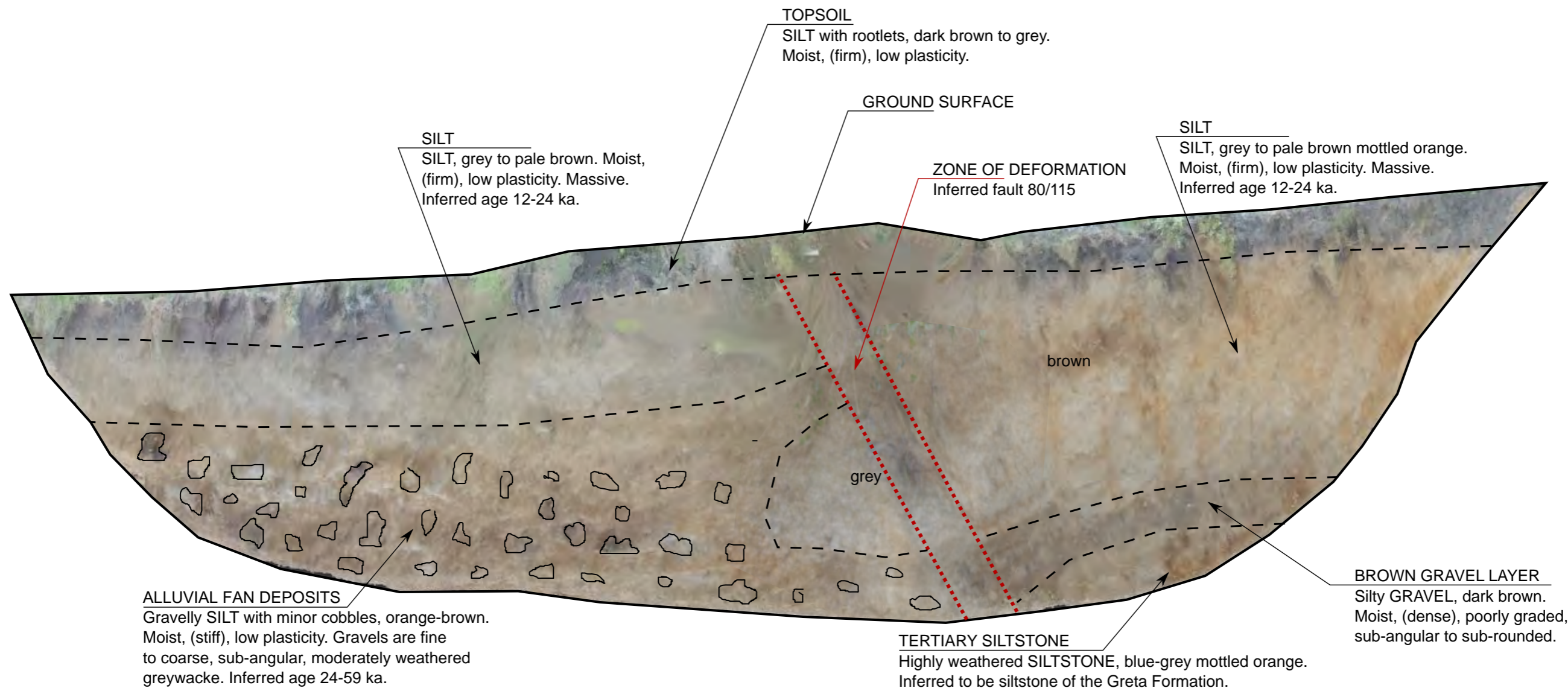


APPENDIX C

Test Pit Logs



DATE OF TEST PIT: 28/29 NOVEMBER 2018
 LOT NUMBER: 92
 COORDINATES: E 1612459 m, N 5296223 m
 TEST PIT ORIENTATION: 120 (to right)
 TEST PIT LENGTH: 10 METRES

