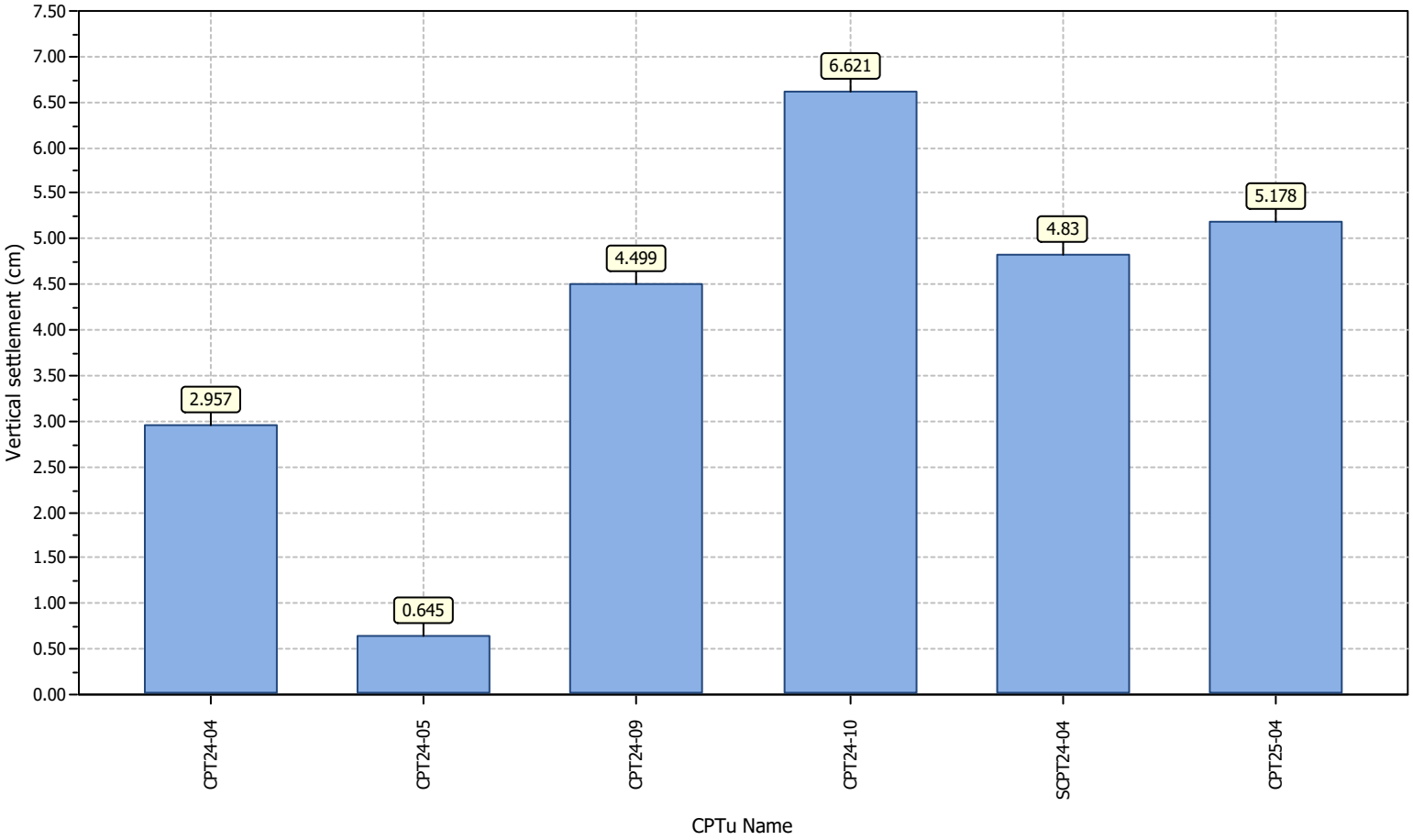
CPT Name	Assesment method	Earthquake Mag.	GWT in situ (m)	GWT earthq. (m)
CPT24-04	Boulanger & Idriss (2014)	5.90	1.70	1.70
CPT24-05	Boulanger & Idriss (2014)	5.90	3.00	3.00
CPT24-09	Boulanger & Idriss (2014)	5.90	0.60	0.60
CPT24-10	Boulanger & Idriss (2014)	5.90	0.50	0.50
SCPT24-04	Boulanger & Idriss (2014)	5.90	2.10	2.10
CPT25-04	Boulanger & Idriss (2014)	5.90	0.50	0.50

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall vertical settlements report

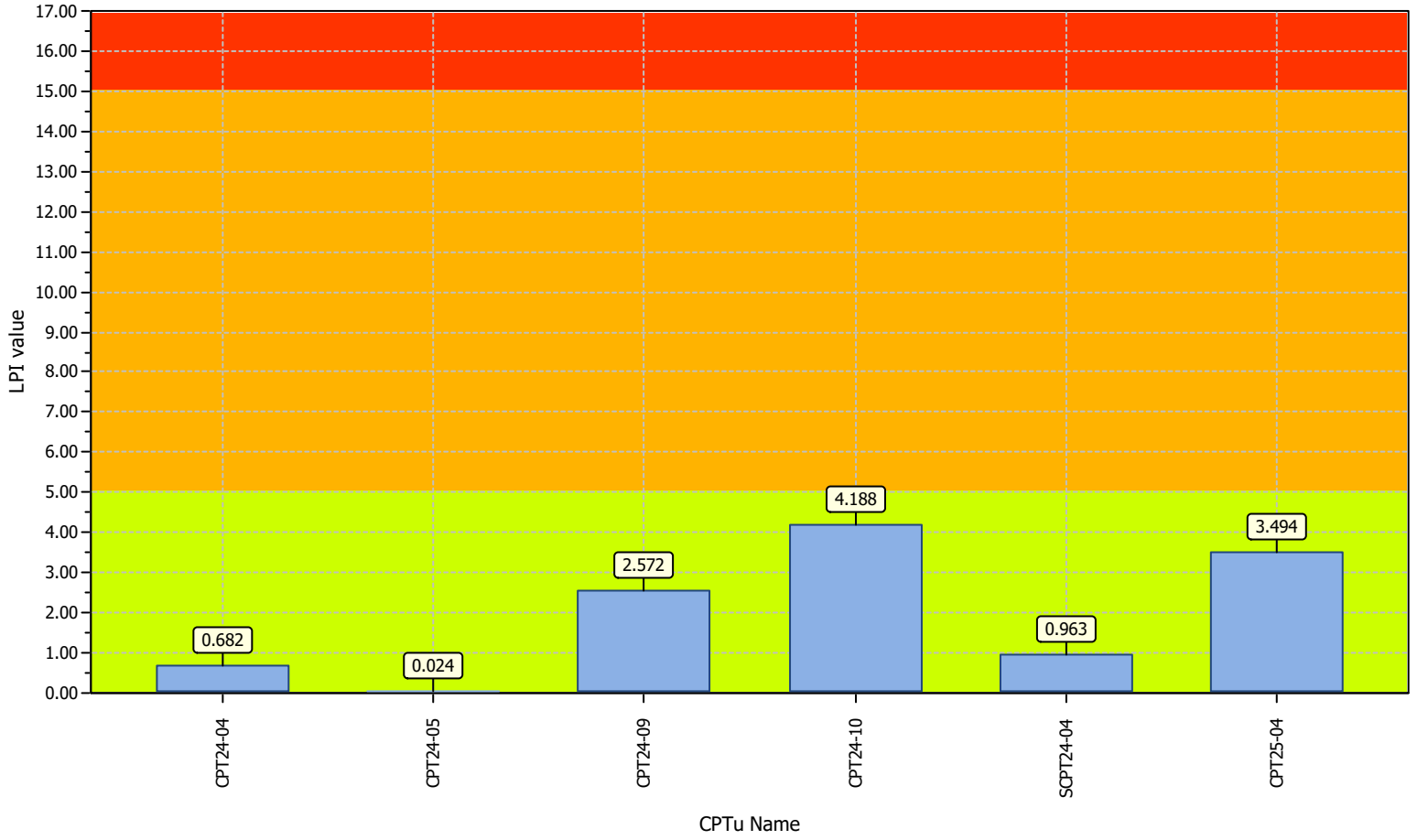


CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall Liquefaction Potential Index report



LPI color scheme

- Very high risk
- High risk
- Low risk

Basic statistics

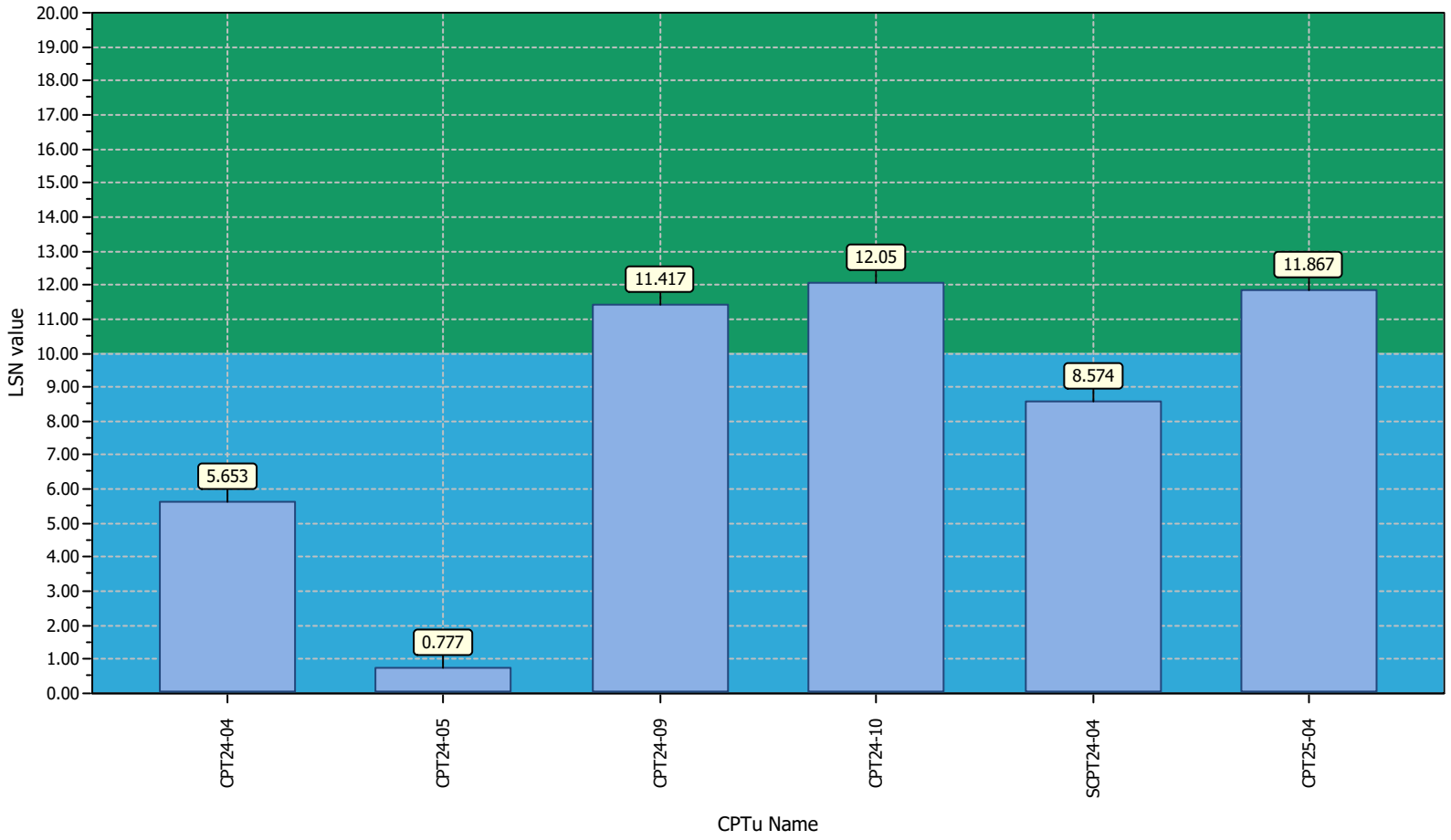
Total CPT number: 6
100% low risk
0% high risk
0% very high risk

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall Liquefaction Severity Number report



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

Basic statistics

Total CPT number: 6

50% little liquefaction

50% minor liquefaction

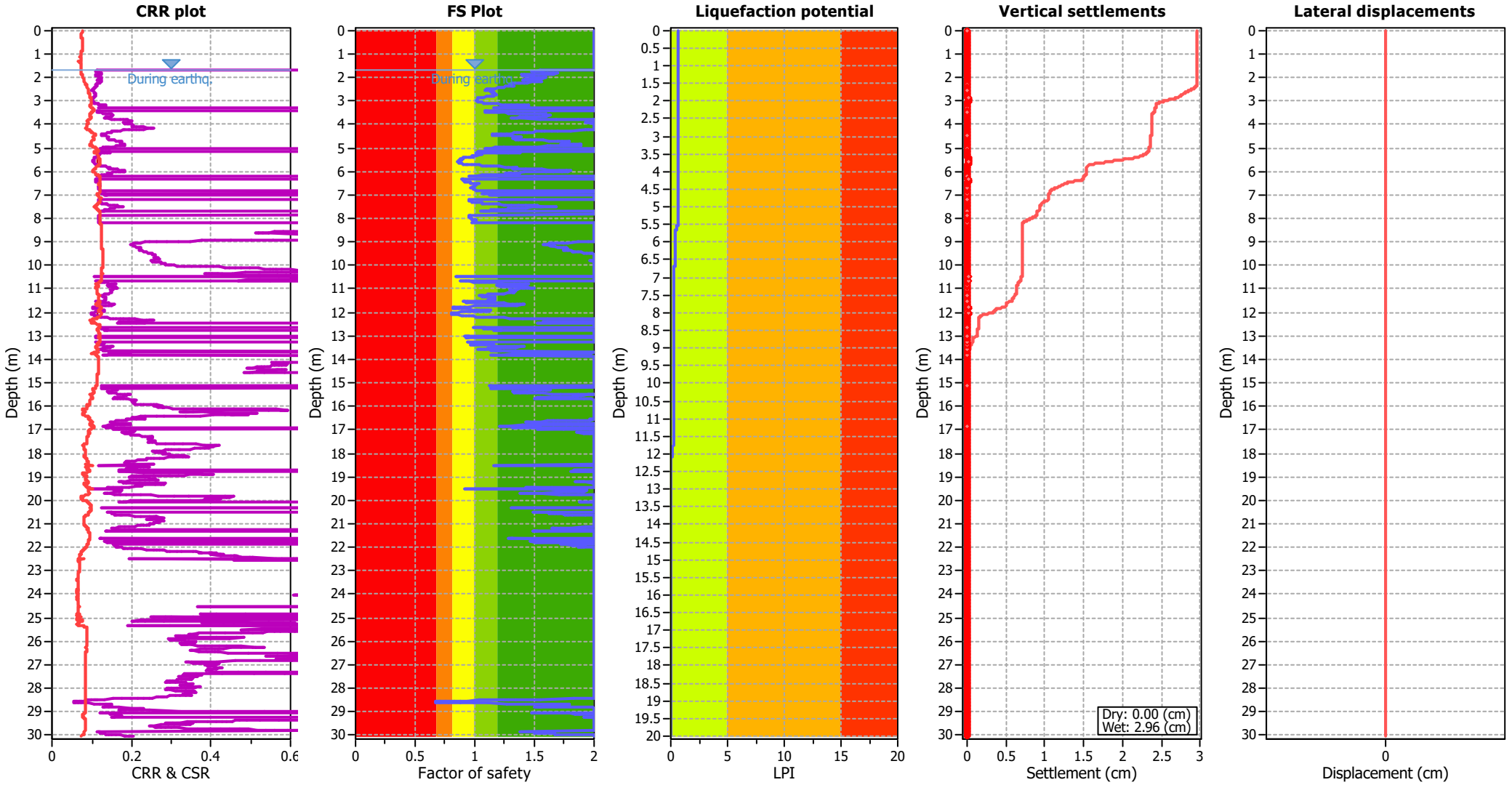
0% moderate liquefaction

0% moderate to major liquefaction

0% major liquefaction

0% severe liquefaction

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.70 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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.14	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	1.70 m	Fill height:	N/A	Limit depth:	N/A

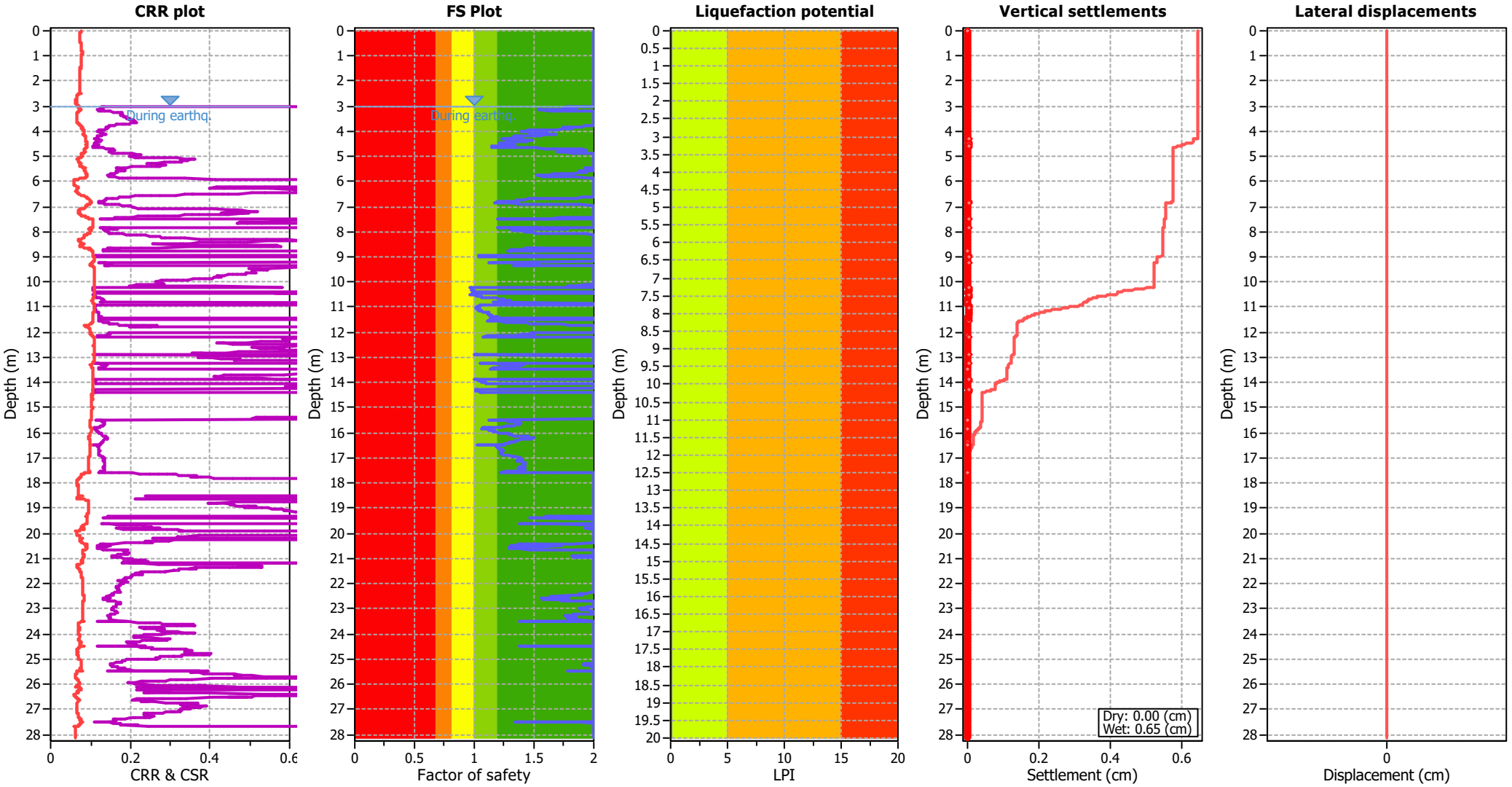
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.00 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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.14	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.00 m	Fill height:	N/A	Limit depth:	N/A

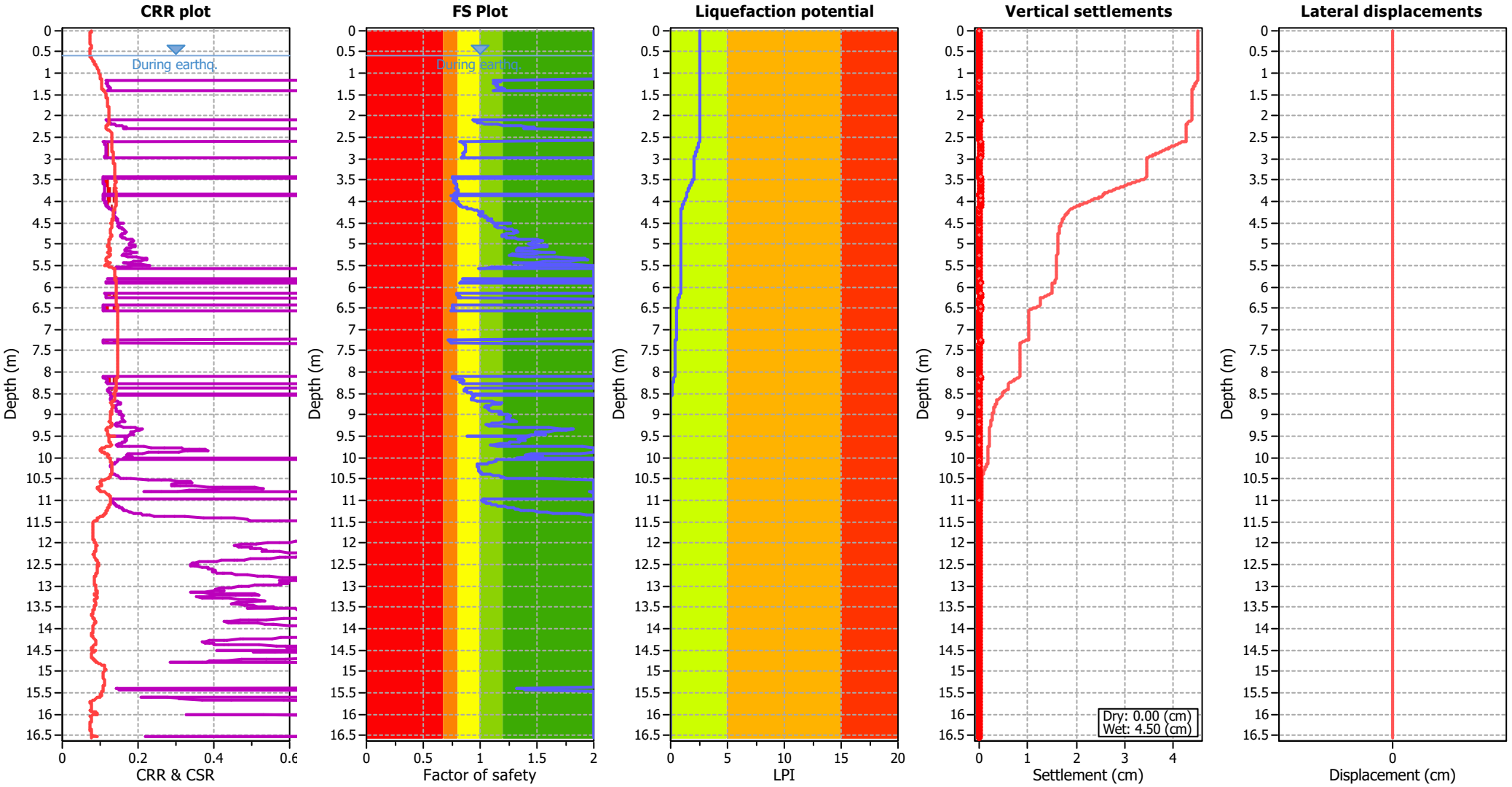
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.60 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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.14	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	0.60 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

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LPI color scheme

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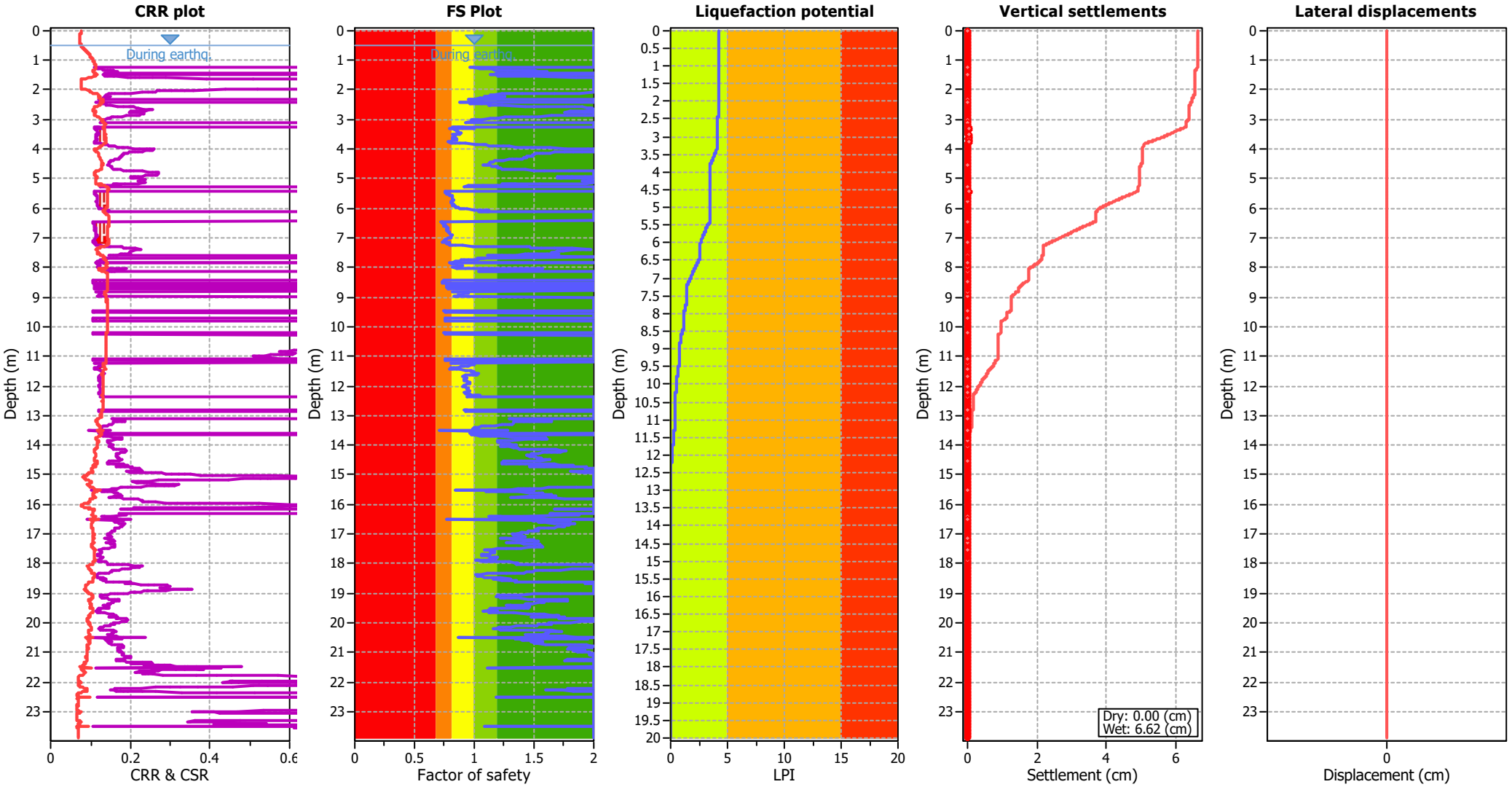
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.50 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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.14	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	0.50 m	Fill height:	N/A	Limit depth:	N/A

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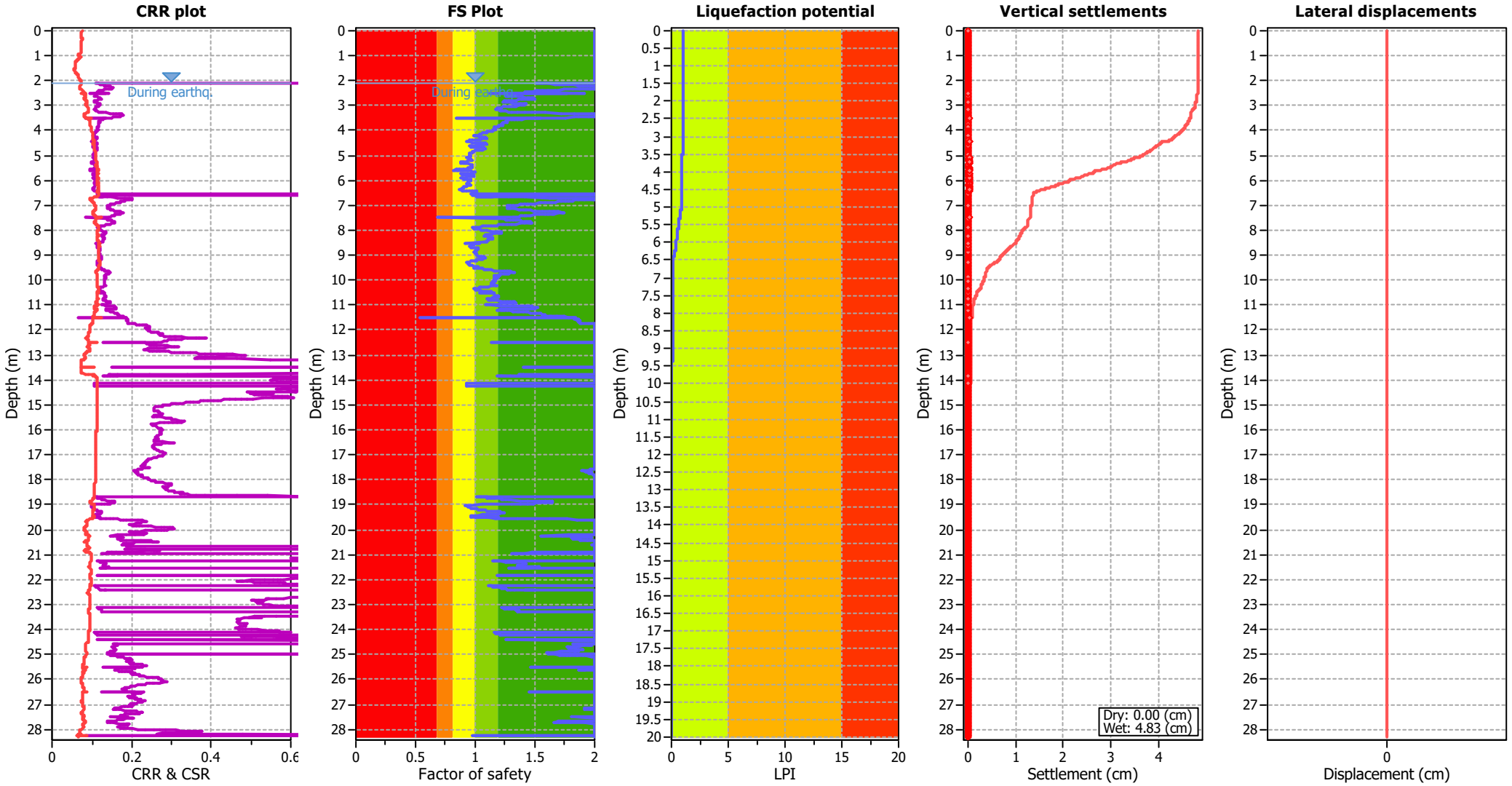
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.10 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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.14	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.10 m	Fill height:	N/A	Limit depth:	N/A

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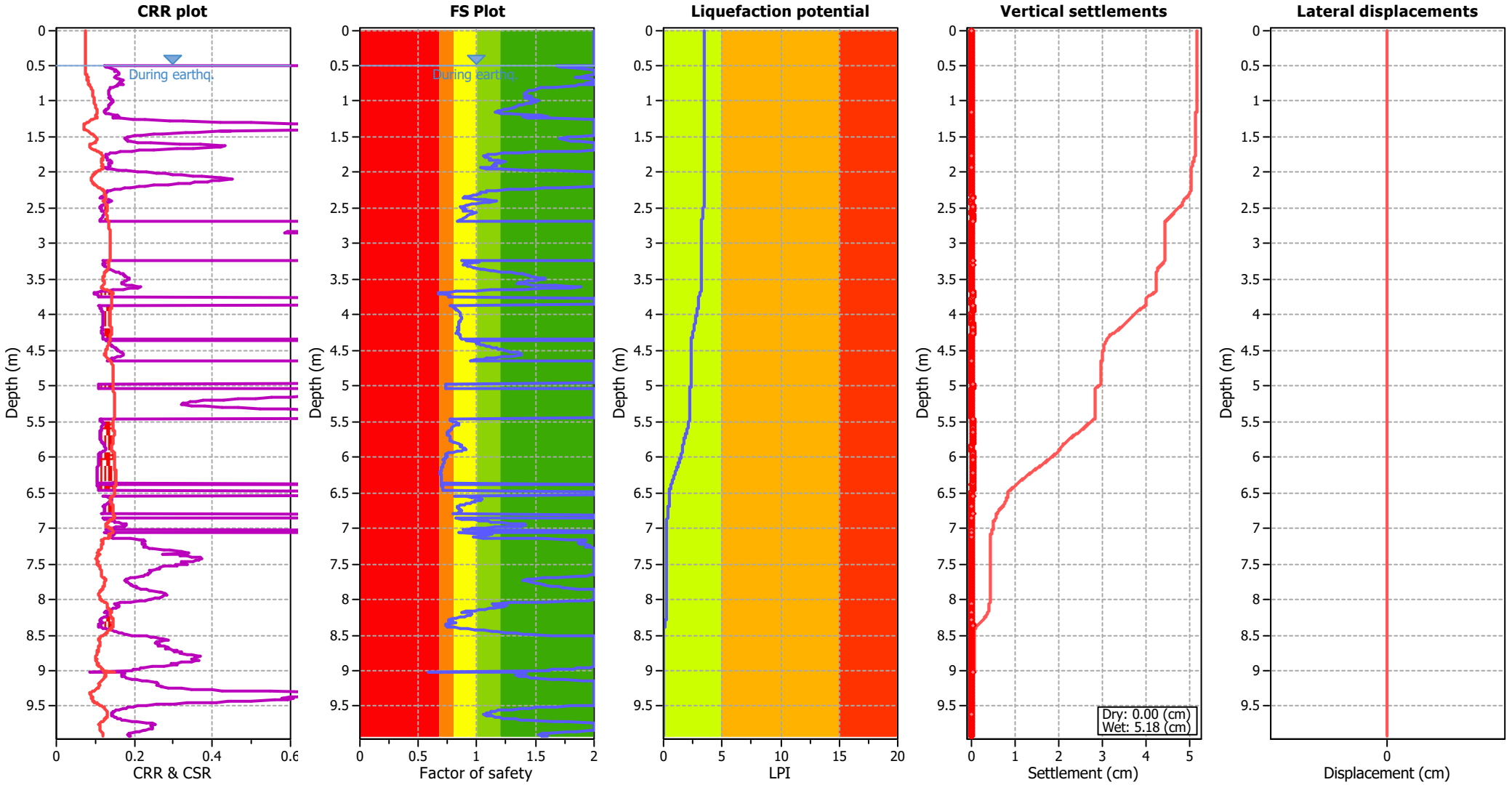
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.50 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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.14	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	0.50 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

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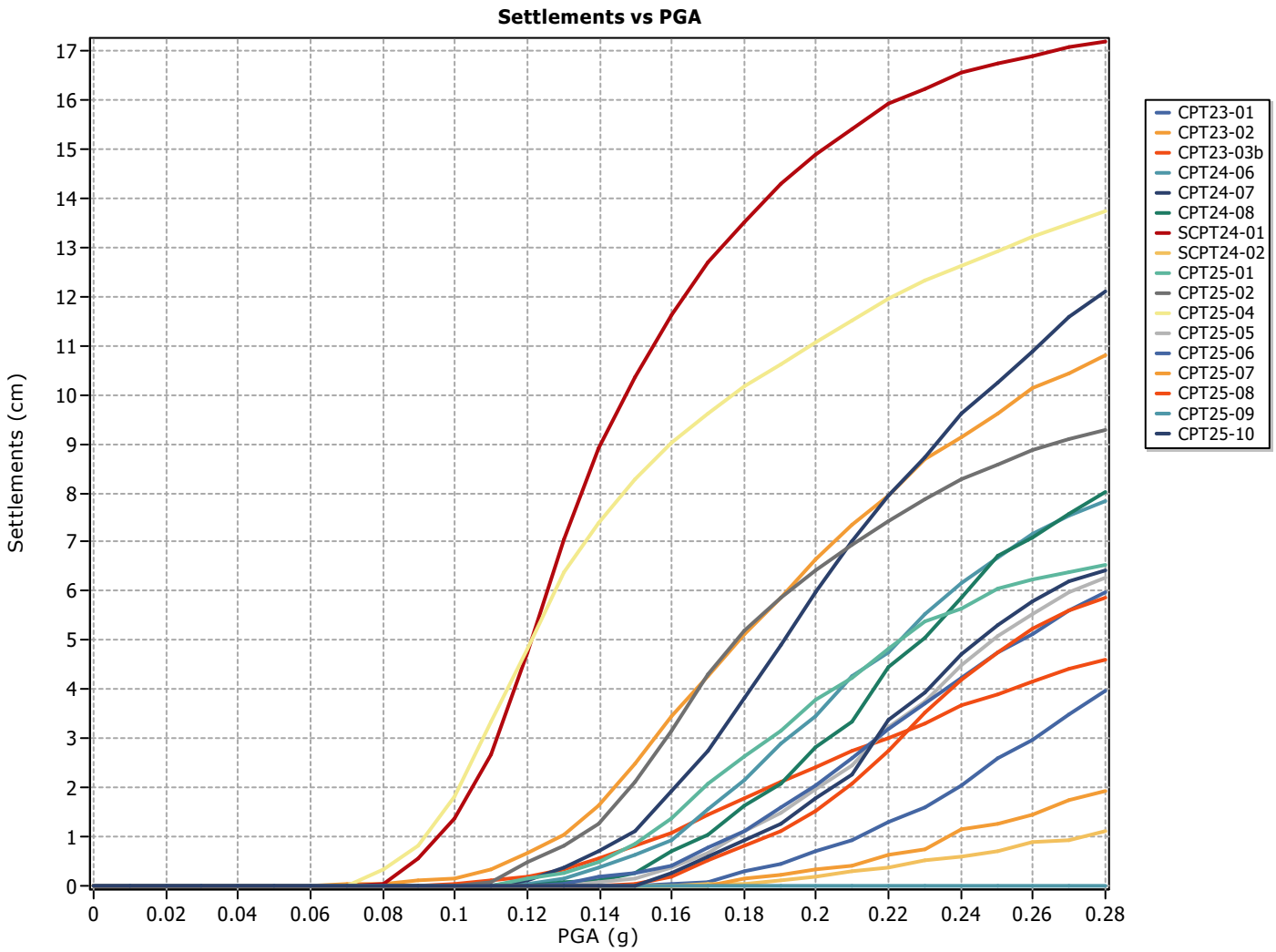
IL2 INDEX LIQUFACTION RESULTS

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

PGA Based Parametric Analysis



:: CPT main liquefaction parameters details ::

CPT Name	Assesment method	Earthquake Mag.	GWT in situ (m)	GWT earthq. (m)
CPT23-01	Boulanger & Idriss (2014)	5.90	6.20	6.20
CPT23-02	Boulanger & Idriss (2014)	5.90	2.90	2.90
CPT23-03b	Boulanger & Idriss (2014)	5.90	4.60	4.60
CPT24-06	Boulanger & Idriss (2014)	5.90	1.80	3.80
CPT24-07	Boulanger & Idriss (2014)	5.90	1.30	1.80
CPT24-08	Boulanger & Idriss (2014)	5.90	2.90	4.90
SCPT24-01	Boulanger & Idriss (2014)	5.90	0.70	0.70
SCPT24-02	Boulanger & Idriss (2014)	5.90	6.40	6.40
CPT25-01	Boulanger & Idriss (2014)	5.90	2.00	3.00
CPT25-02	Boulanger & Idriss (2014)	5.90	1.80	2.80
CPT25-04	Boulanger & Idriss (2014)	5.90	0.50	0.50
CPT25-05	Boulanger & Idriss (2014)	5.90	3.20	4.20
CPT25-06	Boulanger & Idriss (2014)	5.90	2.70	4.70
CPT25-07	Boulanger & Idriss (2014)	5.90	6.40	6.40
CPT25-08	Boulanger & Idriss (2014)	5.90	4.60	6.60

PGA Based Parametric Analysis

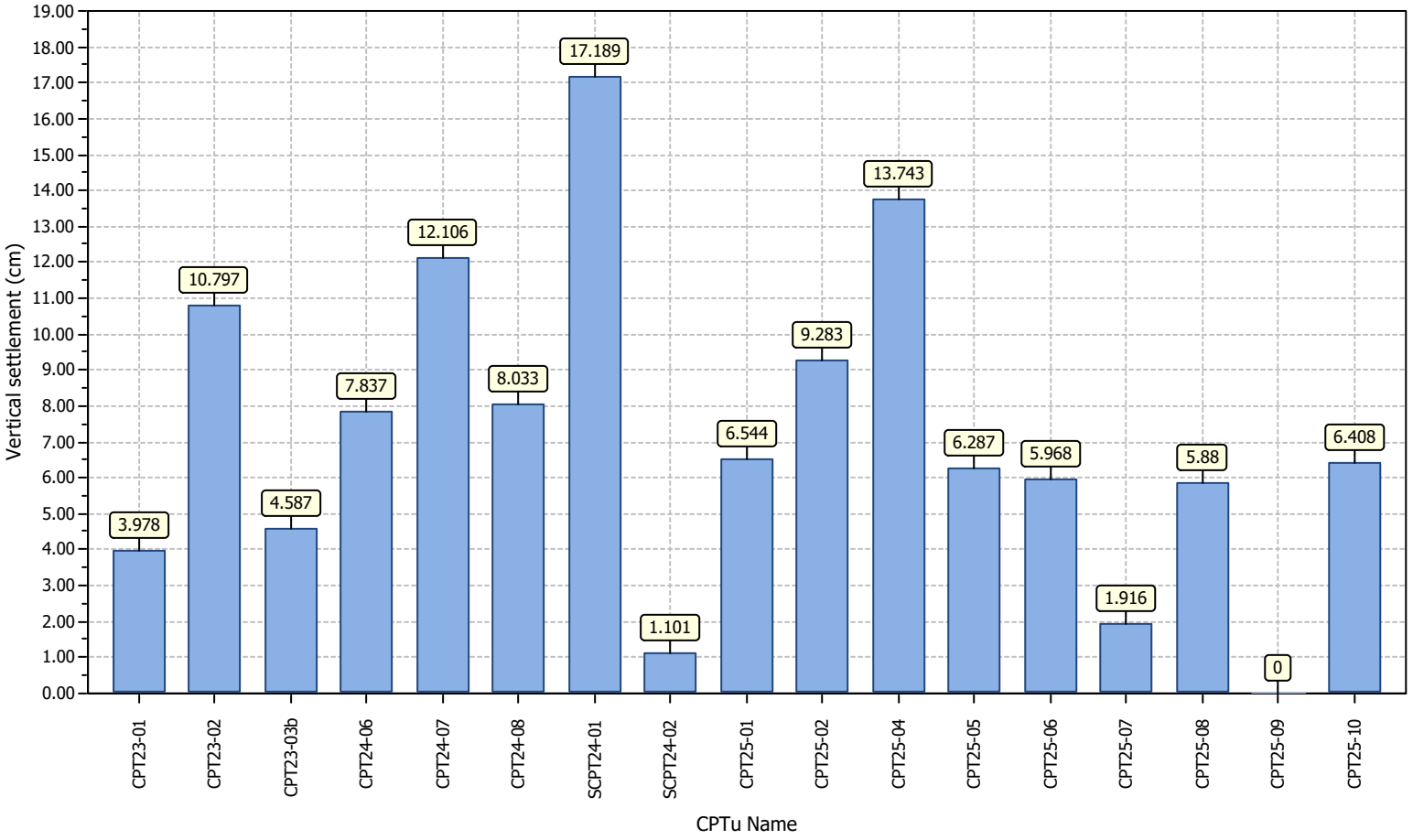
CPT25-09	Boulanger & Idriss (2014)	5.90	13.50	13.50
CPT25-10	Boulanger & Idriss (2014)	5.90	5.20	7.20

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall vertical settlements report

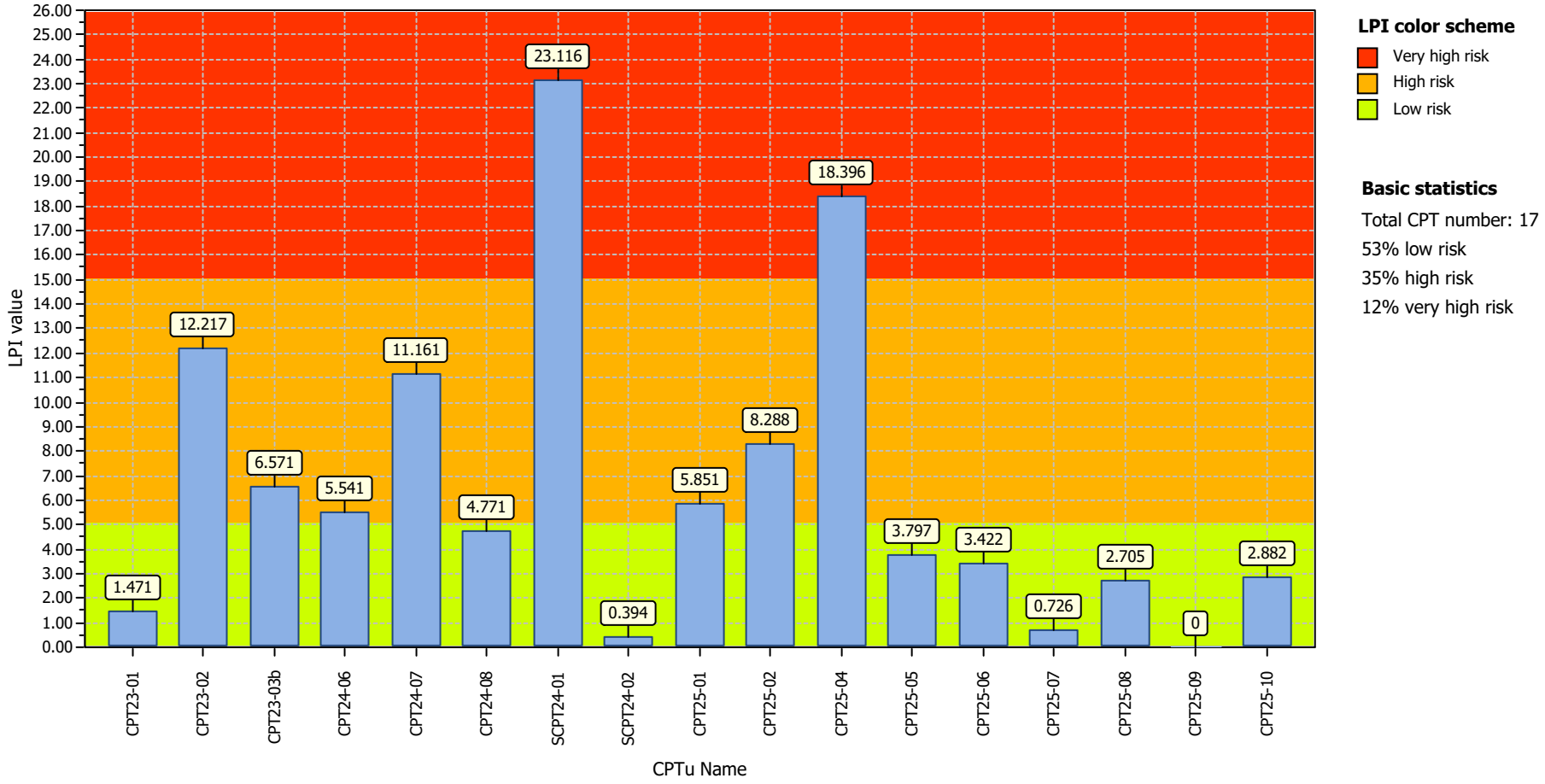


CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall Liquefaction Potential Index report