CLIENT
 HURUNUI DISTRICT COUNCIL

PROJECT
 MOUNT LYFORD VILLAGE

CONSULTANT

YYYY-MM-DD 2018-12-13

TITLE

TP01 GEOLOGICAL INTERPRETATION



DESIGNED HVC

PREPARED SAT

REVIEWED MCH

APPROVED TJM

PROJECT NO.
 1895571

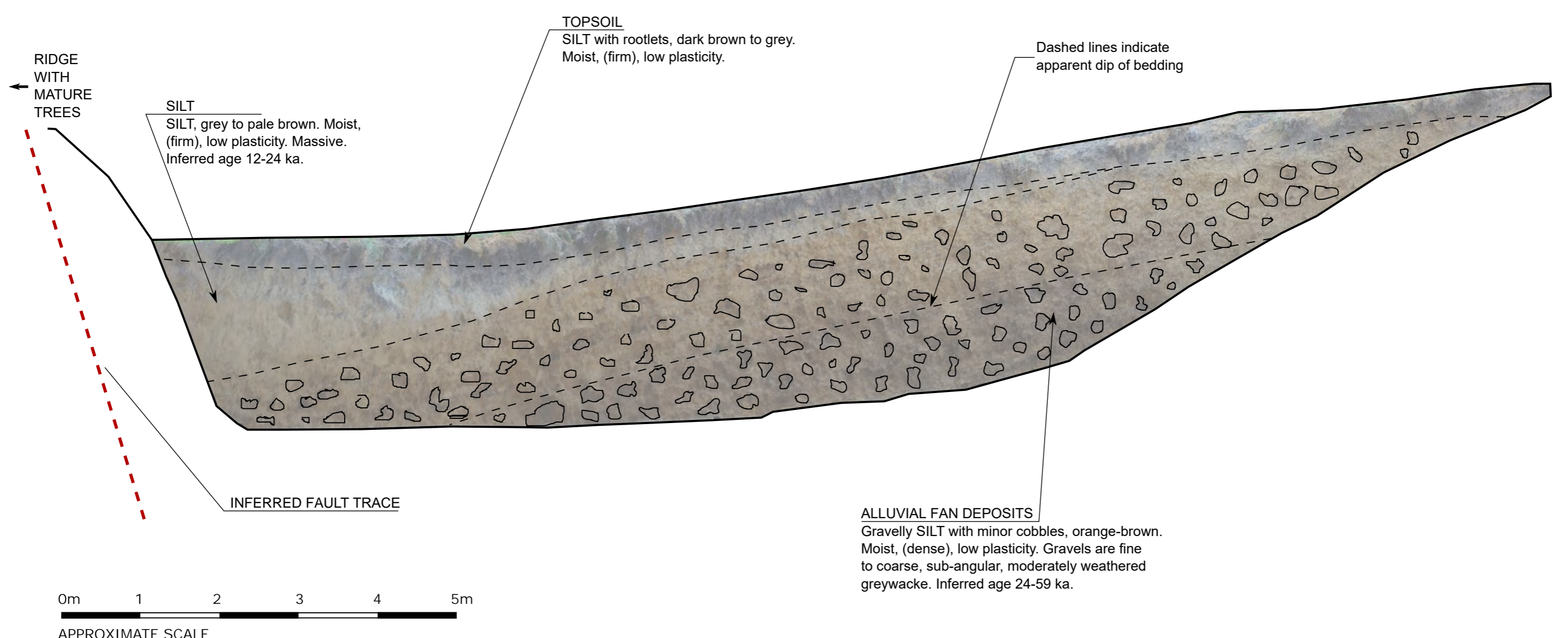
PHASE
 003

REV.
 0

LOG
 TP01

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
 25 mm

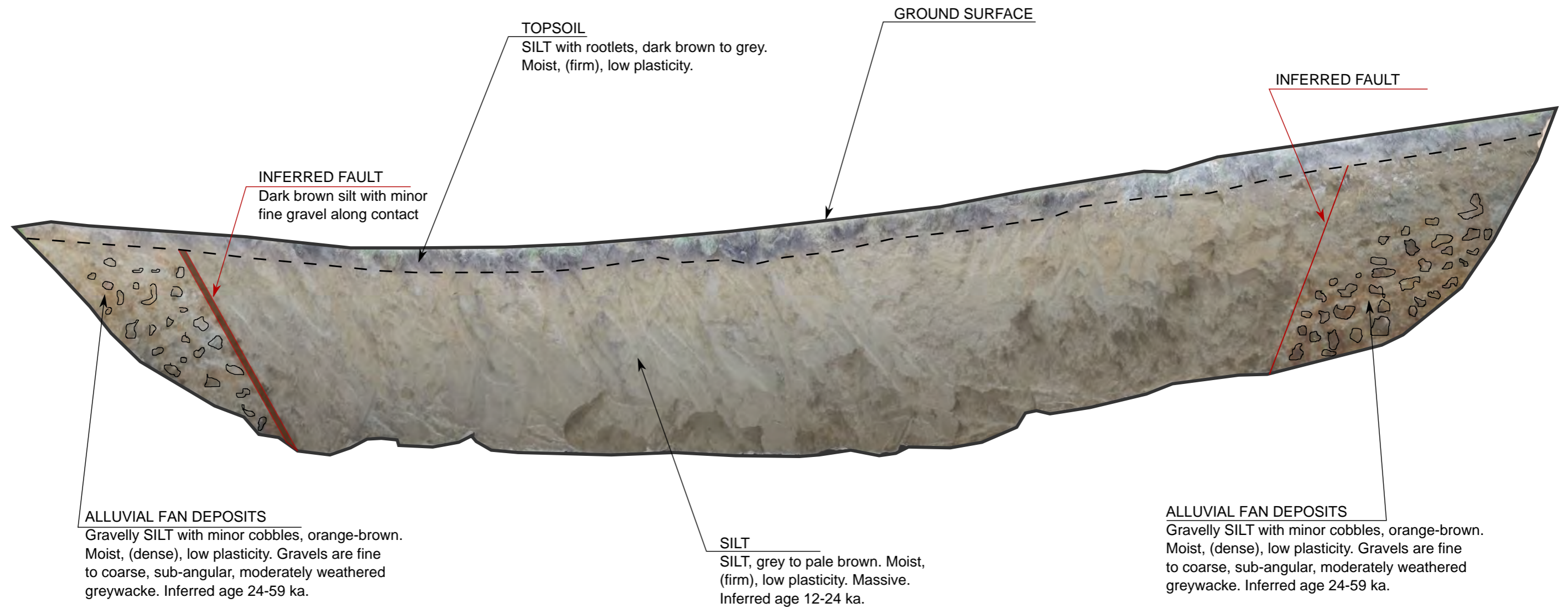
Note: Trench could not be extended south across the inferred fault scarp due to the presence of mature pine trees.



DATE OF TEST PIT: 29 NOVEMBER 2018
 LOT NUMBER: N/A
 COORDINATES: E 1613101 m, N 5295740 m
 TEST PIT ORIENTATION: 150 (to left)
 TEST PIT LENGTH: 16 METRES

CLIENT HURUNUI DISTRICT COUNCIL		PROJECT MOUNT LYFORD VILLAGE	
CONSULTANT GOLDER		TITLE TP02 GEOLOGICAL INTERPRETATION	
DESIGNED	HVC	PROJECT NO.	1895571
PREPARED	SAT	PHASE	003
REVIEWED	MCH	REV.	0
APPROVED	TJM	LOG	TP02

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3



DATE OF TEST PIT: 29 NOVEMBER 2018
 LOT NUMBER: N/A
 COORDINATES: E 1613485 m N 5296191 m
 TEST PIT ORIENTATION: 152
 TEST PIT LENGTH: 20 METRES

CLIENT
 HURUNUI DISTRICT COUNCIL

PROJECT
 MOUNT LYFORD VILLAGE

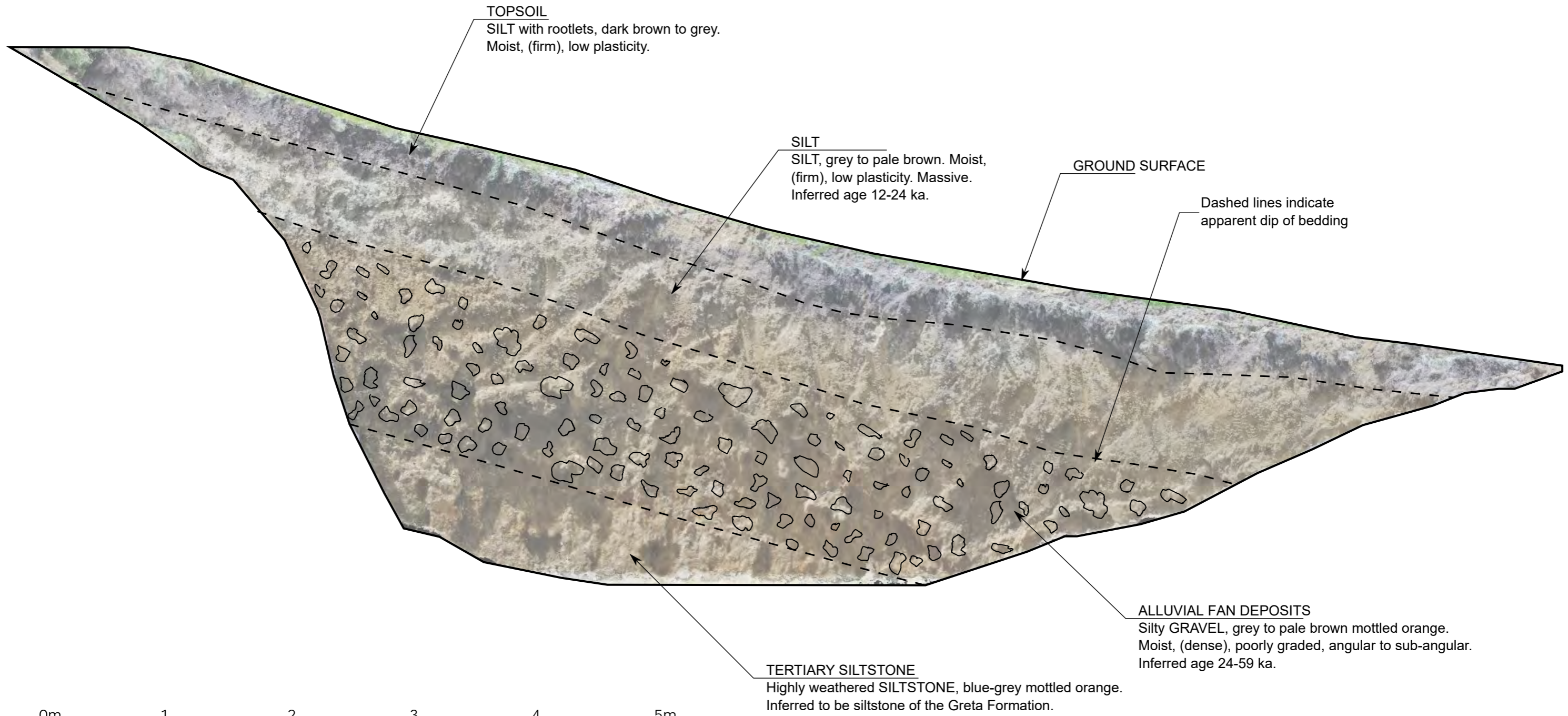
CONSULTANT	YYYY-MM-DD	2018-12-13
DESIGNED	HVC	
PREPARED	SAT	
REVIEWED	MCH	
APPROVED	TJM	