LPI color scheme

- Very high risk
- High risk
- Low risk

Basic statistics

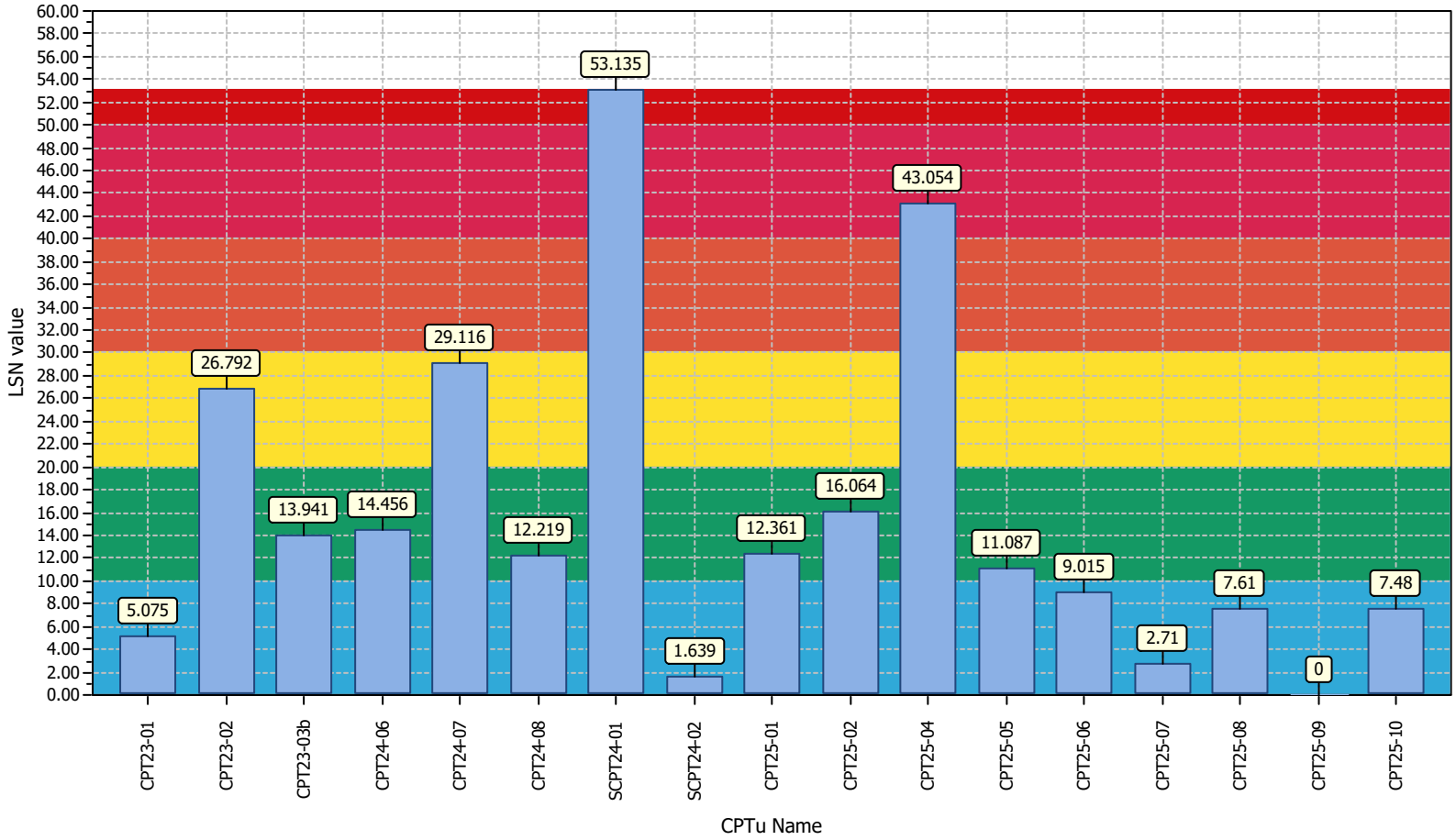
Total CPT number: 17
53% low risk
35% high risk
12% very high risk

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall Liquefaction Severity Number report



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

Basic statistics

Total CPT number: 17

41% little liquefaction

35% minor liquefaction

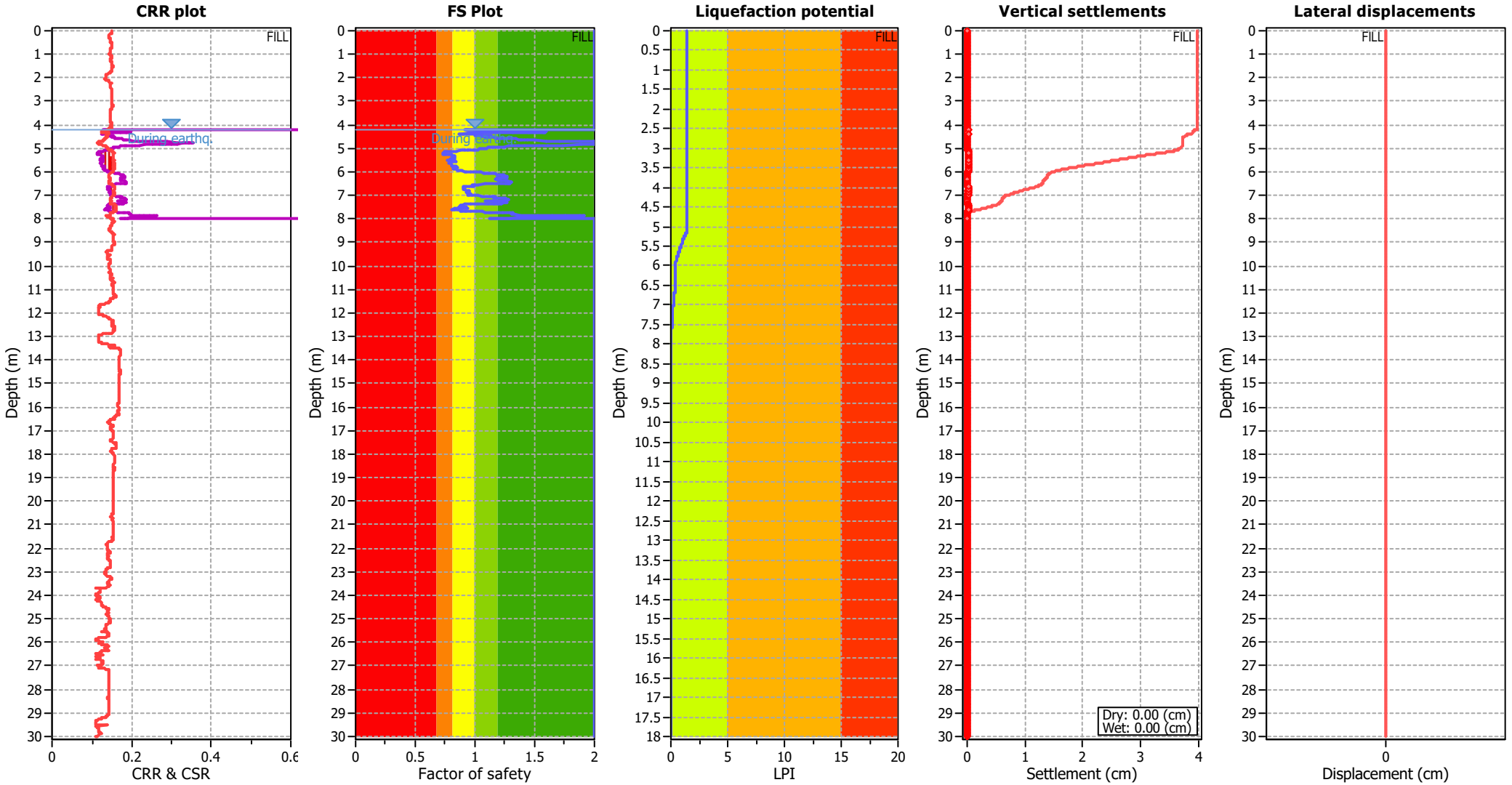
12% moderate liquefaction

0% moderate to major liquefaction

6% major liquefaction

6% severe liquefaction

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.20 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	6.20 m	Fill height:	2.00 m	Limit depth:	10.00 m

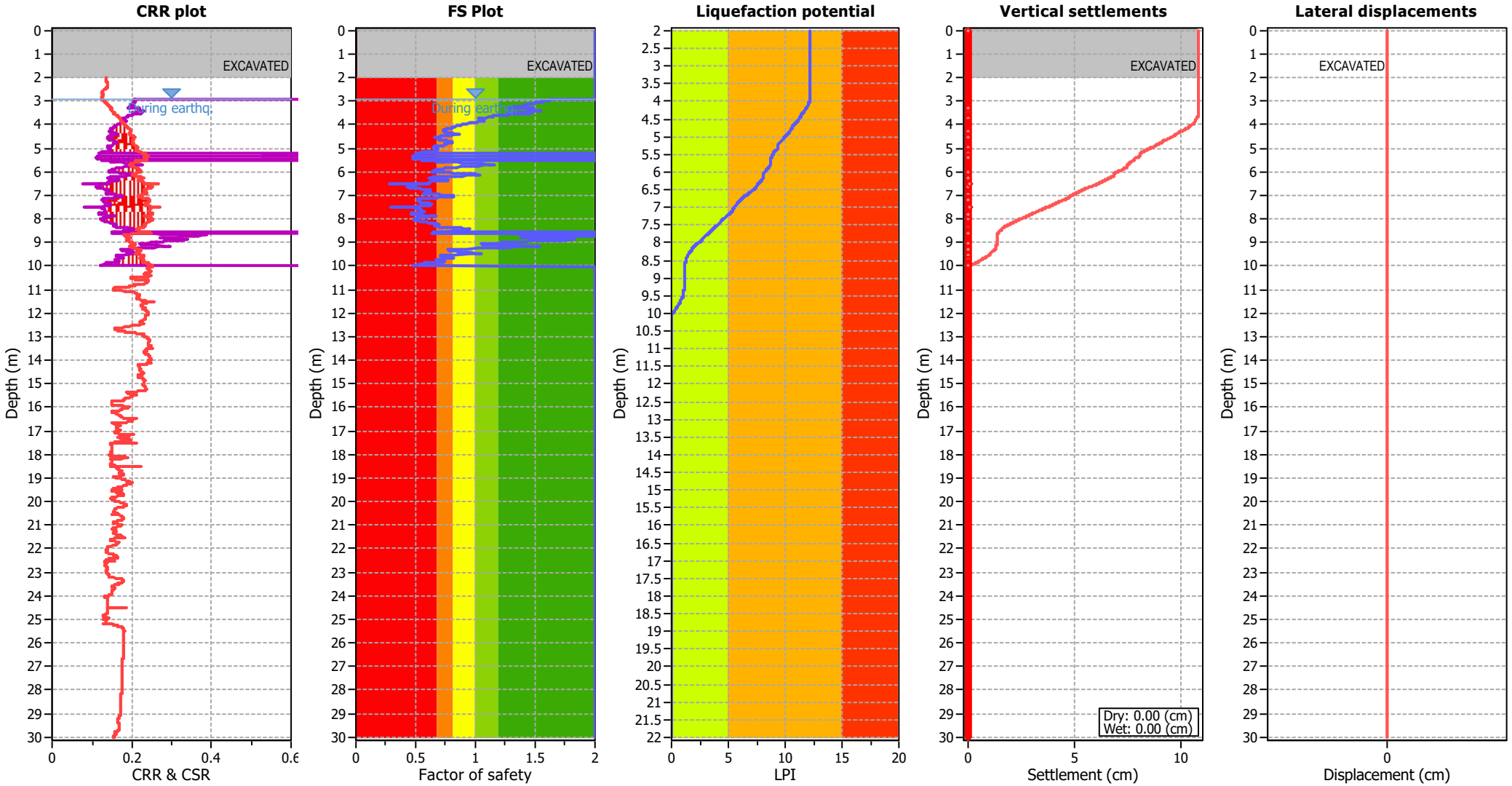
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.90 m	Footing load:	0.00 kPa
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Excavation:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	2.90 m	Excavation depth:	2.00 m	Limit depth:	10.00 m

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LPI color scheme

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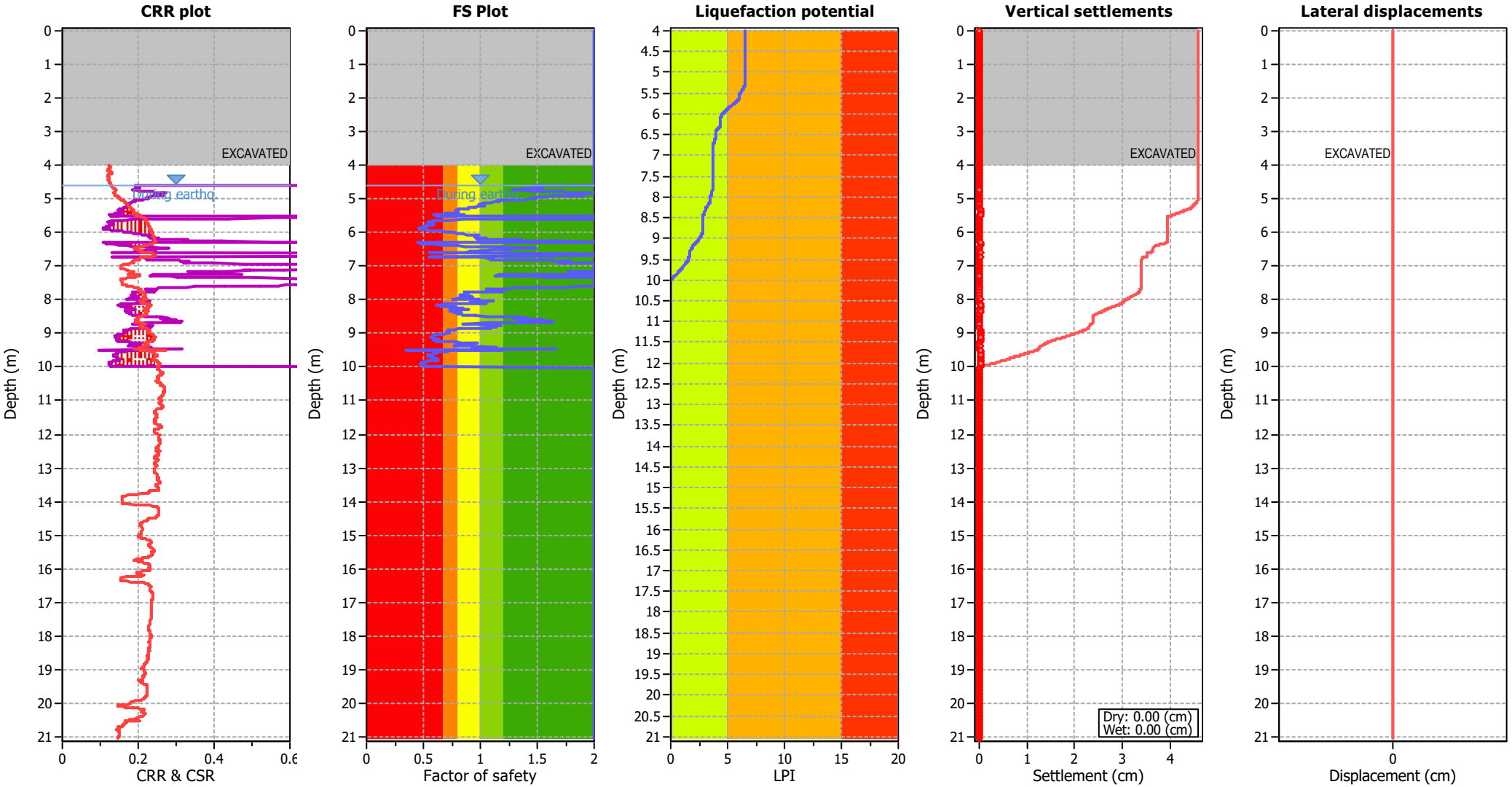
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.60 m	Footing load:	0.00 kPa
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Excavation:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	4.60 m	Excavation depth:	4.00 m	Limit depth:	10.00 m

F.S. color scheme

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LPI color scheme

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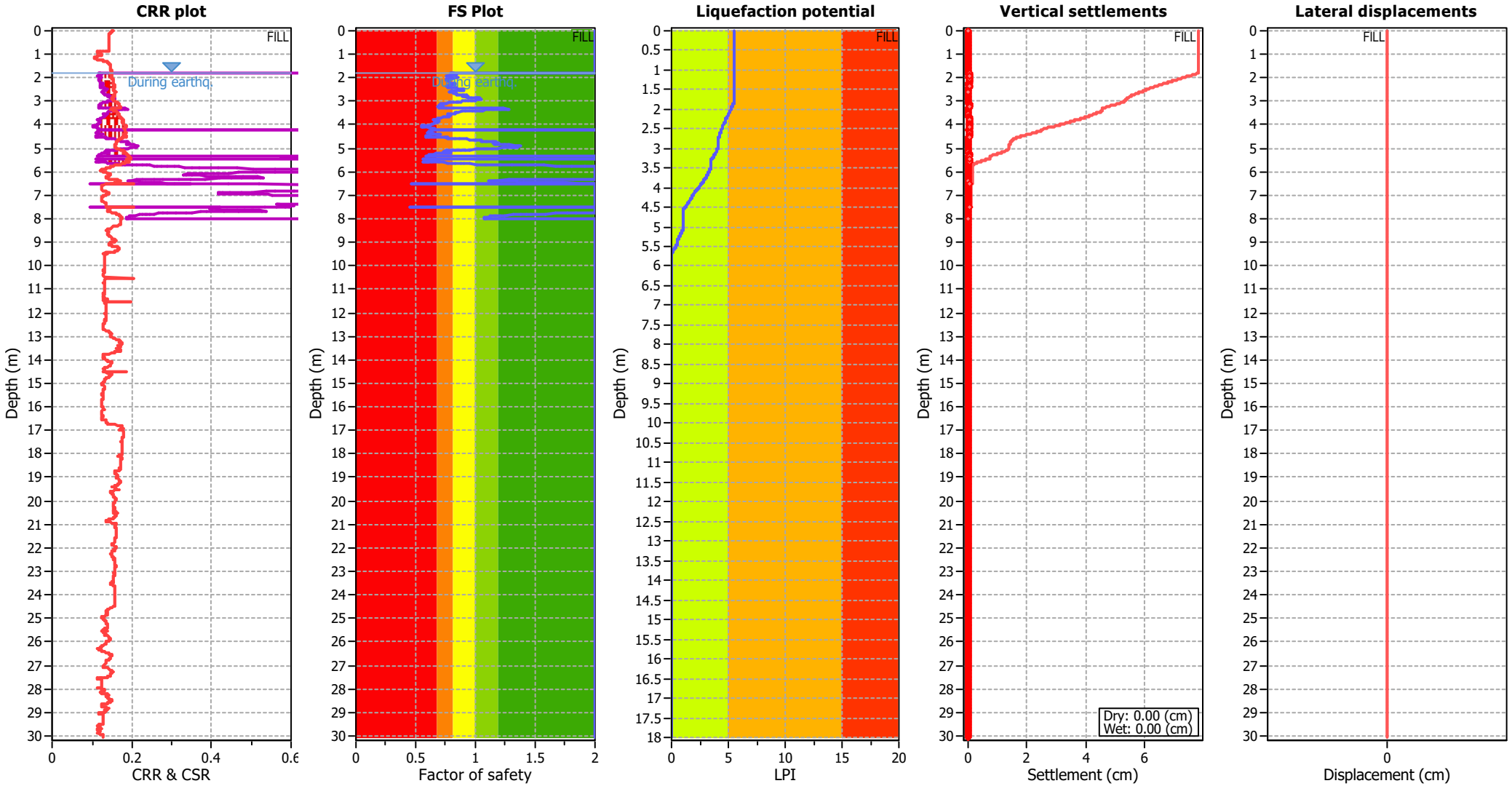
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.80 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	1.80 m	Fill height:	2.00 m	Limit depth:	10.00 m

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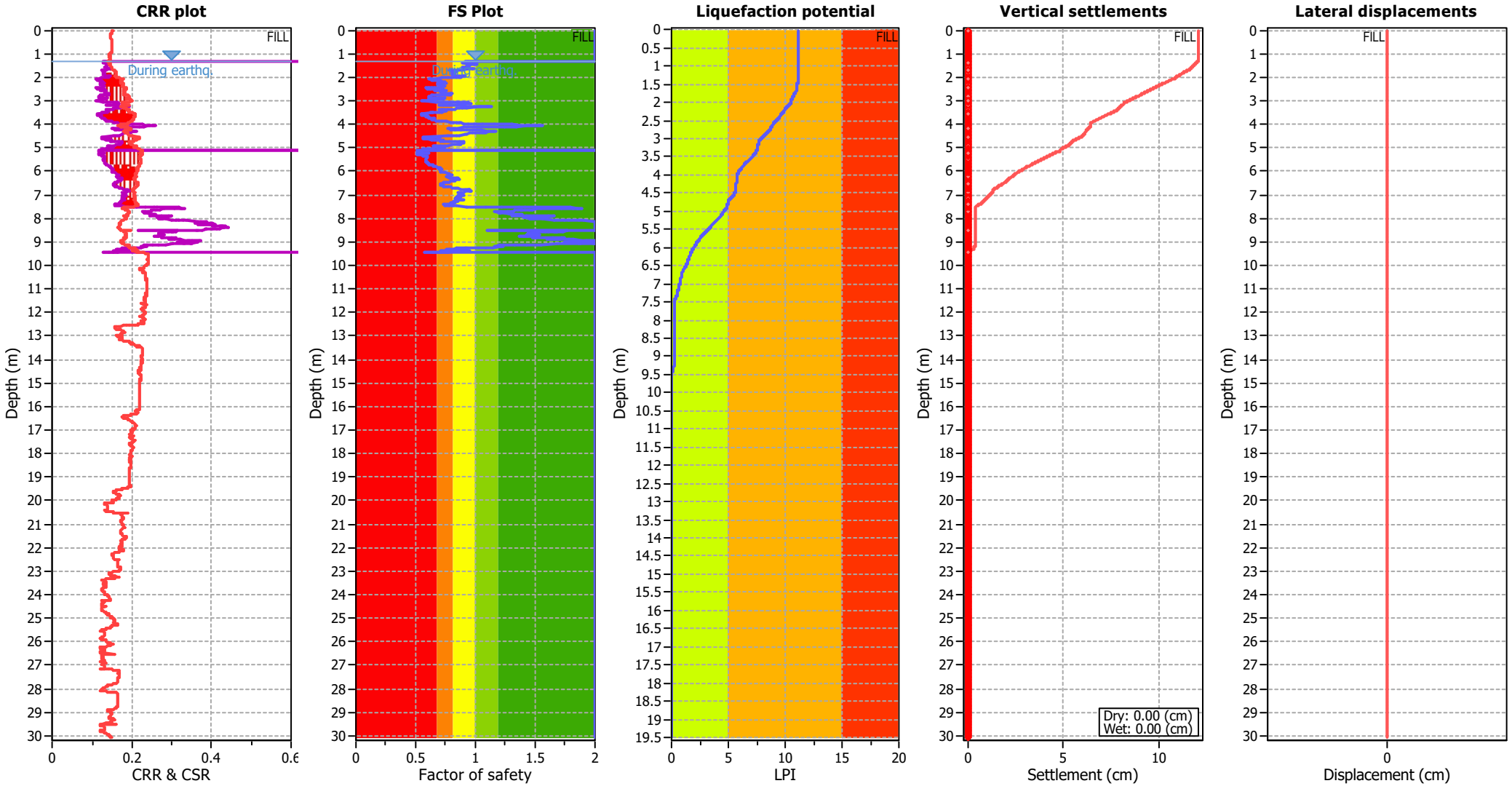
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.80 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	1.30 m	Fill height:	0.50 m	Limit depth:	10.00 m

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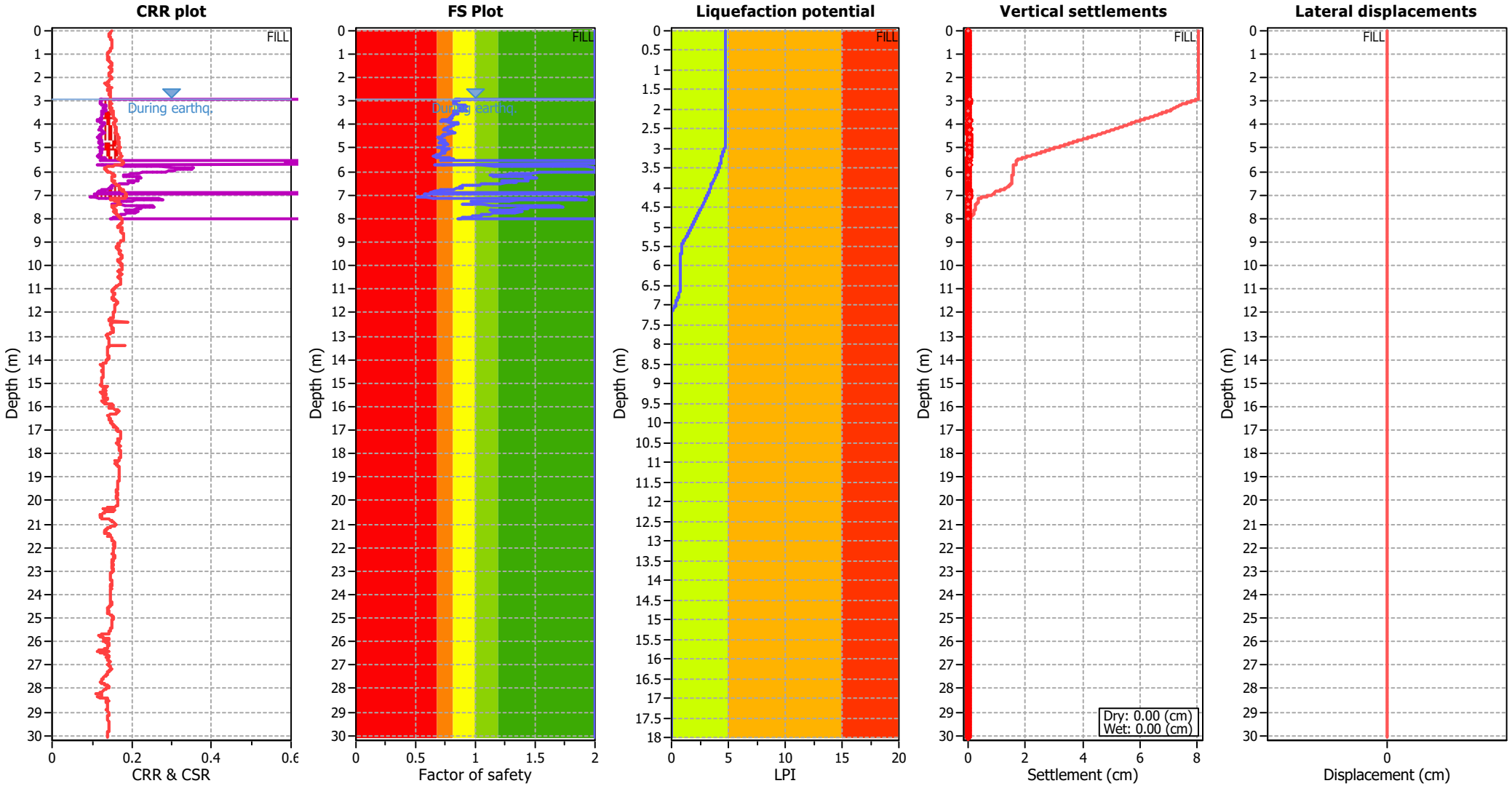
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.90 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	2.90 m	Fill height:	2.00 m	Limit depth:	10.00 m

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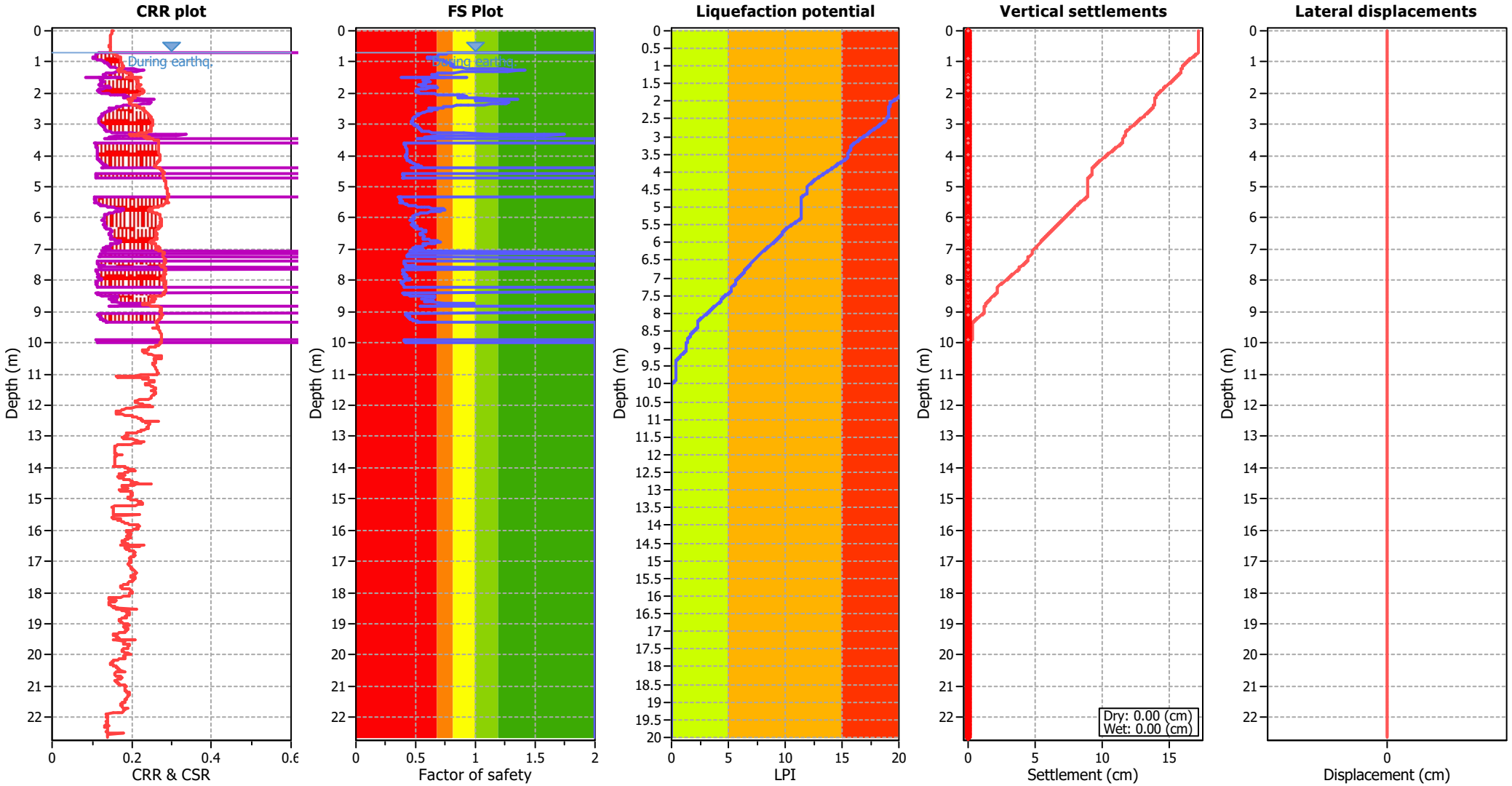

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.70 m	Fill weight:	18.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	0.70 m	Fill height:	0.00 m	Limit depth:	10.00 m

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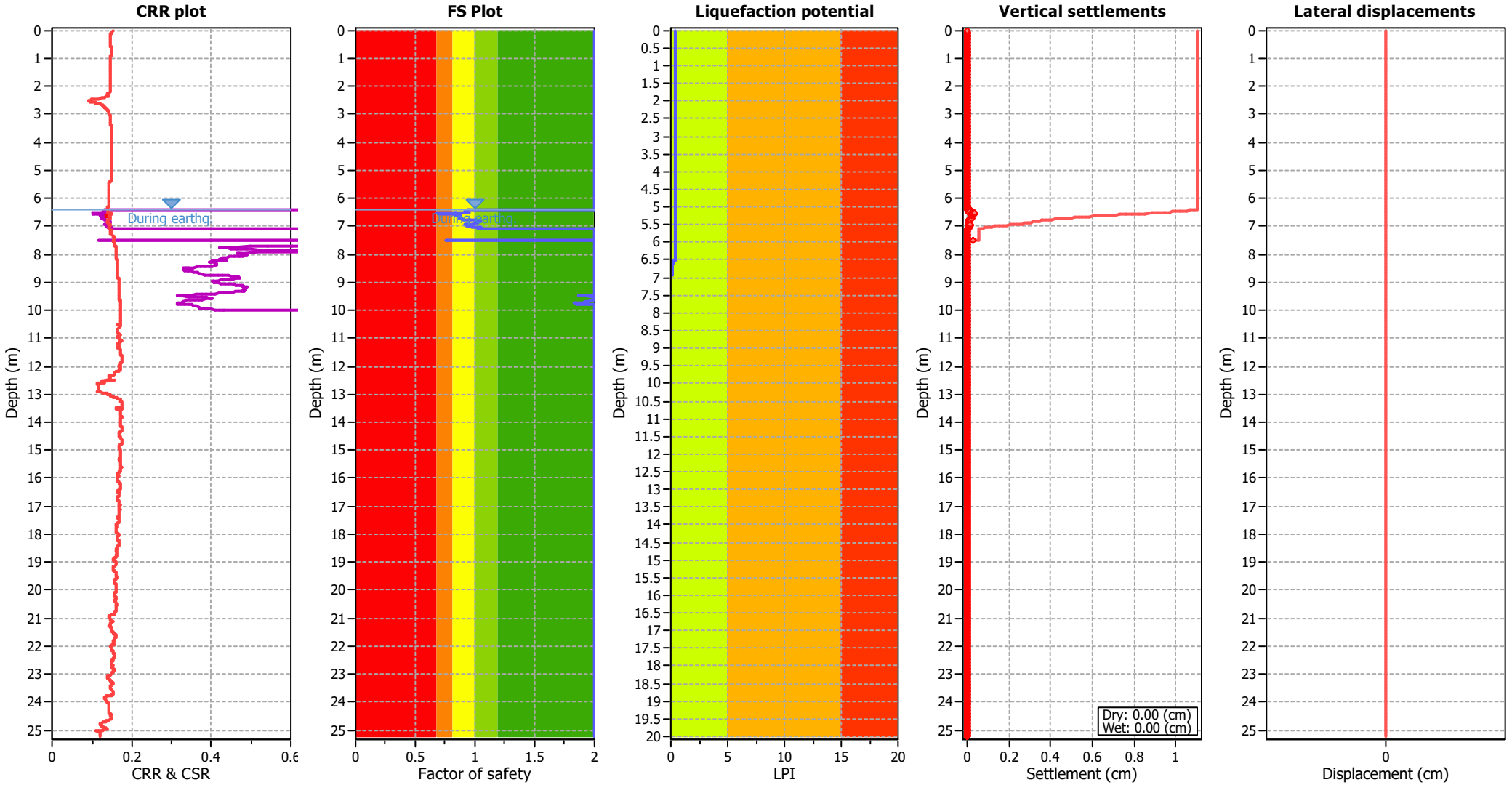
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.40 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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	6.40 m	Fill height:	N/A	Limit depth:	10.00 m

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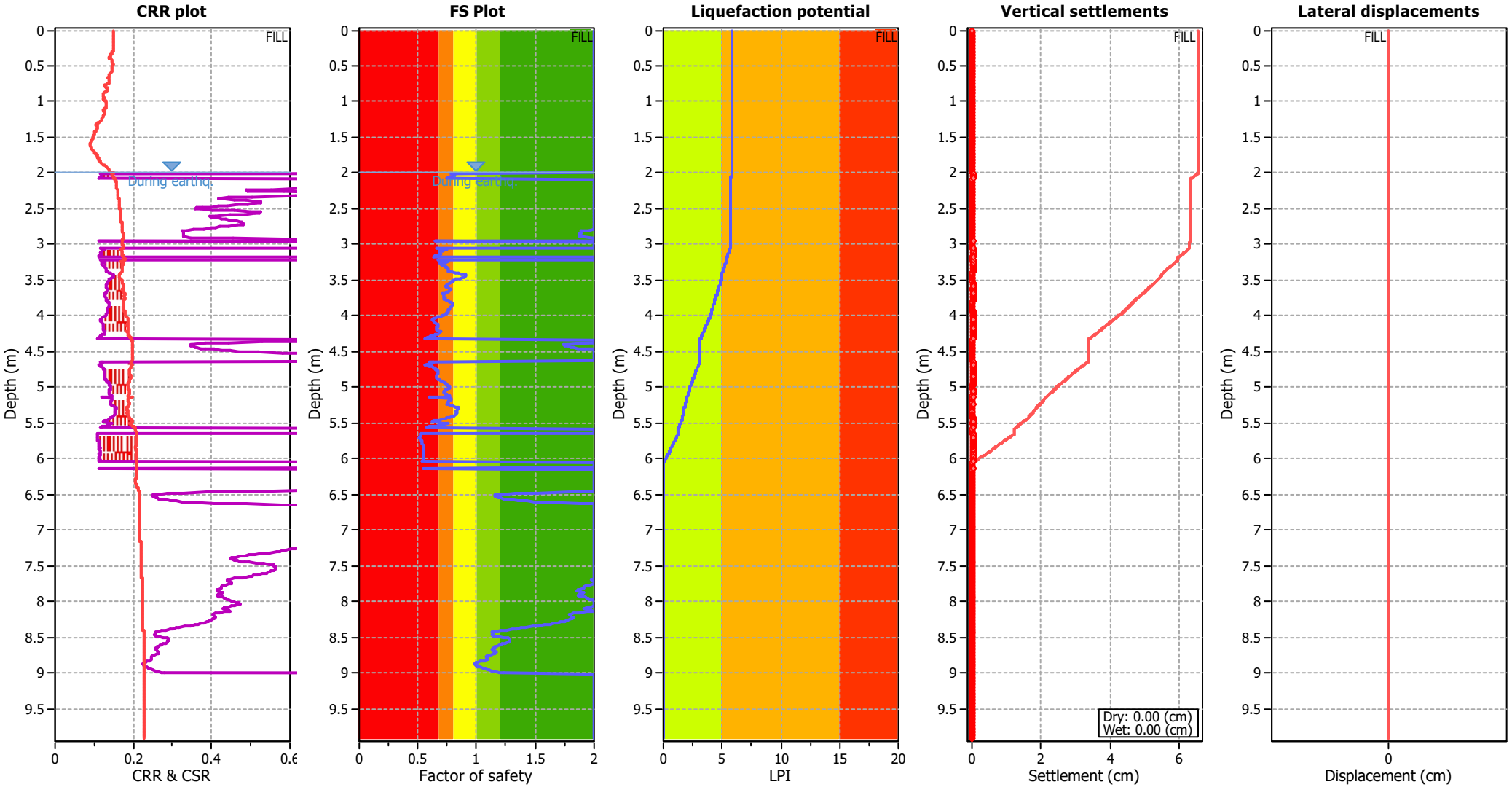

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.00 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	1.00 m	Limit depth:	10.00 m

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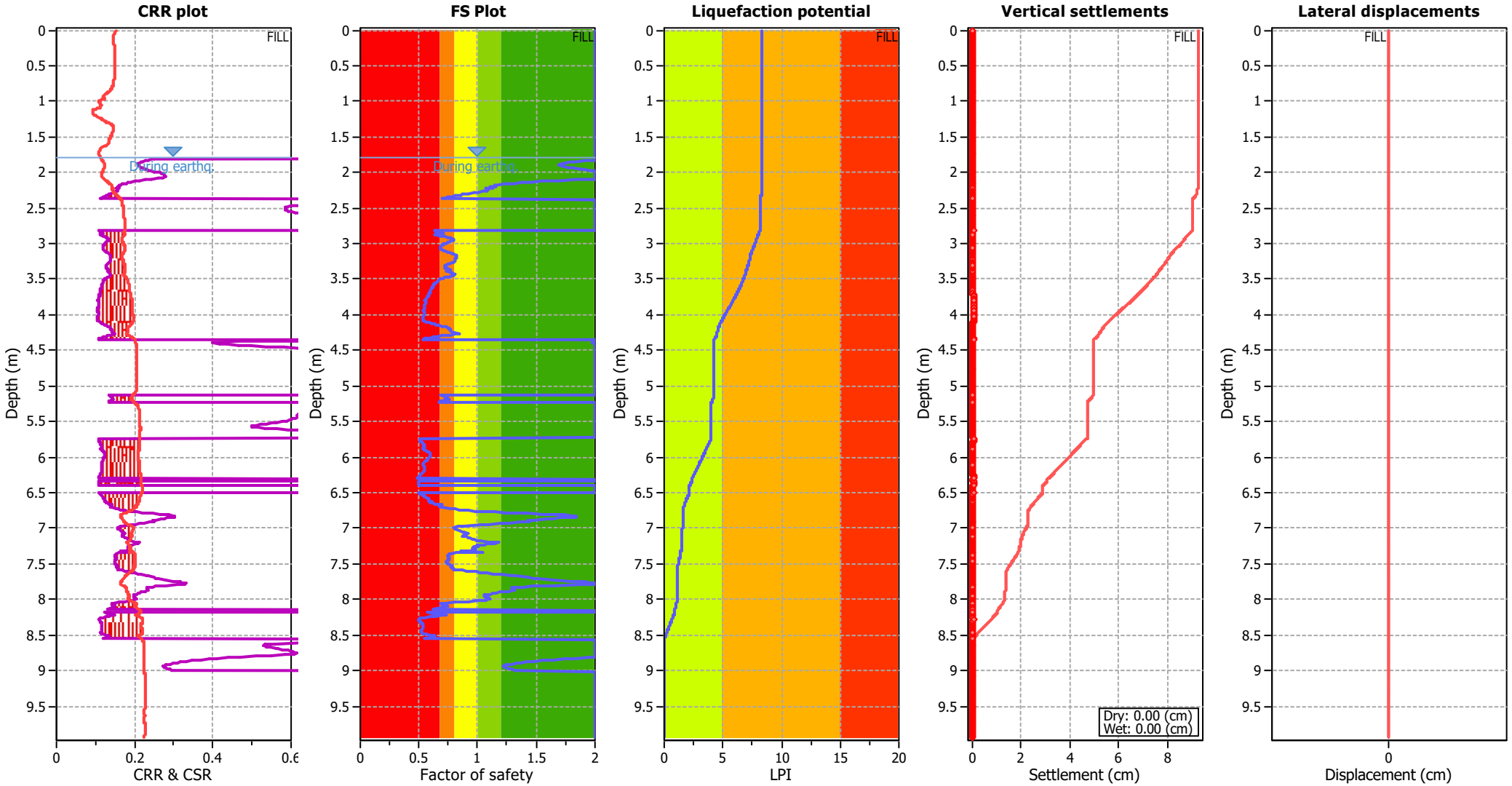

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.80 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	1.80 m	Fill height:	1.00 m	Limit depth:	10.00 m

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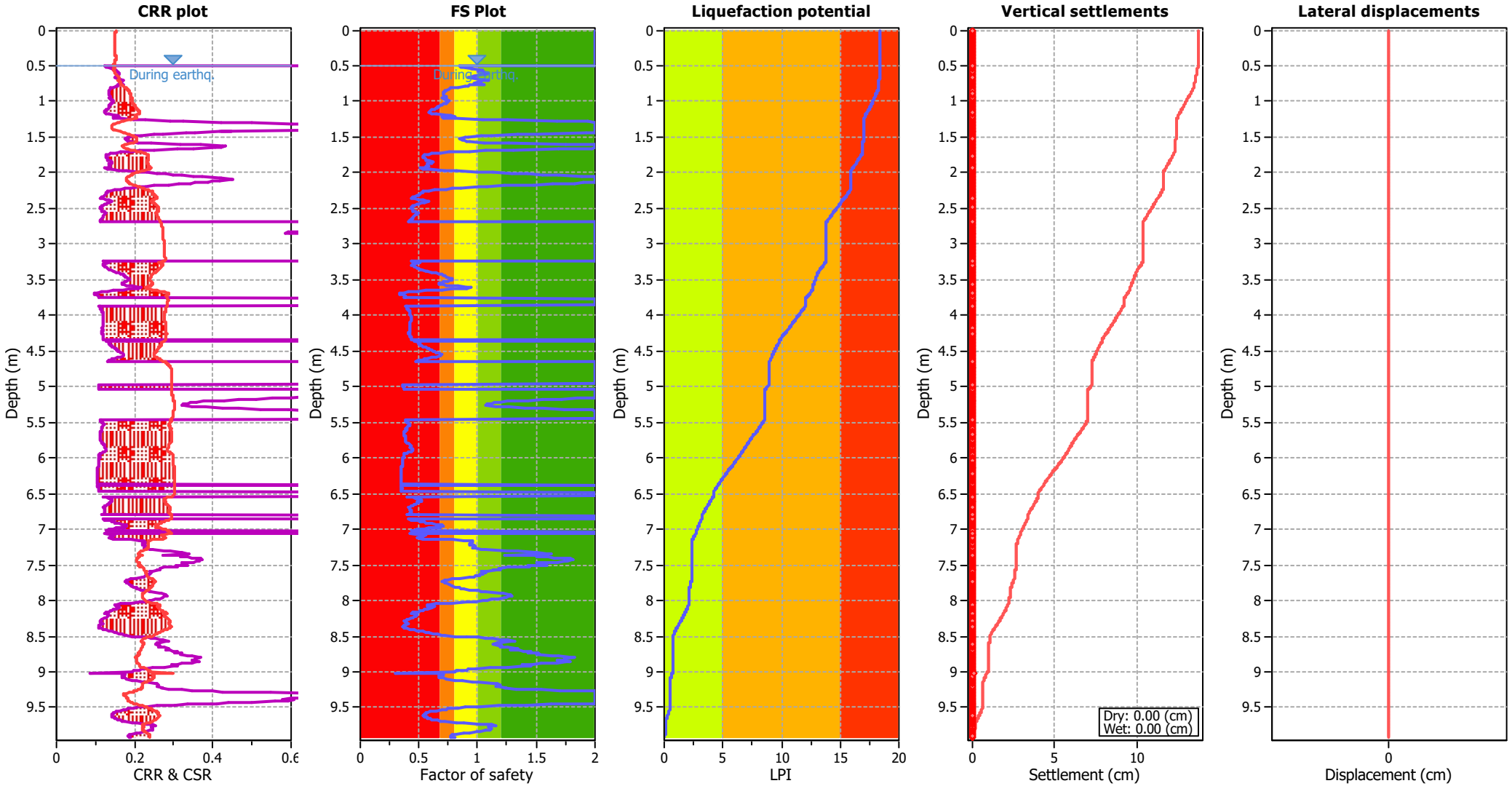
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.50 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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	0.50 m	Fill height:	N/A	Limit depth:	10.00 m