TITLE
TP03 GEOLOGICAL INTERPRETATION

PROJECT NO.	PHASE	REV.	LOG
1895571	003	0	TP03

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

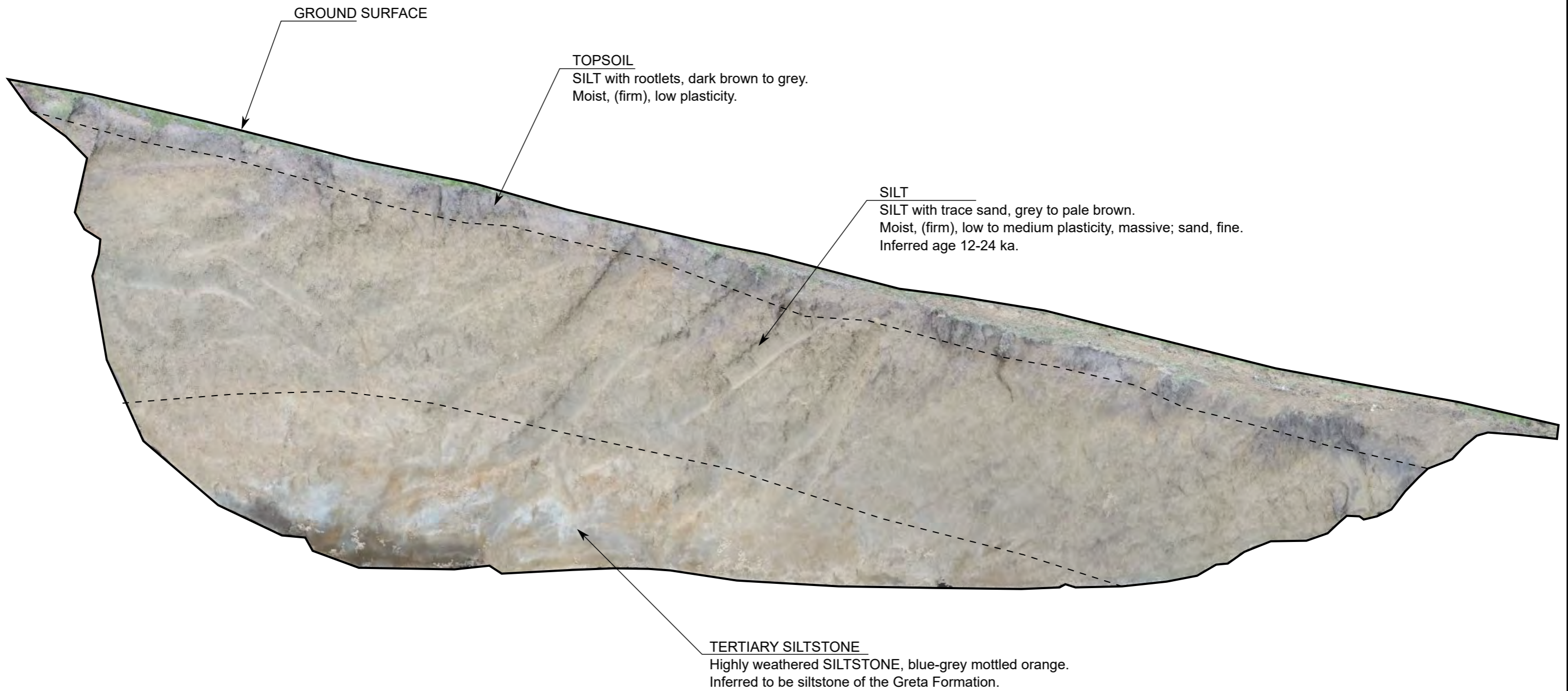


0m 1 2 3 4 5m
 APPROXIMATE SCALE

DATE OF TEST PIT: 29 NOVEMBER 2018
 LOT NUMBER: N/A
 COORDINATES: E 1613349 m N 5296280 m
 TEST PIT ORIENTATION: 165 (right)
 TEST PIT LENGTH: 11 METRES

CLIENT HURUNUI DISTRICT COUNCIL		PROJECT MOUNT LYFORD VILLAGE	
CONSULTANT GOLDER		TITLE TP04 GEOLOGICAL INTERPRETATION	
DESIGNED	HVC	PROJECT NO.	1895571
PREPARED	SAT	PHASE	003
REVIEWED	MCH	REV.	0
APPROVED	TJM	LOG	TP04

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3



APPROXIMATE SCALE

DATE OF TEST PIT: 29 NOVEMBER 2018
 LOT NUMBER: N/A
 COORDINATES: E 1613367 m N 5296200 m
 TEST PIT ORIENTATION: 225 (right)
 TEST PIT LENGTH: 11 METRES

CLIENT
 HURUNUI DISTRICT COUNCIL

PROJECT
 MOUNT LYFORD VILLAGE

CONSULTANT

YYYY-MM-DD 2018-12-13

TITLE

TP05 GEOLOGICAL INTERPRETATION



DESIGNED HVC

PREPARED SAT

REVIEWED MCH

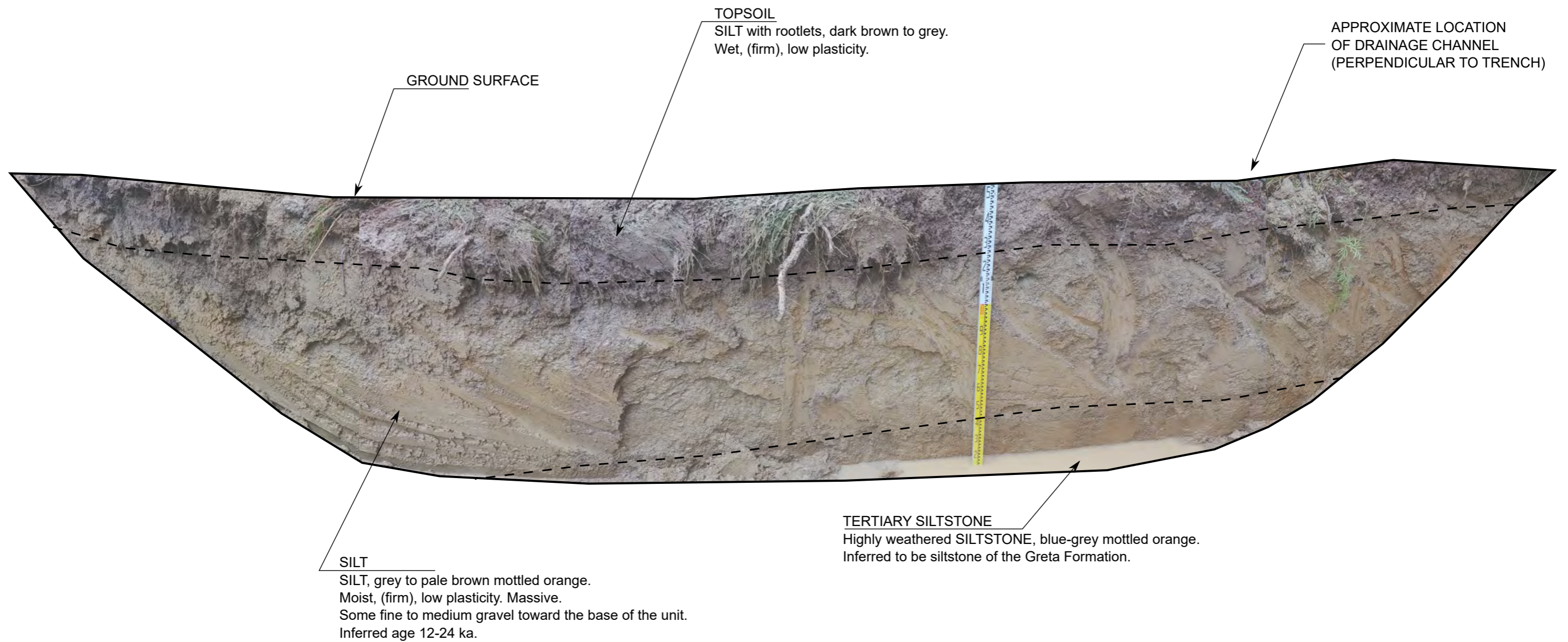
APPROVED TJM

PROJECT NO.
 1895571

PHASE
 003

REV.
 0

LOG
 TP05



APPROXIMATE SCALE

DATE OF TEST PIT: 29 NOVEMBER 2018
 LOT NUMBER: 68
 COORDINATES: E 1612511 m, N 5296241 m
 TEST PIT ORIENTATION: 150 (to right)
 TEST PIT LENGTH: 8 METRES

CLIENT
 HURUNUI DISTRICT COUNCIL

PROJECT
 MOUNT LYFORD VILLAGE

CONSULTANT	YYYY-MM-DD	2018-12-13
	DESIGNED	HVC
	PREPARED	SAT
	REVIEWED	MCH
	APPROVED	TJM

TITLE
TP06 GEOLOGICAL INTERPRETATION

PROJECT NO.	PHASE	REV.	LOG
1895571	003	0	TP06

APPENDIX D

Borehole Logs



GOLDER

Project Name: Mt Lyford Geological Assessment

Client: Hurunui District Council

Location: Mt Lyford Village, Hurunui

Description: Drilling Investigation

ProjectID: 1895571

Reference: BH01 - Soil Log.

North (m): 5296223

East (m): 1612932

Elevation (m): 663

Hole Depth (m): 14.80

BOREHOLE LOG

Grid: NZTM

Datum: NZTM

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth	TCR (%)			SPT N-value (Uncorrected)				Samples & In-situ Testing	Backfill & Installation
								25	50	75	100	10	20	30		
		Gravelly COBBLES; grey. Dry; cobbles, subangular to angular; gravel, fine to coarse, subangular to angular, (FILL). SILT, with trace sand and gravel and cobbles; brown/pale yellow. Very soft; low plasticity; moist; sand, fine to coarse, gravel, fine to coarse, subangular to angular, Sandstone, cobbles, subangular to angular, Sandstone.	ML	D	VS		0.50									
		1.25 to 1.5 m, moderately weathered, brown/pale yellow to orange SANDSTONE, moderately strong (Inferred boulder).		M	F		1.00									
		Silty GRAVEL, with trace sand and cobbles; brown/pale yellow. Loose; moist; gravel, fine to coarse, subangular to angular, Sandstone; sand, fine to coarse, cobbles, subangular to angular, Sandstone. Core Loss.	GM		L		2.50									
		GRAVEL & COBBLES, with some silt and boulders, with trace sand; brown/pale yellow. Loose; low plasticity; moist; gravel, fine to coarse, subangular to angular, cobbles, subangular to angular, Sandstone; boulders, Sandstone; sand, fine to coarse. 4.2 to 5.0 m, with some broken boulders and cobbles (SANDSTONE). With minor cobbles.	GM		L		4.00									
		Core Loss					5.00									
		Push tube sample collected in inferred extremely weak siltstone (SILT).					6.00									
		For Continuation Refer to BH1 - Rock Log.					6.50									
							7.00									
							7.50									

Driller Speight Drilling.	Logged By HVC
Drill Method / Rig CS1000	Checked By TJM
Start Date 03/12/2018	
End Date 04/12/2018	

Remarks Rotary core, triple tube.

Hole Depth 14.80m

Page 1 of 2



GOLDER

Rock Drillhole Log

Project Name: Mt Lyford Geological Assessment

Client: Hurunui District Council

Location: Mt Lyford Village, Hurunui

Description: Drilling Investigation

ProjectID: 1895571

Reference: BH01 - Rock Log.

North (m): 5296223

East (m): 1612932

Elevation (m): 0

Hole Depth (m): 14.8 m

Orientation (°): -

Inclination (°): 90

Local Grid: -

Datum: NZTM

Description	Graphic Log	Weathering				Strength				Depth	TCR (%)			RQD (%)			Discontinuities	
		SW	MW	HW	CW	VS	S	MS	W		WW	25	50	75	25	50		75
		<p>Continuation of BH1 - Soil log.</p> <p>Moderately weathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, very weak.</p> <p>Slightly weathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, very weak, calcareous, fossiliferous, with frequent cross bedding.</p>																
										1								
										2								
										3								
										4								
										5								
										6								
										7	100			70			J x 5, 20° - 45°, sp 100 - 200 mm, Un, Ro.	
										8	100			70			B x 3, 30° - 45°, Un, Ro.	
										9							B, 20° - 30°.	
										10	100			85			J, 45°, Un, Ro.	
										11	100			90				
										12								
										13	100			80			B, 30° - 35°.	
										14	100			100			Lighter grey circular feature, stronger than surrounding unit.	

EOH: 14.8 m

Drill Rig ID: CS1000	Remarks Rotary core, triple tube.	Key: J = Joint CZ = Crushed Zone DS = Decomposed Seam sp = Spacing PI = Planar Un = Undulating St = Stepped Ro = Rough Sn = Stain Vr = Veneer Ct = Coating	Hole Depth (m): 14.8
Driller: Speight Drilling.			Hole Size (mm): 0
Logged By: HVC			Start Date: 03/12/2018
Page Depth: 15.5 m			End Date: 04/12/2018
			Page 2 of 2



GOLDER

Project Name: Mt Lyford Geological Assessment

Client: Hurunui District Council

Location: Mt Lyford Village, Hurunui

Description: Drilling Investigation

ProjectID: 1895571

Reference: BH02 - Soil Log.