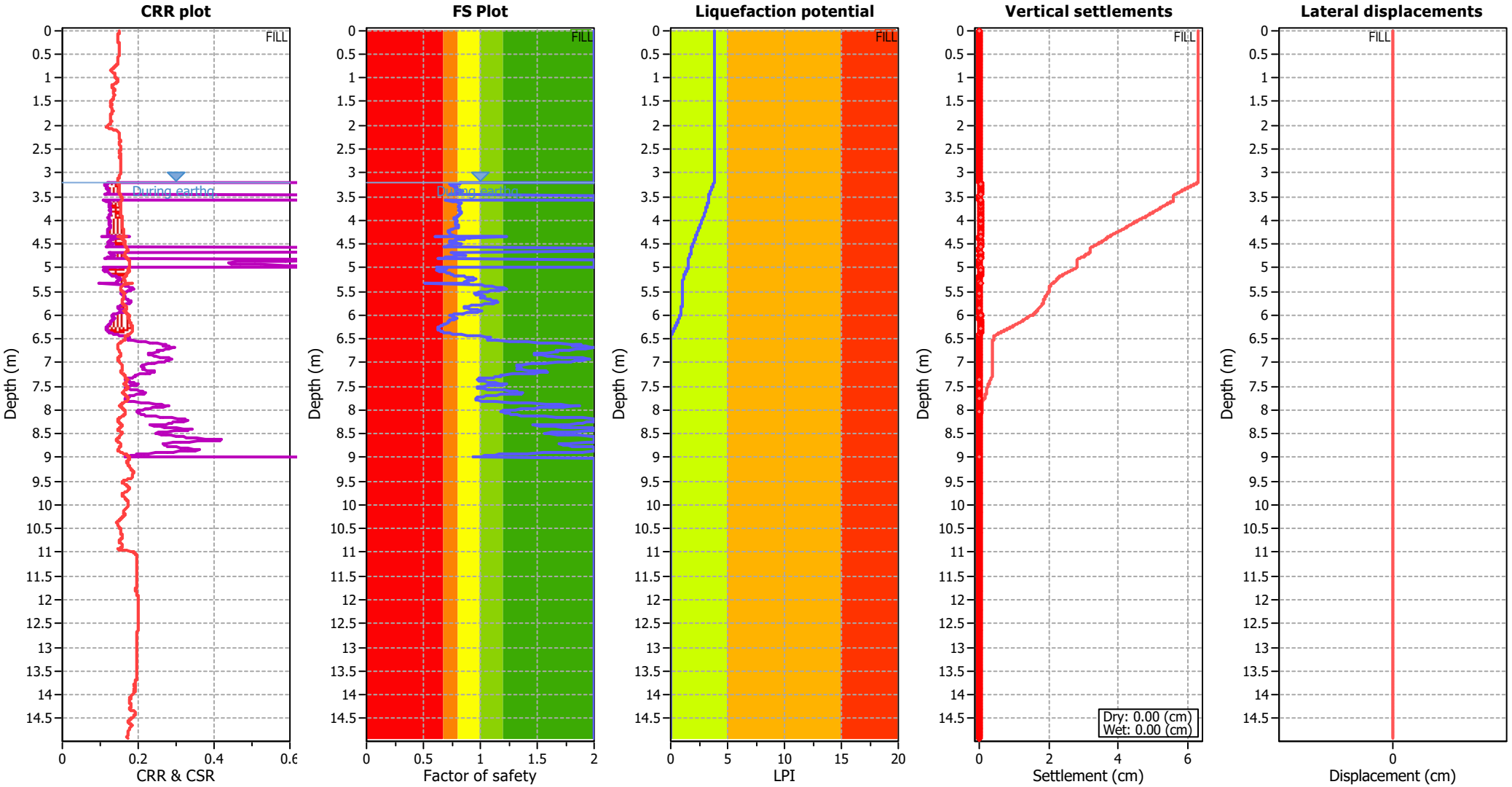
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.20 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	3.20 m	Fill height:	1.00 m	Limit depth:	10.00 m

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
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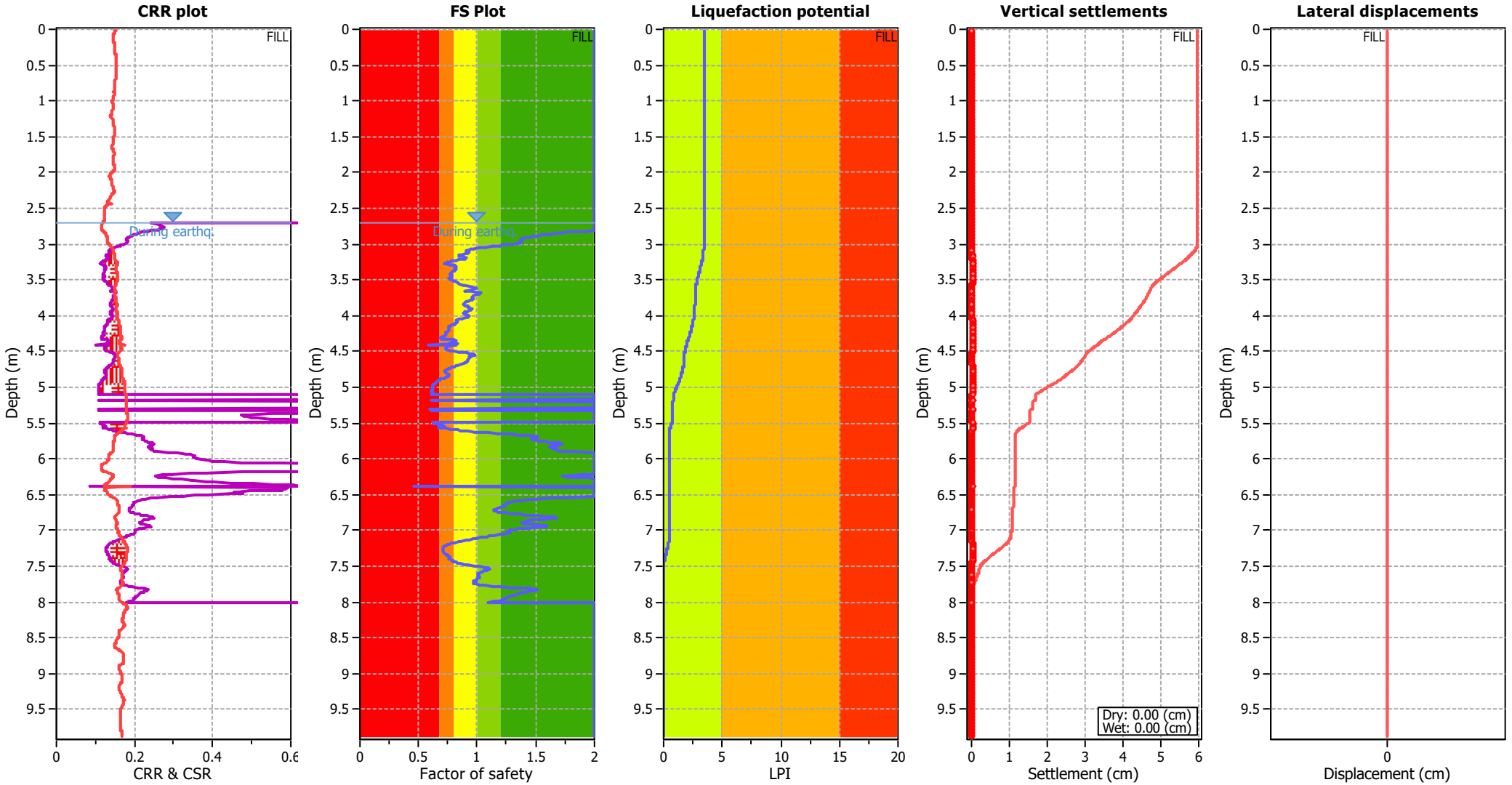
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.70 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	2.70 m	Fill height:	2.00 m	Limit depth:	10.00 m

F.S. color scheme

- Almost certain it will liquefy
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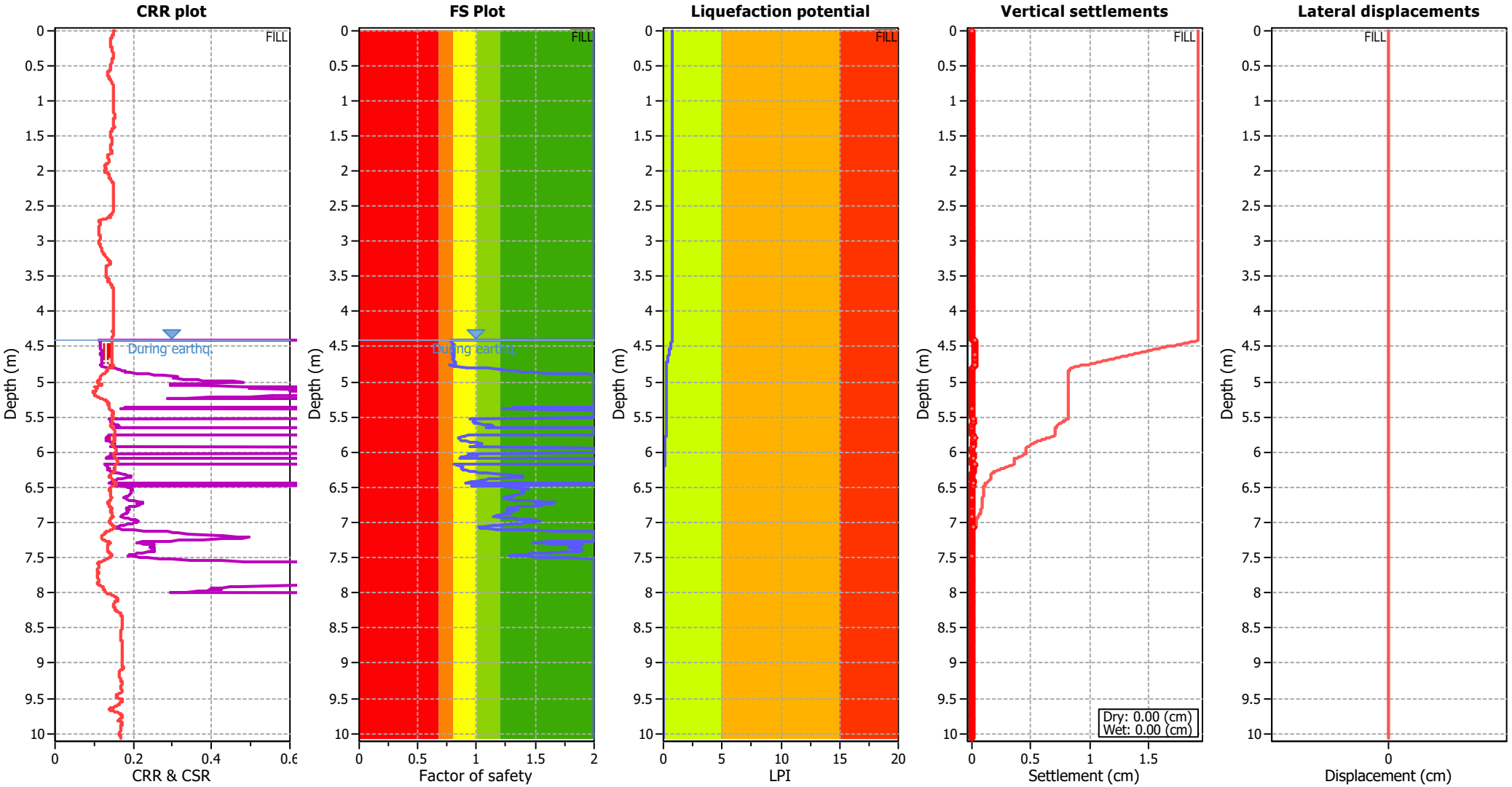
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.40 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	6.40 m	Fill height:	2.00 m	Limit depth:	10.00 m

F.S. color scheme

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LPI color scheme

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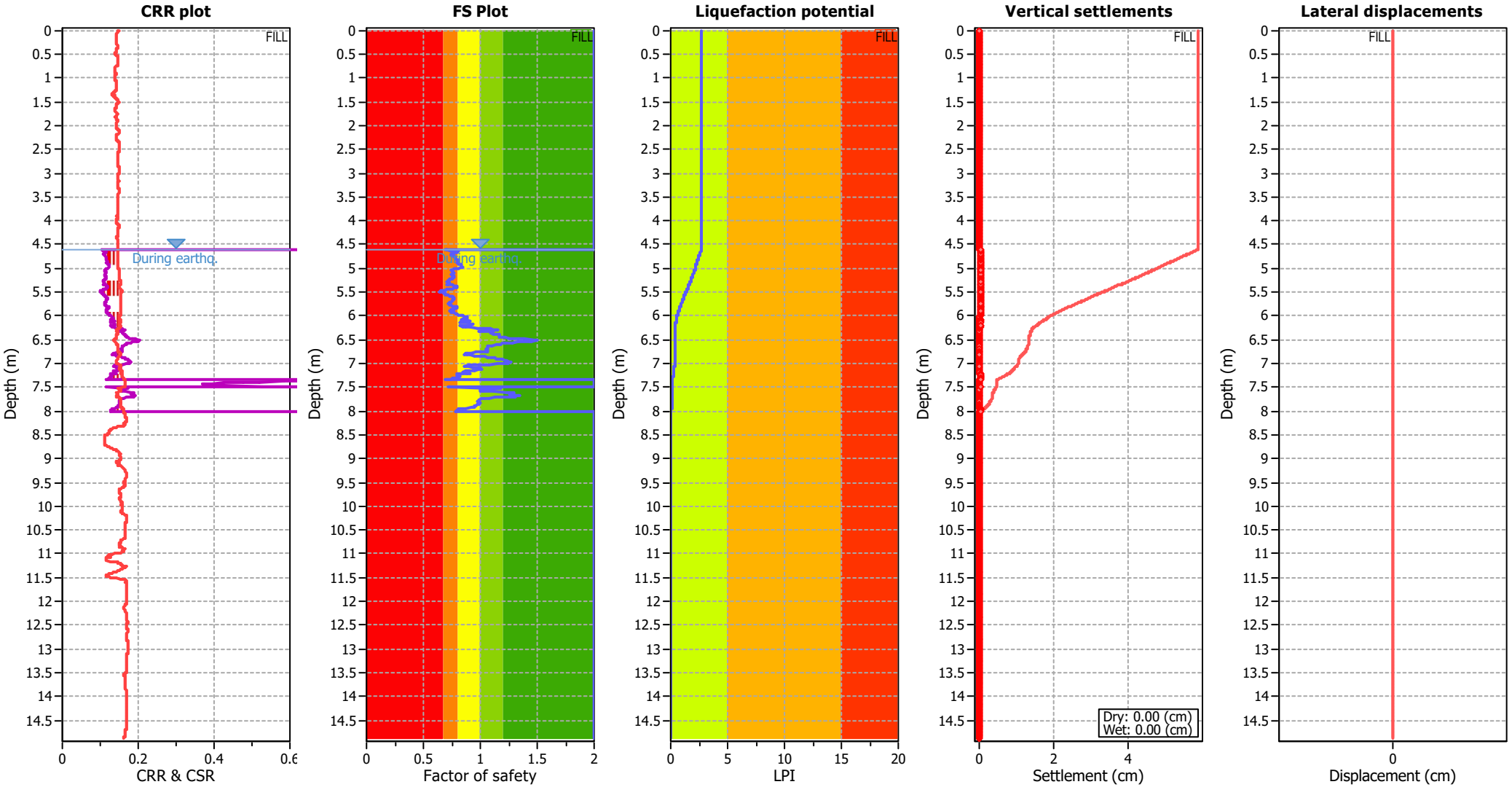
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.60 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	4.60 m	Fill height:	2.00 m	Limit depth:	10.00 m

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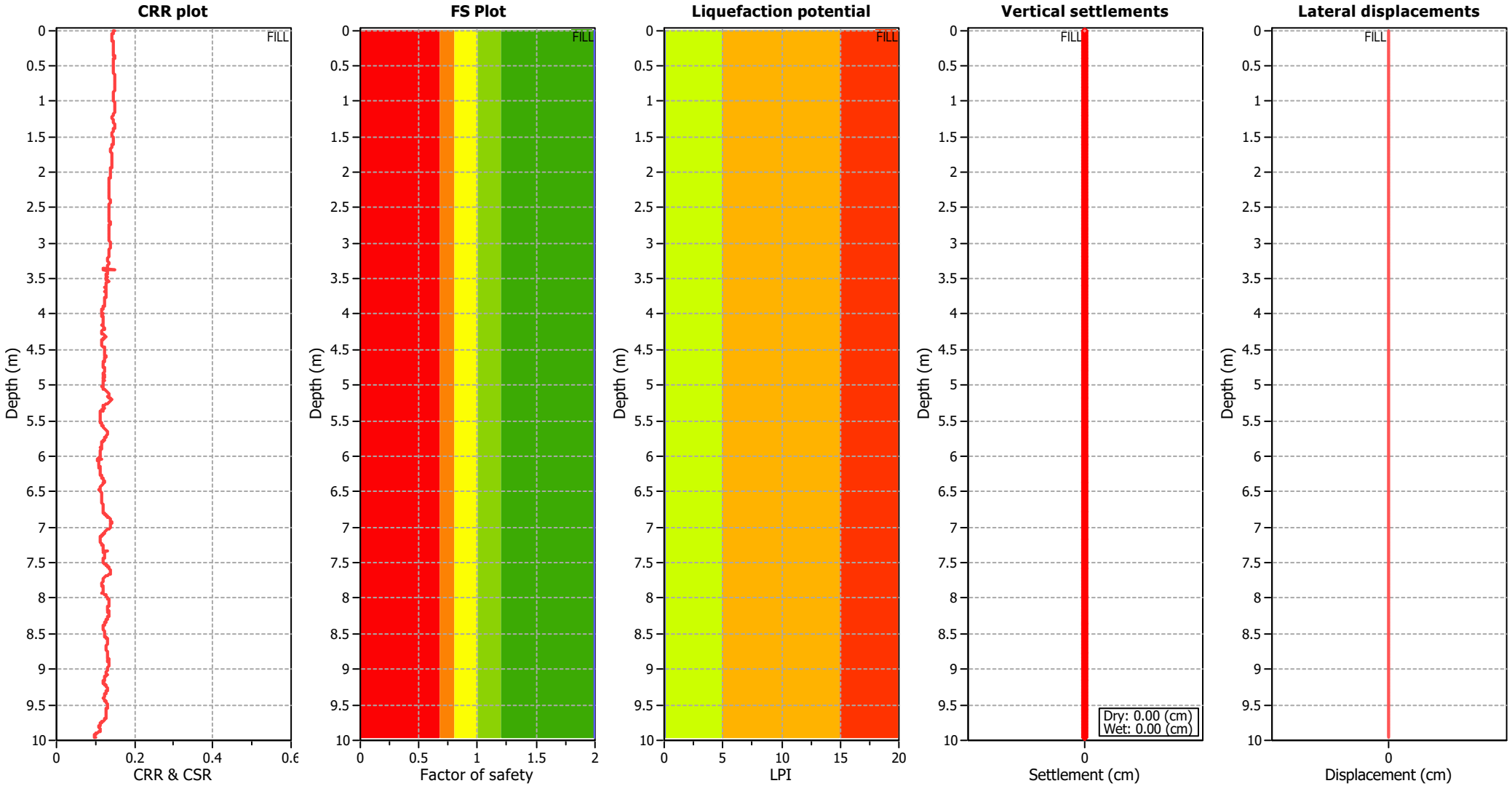
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	13.50 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	13.50 m	Fill height:	2.00 m	Limit depth:	10.00 m

F.S. color scheme

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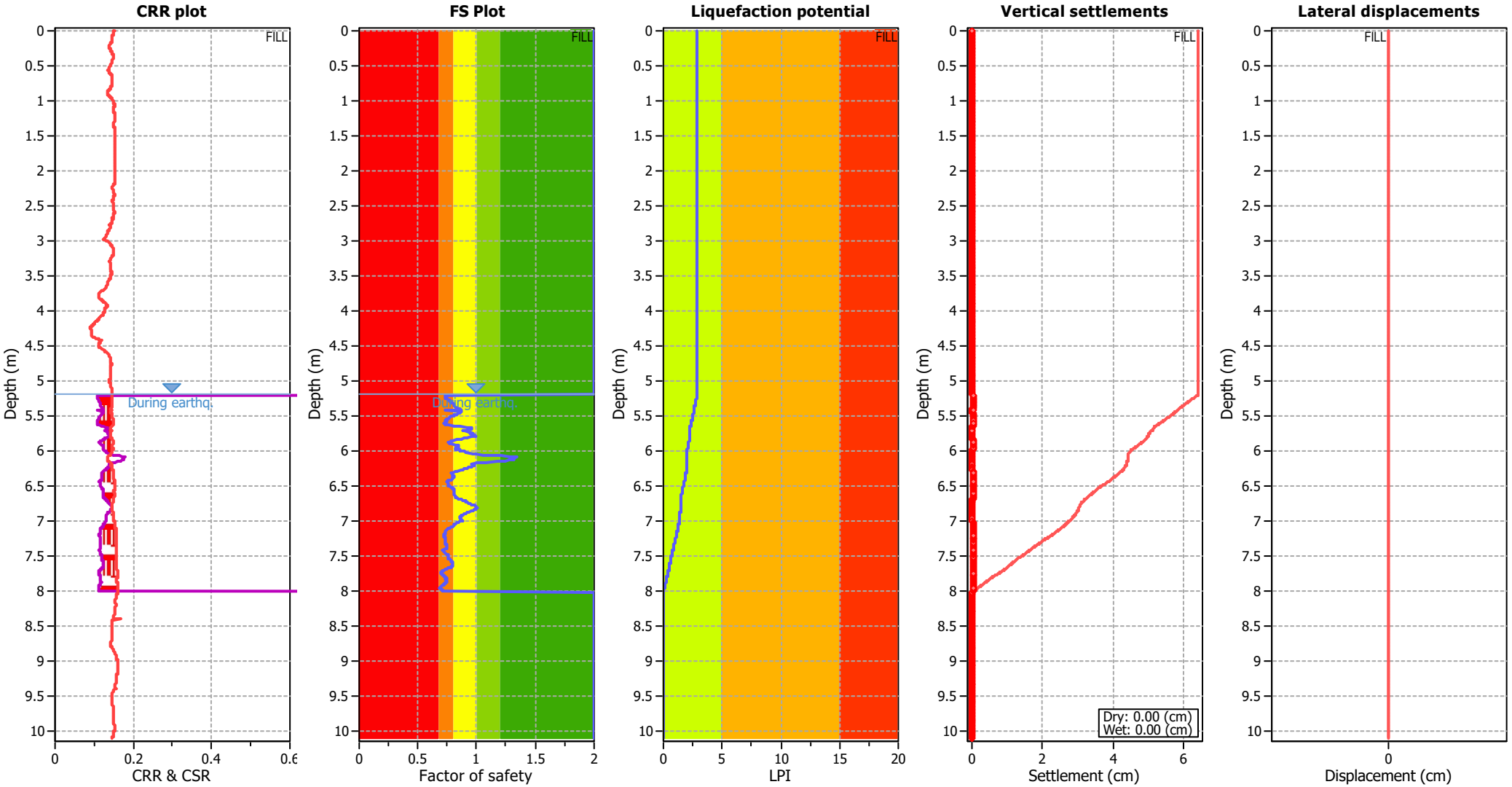
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	7.20 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	5.20 m	Fill height:	2.00 m	Limit depth:	10.00 m

F.S. color scheme

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LPI color scheme

- Very high risk
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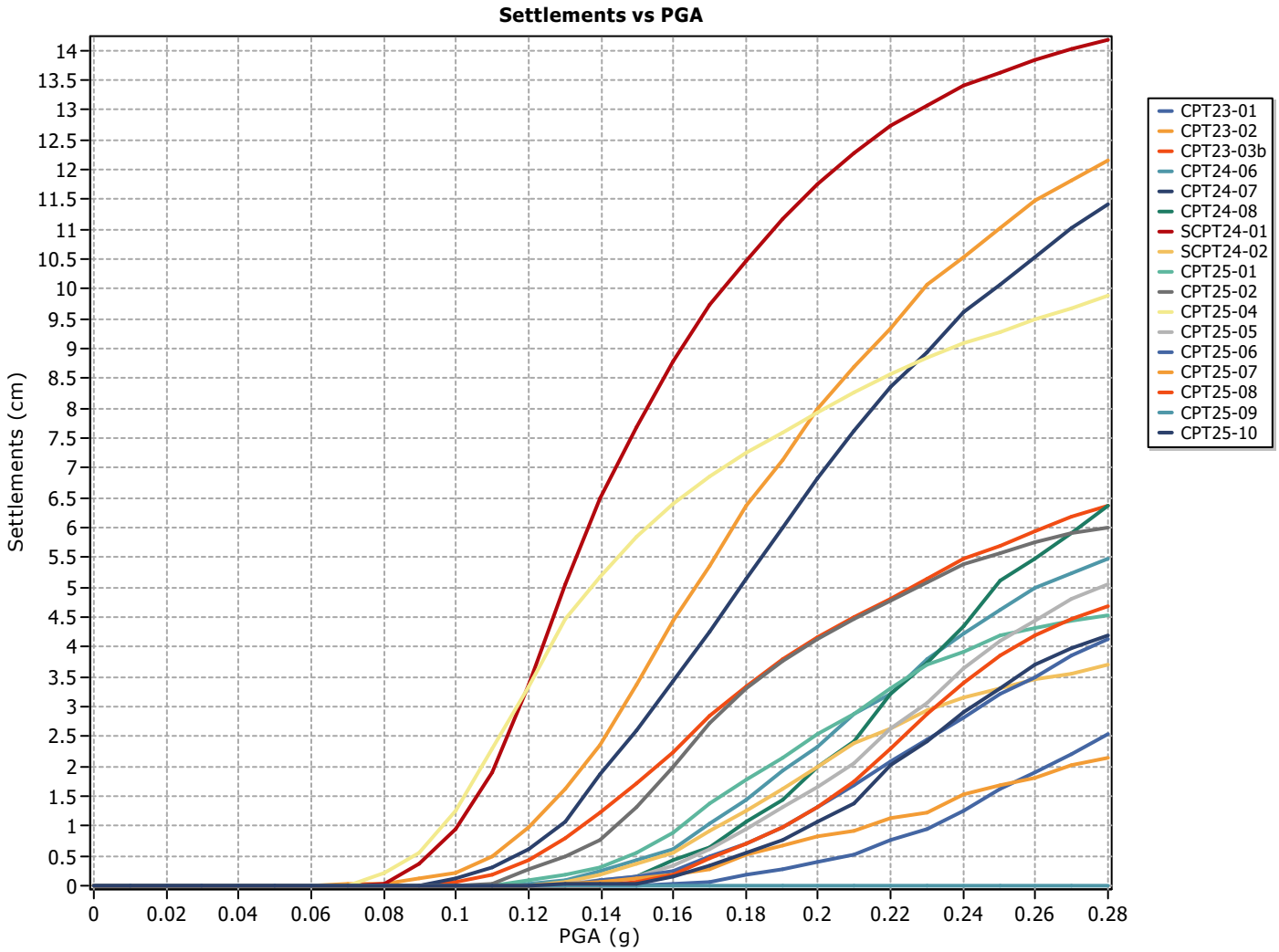
- Low risk

IL2 FULL DEPTH LIQUFACTION RESULTS

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

PGA Based Parametric Analysis



:: CPT main liquefaction parameters details ::

CPT Name	Assesment method	Earthquake Mag.	GWT in situ (m)	GWT earthq. (m)
CPT23-01	Boulanger & Idriss (2014)	5.90	6.20	6.20
CPT23-02	Boulanger & Idriss (2014)	5.90	2.90	2.90
CPT23-03b	Boulanger & Idriss (2014)	5.90	4.60	4.60
CPT24-06	Boulanger & Idriss (2014)	5.90	1.80	3.80
CPT24-07	Boulanger & Idriss (2014)	5.90	1.30	1.80
CPT24-08	Boulanger & Idriss (2014)	5.90	2.90	4.90
SCPT24-01	Boulanger & Idriss (2014)	5.90	0.70	0.70
SCPT24-02	Boulanger & Idriss (2014)	5.90	6.40	6.40
CPT25-01	Boulanger & Idriss (2014)	5.90	2.00	3.00
CPT25-02	Boulanger & Idriss (2014)	5.90	1.80	2.80
CPT25-04	Boulanger & Idriss (2014)	5.90	0.50	0.50
CPT25-05	Boulanger & Idriss (2014)	5.90	3.20	4.20
CPT25-06	Boulanger & Idriss (2014)	5.90	2.70	4.70
CPT25-07	Boulanger & Idriss (2014)	5.90	6.40	6.40
CPT25-08	Boulanger & Idriss (2014)	5.90	4.60	6.60

PGA Based Parametric Analysis

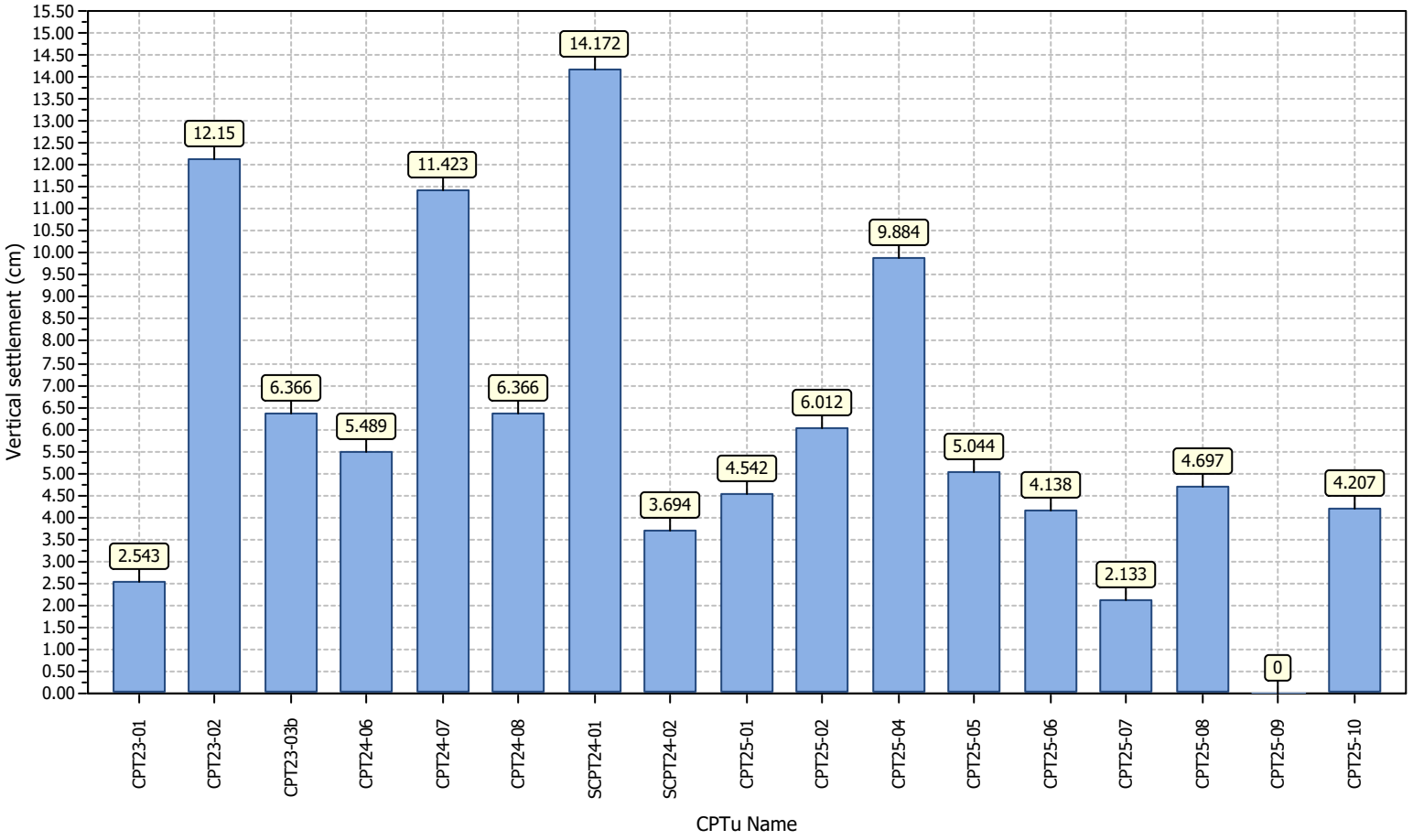
CPT25-09	Boulanger & Idriss (2014)	5.90	13.50	13.50
CPT25-10	Boulanger & Idriss (2014)	5.90	5.20	7.20

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall vertical settlements report

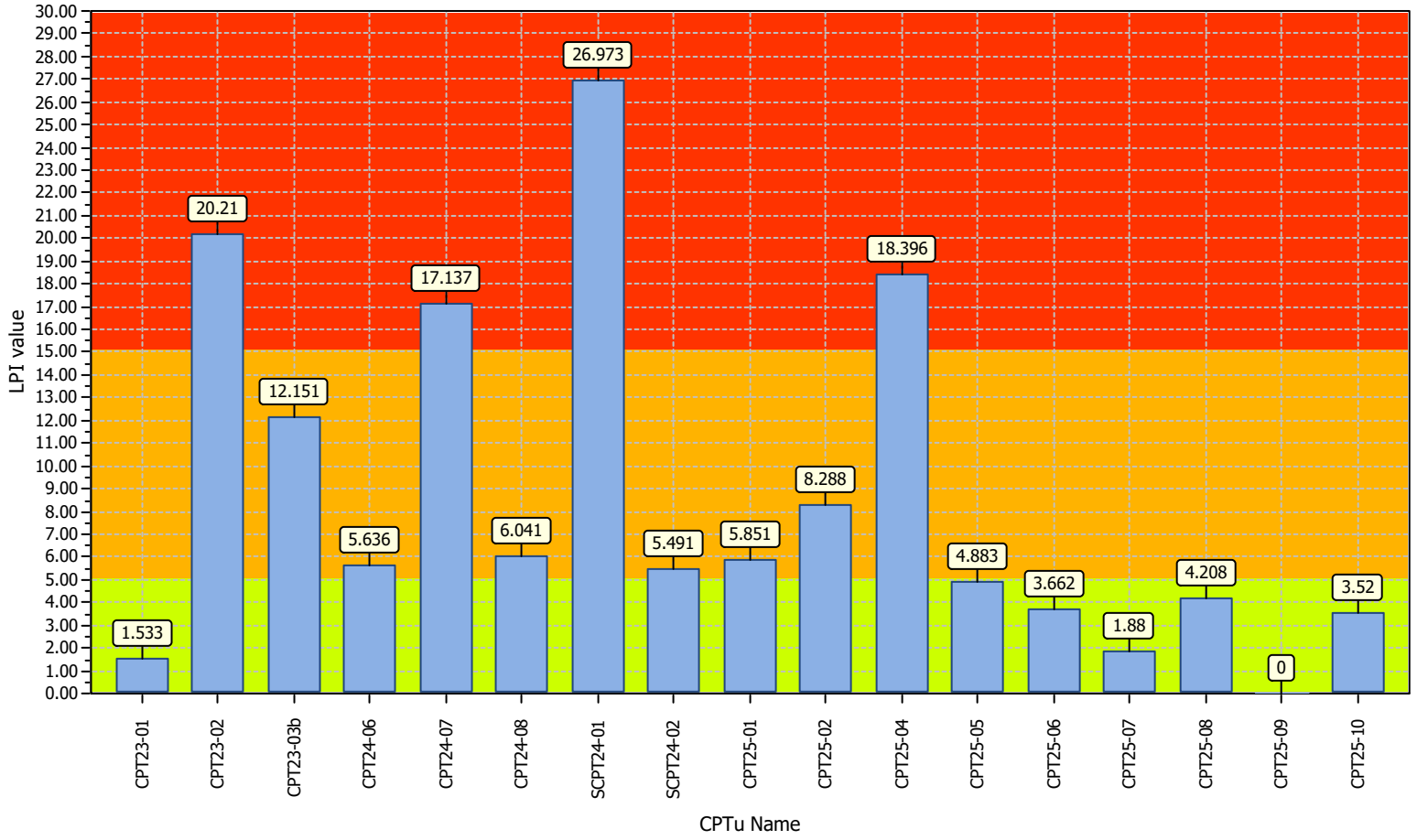


CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall Liquefaction Potential Index report



LPI color scheme

- Very high risk
- High risk
- Low risk

Basic statistics

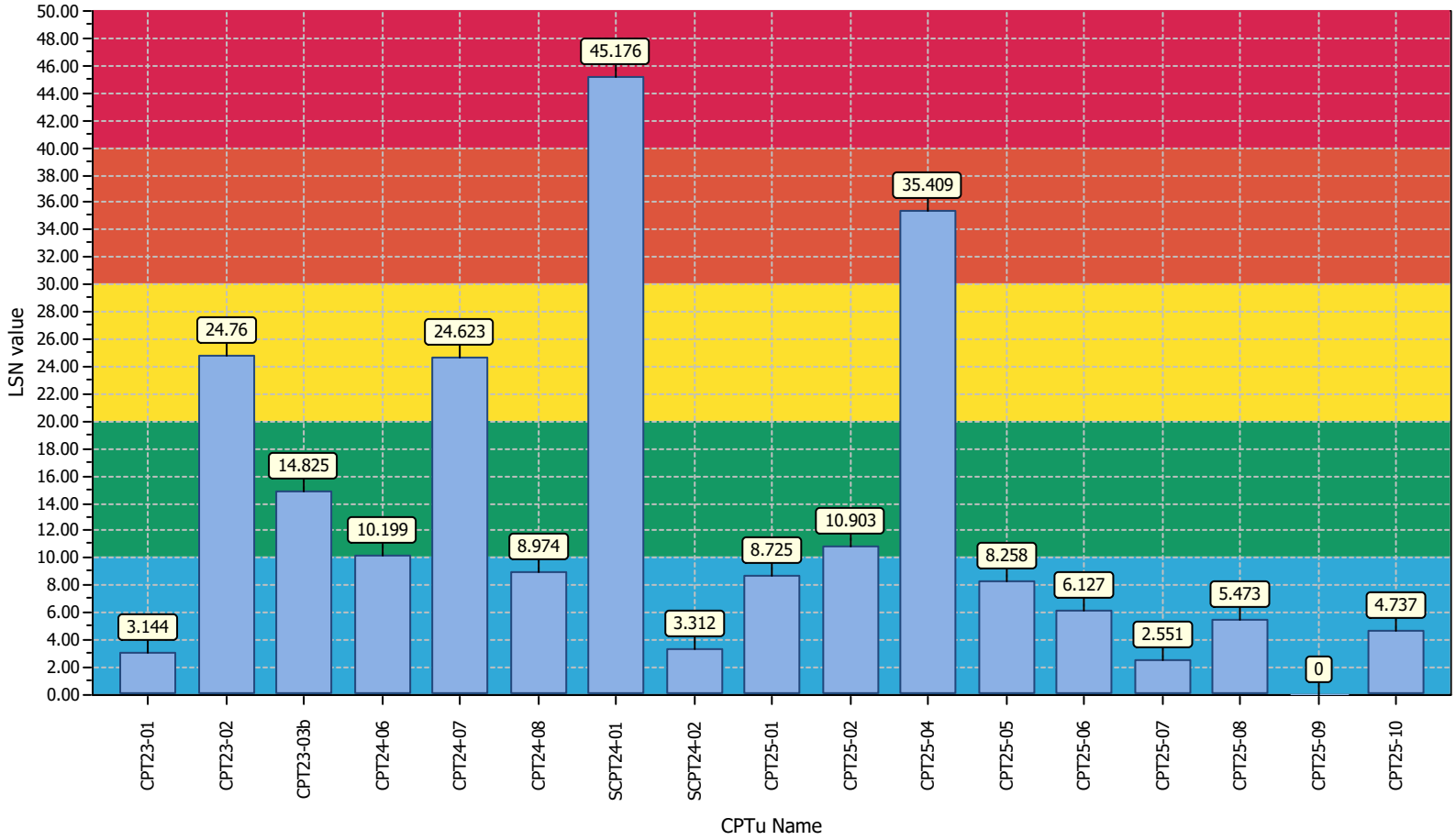
Total CPT number: 17
41% low risk
35% high risk
24% very high risk

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall Liquefaction Severity Number report



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

Basic statistics

Total CPT number: 17

59% little liquefaction

18% minor liquefaction

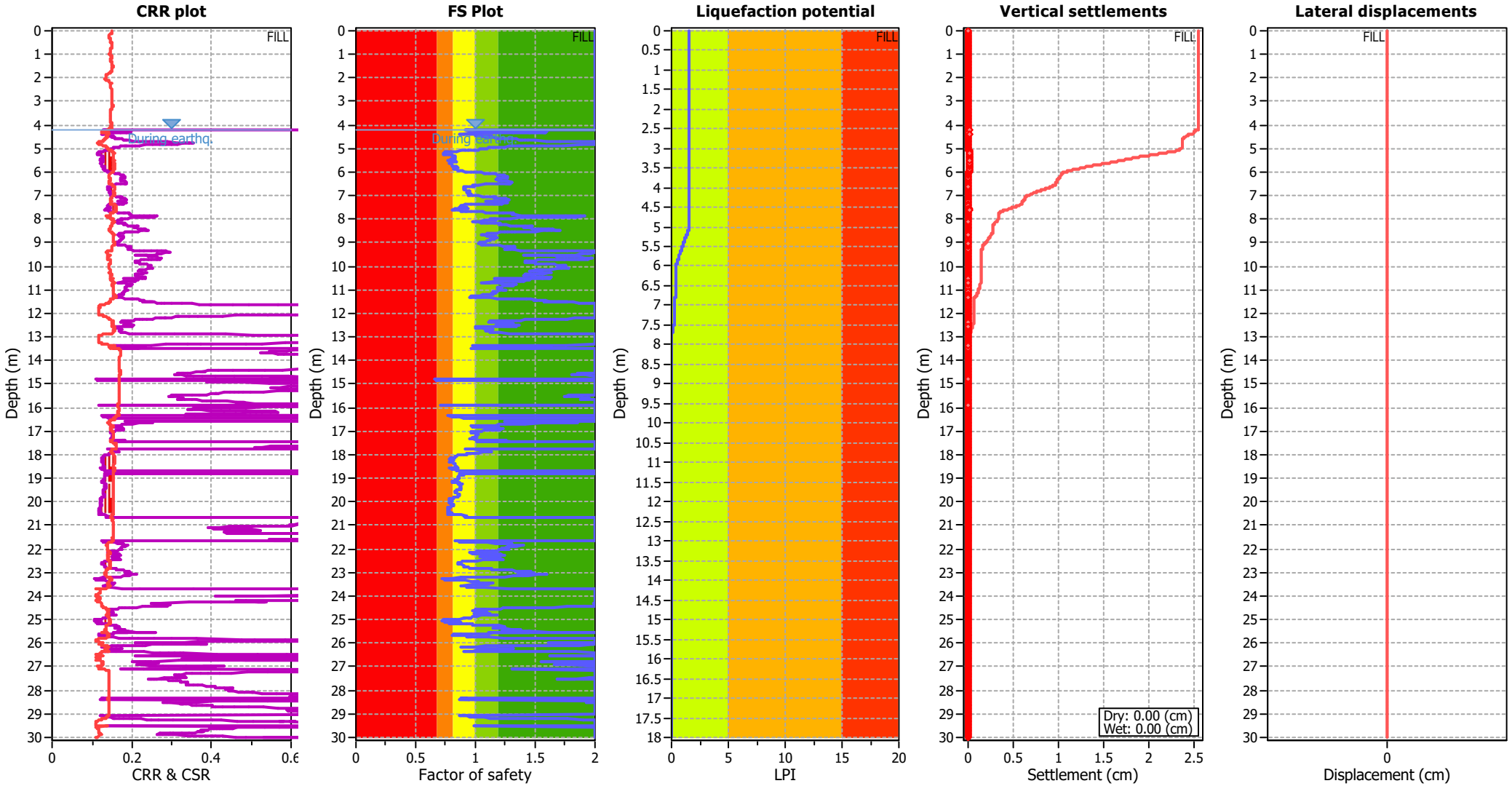
12% moderate liquefaction

6% moderate to major liquefaction

6% major liquefaction

0% severe liquefaction

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.20 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	6.20 m	Fill height:	2.00 m	Limit depth:	N/A

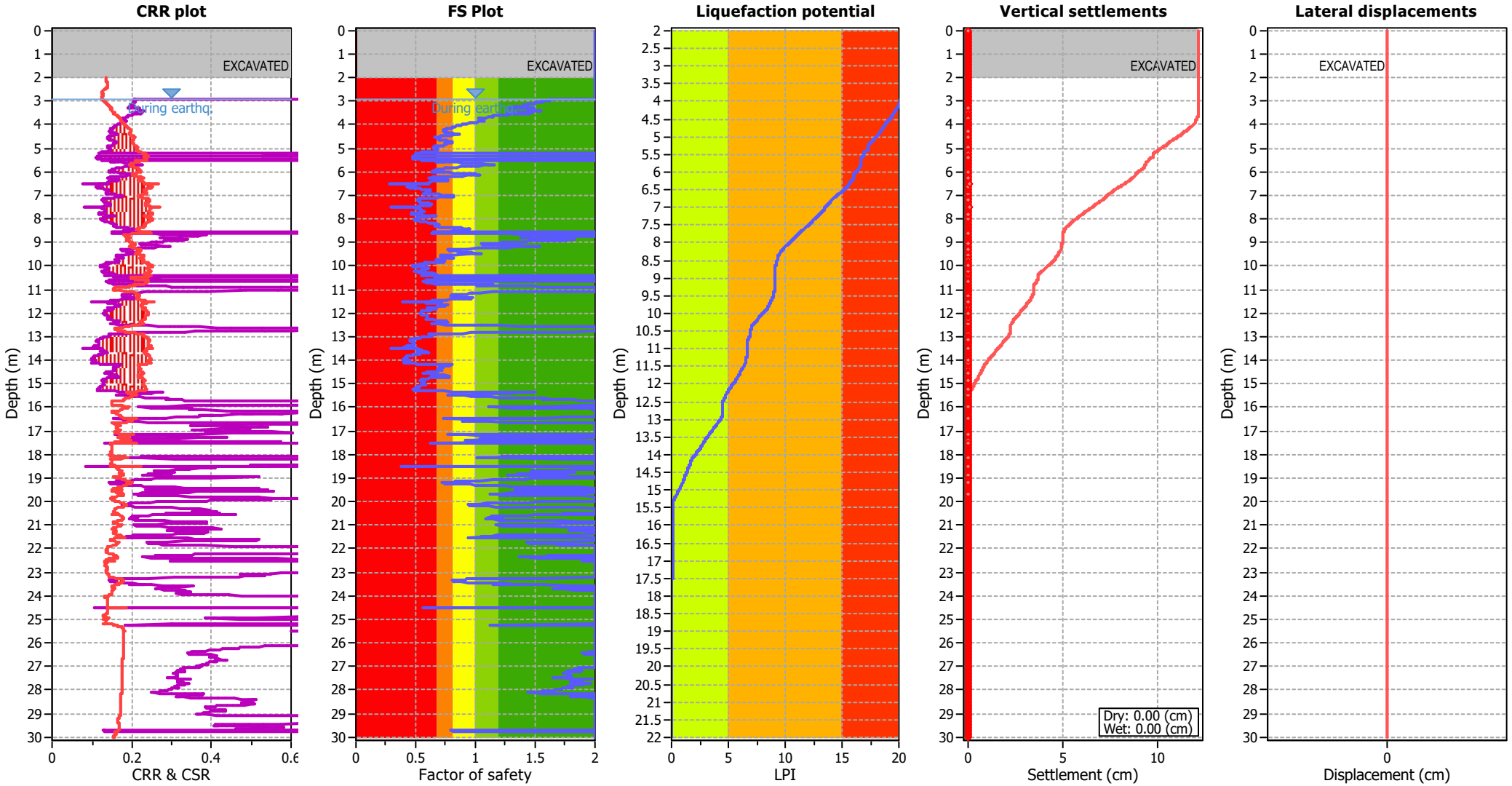
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.90 m	Footing load:	0.00 kPa
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Excavation:	Yes	Limit depth applied:	No
Depth to water table (insitu):	2.90 m	Excavation depth:	2.00 m	Limit depth:	N/A