North (m): 5296164

East (m): 1612631

Elevation (m): 679

Hole Depth (m): 9.00

BOREHOLE LOG

Grid: NZTM

Datum: NZTM

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth	TCR (%)			SPT N-value (Uncorrected)				Samples & In-situ Testing	Backfill & Installation
								25	50	75	100	10	20	30		
		GRAVEL, with minor cobbles: grey. Very loose; dry; gravel, Sandstone; (FILL).		D												
		Gravelly SILT, with trace sand and cobbles; light brown/brown to dark brown. Low plasticity; moist to wet; gravel, fine to coarse, subangular to angular; sand, fine to coarse.		M-W	L											
		SILT, with some gravel, with trace sand; brown. Firm; low plasticity; moist; gravel, fine to coarse, subangular to angular, Sandstone; sand, fine to coarse.		M	F	▼										
		Gravelly SILT, with trace sand; pale yellow/brown and orange staining. Firm; low plasticity; moist to wet; gravel, fine to coarse, subangular to angular; sand, fine to coarse.		M-W	VS-S											
		SILT, with some cobbles and boulders; pale yellow/brown. Firm; low plasticity; moist; cobbles, subangular to angular, Sandstone, boulders, subangular to angular, Sandstone; orange staining on cobble faces.			S											
		SILT, with some gravel and cobbles, with trace sand; pale yellow/brown with orange staining. Soft; low plasticity; moist; gravel, subangular to angular, Sandstone, cobbles, subangular to angular, Sandstone; sand, fine to coarse.	ML		S-F											
		SILT & GRAVEL, with minor cobbles, with trace sand; pale yellow/brown. Very soft to soft; low plasticity; moist to wet; gravel, fine to coarse, subangular to angular, Sandstone; cobbles, subangular to angular, Sandstone; sand, fine to coarse.		M	F											
		Very soft, wet - saturated, poor return.			S											
		For Continuation Refer to BH2 - Rock Log.			VS-S											

EOH: 9 m

Driller Speight Drilling.	Logged By HVC	Remarks Rotary core, triple tube.	Hole Depth 9.00m
Drill Method / Rig CS1000			
Start Date 04/12/2018	Checked By TJM		
End Date 05/12/2018			
Borehole logged in accordance with NZGS guideline "Field description of soil and rock" 2005			Page 1 of 2



GOLDER

Rock Drillhole Log

Project Name: Mt Lyford Geological Assessment

Client: Hurunui District Council

Location: Mt Lyford Village, Hurunui

Description: Drilling Investigation

ProjectID: 1895571

Reference: BH02 - Rock Log.

North (m): 5296164

East (m): 1612631

Elevation (m): 0

Hole Depth (m): 9 m

Orientation (°): -

Inclination (°): 90

Local Grid: -

Datum: NZTM

Description	Graphic Log	Weathering			Strength			Depth	TCR (%)			RQD (%)			Discontinuities									
		SW	MW	HW	CW	VS	S		MS	WS	VV	25	50	75		25	50	75						
		Continuation of BH2 - Soil Log.																						
Moderately weathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, very weak, Bedding inclined between 15° - 30°.	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	1																
								2																
								3																
[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	4																
								5																
								6							75			75						
[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	7							100			100			J, 1-2 mm, closed, dark grey infill, 60° inclination.			
								8							100			100						
								9							100			100						

EOH: 9 m

Drill Rig ID: CS1000	Remarks Rotary core, triple tube.	Key: J = Joint CZ = Crushed Zone DS = Decomposed Seam sp = Spacing PI = Planar Un = Undulating St = Stepped Ro = Rough Sn = Stain Vr = Veneer Ct = Coating	Hole Depth (m): 9
Driller: Speight Drilling.			Hole Size (mm): 0
Logged By: HVC			Start Date: 04/12/2018
Page Depth: 10 m			End Date: 05/12/2018
			Page 2 of 2



Project Name: Mt Lyford Geological Assessment

ProjectID: 1895571

Client: Hurunui District Council

Reference: BH03 - Soil Log.

Location: Mt Lyford Village, Hurunui

North (m): 5295897

East (m): 1613297

Elevation (m): 597

Hole Depth (m): 7.50

BOREHOLE LOG

Description: Drilling Investigation

Grid: NZTM

Datum: NZTM

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth	TCR (%)			SPT N-value (Uncorrected)			Samples & In-situ Testing	Backfill & Installation
								25	50	75	100	10	20		
		Gravelly SILT, with minor sand; dark brown/grey. Firm; low plasticity; moist; gravel, fine to coarse, angular to subangular; sand, fine to coarse; (FILL).			S-F		0.00								
		SILT; pale yellow/brown; homogeneous. Firm; low plasticity; moist.	ML	M	F	▼	0.50							Bentonite	
		Silt becoming gradually darker.			St		1.00								
		For Continuation Refer to BH3 - Rock Log.					1.50								
							2.00								
							2.50								
							3.00								
							3.50								
							4.00								
							4.50								
							5.00								
							5.50								
							6.00								
							6.50								
							7.00								
							7.50								

EOH: 7.5 m

Driller Speight Drilling.	Logged By HVC	Remarks Rotary core, triple tube.	Hole Depth 7.50m
Drill Method / Rig CS1000			
Start Date 05/12/2018	Checked By TJM		
End Date 06/12/2018			
Borehole logged in accordance with NZGS guideline "Field description of soil and rock" 2005			Page 1 of 2



GOLDER

Rock Drillhole Log

Project Name: Mt Lyford Geological Assessment

Client: Hurunui District Council

Location: Mt Lyford Village, Hurunui

Description: Drilling Investigation

ProjectID: 1895571

Reference: BH03 - Rock Log.