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LPI color scheme

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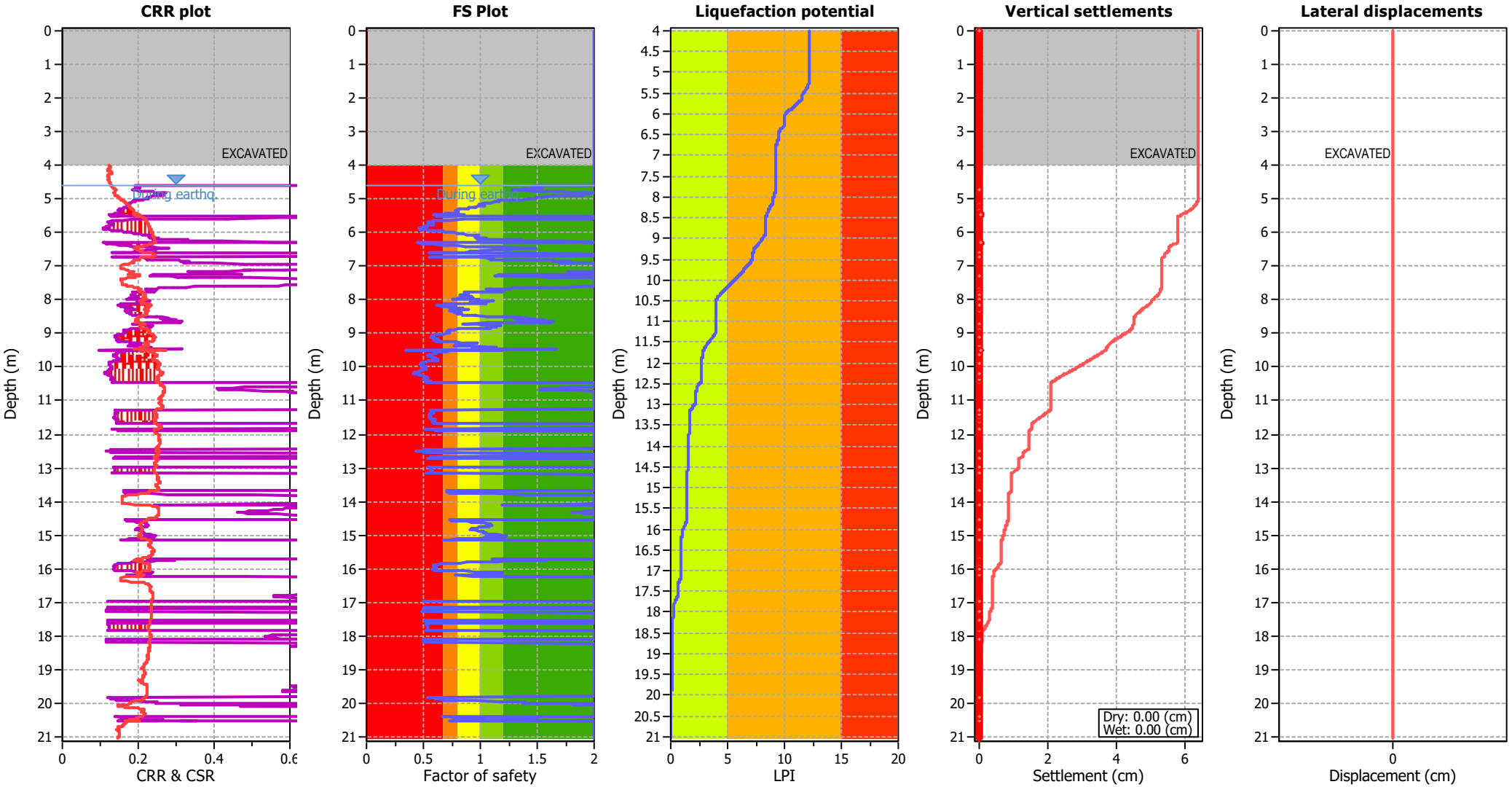
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.60 m	Footing load:	0.00 kPa
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Excavation:	Yes	Limit depth applied:	No
Depth to water table (insitu):	4.60 m	Excavation depth:	4.00 m	Limit depth:	N/A

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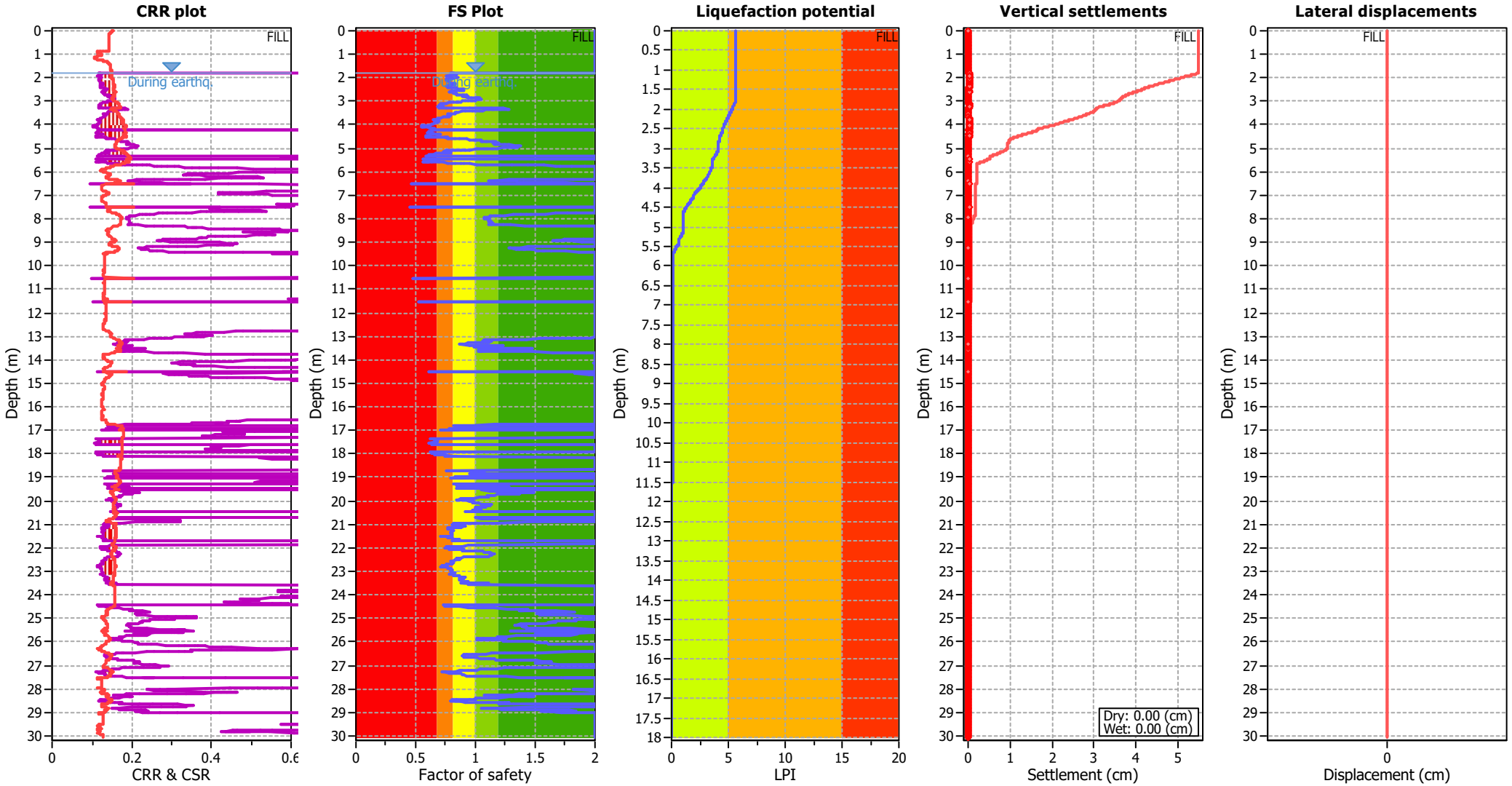
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.80 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.80 m	Fill height:	2.00 m	Limit depth:	N/A

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LPI color scheme

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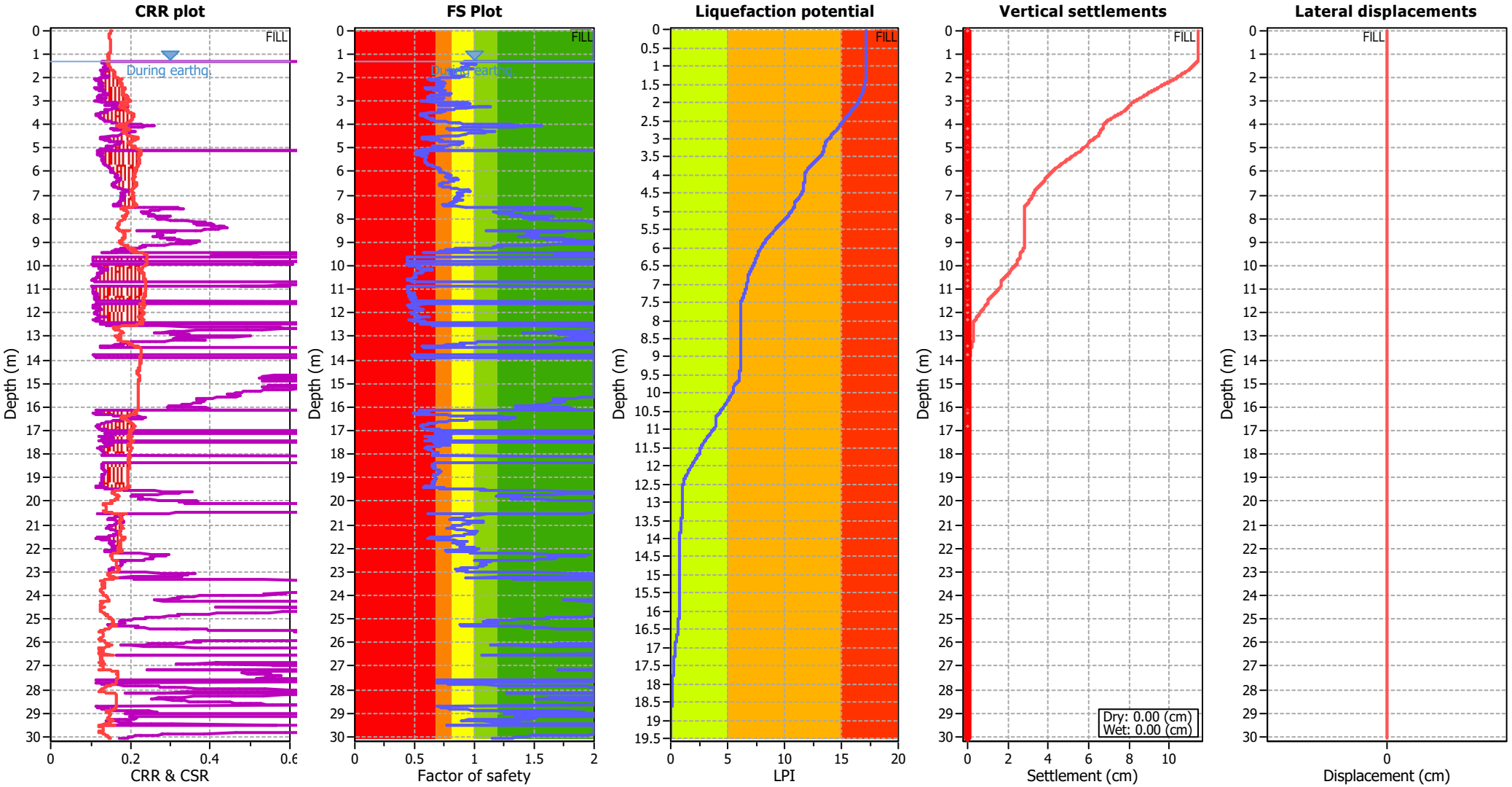
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.80 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.30 m	Fill height:	0.50 m	Limit depth:	N/A

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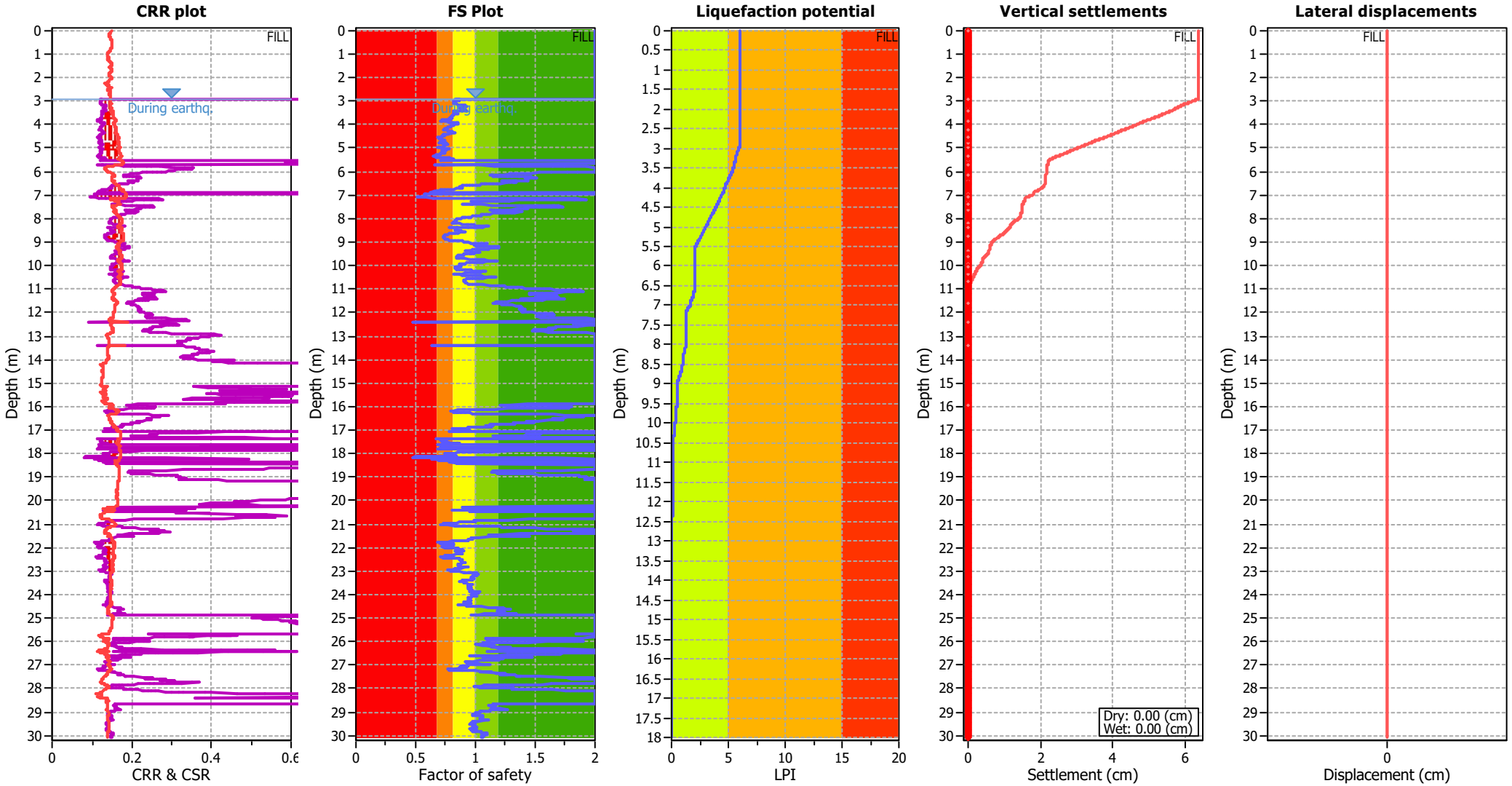
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.90 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	2.90 m	Fill height:	2.00 m	Limit depth:	N/A

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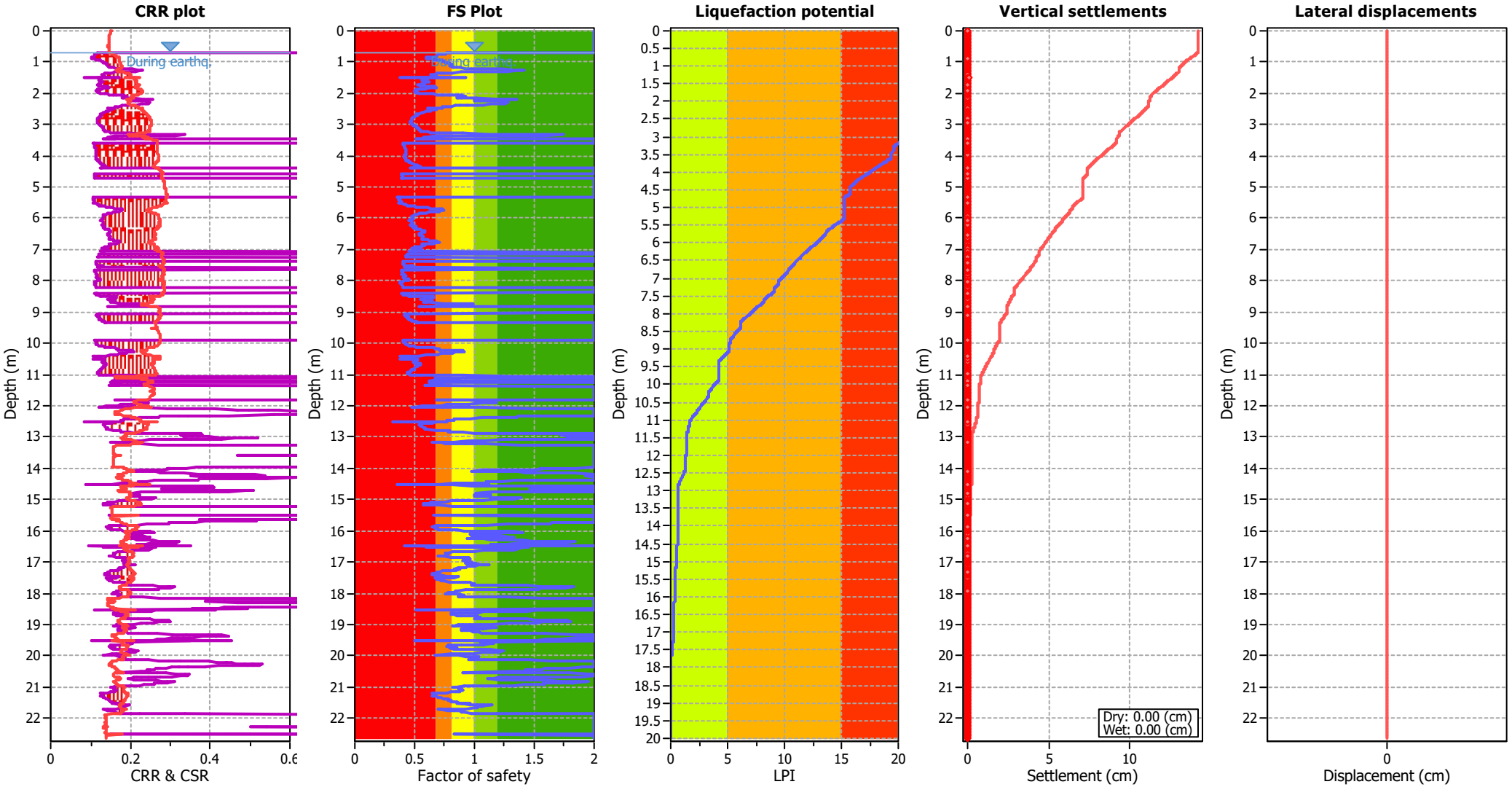
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.70 m	Fill weight:	18.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	0.70 m	Fill height:	0.00 m	Limit depth:	N/A

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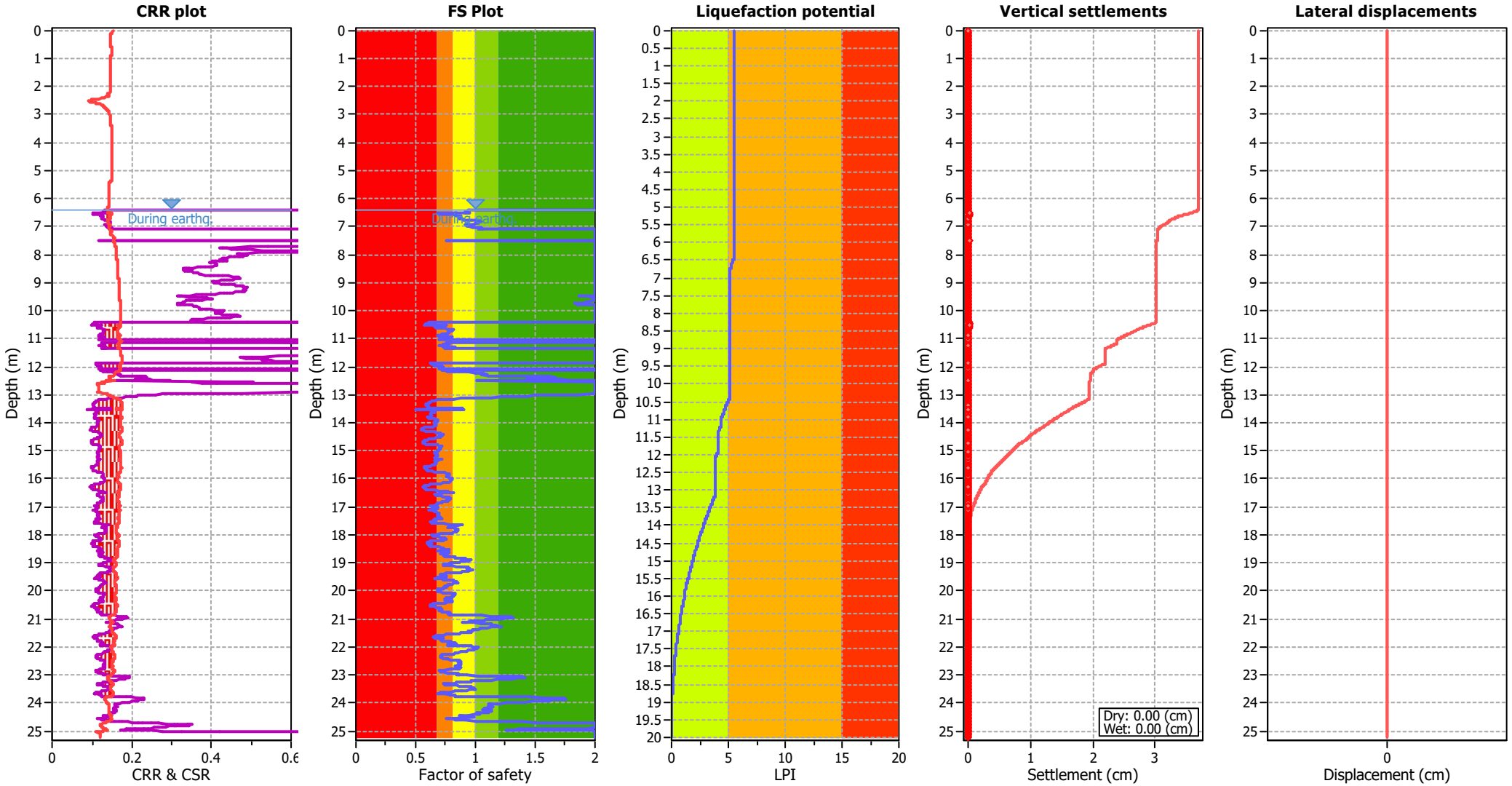
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.40 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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.40 m	Fill height:	N/A	Limit depth:	N/A

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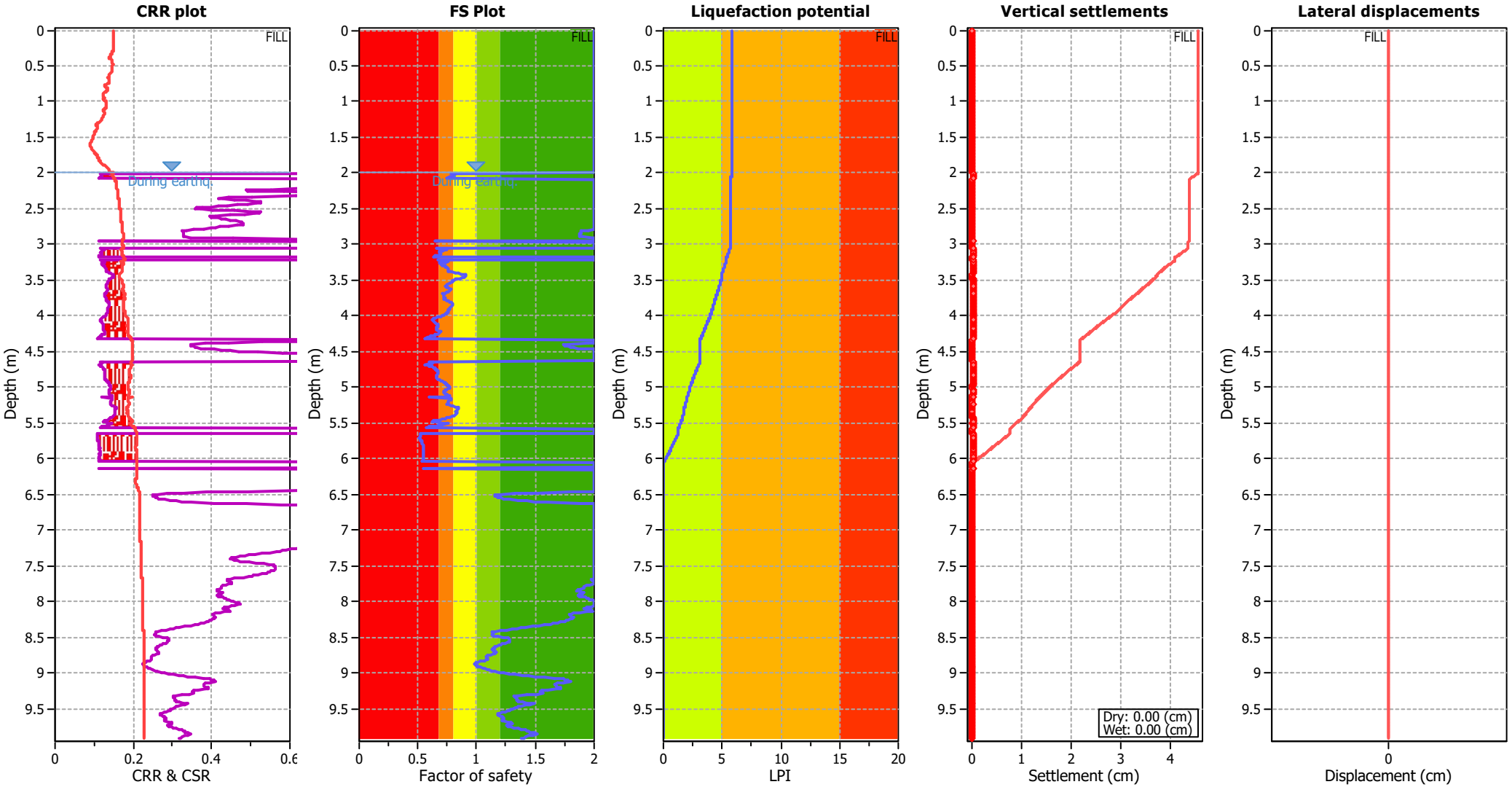
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.00 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	2.00 m	Fill height:	1.00 m	Limit depth:	N/A

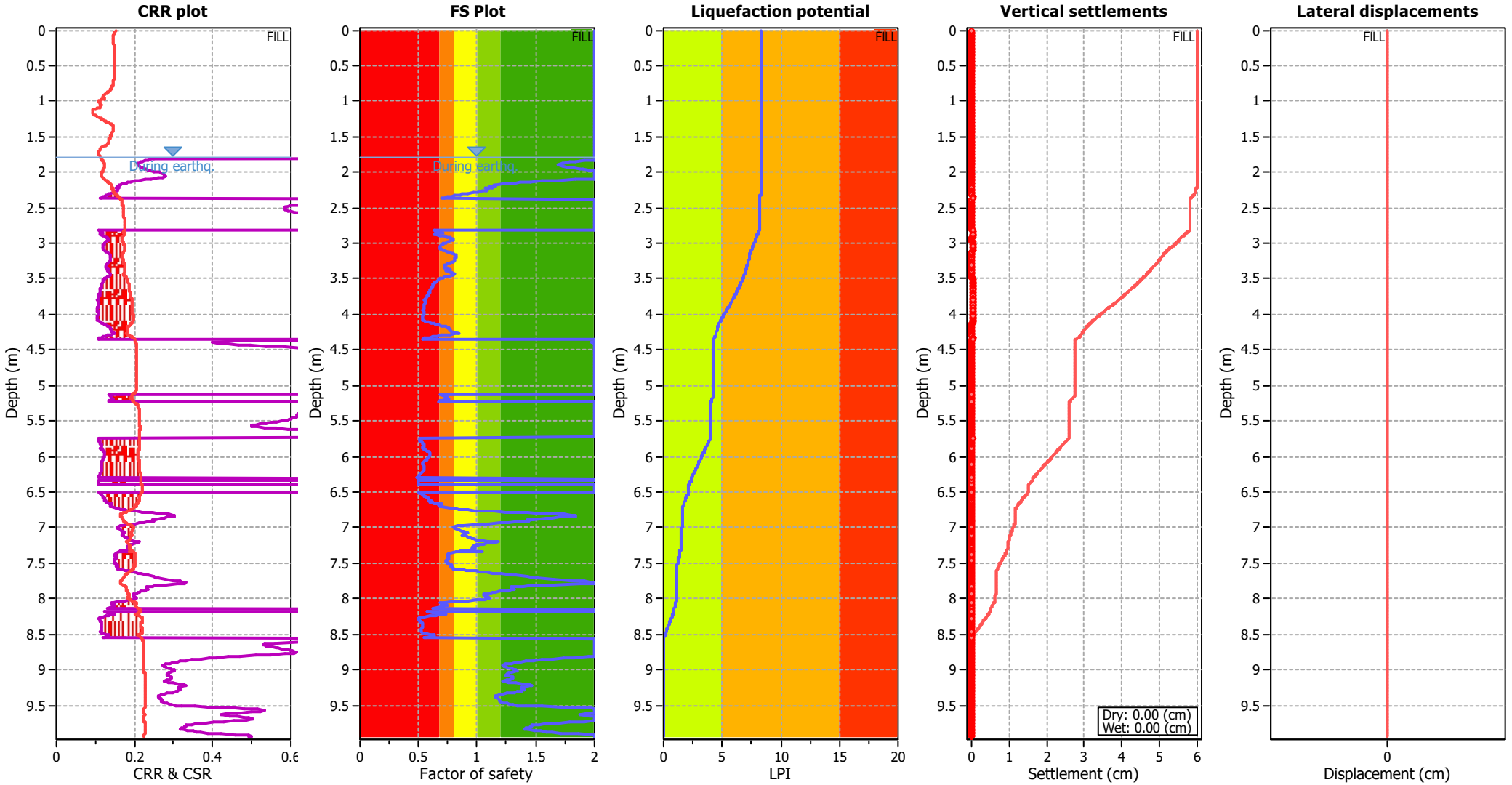
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.80 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.80 m	Fill height:	1.00 m	Limit depth:	N/A

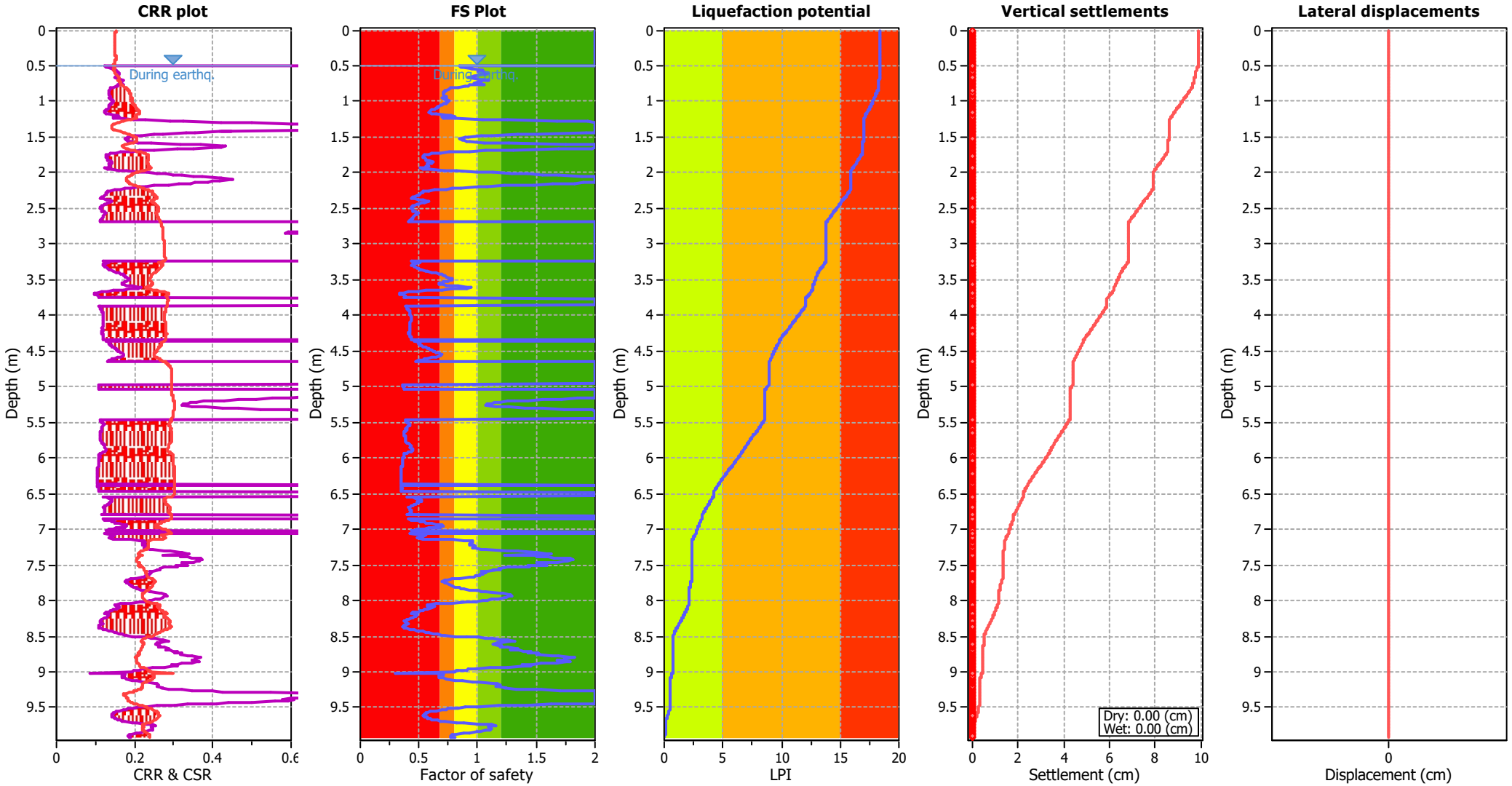
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.50 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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	0.50 m	Fill height:	N/A	Limit depth:	N/A

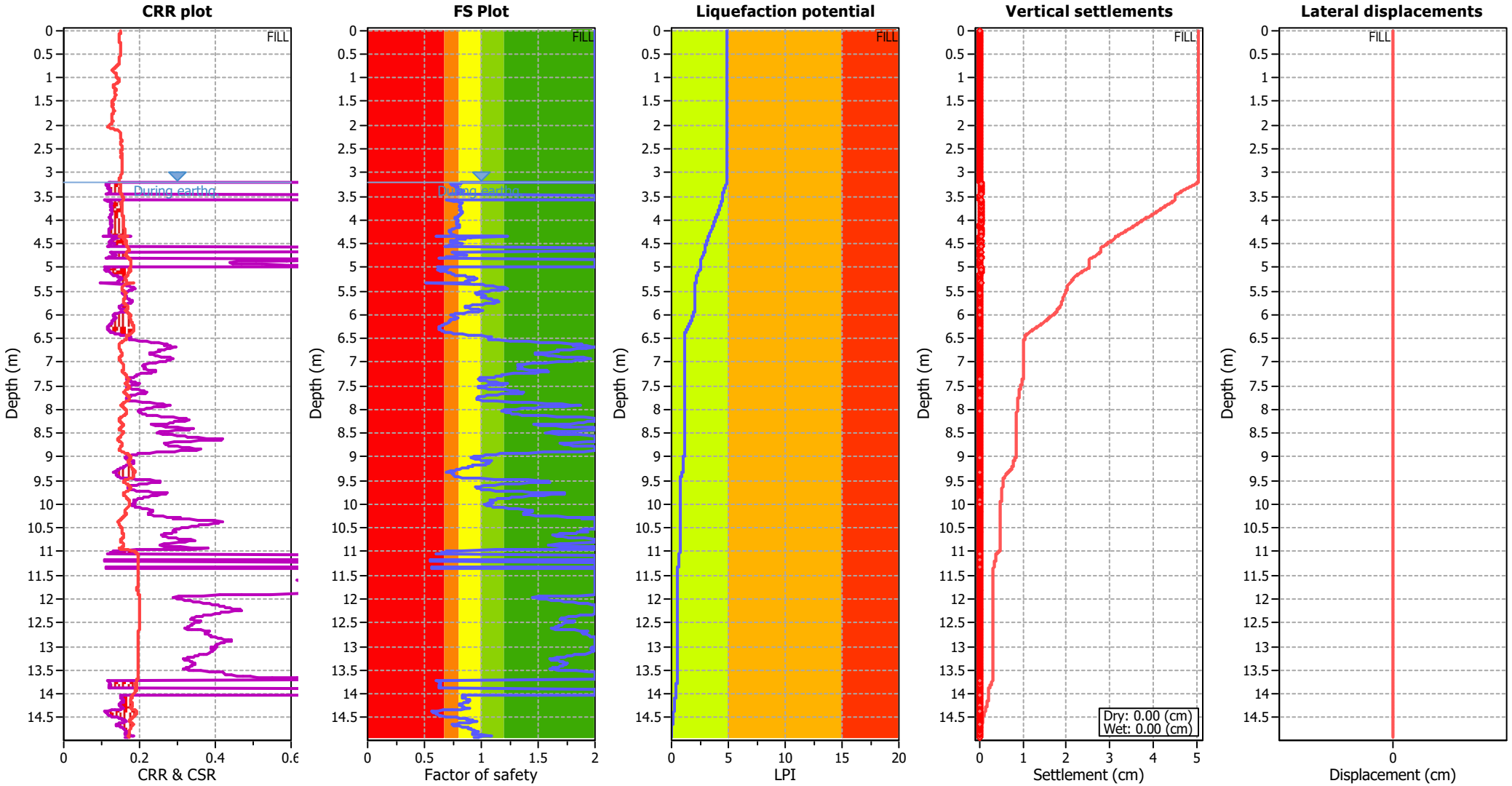
F.S. color scheme

- 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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.20 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	3.20 m	Fill height:	1.00 m	Limit depth:	N/A

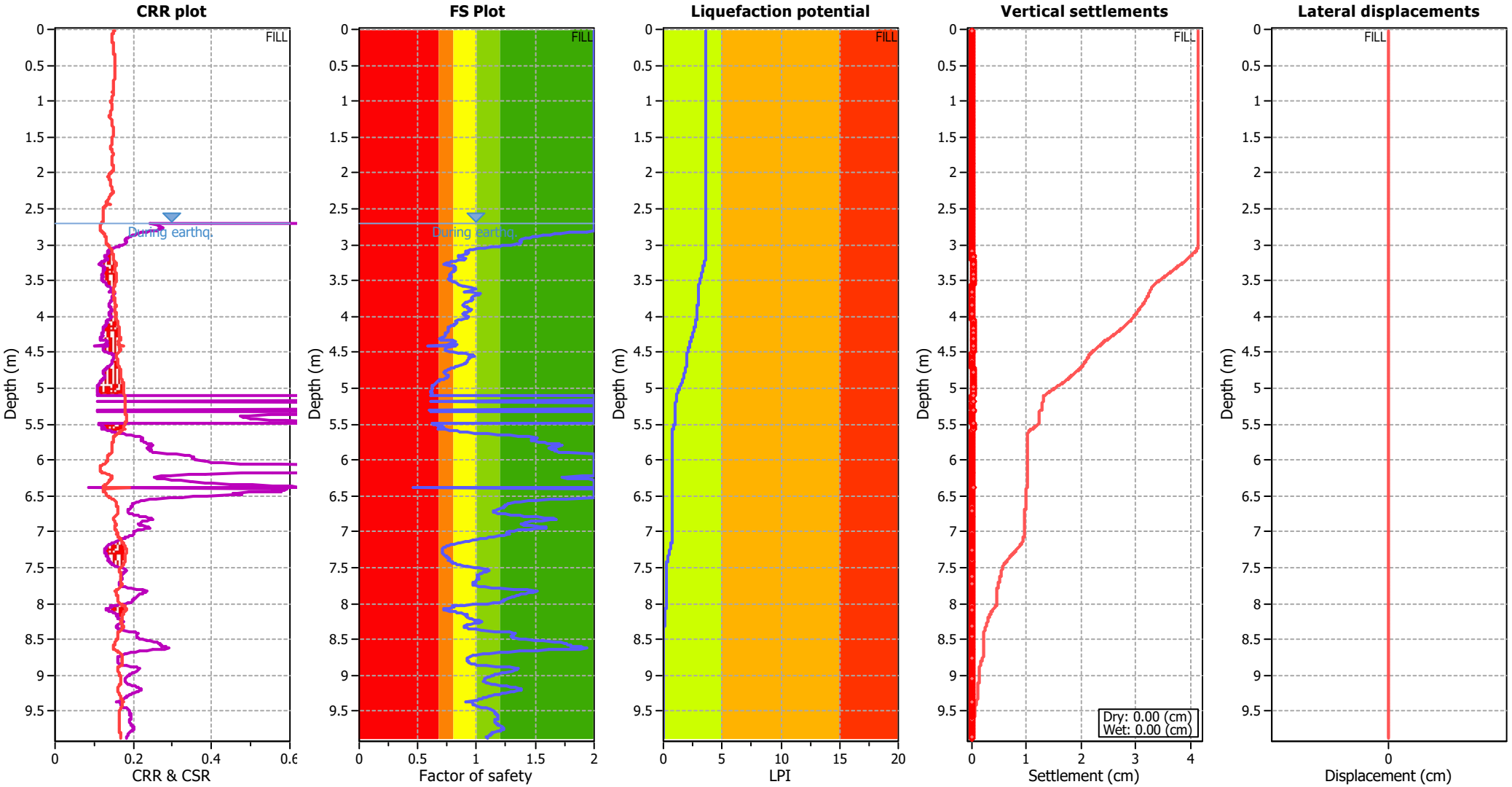
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.70 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	2.70 m	Fill height:	2.00 m	Limit depth:	N/A

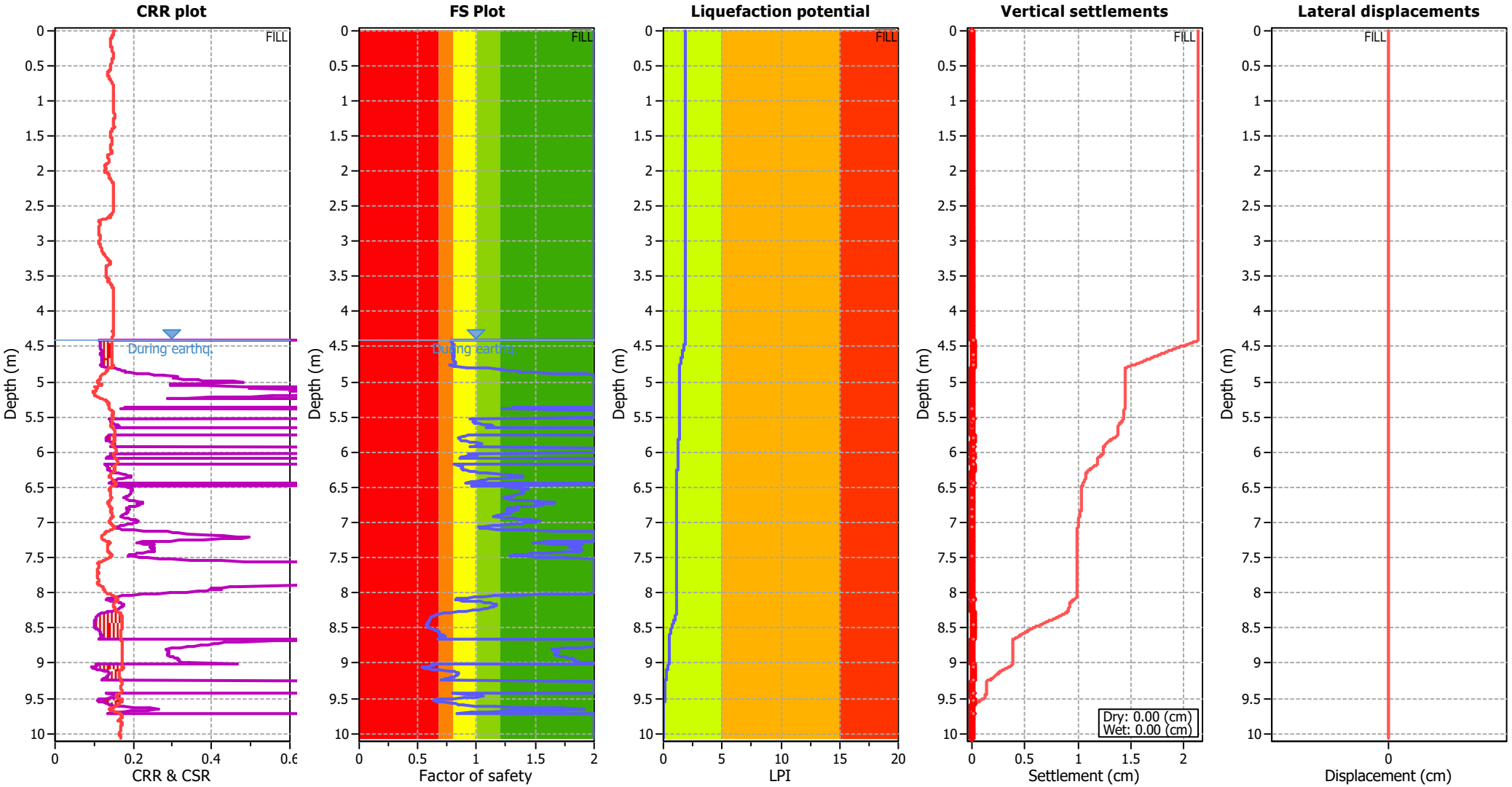
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.40 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	6.40 m	Fill height:	2.00 m	Limit depth:	N/A