North (m): 5295897

East (m): 1613297

Elevation (m): 0

Hole Depth (m): 7.5 m

Orientation (°): -

Inclination (°): 90

Local Grid: -

Datum: NZTM

Description	Graphic Log	Weathering			Strength			Depth	TCR (%)			RQD (%)			Discontinuities	
		SW	MW	HW	CW	VS	MS		WS	25	50	75	25	50		75
Continuation of BH3 - Soil Log.								1								
Moderately weathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, very weak.								2	100	100	100	100	100	100	J, 50°, Pl, Ro.	
Slightly weathered, bluish grey/brown, fine fabric, bedded, laminated, SANDSTONE, strong.								3	100	100	100	100	100	100	J, 50°, Pl, Ro.	
Moderately weathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, very weak.								4	100	100	100	100	100	100	J, 50°, Pl, Ro.	
Slightly weathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, weak.								5	100	100	100	100	100	100		
								6	100	100	100	100	100	100		
								7	100	100	100	100	100	100		

EOH: 7.5 m

Drill Rig ID: CS1000	Remarks Rotary core, triple tube.	Key: J = Joint CZ = Crushed Zone DS = Decomposed Seam sp = Spacing Pl = Planar Un = Undulating St = Stepped Ro = Rough Sn = Stain Vr = Veneer Ct = Coating	Hole Depth (m): 7.5
Driller: Speight Drilling.			Hole Size (mm): 0
Logged By: HVC			Start Date: 05/12/2018
Page Depth: 10 m			End Date: 06/12/2018
			Page 2 of 2



GOLDER

Project Name: Mt Lyford Geological Assessment

Client: Hurunui District Council

Location: Mt Lyford Village, Hurunui

Description: Drilling Investigation

ProjectID: 1895571

Reference: BH04 - Soil Log.

North (m): 5295341

East (m): 1613697

Elevation (m): 506

Hole Depth (m): 28.60

BOREHOLE LOG

Grid: NZTM

Datum: NZTM

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth	TCR (%)			SPT N-value (Uncorrected)			Samples & In-situ Testing	Backfill & Installation
								25	50	75	100	10	20		
		Silty GRAVEL, with trace rootlets; grey/brown. Low plasticity; moist; gravel, fine to coarse, subangular to angular; (FILL). SILT, with some gravel, with trace sand; brown. Firm; low plasticity; moist; gravel, fine to coarse, subangular to angular; sand, fine to coarse. Silty GRAVEL & COBBLES; pale yellow/brown. Very loose; low plasticity; moist; gravel, fine to coarse, subangular to angular; Sandstone, cobbles, subangular to angular, Sandstone. Gravelly SILT, with trace sand; pale yellow/brown. Soft; low plasticity; moist; gravel, fine to coarse, subangular to angular, Sandstone; sand, fine to coarse. Sandy GRAVEL, with minor silt and cobbles, with trace boulders; brown to dark brown. Loose; low plasticity; moist; gravel, fine to coarse, subangular to angular, Sandstone; sand, fine to coarse; cobbles, subangular to angular; boulders, Sandstone.	ML		F		0.50								
			GW-GM		VL		1.00								
			ML	M	S		1.50								
			GW		L		2.00								
		For Continuation Refer to BH4 - Rock Log					2.50								
							3.00								
							3.50								
							4.00								
							4.50								
							5.00								
							5.50								
							6.00								
							6.50								
							7.00								
							7.50								
							8.00								
							8.50								
							9.00								
							9.50								

Driller Speight Drilling.	Logged By HVC	Remarks Rotary core, triple tube.
Drill Method / Rig CS1000		
Start Date 07/12/2018	Checked By TJM	
End Date 07/12/2018		
		Hole Depth 28.60m
		Page 1 of 4



GOLDER

Rock Drillhole Log

Project Name: Mt Lyford Geological Assessment

Client: Hurunui District Council

Location: Mt Lyford Village, Hurunui

Description: Drilling Investigation

Local Grid: -

Datum: NZTM

ProjectID: 1895571

Reference: BH04 - Rock Log.

North (m): 5295341

East (m): 1613697

Elevation (m): 0

Hole Depth (m): 28.6 m

Orientation (°): -

Inclination (°): 90

Description	Graphic Log	Weathering						Strength						Depth	TCR (%)			RQD (%)			Discontinuities
		SW		MW		HW		VS		MS		WS			25	50	75	25	50	75	
Continuation of BH4 - Soil Log.														1							
Moderately weathered, pale yellow/brown, fine fabric, bedded, laminated, SANDSTONE, very weak.														2							
Slightly weathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, very weak.														3							
														4	100			100			Soft very fine sandy SILT for 100mm.
														5	100			100			Bivalve fossil, 50mm length.
														6	100			100			J, 40°, Un, Sm.
														7	100			100			
														8	100			100			Rock is weak to moderately strong. J, 15°, Un, Ro.
														9	100			100			J, 80°, SILT Infill, Ap 1 - 3 mm, Pl, Ro. Rock is weak to moderately strong.

Drill Rig ID: CS1000
Driller: Speight Drilling.
Logged By: HVC
Page Depth: 10 m

Remarks
Rotary core, triple tube.

Key: J = Joint CZ = Crushed Zone DS = Decomposed Seam sp = Spacing Pl = Planar Un = Undulating St = Stepped Ro = Rough Sn = Stain Vr = Veneer Ct = Coating
--

Hole Depth (m): 28.6
Hole Size (mm): 0
Start Date: 07/12/2018
End Date: 07/12/2018
Page 2 of 4



GOLDER

Rock Drillhole Log

Project Name: Mt Lyford Geological Assessment

Client: Hurunui District Council

Location: Mt Lyford Village, Hurunui

Description: Drilling Investigation

Local Grid: -

Datum: NZTM

ProjectID: 1895571

Reference: BH04 - Rock Log.