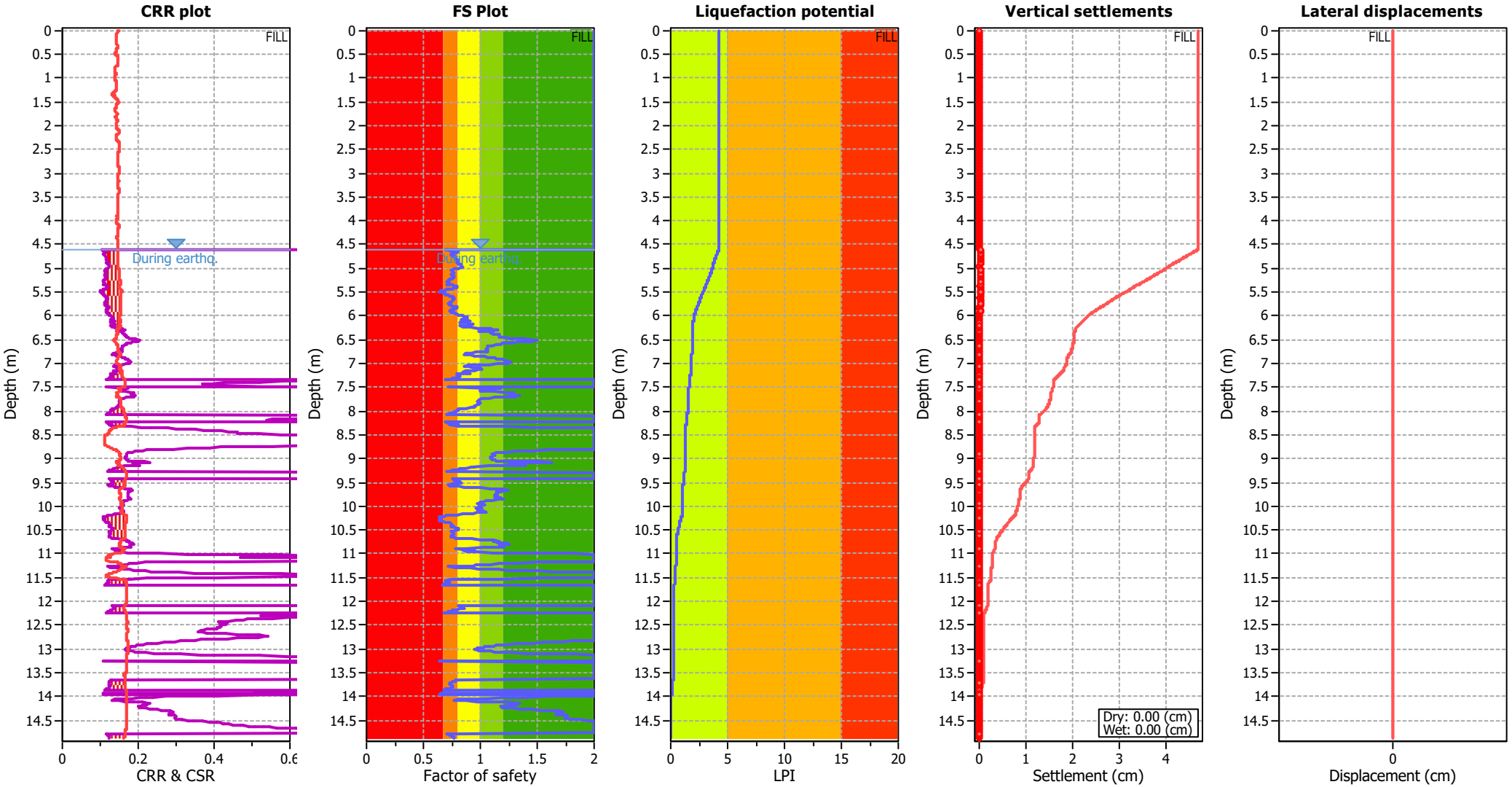
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.60 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	4.60 m	Fill height:	2.00 m	Limit depth:	N/A

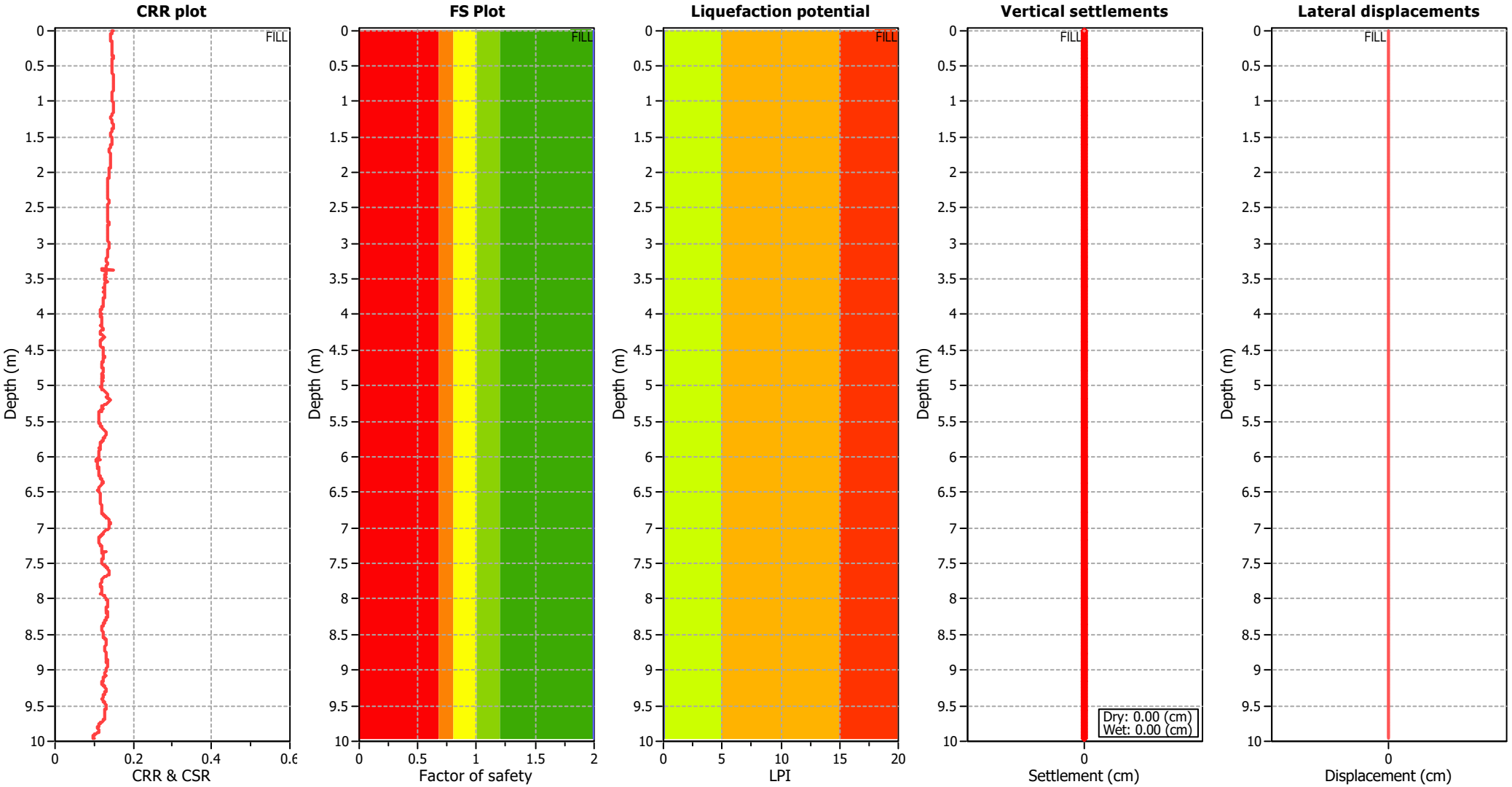
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	13.50 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	13.50 m	Fill height:	2.00 m	Limit depth:	N/A

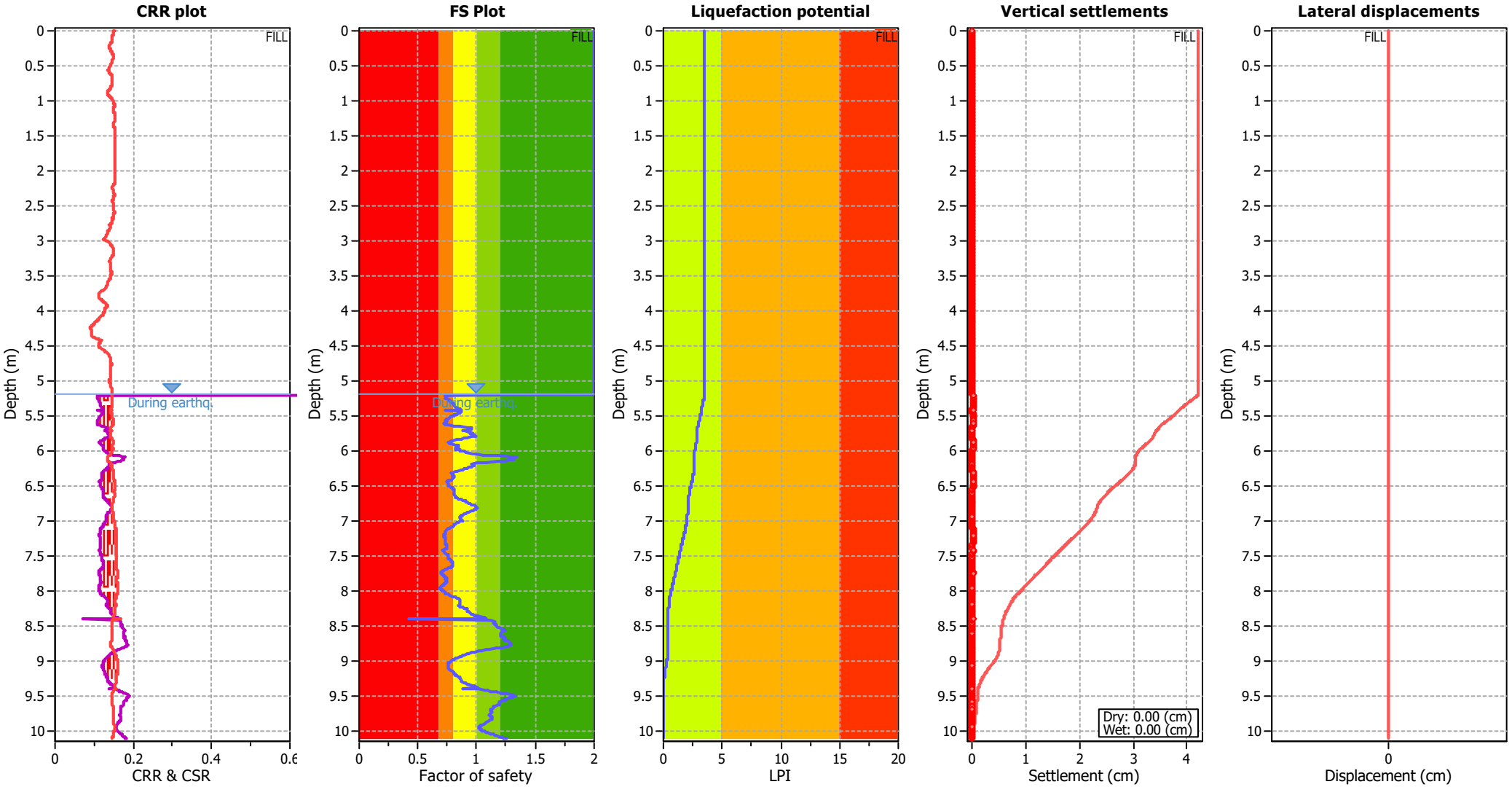
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	7.20 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.28	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	5.20 m	Fill height:	2.00 m	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

IL3 INDEX LIQUFACTION RESULTS

CMW Geosciences
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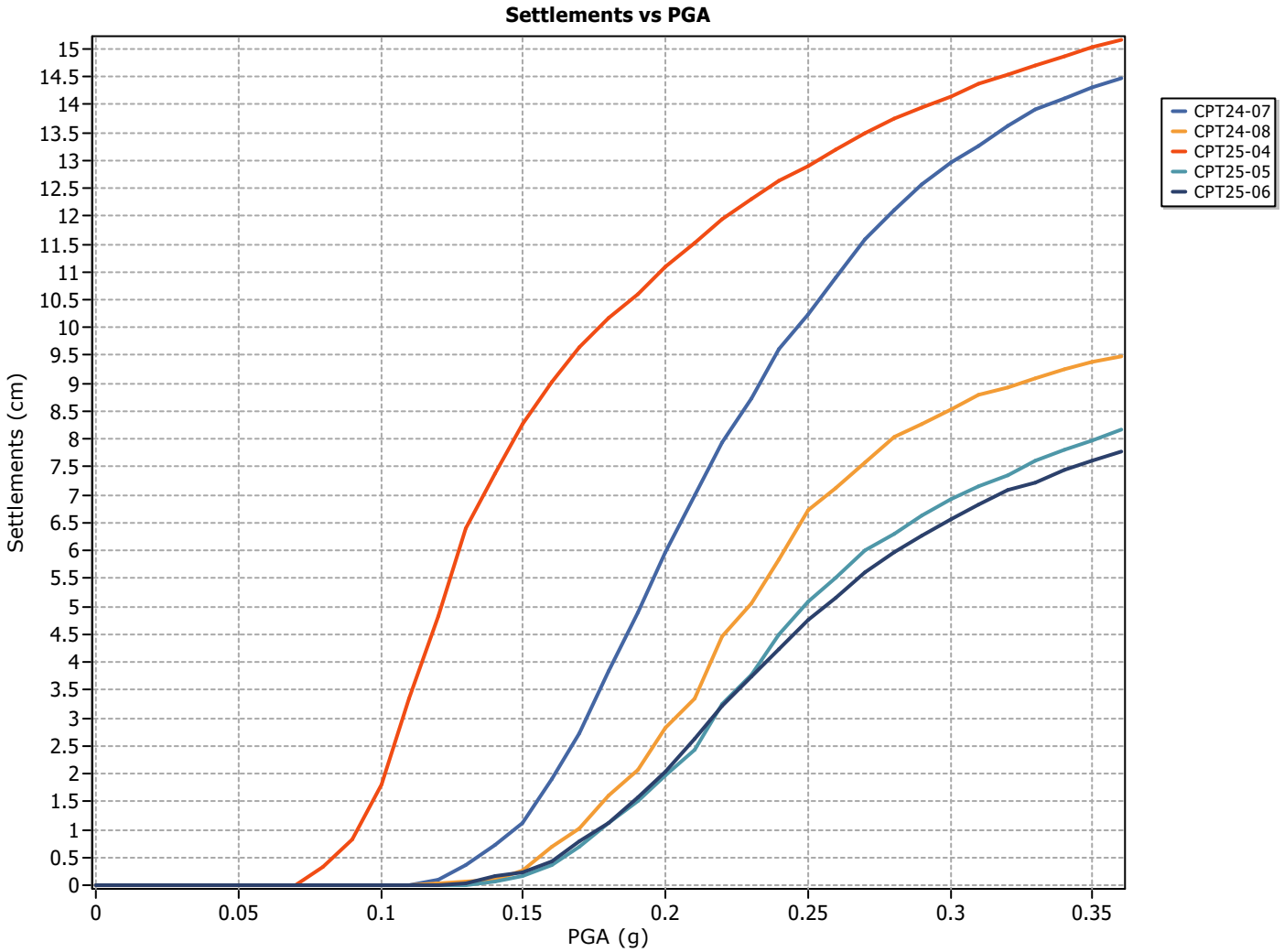
Hamilton 3216
www.cmwgeosciences.com

PGA Based Parametric Analysis



:: CPT main liquefaction parameters details ::

CPT Name	Assesment method	Earthquake Mag.	GWT in situ (m)	GWT earthq. (m)
CPT24-07	Boulanger & Idriss (2014)	5.90	1.30	1.80
CPT24-08	Boulanger & Idriss (2014)	5.90	2.90	4.90
CPT25-04	Boulanger & Idriss (2014)	5.90	0.50	0.50
CPT25-05	Boulanger & Idriss (2014)	5.90	3.20	4.20
CPT25-06	Boulanger & Idriss (2014)	5.90	2.70	4.70

CMW Geosciences
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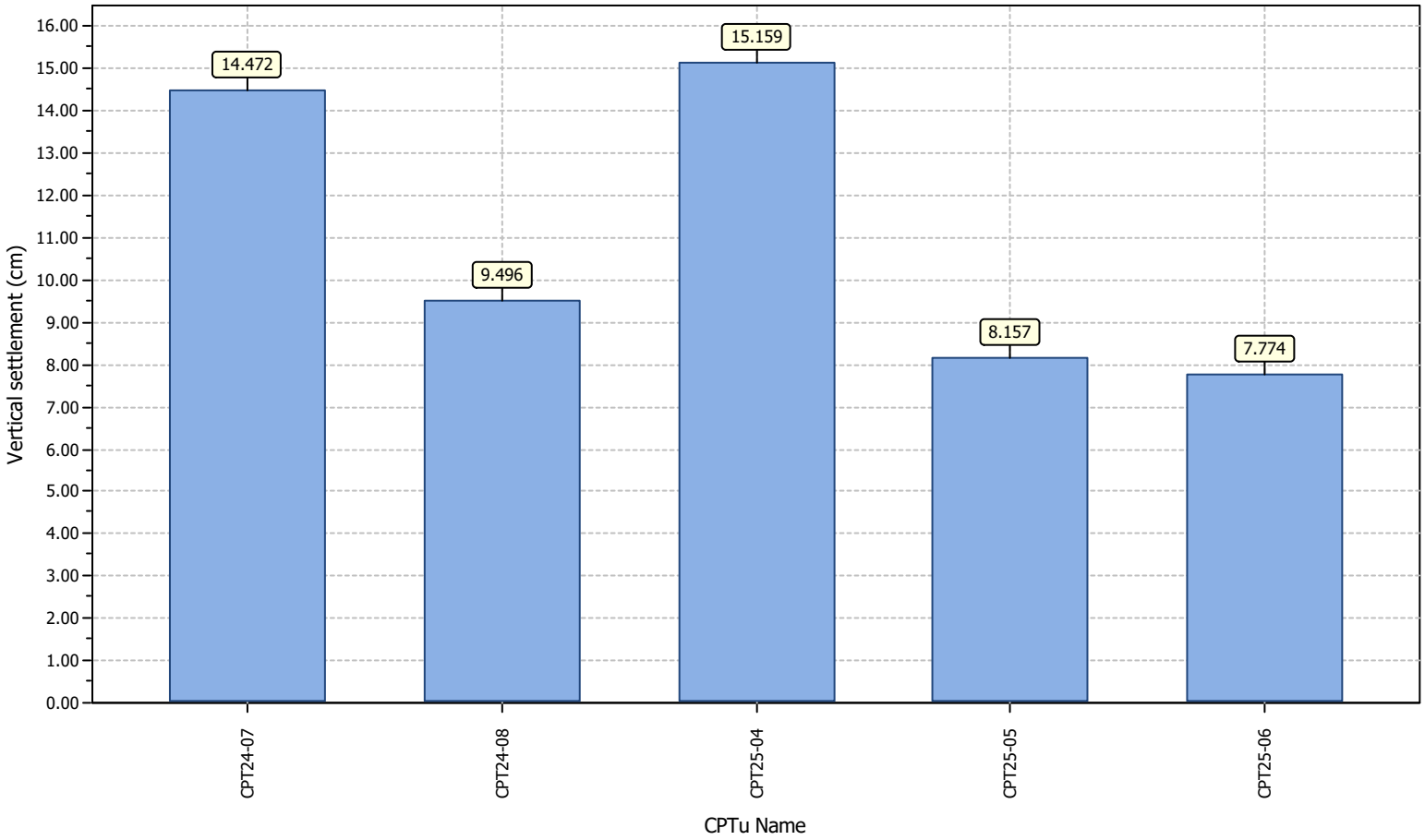
Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall vertical settlements report

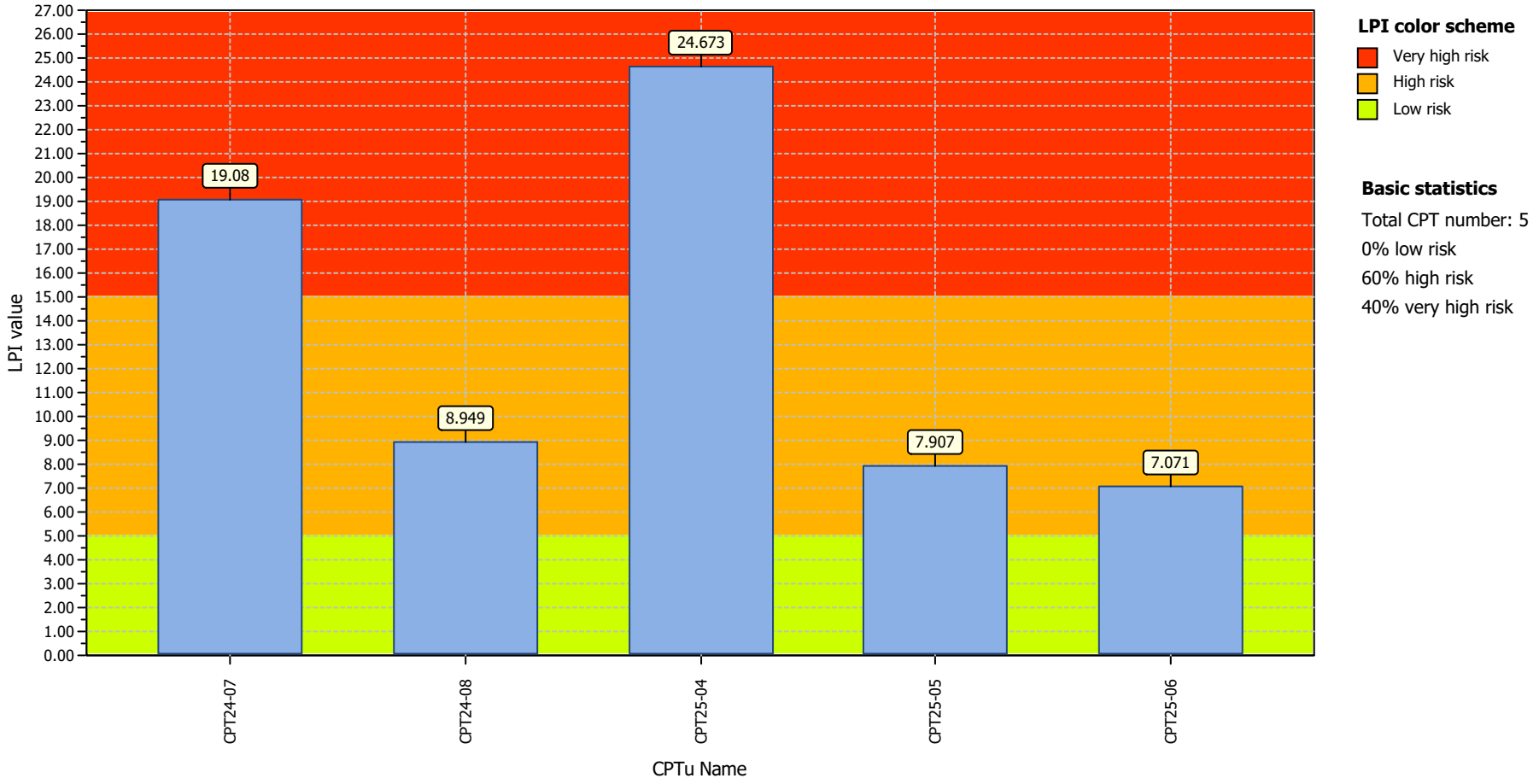


CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall Liquefaction Potential Index report

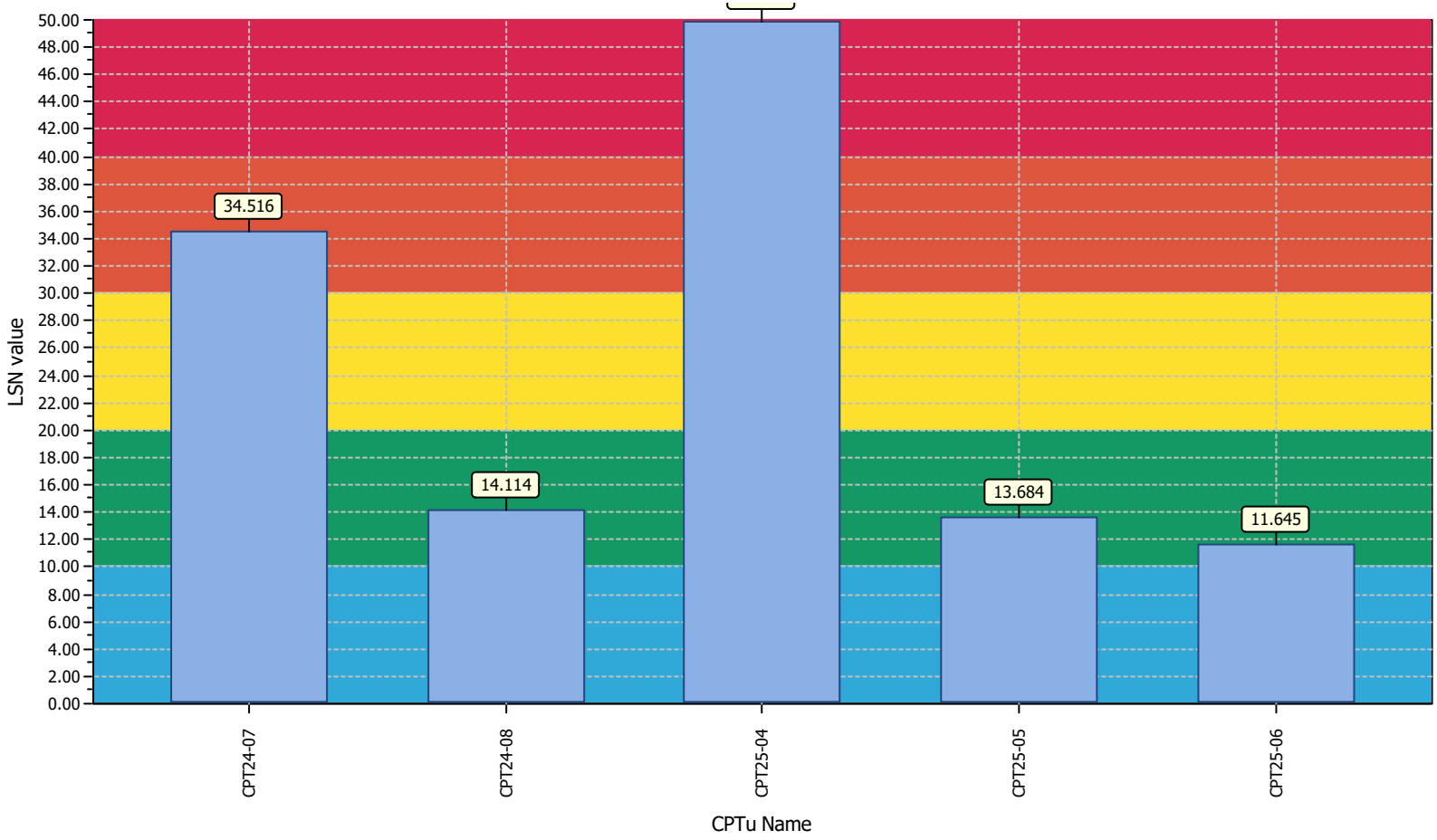


CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall Liquefaction Severity Number report



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

Basic statistics

Total CPT number: 5

0% little liquefaction

60% minor liquefaction

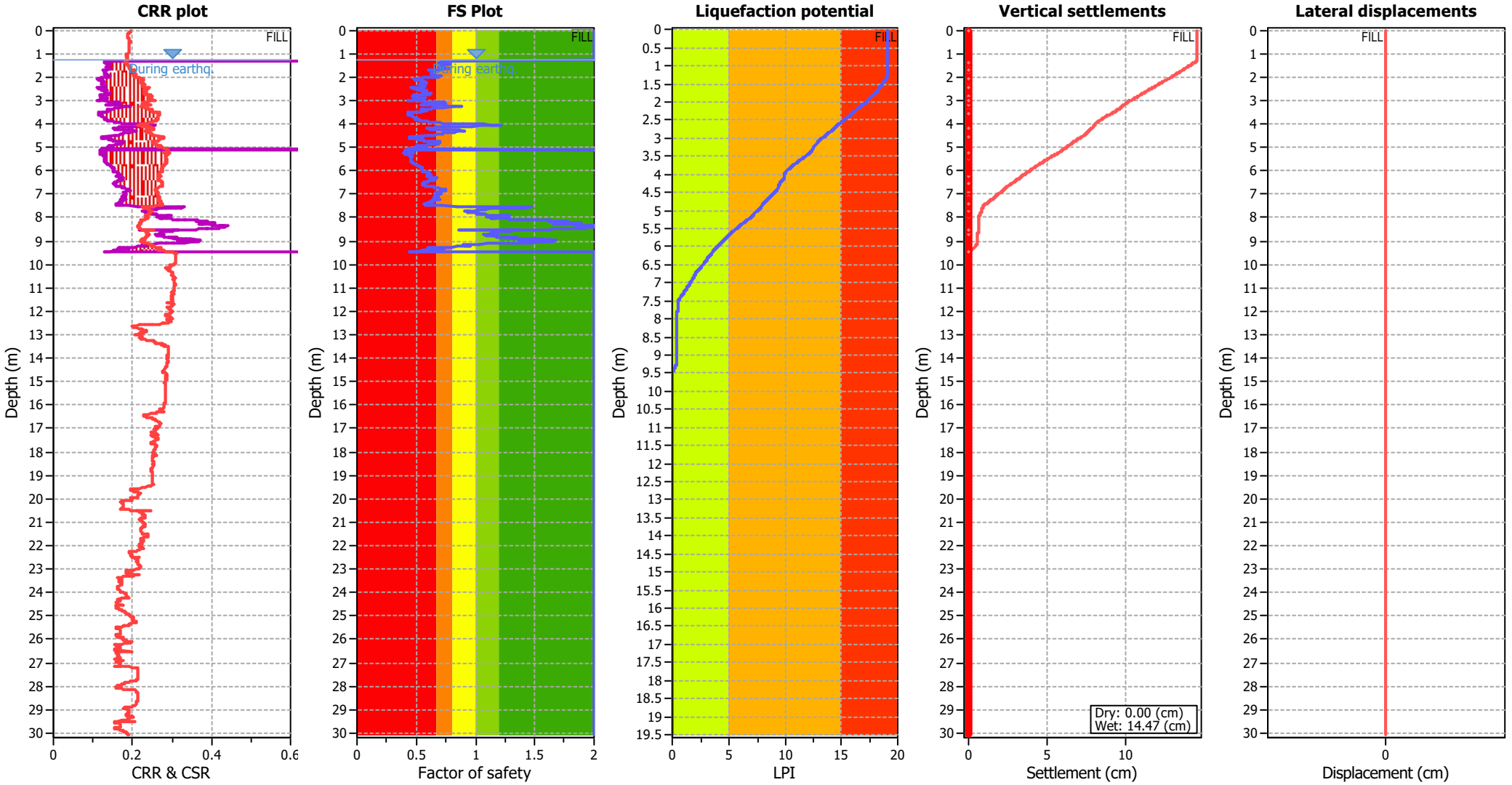
0% moderate liquefaction

20% moderate to major liquefaction

20% major liquefaction

0% severe liquefaction

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.80 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.36	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	1.30 m	Fill height:	0.50 m	Limit depth:	10.00 m

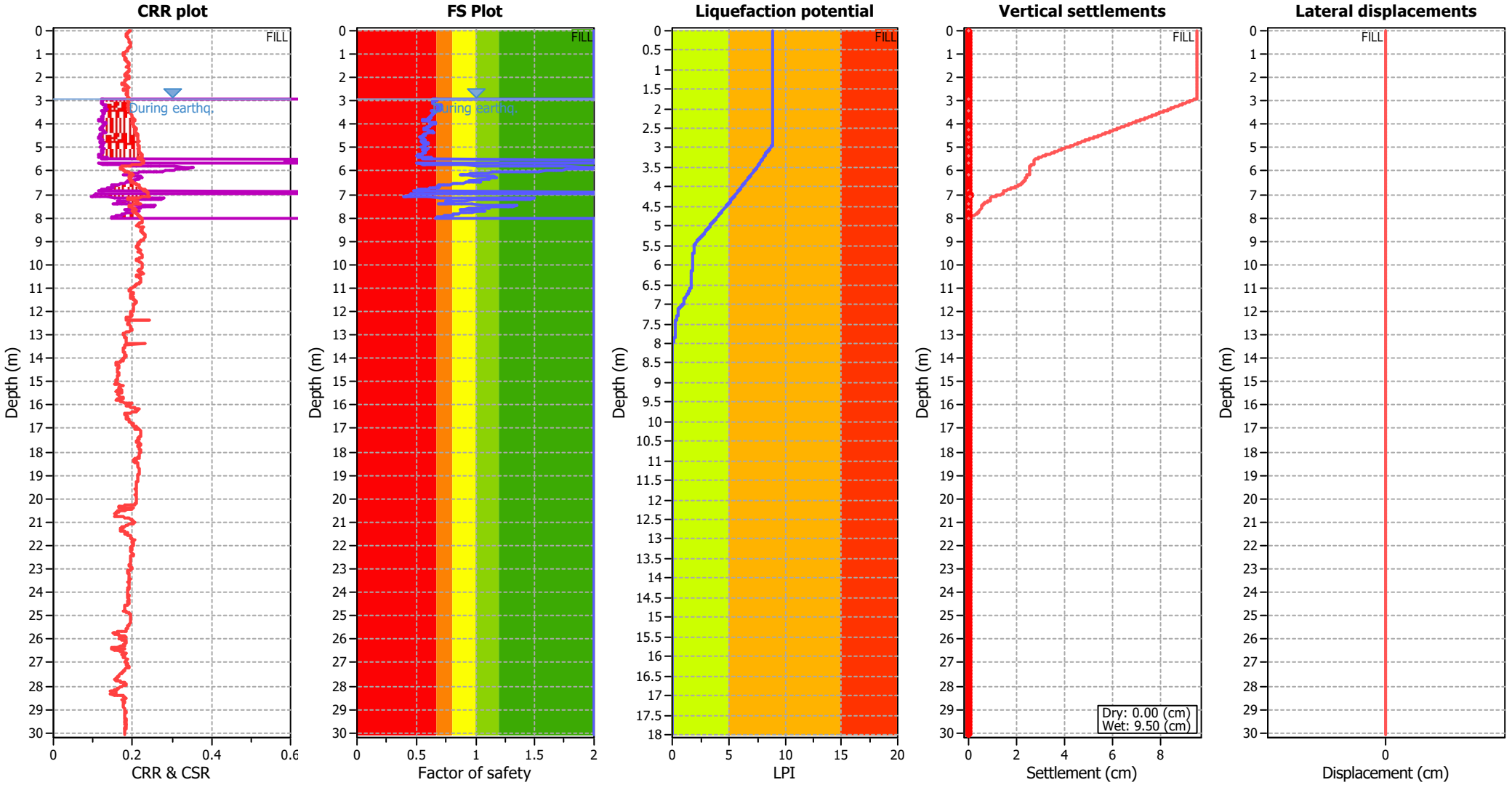
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.90 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.36	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	2.90 m	Fill height:	2.00 m	Limit depth:	10.00 m

F.S. color scheme

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LPI color scheme

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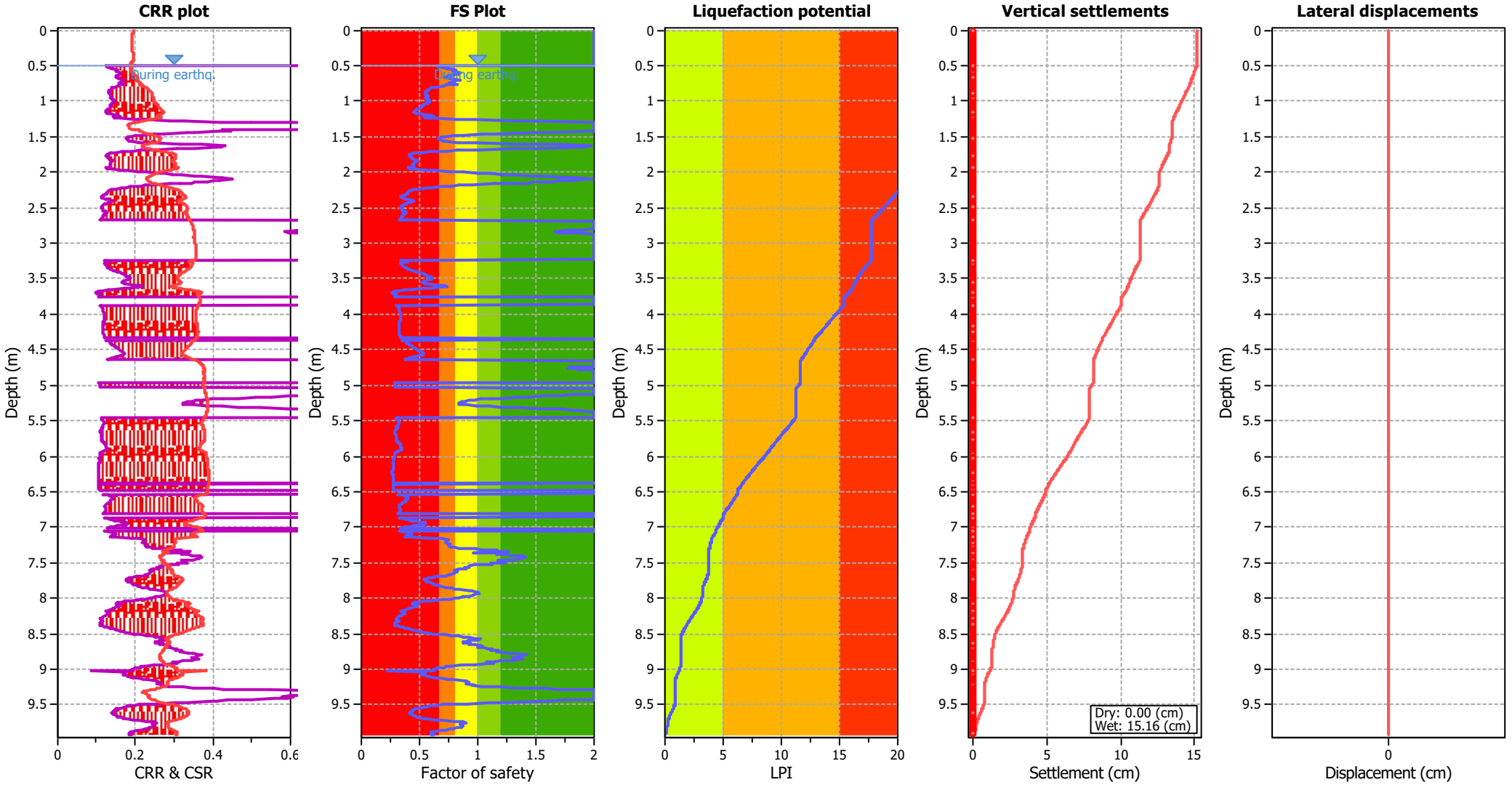
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.50 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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.36	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	0.50 m	Fill height:	N/A	Limit depth:	10.00 m

F.S. color scheme

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LPI color scheme

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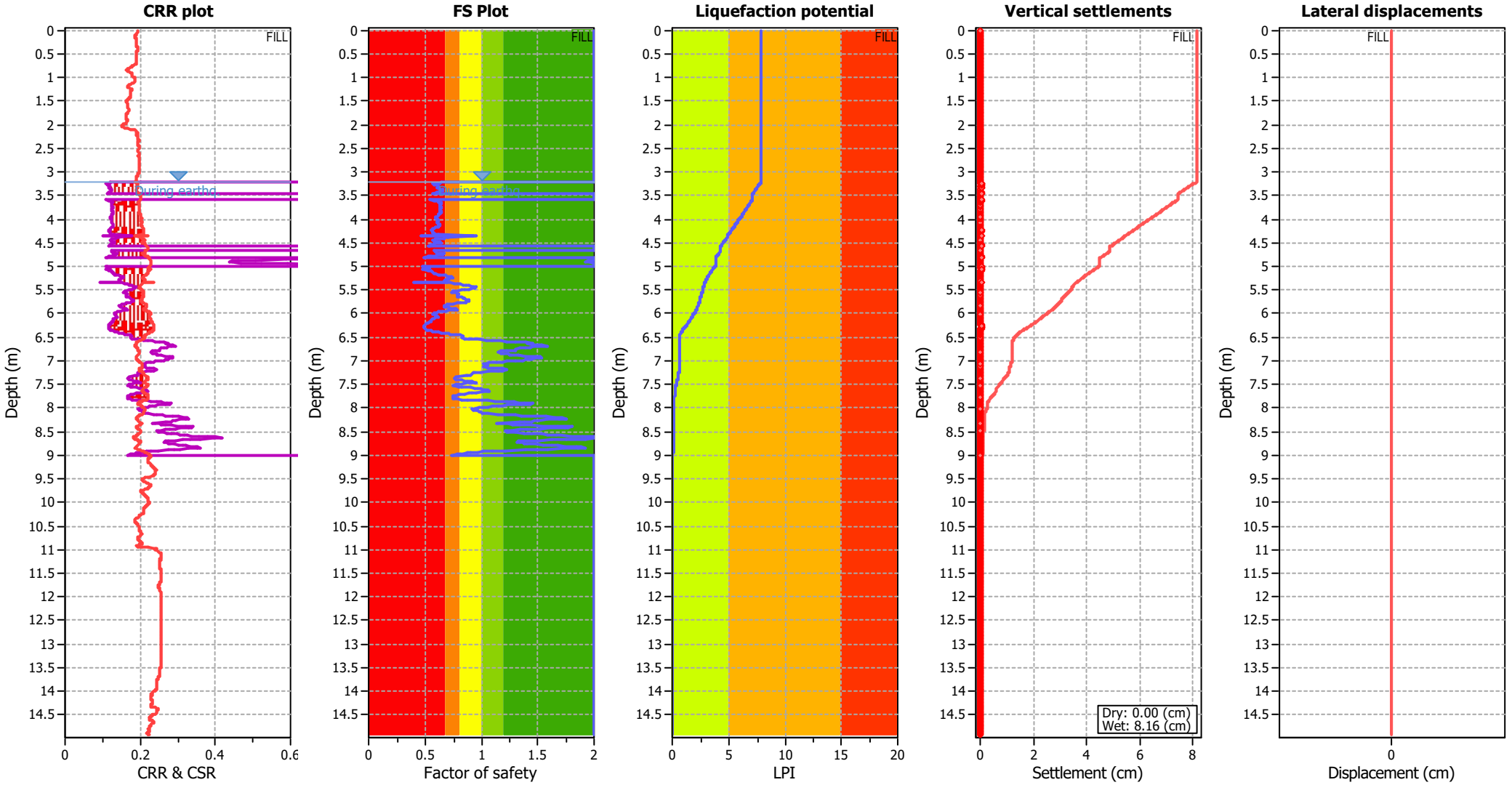
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.20 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.36	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	3.20 m	Fill height:	1.00 m	Limit depth:	10.00 m

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
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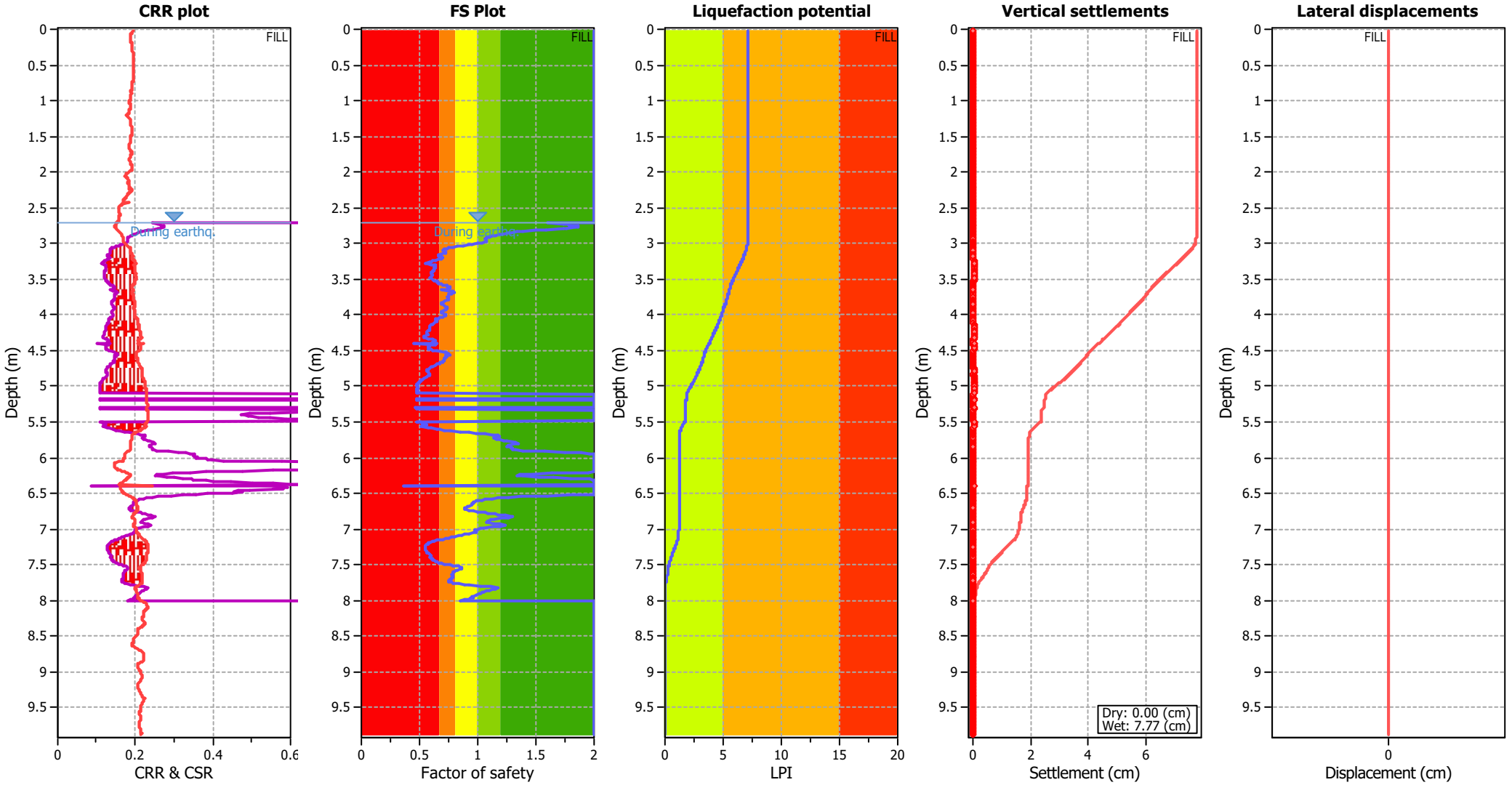
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.70 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.36	Use fill:	Yes	Limit depth applied:	Yes
Depth to water table (insitu):	2.70 m	Fill height:	2.00 m	Limit depth:	10.00 m

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

IL3 FULL DEPTH LIQUFACTION RESULTS

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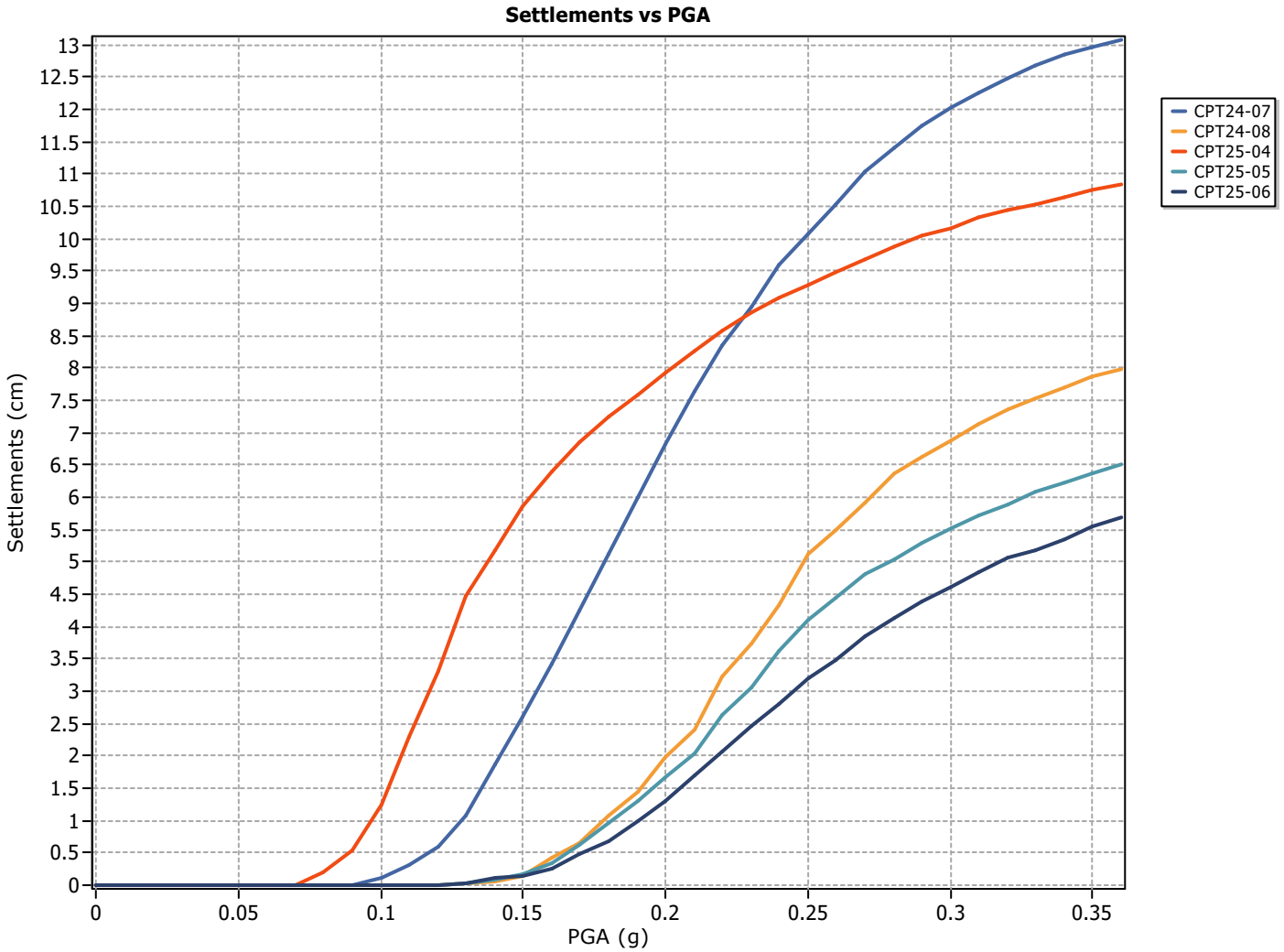
PGA Based Parametric Analysis



:: CPT main liquefaction parameters details ::

CPT Name	Assesment method	Earthquake Mag.	GWT in situ (m)	GWT earthq. (m)
CPT24-07	Boulanger & Idriss (2014)	5.90	1.30	1.80
CPT24-08	Boulanger & Idriss (2014)	5.90	2.90	4.90
CPT25-04	Boulanger & Idriss (2014)	5.90	0.50	0.50
CPT25-05	Boulanger & Idriss (2014)	5.90	3.20	4.20
CPT25-06	Boulanger & Idriss (2014)	5.90	2.70	4.70

CMW Geosciences
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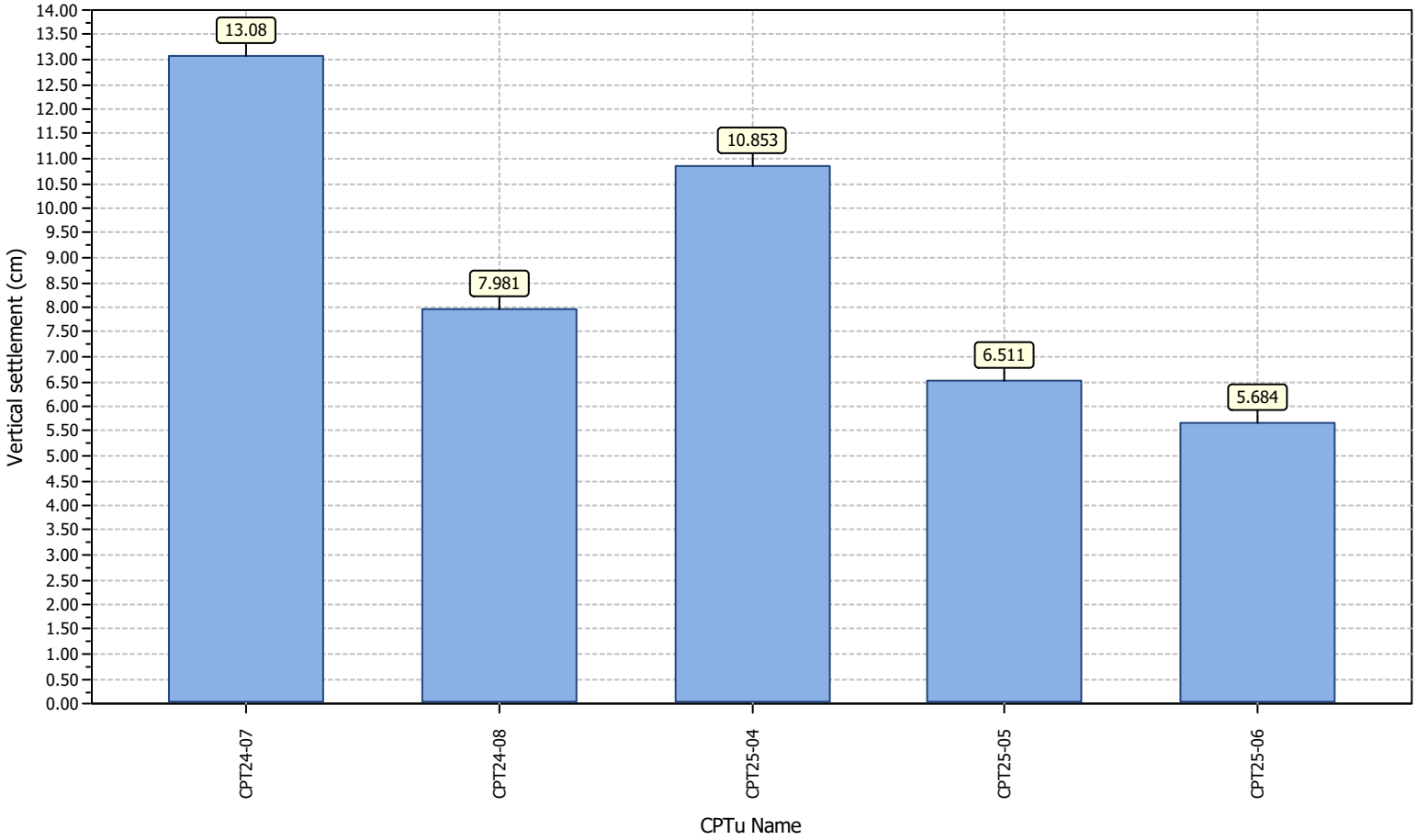
Hamilton 3216
www.cmwgeosciences.com

Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall vertical settlements report



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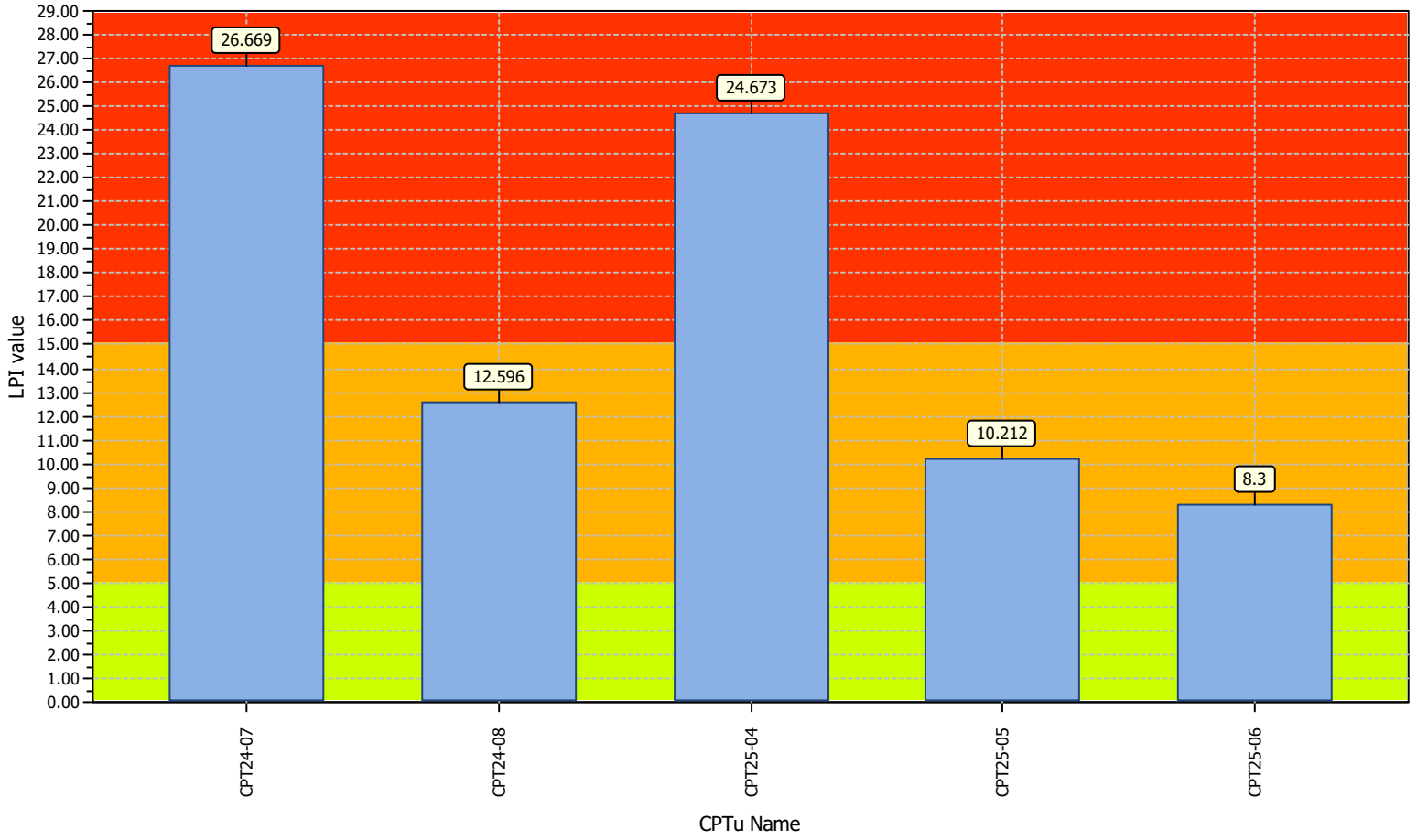
Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall Liquefaction Potential Index report



LPI color scheme

- Very high risk
- High risk
- Low risk

Basic statistics

Total CPT number: 5
0% low risk
60% high risk
40% very high risk

CMW Geosciences
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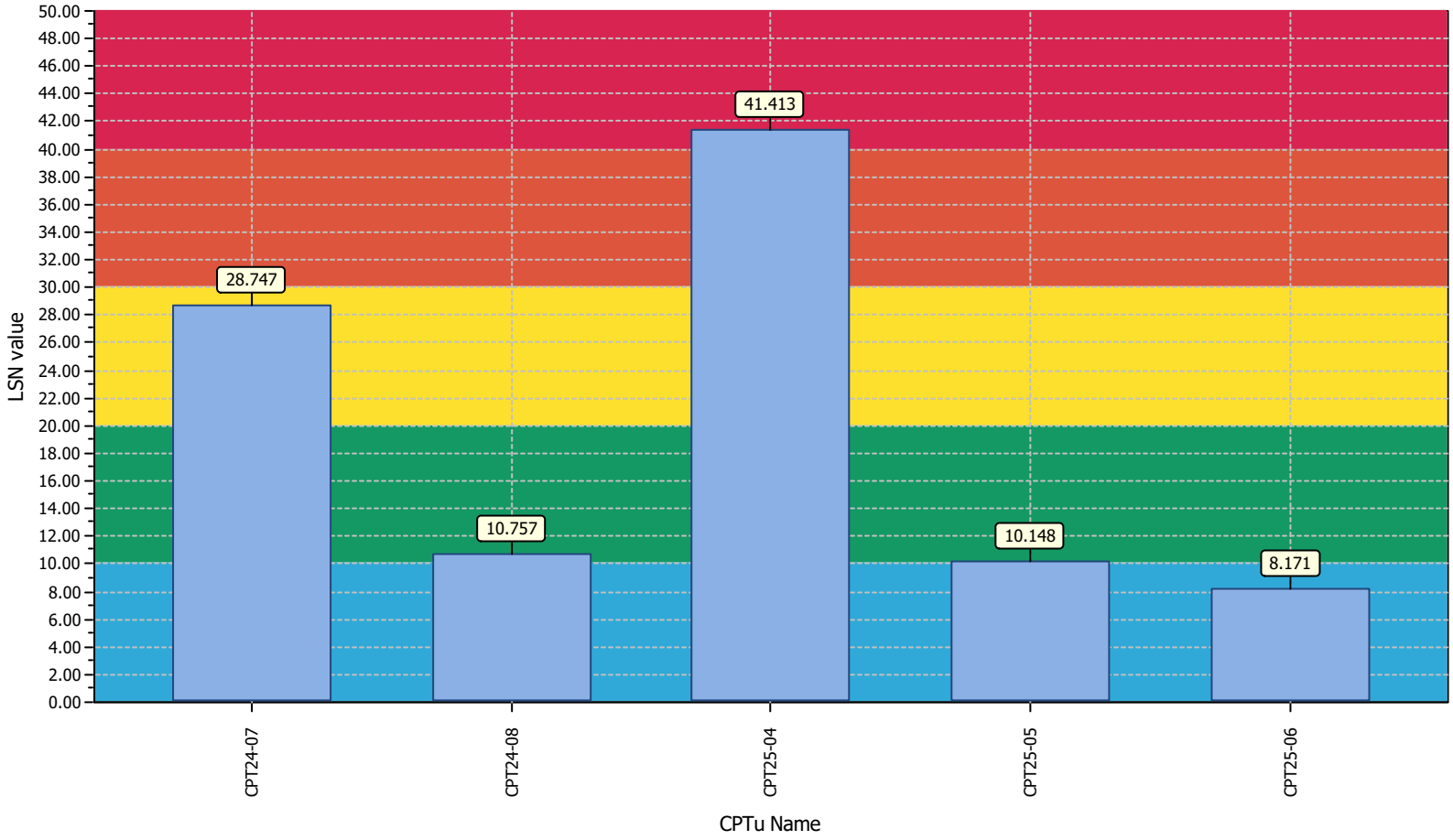
Project title : HAM2023-0124

Location : Ashbourne Development, Matamata

Overall Liquefaction Severity Number report



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

Basic statistics

Total CPT number: 5

20% little liquefaction

40% minor liquefaction

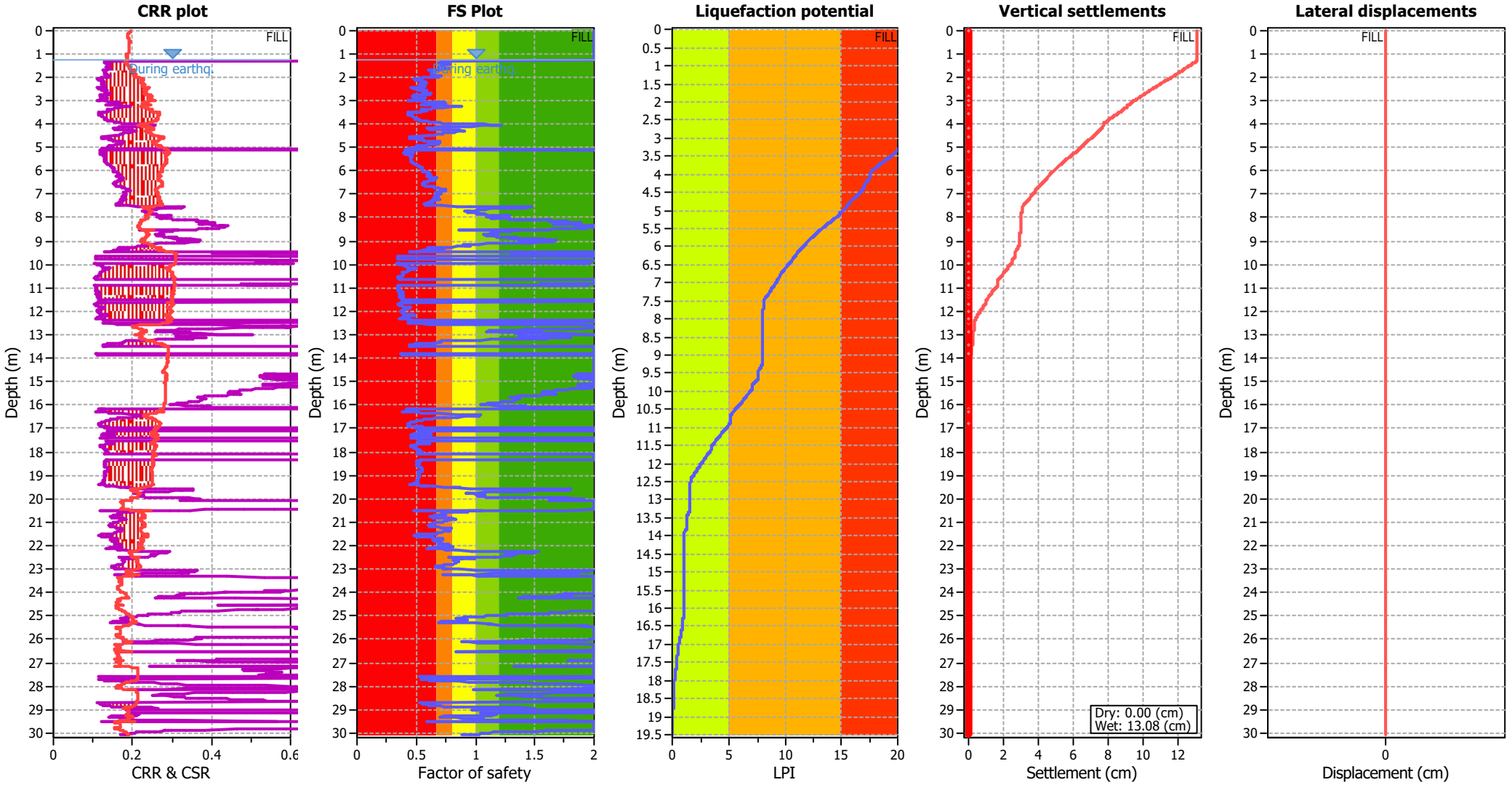
20% moderate liquefaction

0% moderate to major liquefaction

20% major liquefaction

0% severe liquefaction

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.80 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.36	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	1.30 m	Fill height:	0.50 m	Limit depth:	N/A

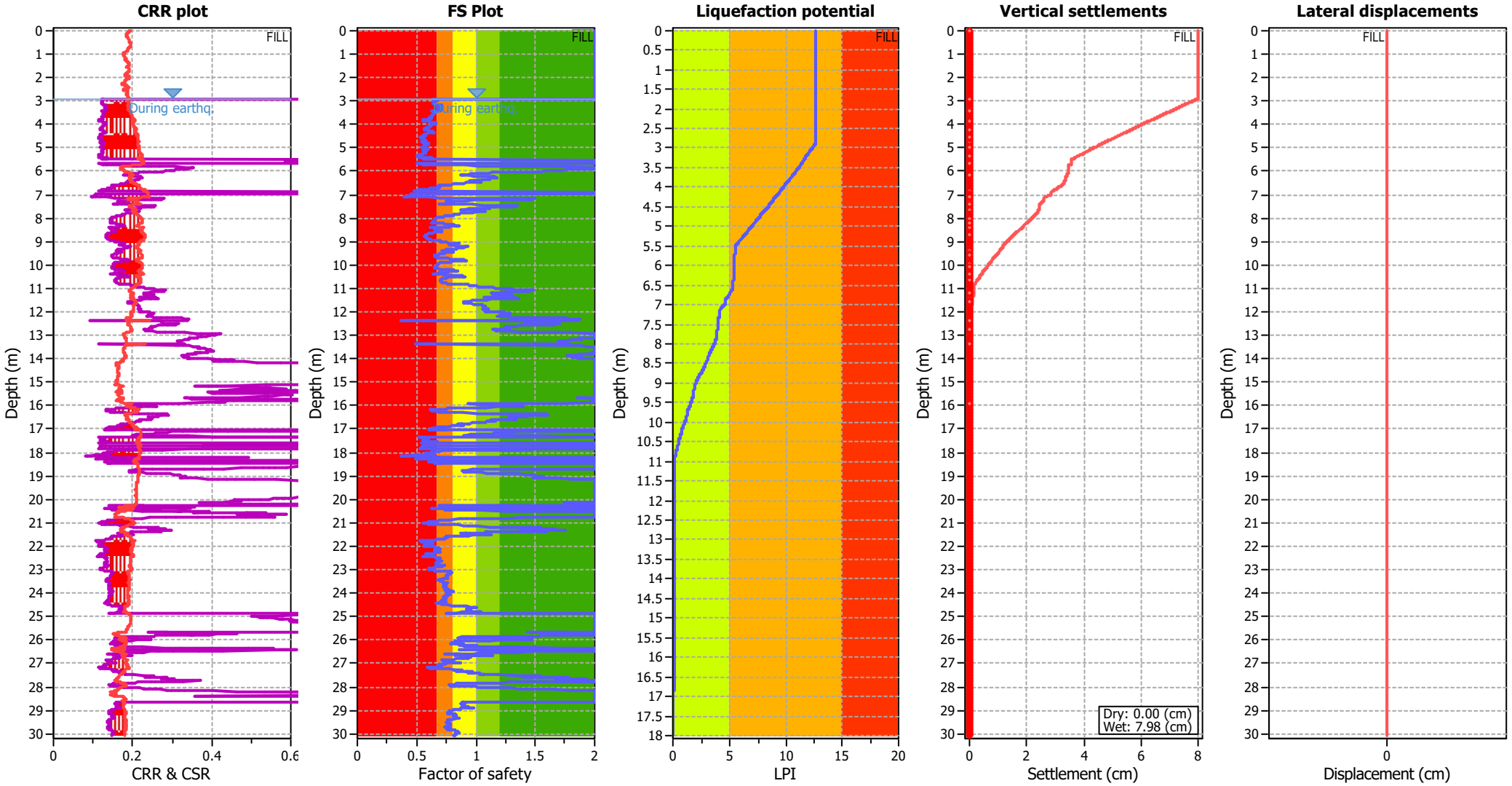
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.90 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.36	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	2.90 m	Fill height:	2.00 m	Limit depth:	N/A

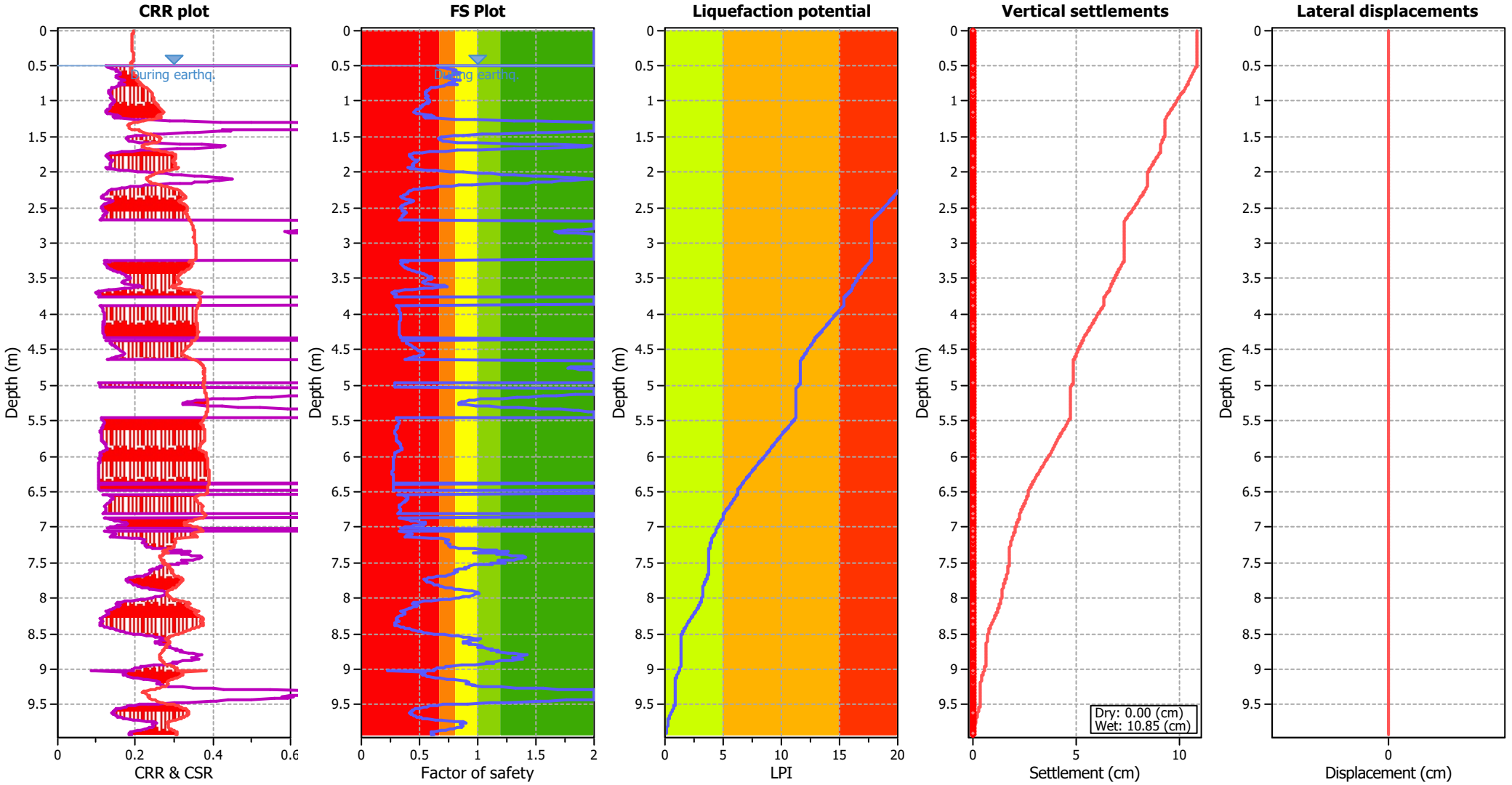
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	0.50 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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.36	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	0.50 m	Fill height:	N/A	Limit depth:	N/A

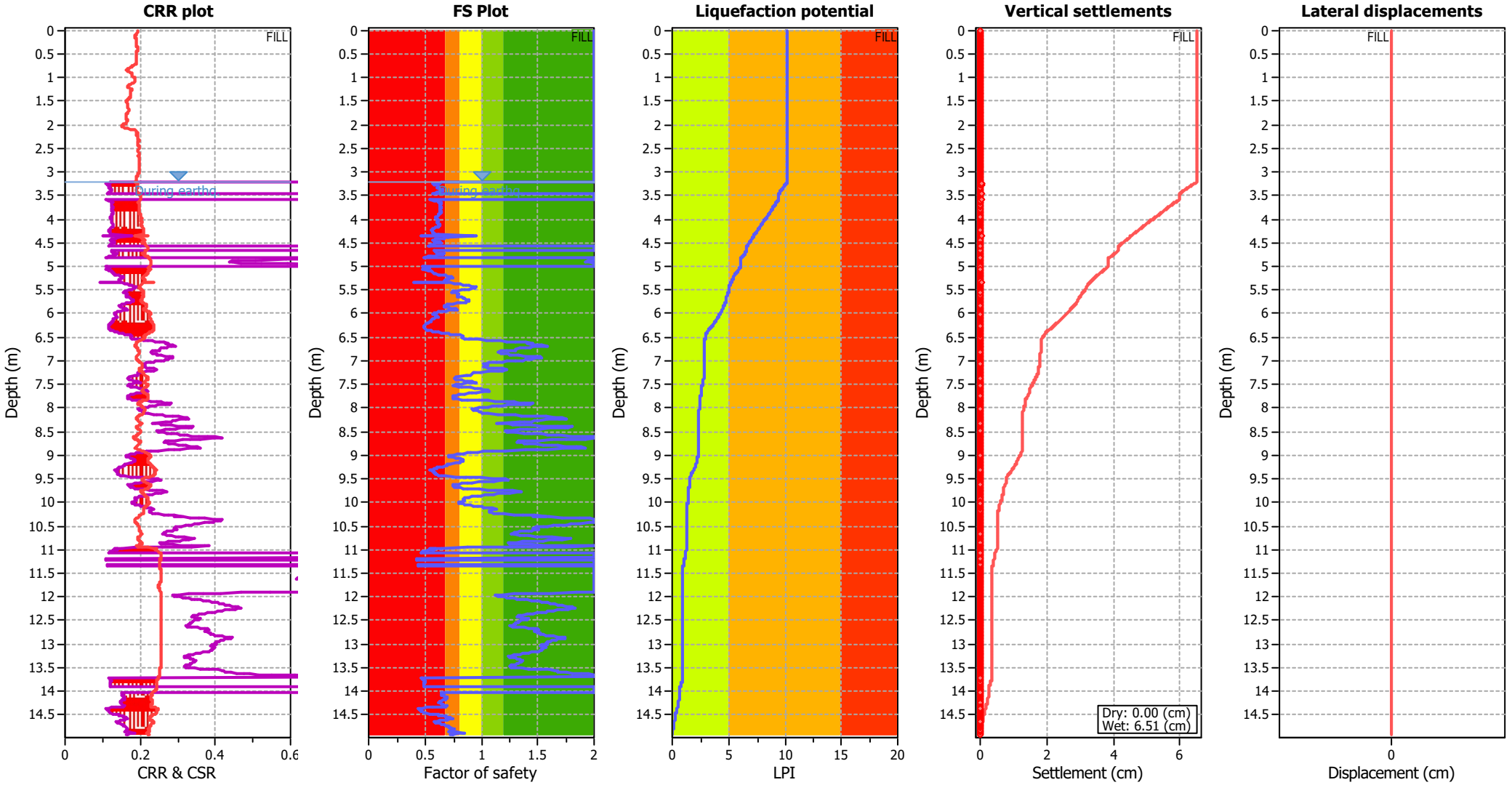
F.S. color scheme

- 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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.20 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.36	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	3.20 m	Fill height:	1.00 m	Limit depth:	N/A

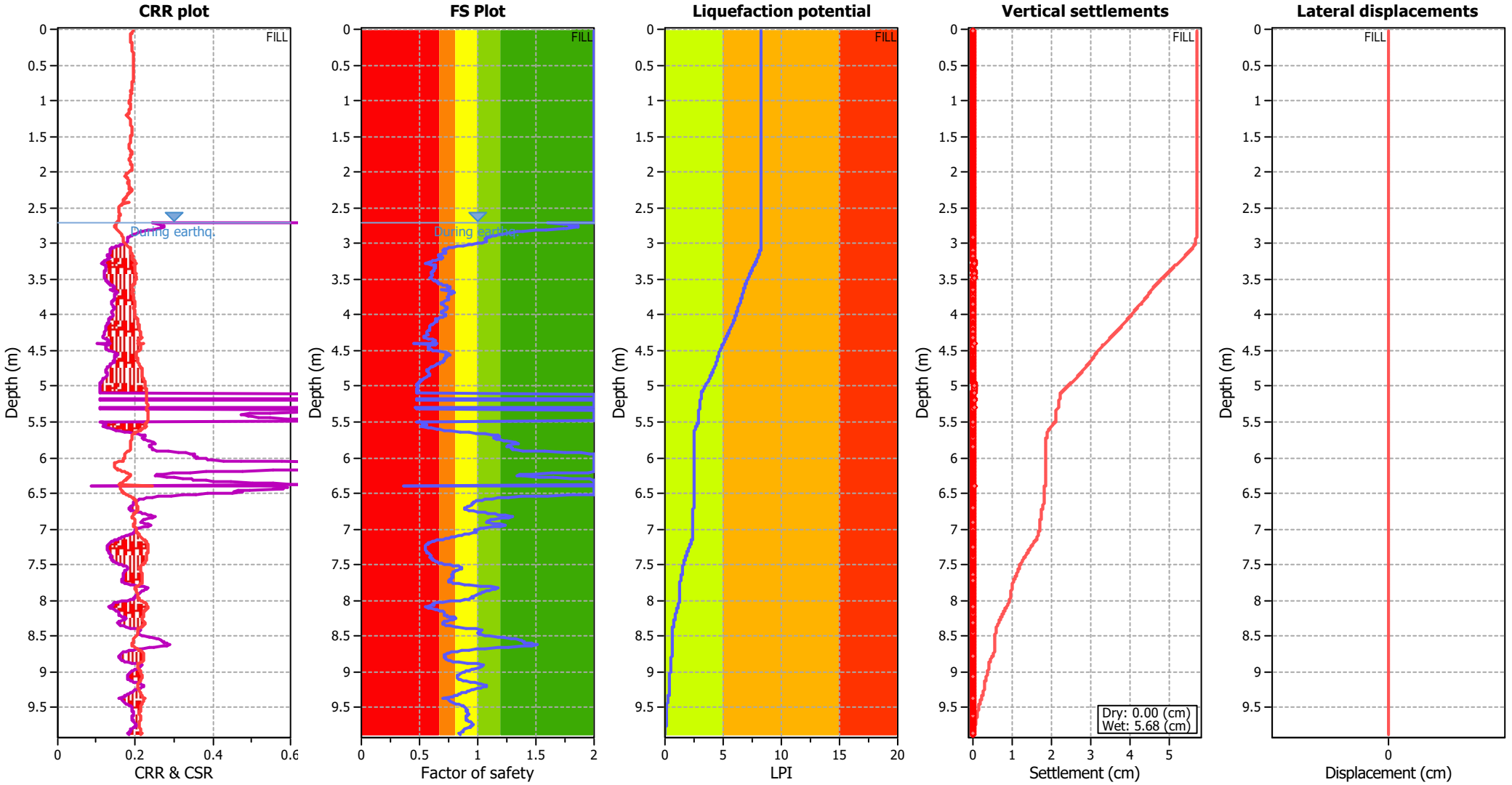
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.70 m	Fill weight:	17.00 kN/m³
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:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.36	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	2.70 m	Fill height:	2.00 m	Limit depth:	N/A

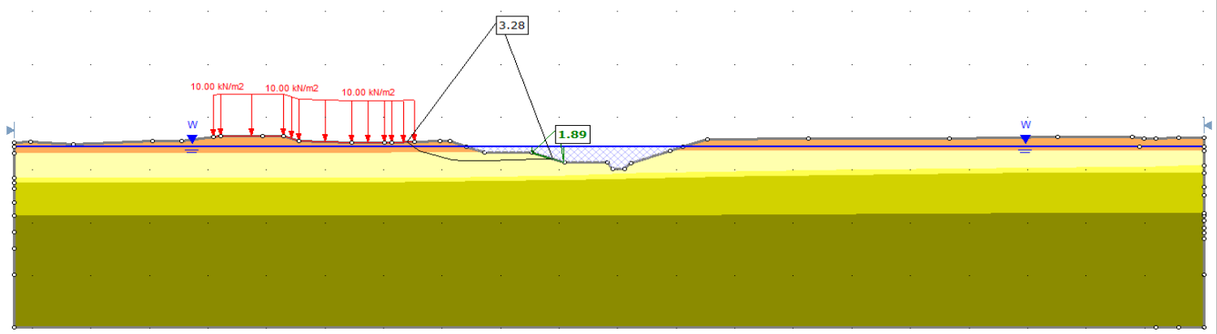
F.S. color scheme

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

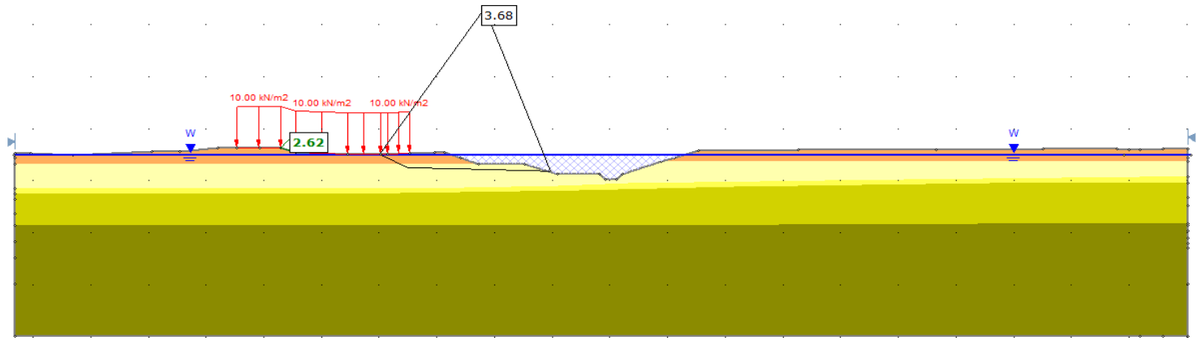
LPI color scheme

- Very high risk
- High risk
- Low risk

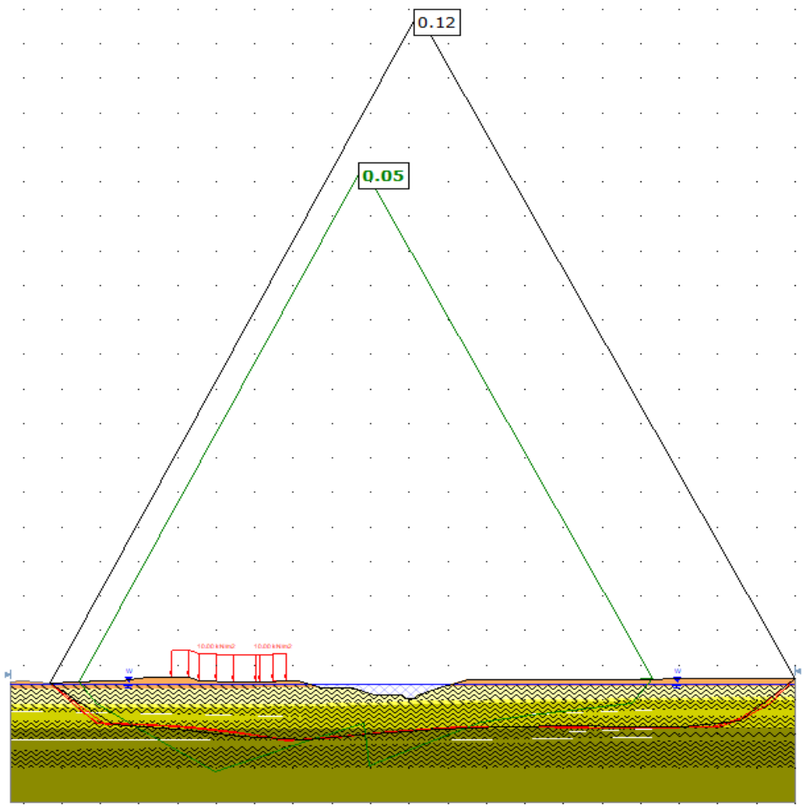
APPENDIX K: SLOPE STABILITY ANALYSIS RESULTS



Proposed Profile - Normal Groundwater Conditions



Proposed Profile - Worst Credible Groundwater Conditions



Yield Seismic Event (Displaying PGA with FoS >1)

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Vertical Stress Ratio	Minimum Shear Strength (kPa)	Water Surface	Hu Type
St SILT/CLAT (Recent Deposits)		16	Mohr-Coulomb	2	30				Water Table	Automatically Calculated
(UD) St SILT/CLAT (Recent Deposits)		16	Undrained	80	0	Constant			Water Table	Automatically Calculated
(SOFTENED) St SILT/CLAT (Recent Deposits)		16	Undrained	64	0	Constant			Water Table	Automatically Calculated
MD SAND (Hinuera Formation)		17	Mohr-Coulomb	0	32				Water Table	Automatically Calculated
(LIQUEFIED) MD SAND (Hinuera Formation)		17	Vertical Stress Ratio				0.15	5	Water Table	Automatically Calculated
St-VSt CLAY/SILT (Hinuera Formation)		17	Mohr-Coulomb	4	28				Water Table	Automatically Calculated
(UD) St-VSt CLAY/SILT (Hinuera Formation)		17	Undrained	100	0	Constant			Water Table	Automatically Calculated
(SOFTENED) St-VSt CLAY/SILT (Hinuera Formation)		17	Undrained	80	0	Constant			Water Table	Automatically Calculated
Interbeded L-MD SAND/St SILT (Hinuera Formation)		17	Mohr-Coulomb	1	30				Water Table	Automatically Calculated
(LIQUEFIED) Interbeded L-MD SAND/ St SILT (Hinuera Formation)		17	Vertical Stress Ratio				0.08	5	Water Table	Automatically Calculated
MD-D SAND (Hinuera Formation)		17	Mohr-Coulomb	0	35				Water Table	Automatically Calculated
(LIQUEFIED) MD-D SAND (Hinuera Formation)		17	Vertical Stress Ratio				0.15	5	Water Table	Automatically Calculated

Parameters

CMW Geosciences
Great People | Practical Solutions

Project Ashbourne Development, Matamata	*Analysis* Cuckoo	*Project No.* HAM2023-0124
Title Section B - Proposed	*Date* 13/10/2025	*Drawing* STAB 01

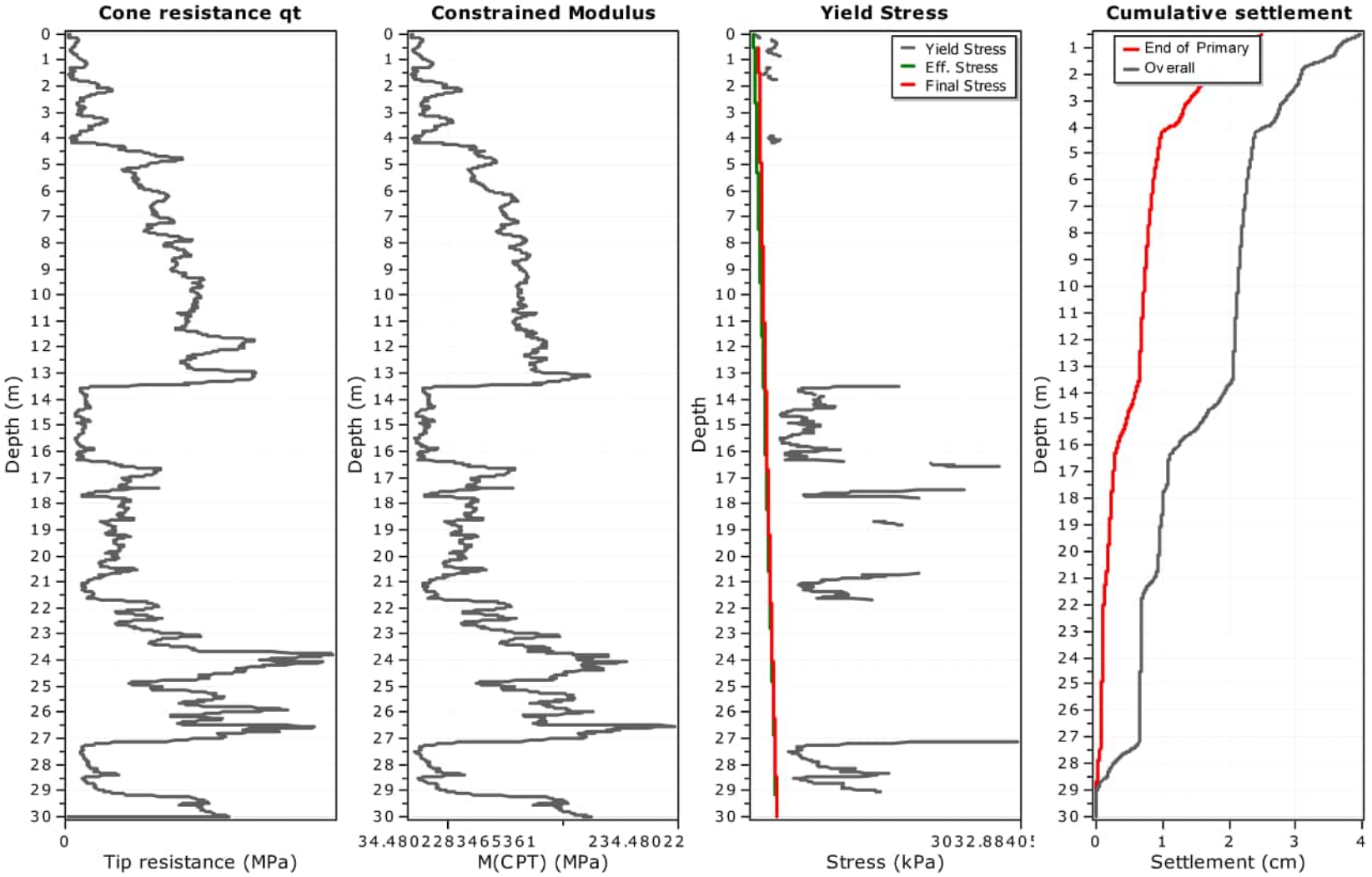
APPENDIX L: SETTLEMENT ANALYSIS RESULTS

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT23-01
Total depth: 30.01 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 46.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

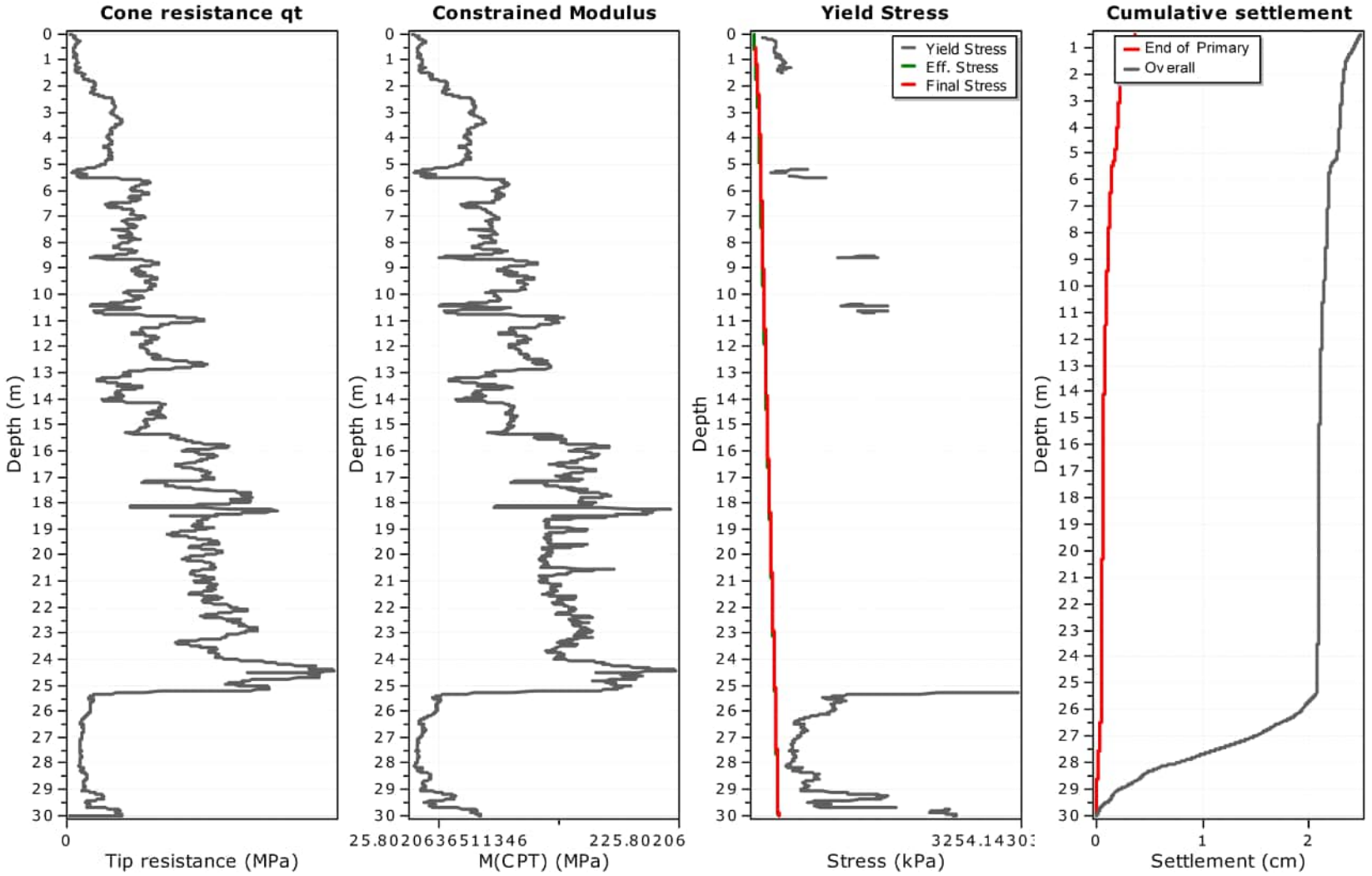
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT23-02
Total depth: 30.02 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 3.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

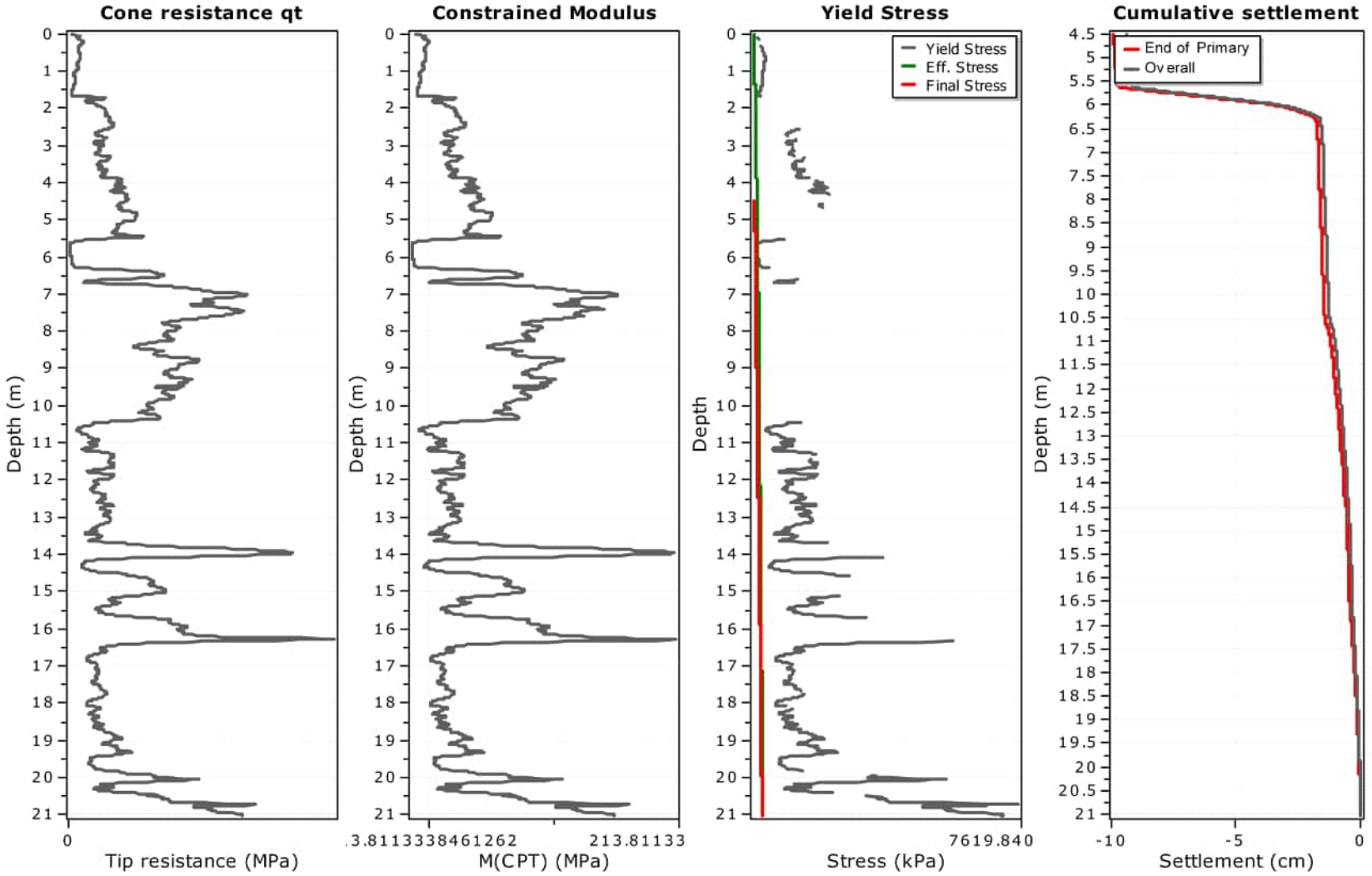
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT23-03b
Total depth: 21.04 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 6.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 4.50 (m)
Footing is rigid: No
Remove excavation load: Yes
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

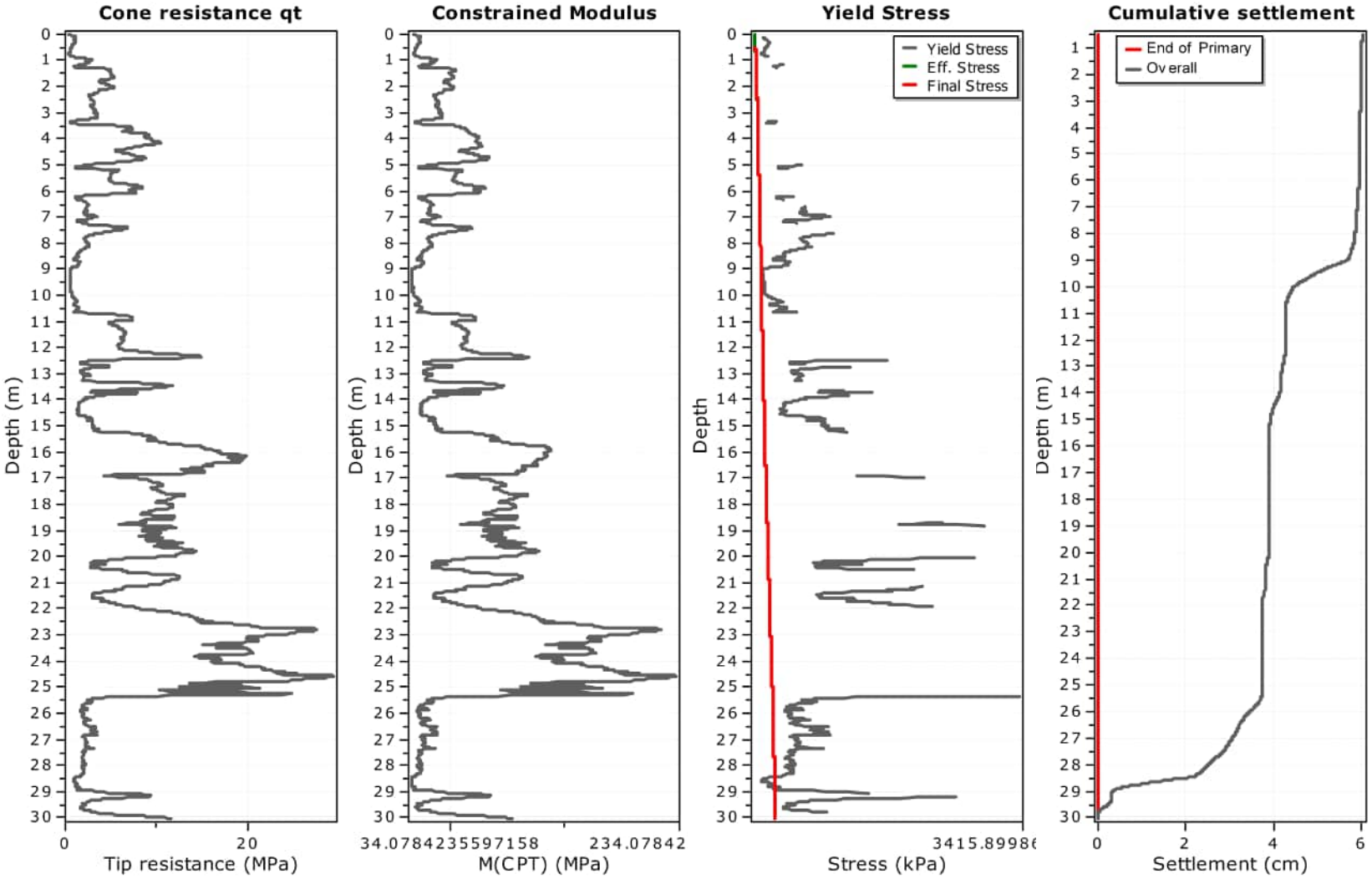
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-04
Total depth: 30.04 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 1.50 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 1.00 (m)
L/B: 1.0
Footing pressure: 1.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

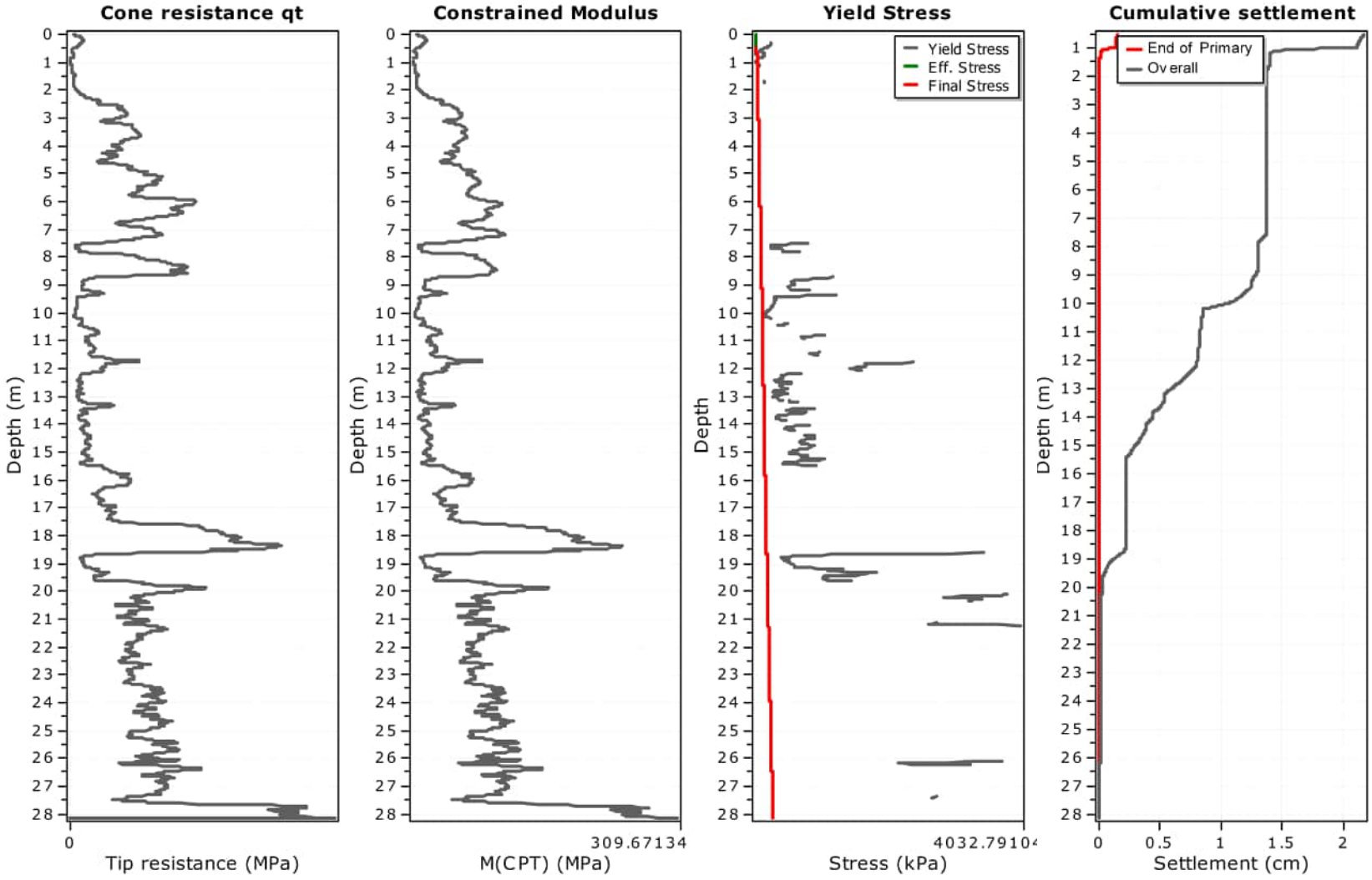
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-05
Total depth: 28.14 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 2.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 1.00 (m)
L/B: 1.0
Footing pressure: 1.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

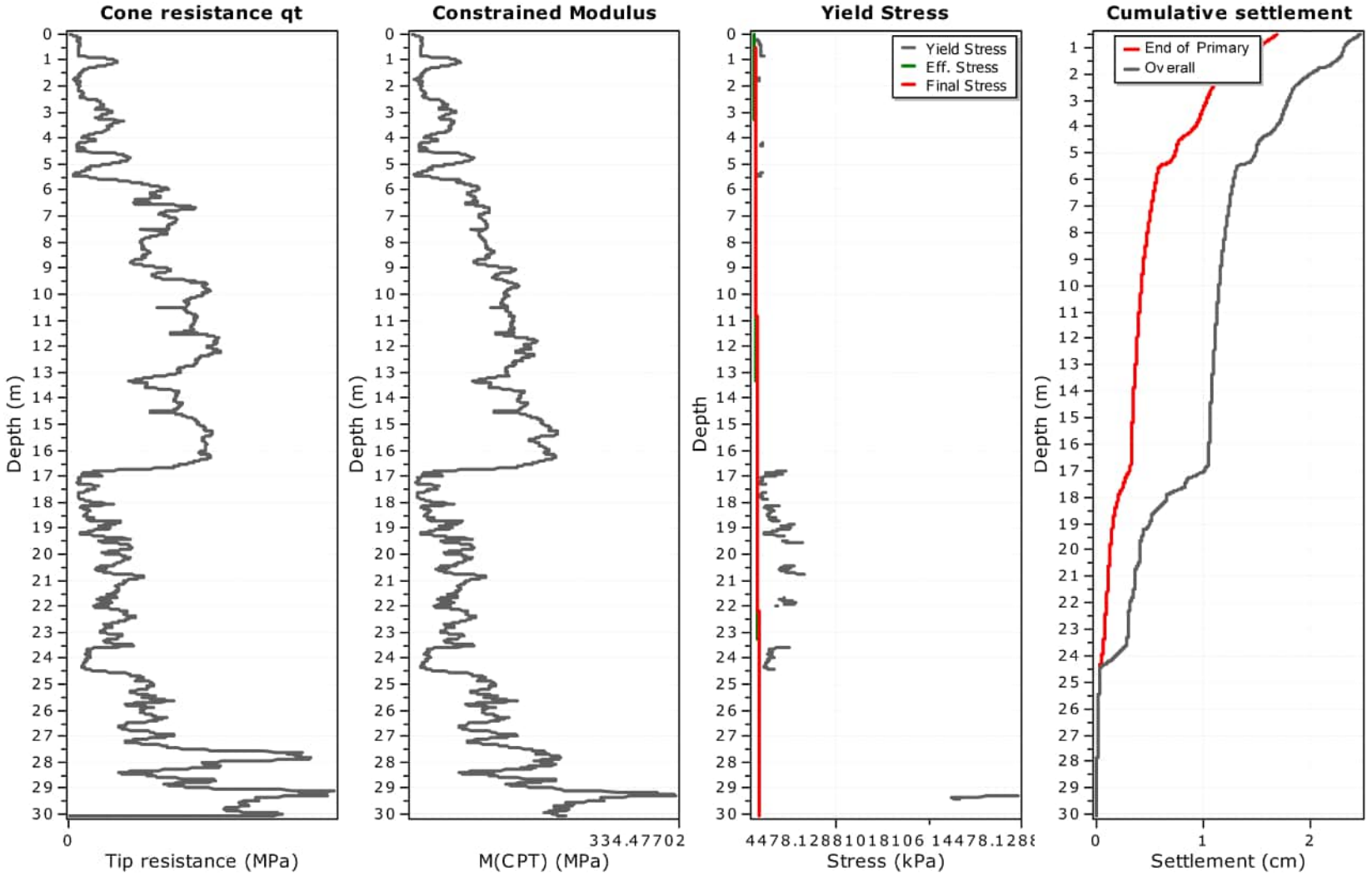
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-06
Total depth: 30.06 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 2.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 46.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

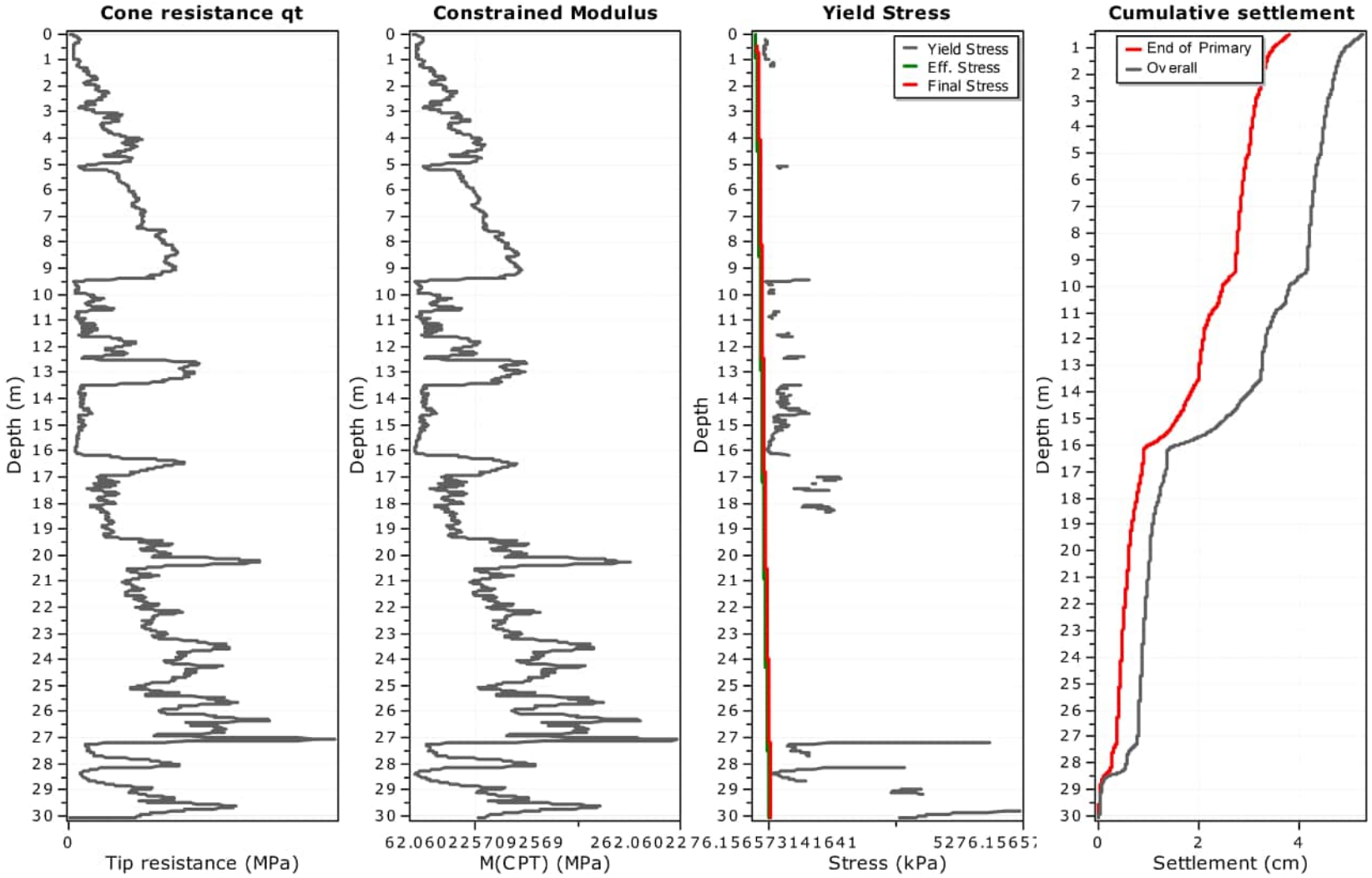
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-07
Total depth: 30.07 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 1.50 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 150.00 (m)
L/B: 1.0
Footing pressure: 37.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

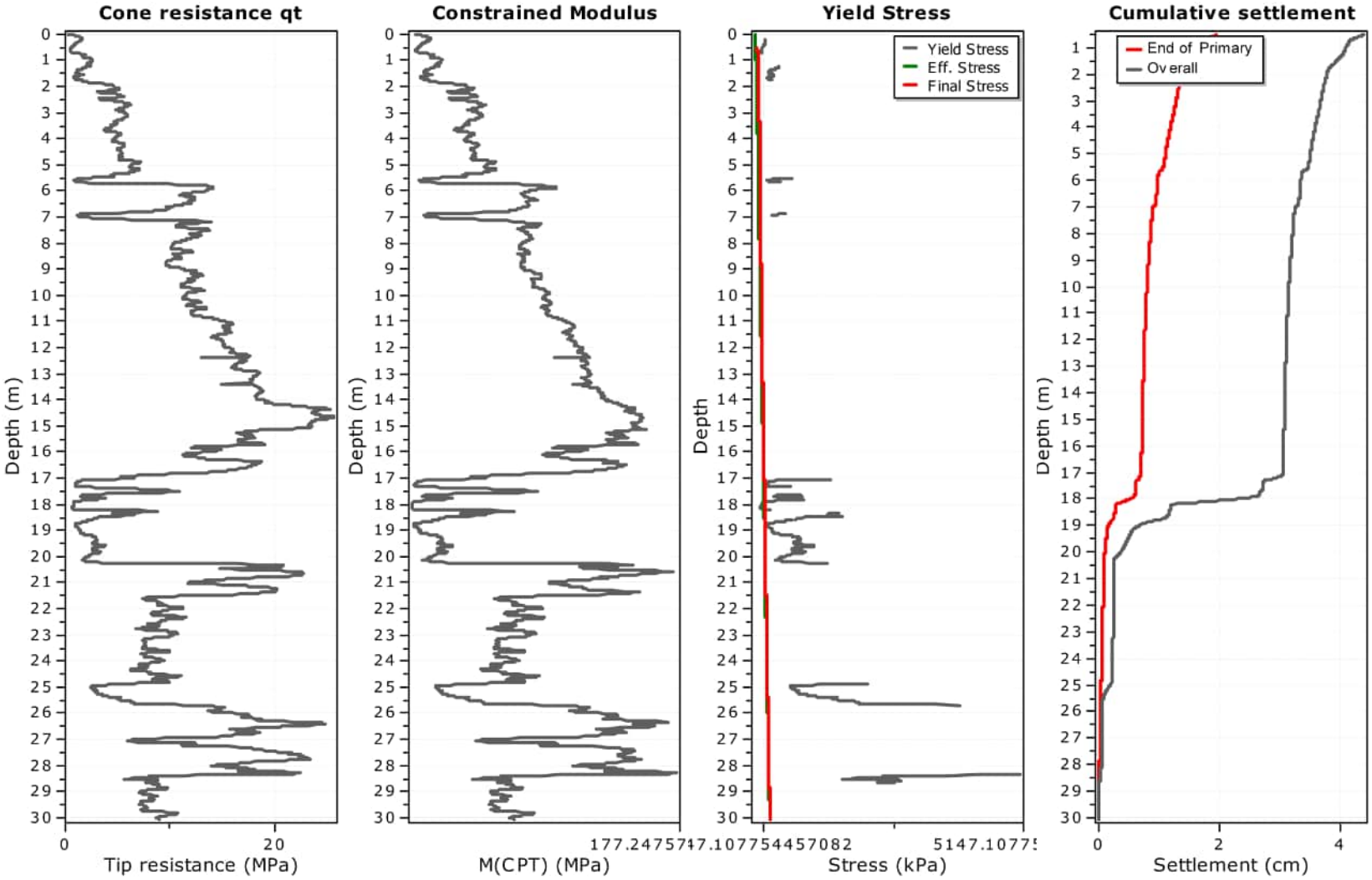
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-08
Total depth: 30.08 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 2.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 37.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

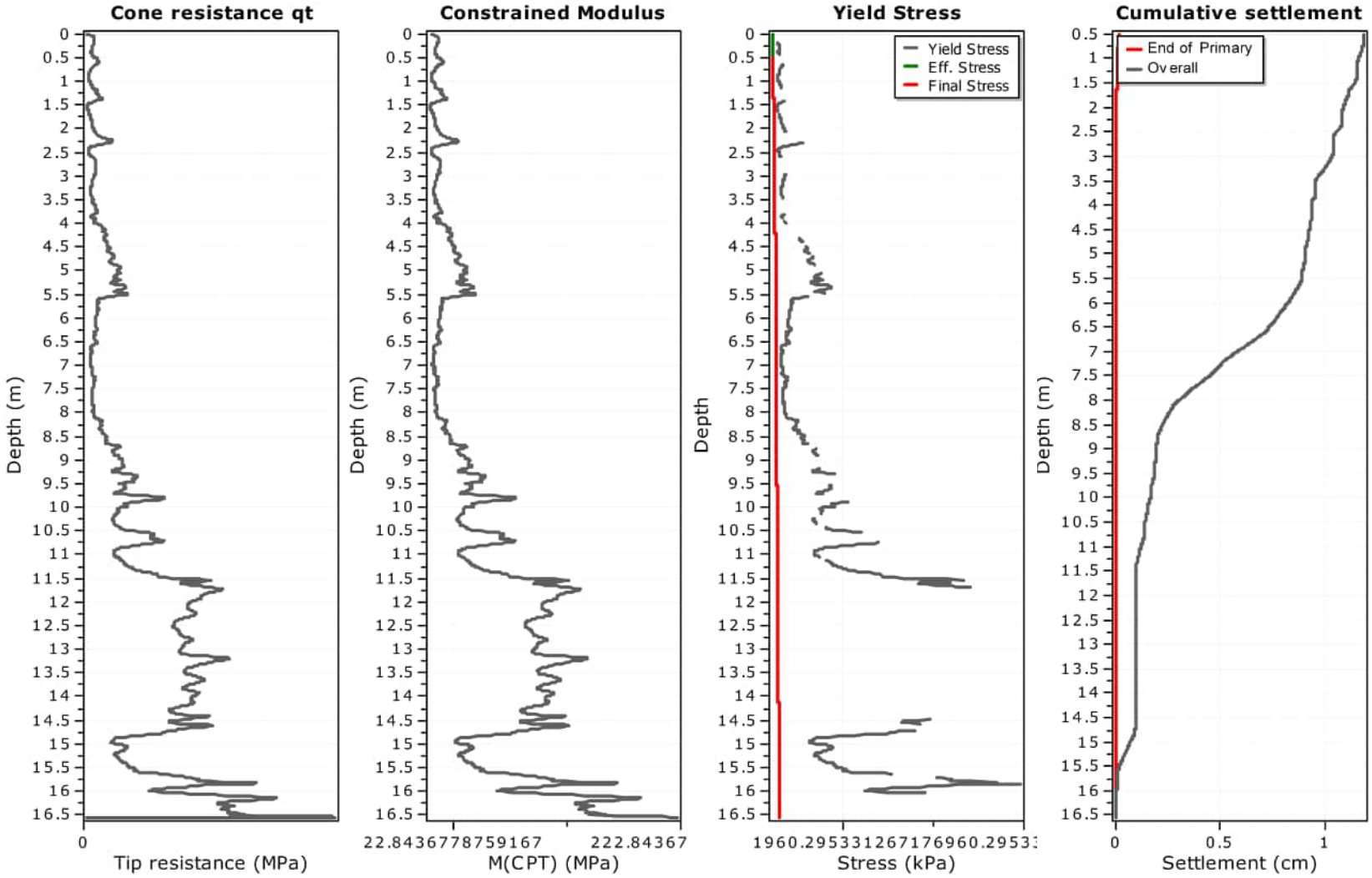
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-09
Total depth: 16.56 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 4.75 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 1.00 (m)
L/B: 1.0
Footing pressure: 1.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

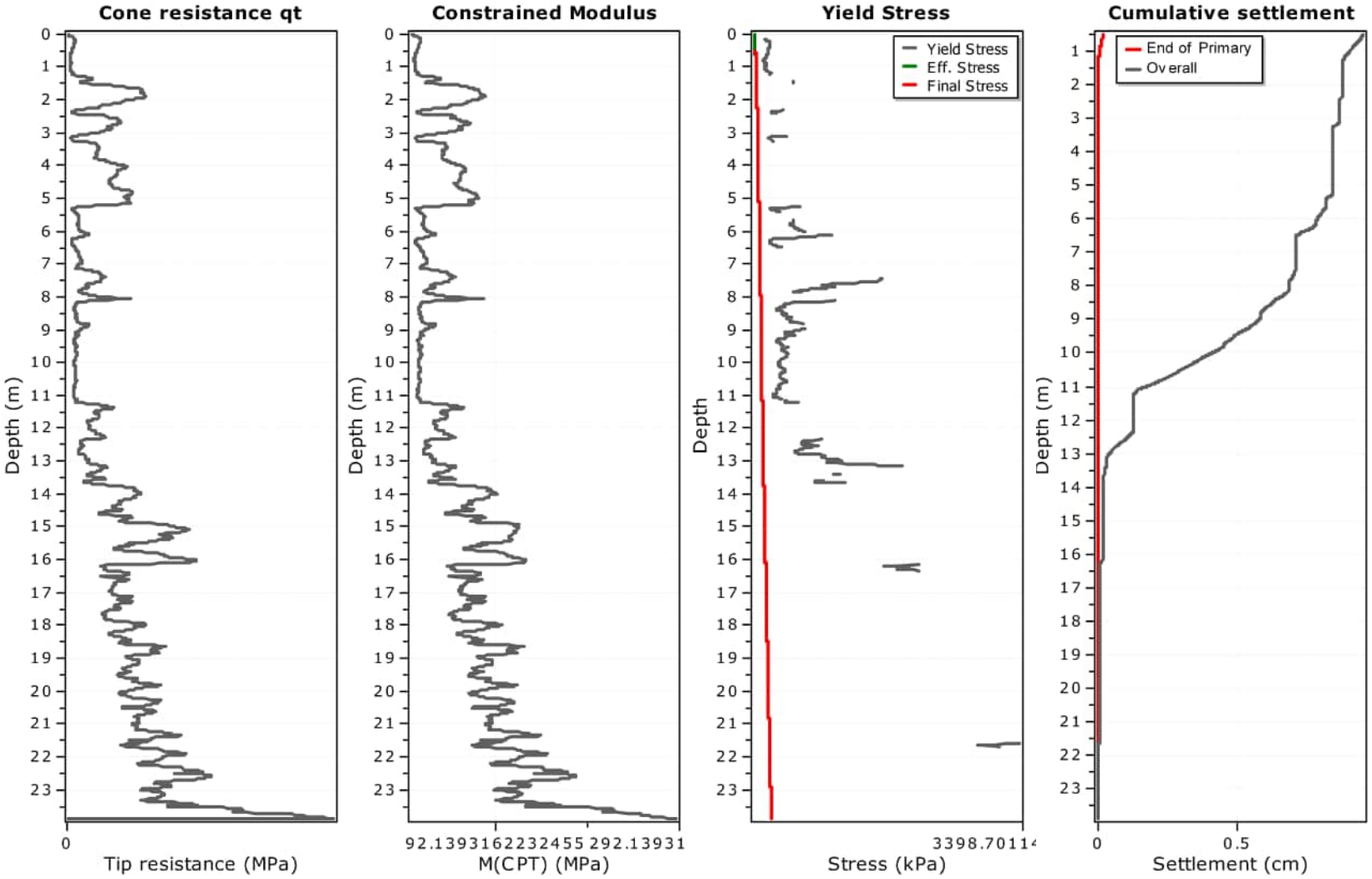
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT24-10
Total depth: 23.89 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 1.50 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 1.00 (m)
L/B: 1.0
Footing pressure: 1.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

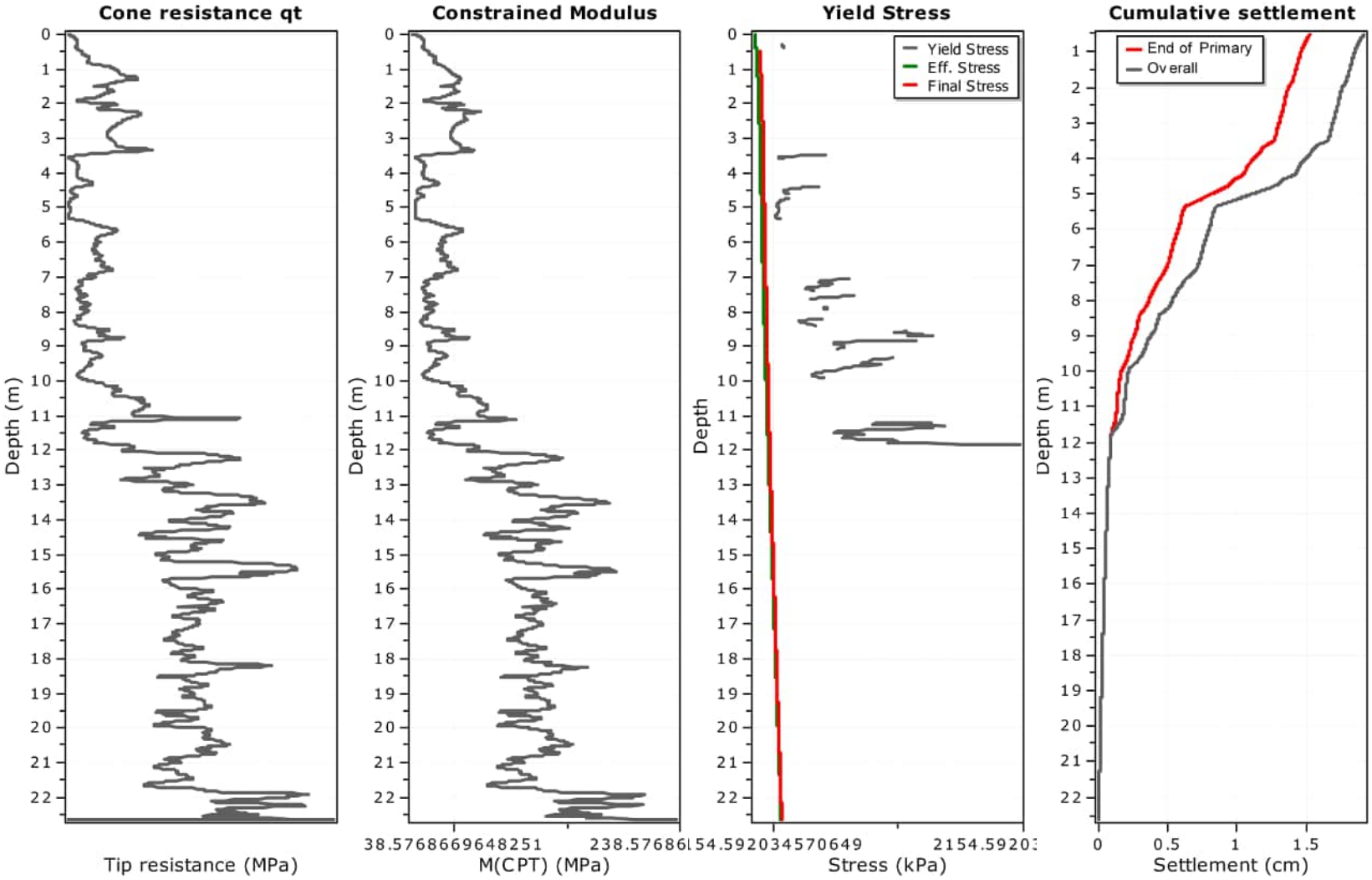
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: SCPT24-01
Total depth: 22.64 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 1.50 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 28.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

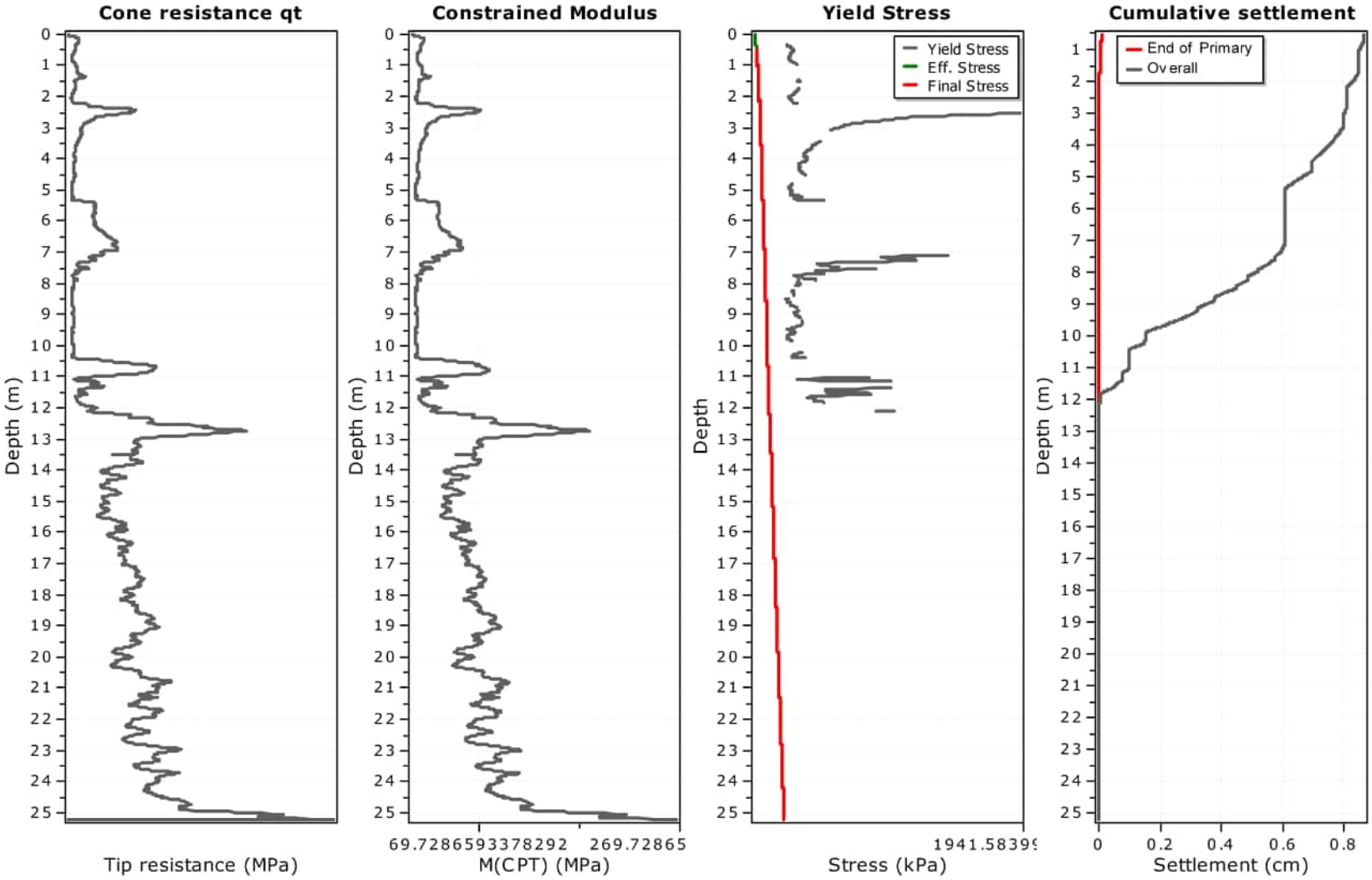
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: SCPT24-02
Total depth: 25.23 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 1.50 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 1.00 (m)
L/B: 1.0
Footing pressure: 1.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

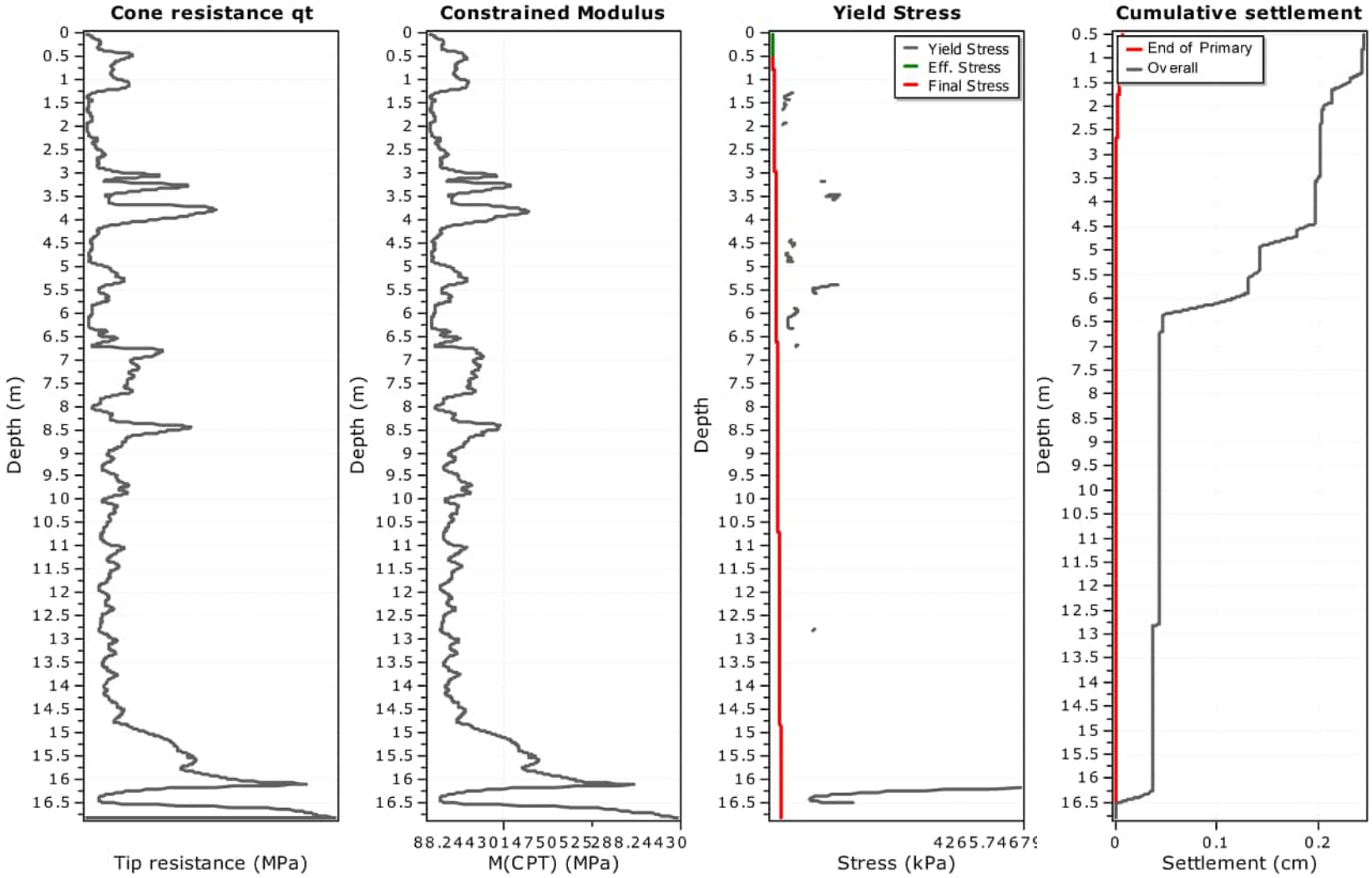
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: SCPT24-03
Total depth: 16.83 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 2.25 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 1.00 (m)
L/B: 1.0
Footing pressure: 1.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

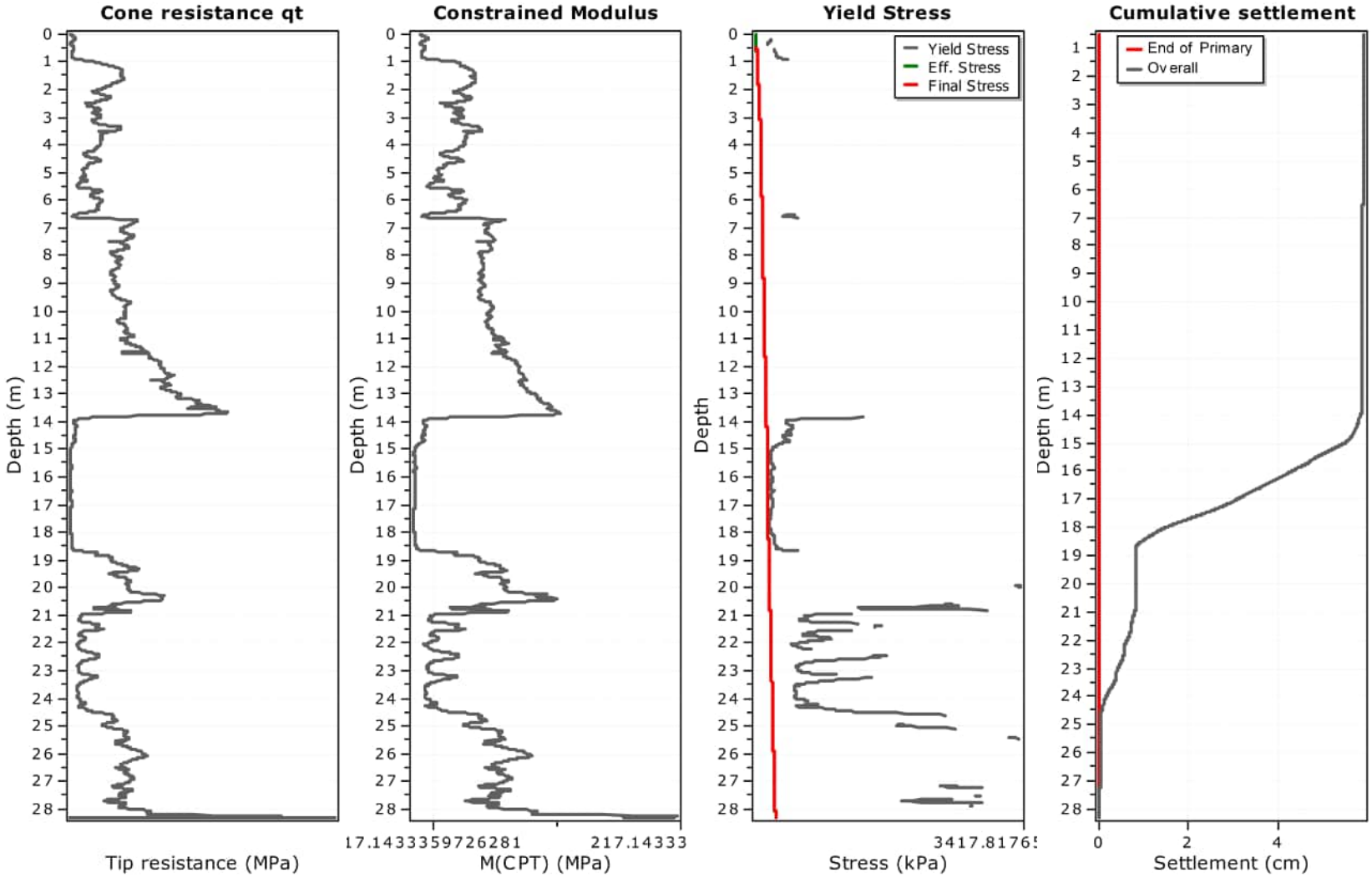
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: SCPT24-04
Total depth: 28.31 m, Date: 29/04/2025
Surface Elevation: 0.00 m, Est. GWL: 3.50 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 1.00 (m)
L/B: 1.0
Footing pressure: 1.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

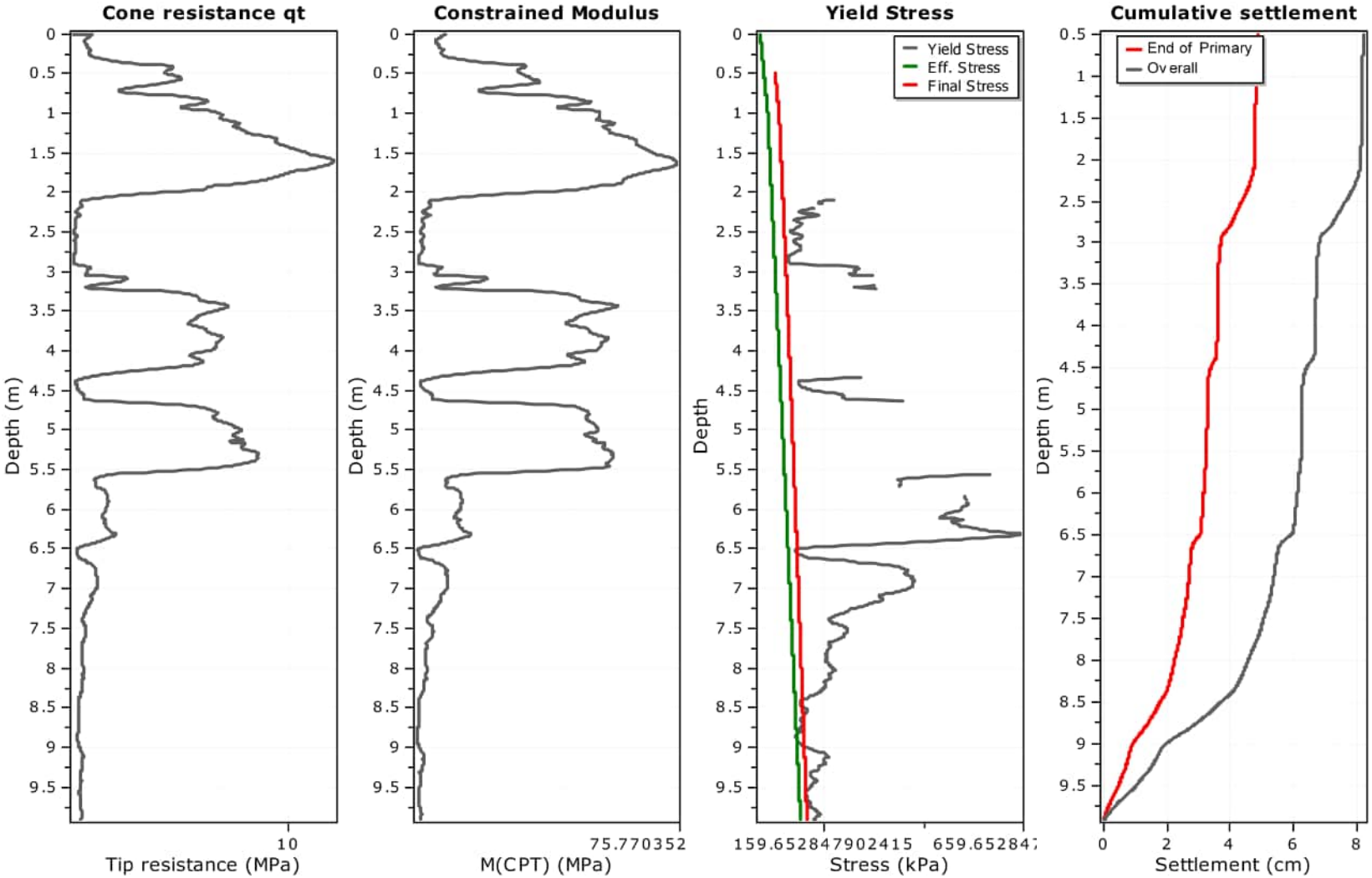
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-01
Total depth: 9.91 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 28.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

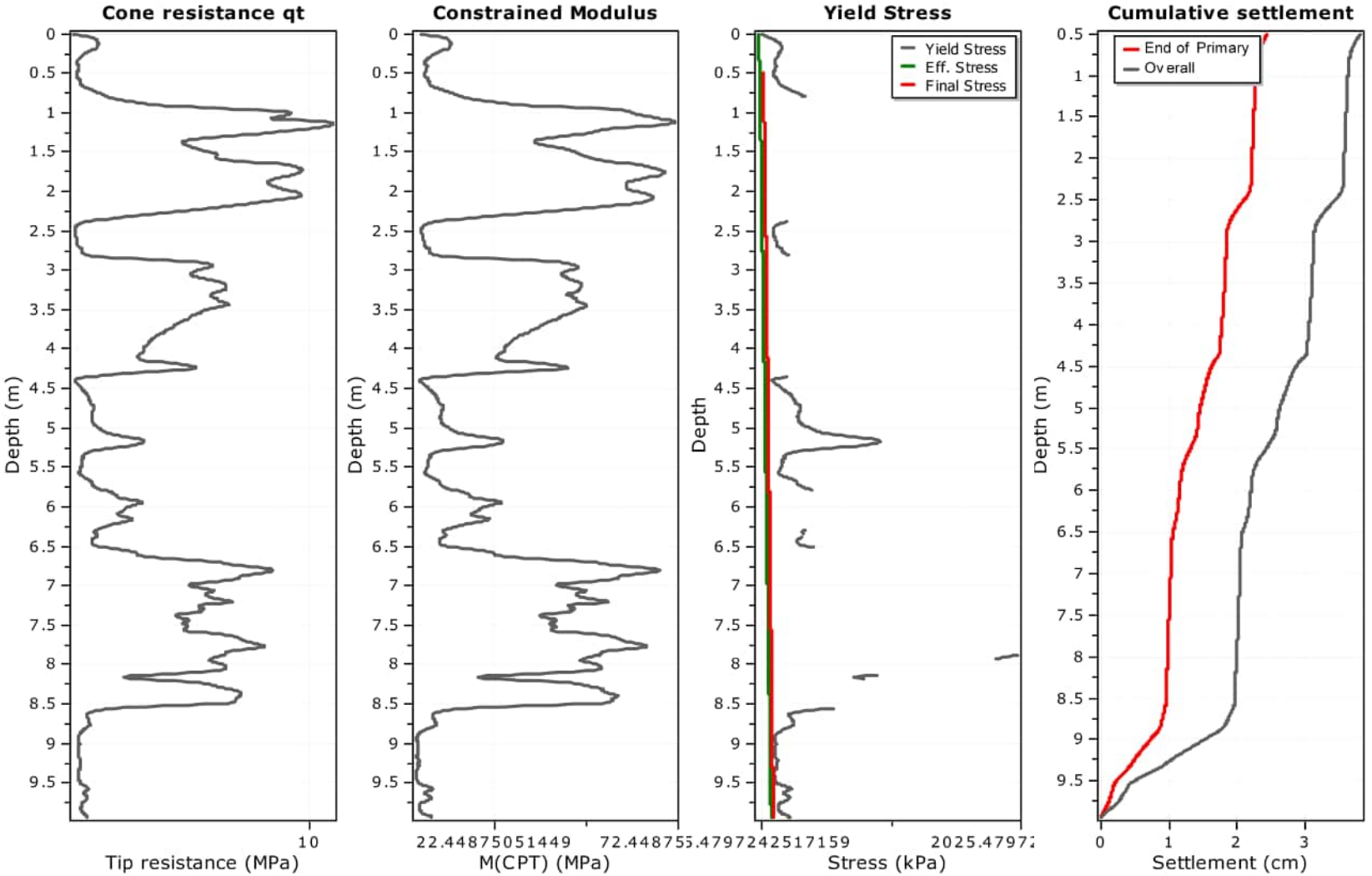
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-02
Total depth: 9.94 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 0.70 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 28.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

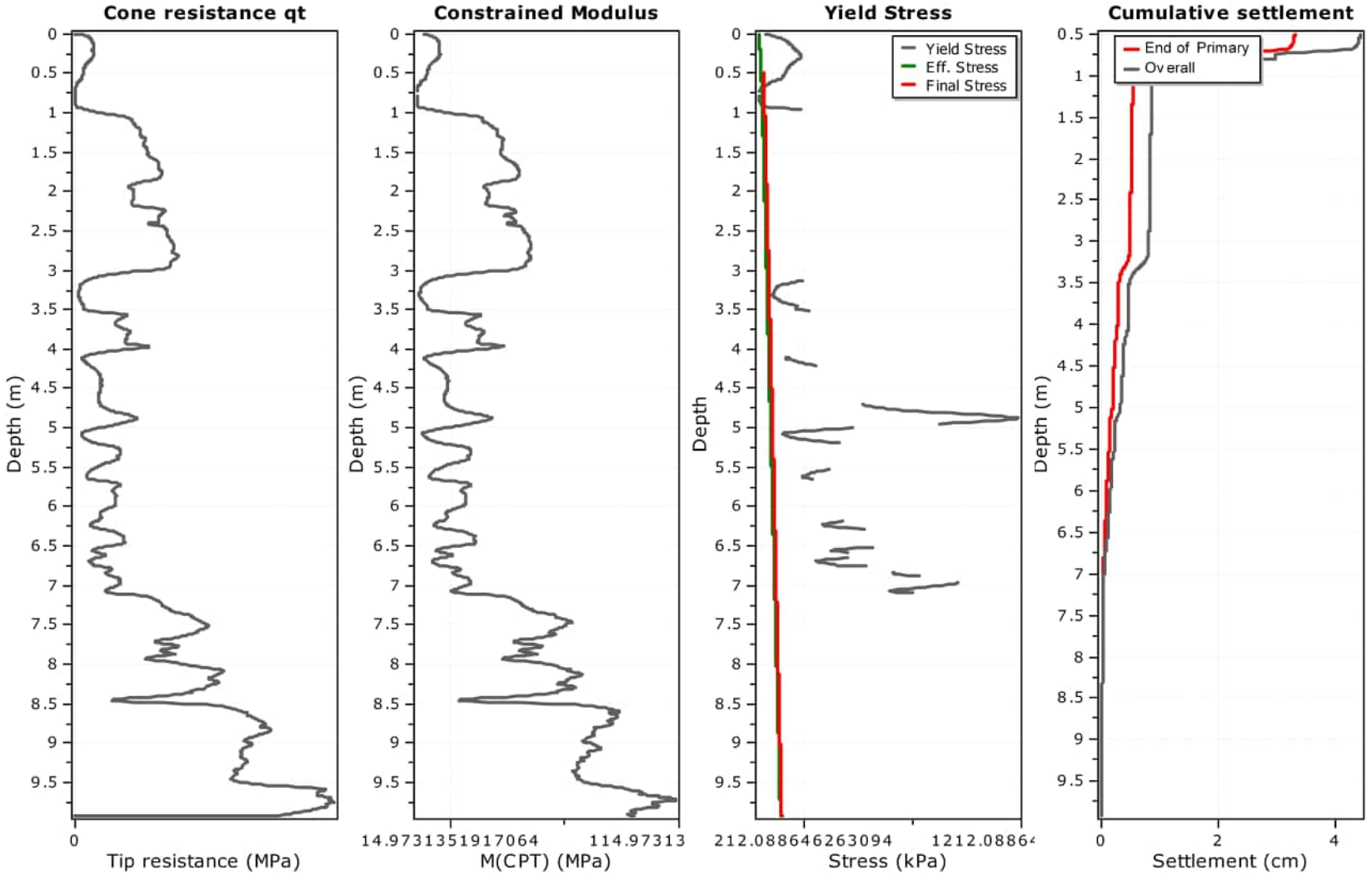
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-03
Total depth: 9.92 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 0.75 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

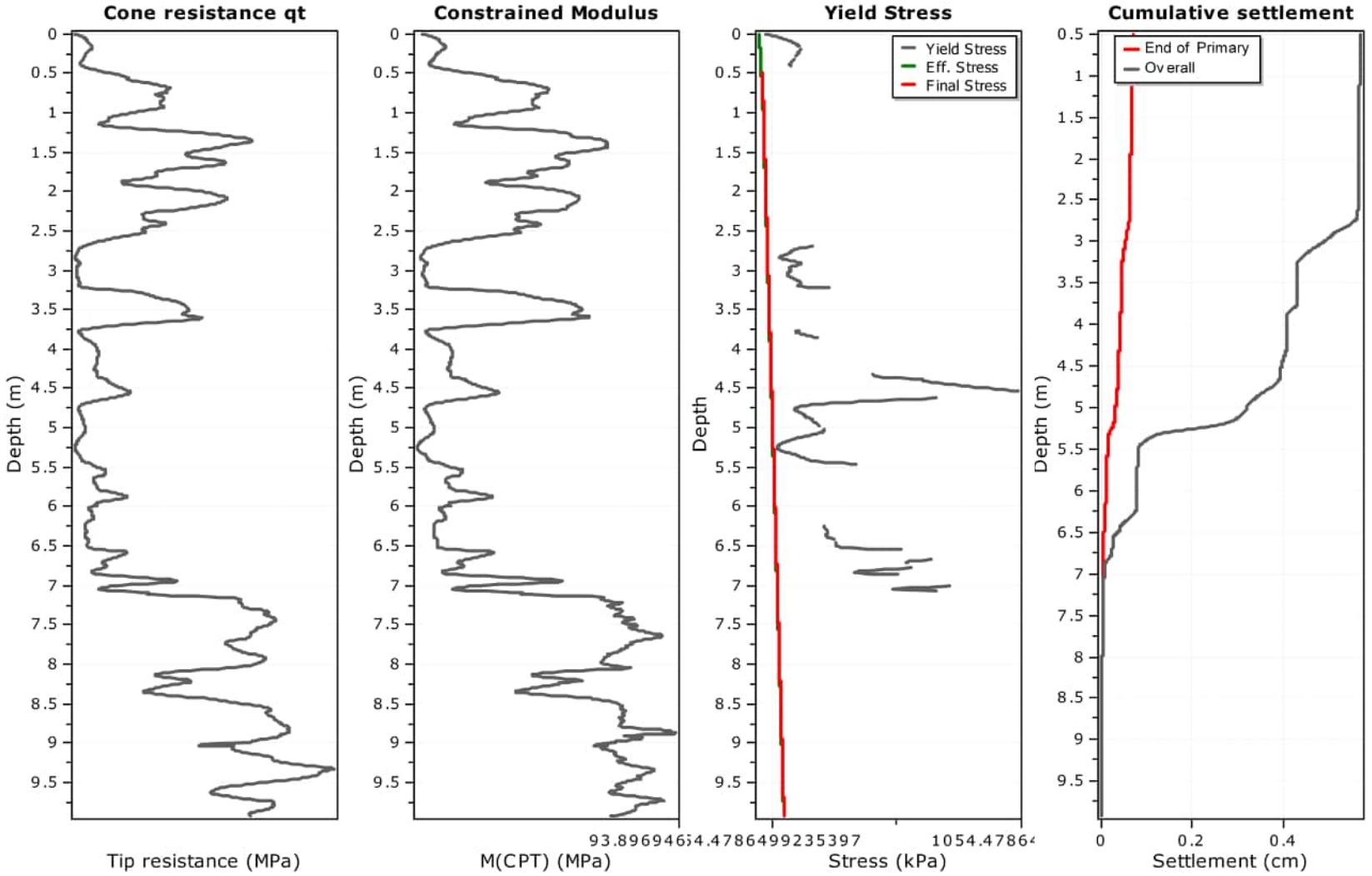
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-04
Total depth: 9.92 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 0.80 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 1.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

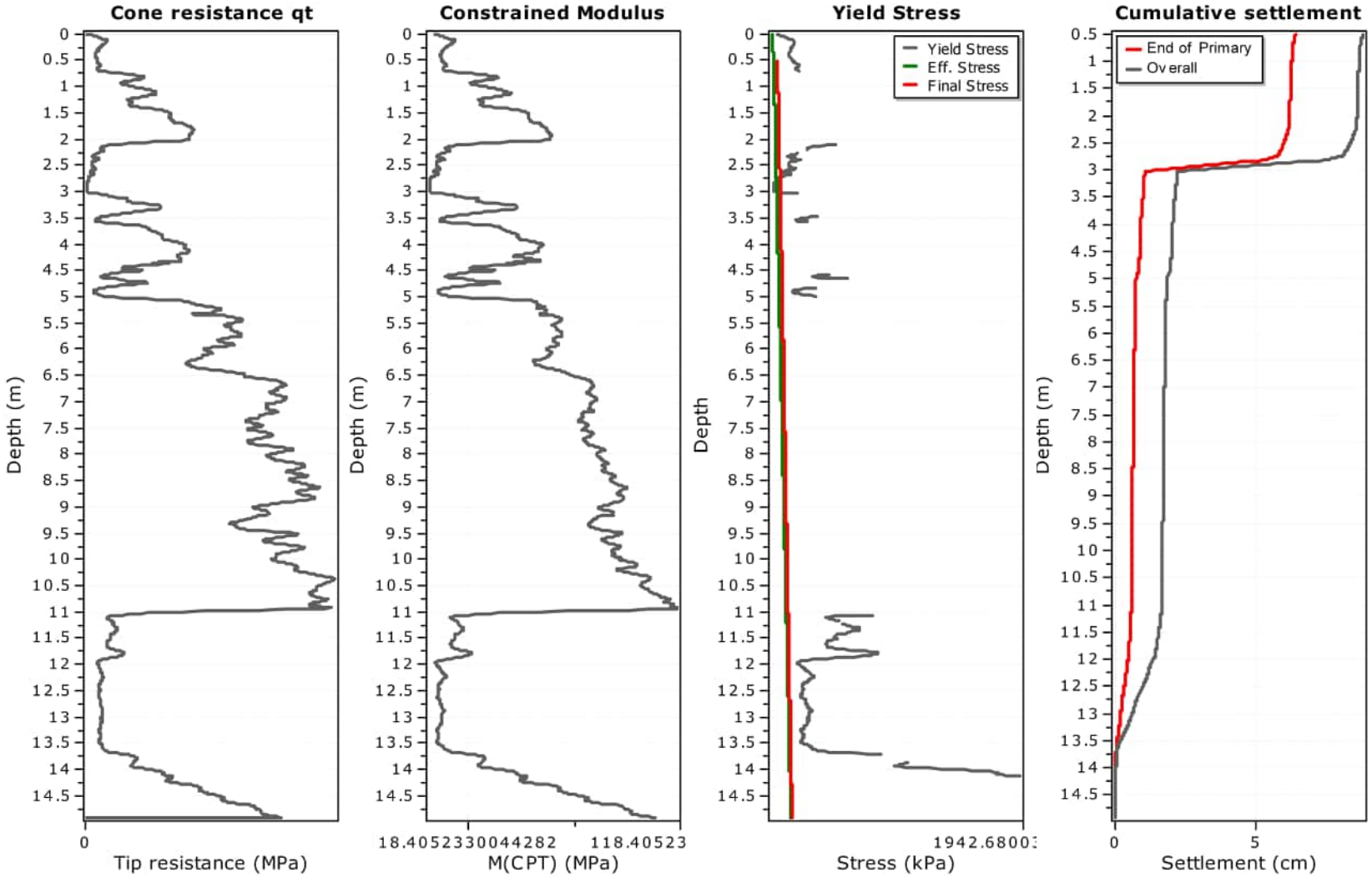
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-05
Total depth: 14.92 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 0.72 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 28.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

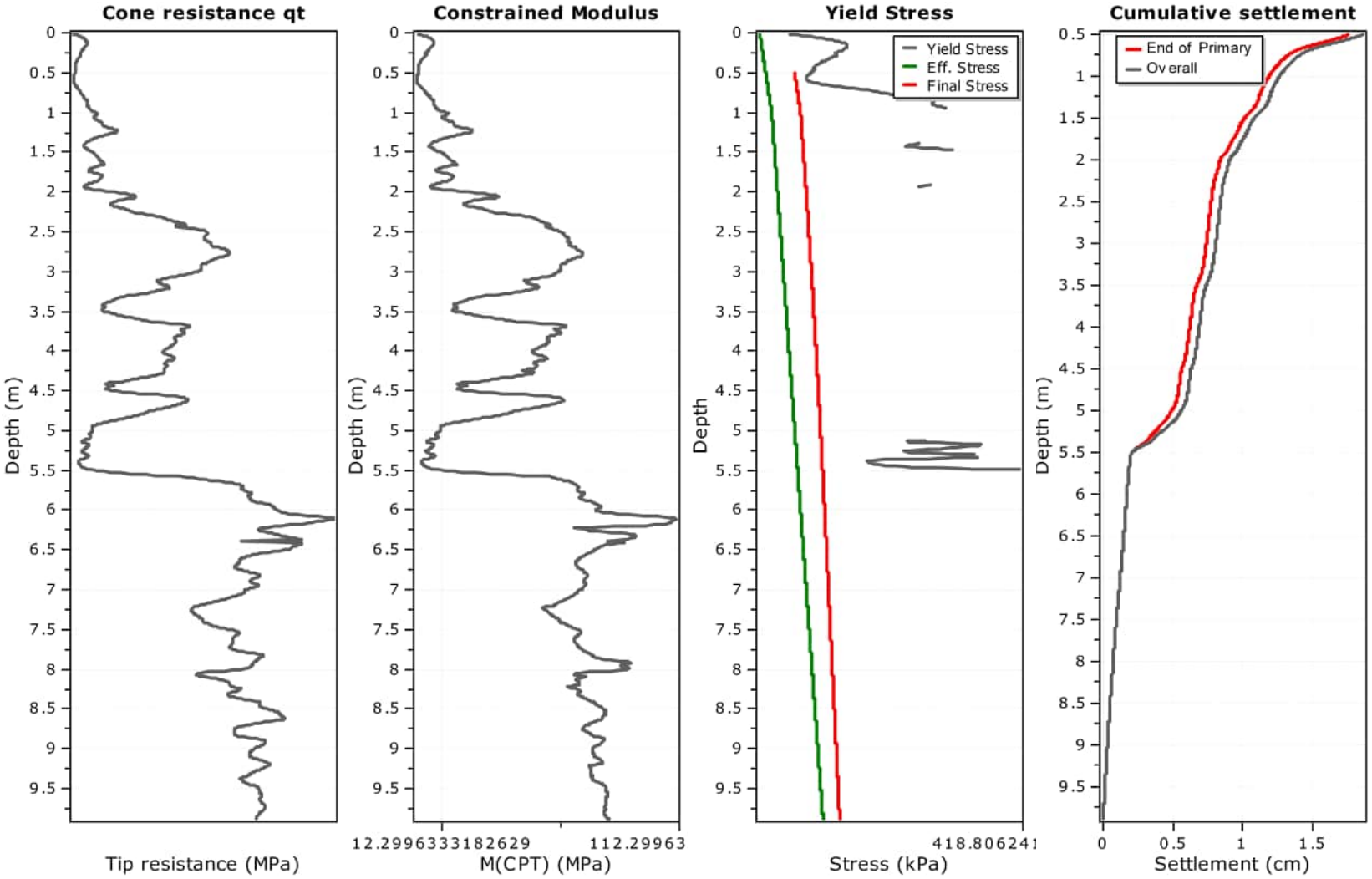
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-06
Total depth: 9.88 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 46.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

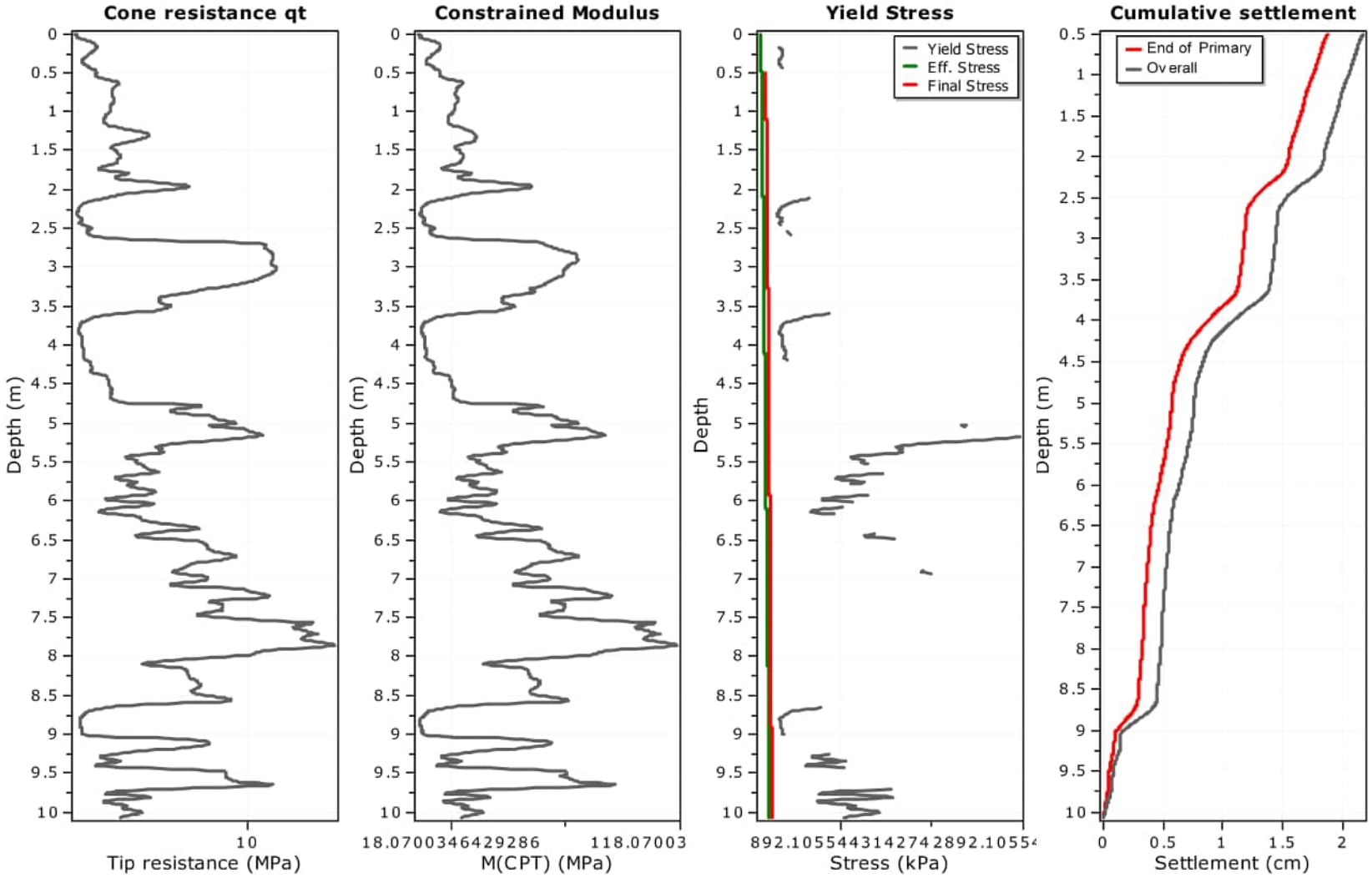
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-07
Total depth: 10.07 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 0.85 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 46.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

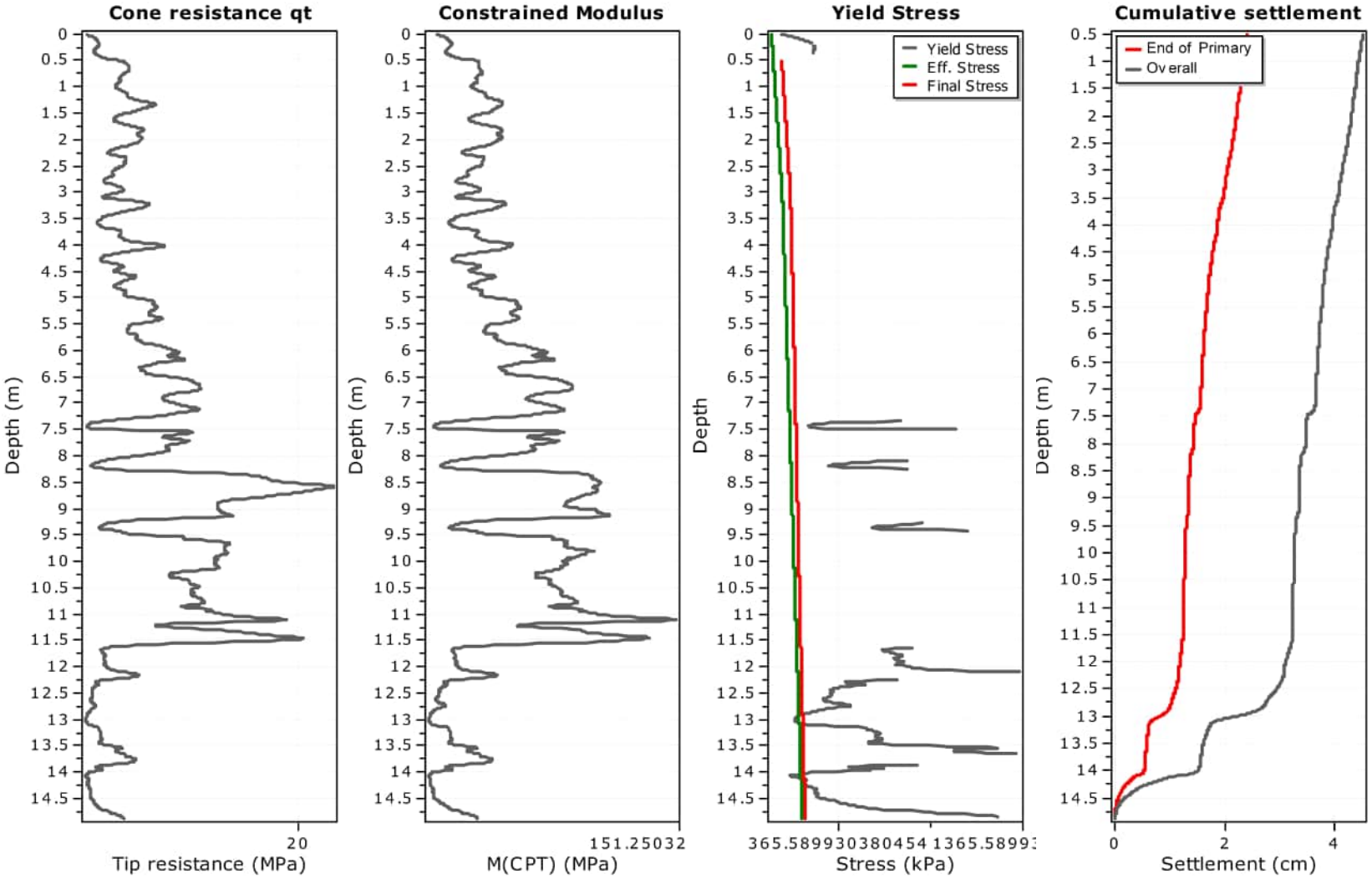
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-08
Total depth: 14.88 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 3.05 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 46.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

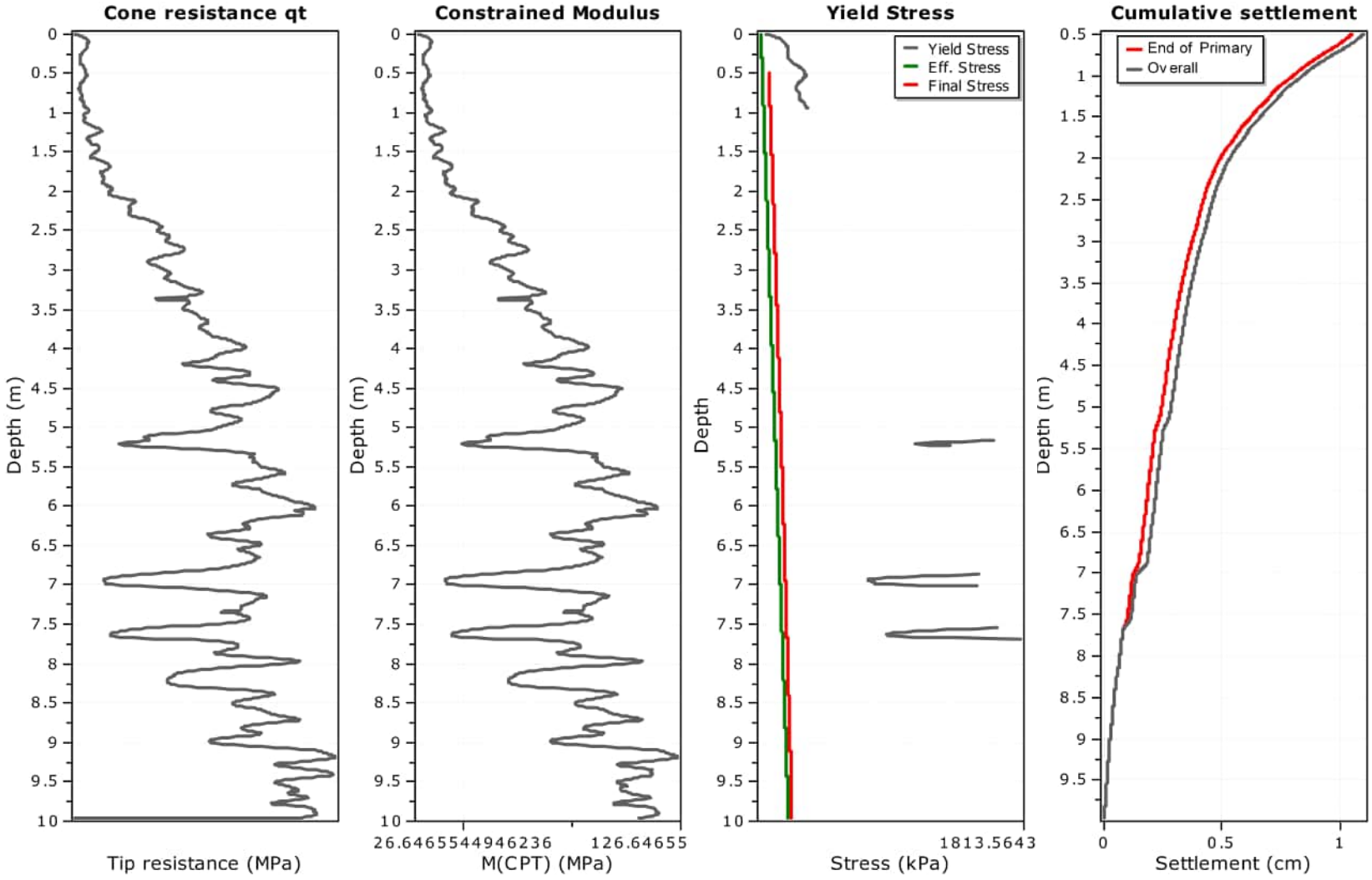
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-09
Total depth: 9.96 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 9.70 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 46.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

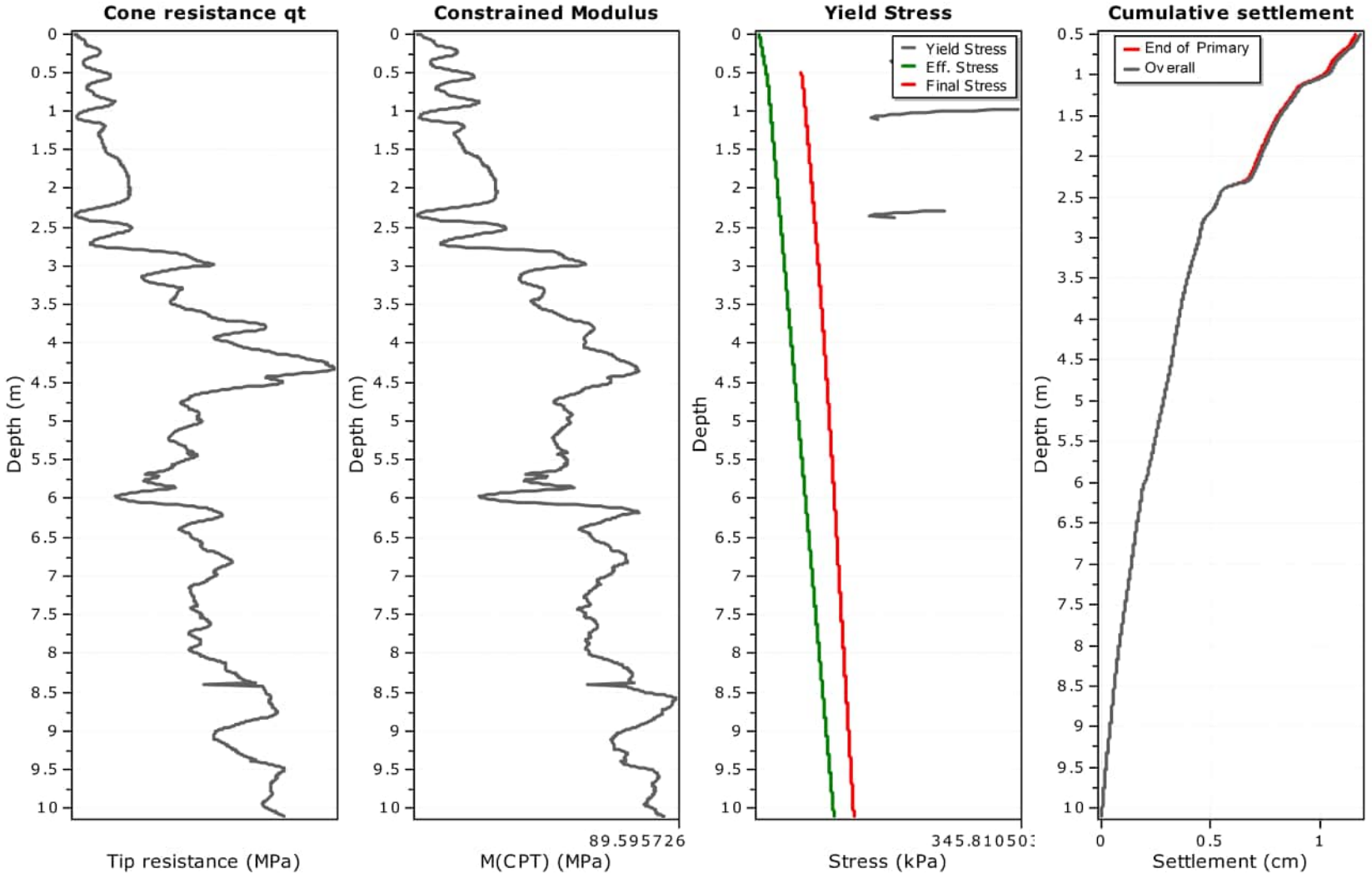
where t_p is the duration of primary consolidation

CMW Geosciences
Level 1, Block C, 401 Grey Street
Hamilton 3216
www.cmwgeosciences.com

CPT: CPT25-10
Total depth: 10.10 m, Date: 2/10/2025
Surface Elevation: 0.00 m, Est. GWL: 0.60 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project: **Station Road Proposed Subdivision**
Location: **Station Road, Matamata**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 15.00 (m)
L/B: 1.0
Footing pressure: 46.00 (kPa)
Embedment depth: 0.50 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 600 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

where t_p is the duration of primary consolidation

APPENDIX M: SID MATRIX

CMW Safety in Design Risk Assessment									
HAM2023-0124 - Station Road Proposed Subdivison and Solar Farm									
Design Element	**Hazard**	**Description**	**Assessed Risk**			**Controls Incorporated in Design**	**Residual Risk**		
			Consequence	**Likelihood**	**Risk Rating**		**Consequence**	**Likelihood**	**Risk Rating**
Retaining Walls (If required)	Falling from height	Injury to construction staff while constructing or public once wall is constructed.	4	3	12	Temporary barrier fence to avoid public climbing, permanent fencing to be considered to prevent falls access.	1	3	3
	Striking underground services	Injury to construction staff if live services are struck.	4	2	8	All sites cleared for services prior to construction requiring digging or boring into the ground.	1	2	2
	Moving Machinery	Lifting and swing area of machinery may cause injury to construction staff.	4	3	12	Separate moving machinery from light vehicles and person movements with fencing and/or safe distances from exposed construction staff operations.	1	3	3
	Working at edges of excavations	Injury to construction staff or public by falling into excavations.	4	3	12	Site to be made safe if excavations are to be left open and public can access, excavations to be filled or securely covered on same day of excavation, safe distances from excavations to be maintained and demarked with boundary fence.	1	3	3
	Excavation collapse	Injury to construction staff or persons able to access the excavation after hours.	4	3	12	Staged excavation to be undertaken where able, boundary fence where excavations are under construction or other means of separation for staff or public from potential collapse.	1	3	3
	Retaining wall failure	Exceed specified loading conditions, wall drainage blockage.	4	2	8	Appropriate construction and permanent loading conditions allowed for, design adequate drainage measures, assess impact of blocked drainage on design.	1	2	2
	Falling objects from above	Injury to construction staff or persons under the proposed wall.	4	3	12	Hard hats to be worn at all times as the wall is constructed and where lifting is undertaken, safe distance from any lifting or movements above when being undertaken.	1	3	3
Earthworks	Falling from height	Injury to construction staff while constructing steep temporary or permanent earthworks cut or fill faces.	4	3	12	Temporary barrier fence or other means to be used to ensure persons cannot access to the edge of steep excavations	1	3	3
	Striking underground services	Injury to construction staff if live services are struck.	4	2	8	All sites cleared for services prior to site investigations and earthworks construction	1	2	2
	Moving Machinery	Injury to construction staff.	4	3	12	Separate moving machinery from light vehicles and person movements with fencing and/or safe distances from exposed construction staff operations.	1	3	3
	Working at edges of excavations	Injury to construction staff.	4	3	12	Install safety barriers, exclusion zones, signage as necessary to warn of hazard.	1	3	3
	Trench excavation collapse	Injury to construction staff or persons due to crushing/impact injury.	4	3	12	Follow Worksafe requirements, trench shields or benching of excavations to be used. No staff to enter the trench without appropriate and approved measures already in place.	1	3	3
	Cut / fill batter collapse	Injury to construction staff during construction.	3	2	6	Safe distances and appropriate temporary slope gradients and heights to be assessed prior to construction and monitored during to confirm as appropriate, safe distances and barrier fencing to be used on site where deemed necessary.	1	3	3
	Excessive noise during construction	Damage to hearing of construction staff or persons adjacent to the site.	3	2	6	Comply with appropriate allowances for noise on site, ear protection to be worn where appropriate, setback distances from adjacent sites or notified working hours to avoid conflict with adjacent property inhabitants.	1	2	2
	Machinery rollover	Machinery trafficability over soft, wet or uneven ground.	4	2	8	Appropriate construction of temporary haul roads, implement drainage and geofabrics, appropriate driver training.	1	2	2
	Contaminated Soils	Airborne or in-ground contaminants affecting construction staff.	4	1	4	Perform an environmental assessment of the site prior to construction.	1	1	1
Plant Platform	Moving Machinery	Injury to construction staff.	4	3	12	Separate moving machinery from light vehicles and person movements with fencing and/or safe distances from exposed construction staff operations.	1	3	3
	Plant platform instability	Injury to construction staff or persons due to crushing/impact injury.	4	3	12	Design to incorporate adequate factor of safety, prepare lift management plans to ensure adequate separation between plant and persons.	1	3	3
	Excessive plant settlement	Plant / equipment damage, injury to construction staff or persons due to sudden plant / load movements.	4	3	12	Undertake trial lift with adequate separation of plant and load from persons, monitor settlements during lift.	1	3	3
NOTE: It is the Contractors responsibility to cover construction related risks in a more comprehensive manner (being the competent party in that respect).									

Safety in Design Assessment Framework						
Risk Matrix		**Consequence**				
		Insignificant 1	**Minor 2**	**Moderate 3**	**Major 4**	**Catastrophic 5**
Likelihood	**Event Will Occur 5**	**Medium 5**	**High 10**	**High 15**	**Extreme 20**	**Extreme 25**
	Event Almost Certain to Occur 4	**Low 4**	**Medium 8**	**High 12**	**Extreme 16**	**Extreme 20**
	Event May Occur 3	**Low 3**	**Medium 6**	**High 9**	**High 12**	**High 15**
	Event Not Likely to Occur 2	**Low 2**	**Low 4**	**Medium 6**	**Medium 8**	**High 10**
	Event Rarely Occurs 1	**Low 1**	**Low 2**	**Low 3**	**Low 4**	**Medium 5**

APPENDIX N: STATEMENT OF PROFESSIONAL OPINION

17 October 2025 Document Ref: HAM2023-0124AI | Rev 2

RE: STATEMENT OF PROFESSIONAL OPINION AS TO THE GEOTECHNICAL SUITABILITY OF LAND FOR DEVELOPMENT

ASHBOURNE DEVELOPMENT, STATION ROAD, MATAMATA

Development: Ashbourne Development, Matamata

Owner: Matamata Developments Limited

Location: Station Road, Matamata

I, Dave Sullivan, of CMW Geotechnical NZ Limited (Level 1, Block C/401 Grey Street, Hamilton)

Hereby confirm that:

1. I am a geo-professional as defined in Clause 1.5.1 of Part 1 General Information of the Matamata-Piako District Council Development Manual 2010 and was retained by the developer as the geo-professional on the above development.
2. The extent of my preliminary investigations is described in report HAM2023-0124AI Rev2 dated 17 October 2025.
3. In my professional opinion, not to be construed as a guarantee, I considered that the proposed works give due regards to land slope, liquefaction and foundation stability and settlement considerations and that the land is suitable for the proposed development provided the geotechnical constraints outlined within my geotechnical investigation report have been considered.
4. The professional opinion is furnished to the Council and the owner for the purpose along, on the express condition that it will not be relied upon by any other person and does not remove the necessity for further inspection during the course of the works.

For and on behalf of CMW Geosciences

Prepared by:

Dave Sullivan
Principal Geotechnical Engineer
CMEngNZ, CPEng