North (m): 5295341
 East (m): 1613697
 Elevation (m): 0
 Hole Depth (m): 28.6 m
 Orientation (°): -
 Inclination (°): 90

Description	Graphic Log	Weathering				Strength				Depth	TCR (%)			RQD (%)			Discontinuities	
		SW	MW	HW	CW	VS	S	MS	W		WW	25	50	75	25	50		75
		Slightly weathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, very weak.												100				100
Slightly weathered, bluish grey/brown, fine fabric, bedded, very thin, SILTSTONE, weak, Fine sand lenses throughout.									11		100			100			45° 10mm thick darker band.	
Unweathered, bluish grey/brown, fine fabric, bedded, laminated, SILTSTONE, weak.									12		100			100			Rock is weak to moderately strong.	
Unweathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, weak.									13		100			100			Siltstone is bluish grey and weak to moderately strong.	
Unweathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, weak.									14		100			100				
Unweathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, weak.									15		100			100				
Unweathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, weak.									16		100			100				
Unweathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, weak.									17		100			100				
Unweathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, weak.									18		100			100			J, 70°, Ap 1 - 3 mm, Un, Ro.	
Unweathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, weak.									19		100			100			B, 30°, Un, Ro.	

Drill Rig ID: CS1000
Driller: Speight Drilling.
Logged By: HVC
Page Depth: 10 m

Remarks
 Rotary core, triple tube.

Key:
 J = Joint
 CZ = Crushed Zone
 DS = Decomposed Seam
 sp = Spacing
 Pl = Planar
 Un = Undulating
 St = Stepped
 Ro = Rough
 Sn = Stain
 Vr = Veneer
 Ct = Coating

Hole Depth (m): 28.6
Hole Size (mm): 0
Start Date: 07/12/2018
End Date: 07/12/2018
 Page 3 of 4



GOLDER

Rock Drillhole Log

Project Name: Mt Lyford Geological Assessment

Client: Hurunui District Council

Location: Mt Lyford Village, Hurunui

Description: Drilling Investigation

Local Grid: -

Datum: NZTM

ProjectID: 1895571

Reference: BH04 - Rock Log.

North (m): 5295341

East (m): 1613697

Elevation (m): 0

Hole Depth (m): 28.6 m

Orientation (°): -

Inclination (°): 90

Description	Graphic Log	Weathering			Strength			Depth	TCR (%)			RQD (%)			Discontinuities	
		SW	MW	HW	CW	VS	MS		WS	25	50	75	25	50		75
Unweathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, weak.									100	100	100	100	100	100	J, 85°, SILT/CLAY infill, Un, Sl.	
Slightly weathered, bluish grey, fine fabric, bedded, SILTSTONE, weak, hair-line fractures run from 45° to sub vertical. Seam is darker, no aperture.									100	100	100	100	100	100	Joint swarm (>10), 45°, micro veins, calcite infill.	
Unweathered, bluish grey, fine fabric, bedded, laminated, SILTSTONE, strong.									100	100	100	100	100	100	Higher percentage of calcite in stronger siltstone (HCL).	
									100	100	100	100	100	100	Hairline fractures throughout, very steeply inclined; 1 - 2 mm darker grey silt infill, closed. Rock is competent.	

EOH: 28.6 m

Drill Rig ID: CS1000	Remarks Rotary core, triple tube.	Key: J = Joint CZ = Crushed Zone DS = Decomposed Seam sp = Spacing PI = Planar Un = Undulating St = Stepped Ro = Rough Sn = Stain Vr = Veneer Ct = Coating	Hole Depth (m): 28.6
Driller: Speight Drilling.			Hole Size (mm): 0
Logged By: HVC			Start Date: 07/12/2018
Page Depth: 10 m			End Date: 07/12/2018
			Page 4 of 4



FILL



CLAY (CL, CI or CH)



GRAVEL (GP or GW)



ORGANIC SOILS (OL or OH or Pt)



SAND (SP or SW)



COBBLES or BOULDERS



SILT (ML or MH)

CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil and Rock is classified and described in Reports of Boreholes and Test Pits using the descriptions given in NZGS 2005 Field Description of Soil and Rock. The material properties are assessed by visual/tactile methods.

PARTICLE SIZE – NZGS 2005

Major Division	Sub Division	Particle Size
BOULDERS		>200 mm
COBBLES		60 to 200 mm
GRAVEL	Coarse	20 to 60 mm
	Medium	6.0 to 20 mm
	Fine	2.0 to 6.0 mm
SAND	Coarse	0.6 to 2.0 mm
	Medium	0.2 to 0.6 mm
	Fine	0.06 to 0.2 mm
SILT		0.002 to 0.006 mm
CLAY		< 0.002 mm

MOISTURE CONDITION – NZGS 2005

Symbol Term Description

D	Dry	Sands and gravels are free flowing. Clays and silts may be brittle or friable and powdery.
M	Moist	Soils are darker than in the dry condition and may feel cool. Sands and gravels tend to cohere.
W	Wet	Soils exude free water. Sands and gravels tend to cohere.
S	Saturated	Feels cool, darkened in colour and free water is present on the sample.

CONSISTENCY AND DENSITY – NZGS 2005

Symbol	Term	Undrained Shear Strength
VS	Very Soft	< 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa
H	Hard	200 to 500 kPa

Symbol	Term	Density Index %	SPT "N" Value (blows/300 mm)	Dynamic Cone (blows/100 mm)
VL	Very Loose	< 15	< 4	< 2
L	Loose	15 to 35	4 to 10	1 to 3
MD	Medium Dense	35 to 65	10 to 30	3 to 7
D	Dense	65 to 85	30 to 50	7 to 17
VD	Very Dense	> 85	> 50	> 17

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material.

SPT "N-Values" are uncorrected.

No correlation is implied between Standard Penetration Test (SPT) and Dynamic Cone Penetrometer Test values.



DRILLING/EXCAVATION METHOD

AS*	Auger Screwing	RD	Rotary Blade or Drag Bit	NQ	Diamond Core – 47 mm
AD*	Auger Drilling	RT	Rotary Tricone bit	NMLC	Diamond Core – 52 mm
*V	V-Bit	RAB	Rotary Air Blast	HQ	Diamond Core – 63 mm
*T	TC-Bit, e.g. ADT	RC	Reverse Circulation	HMLC	Diamond Core – 63 mm
HA	Hand Auger	PT	Push Tube	BH	Tractor Mounted Backhoe
ADH	Hollow Auger	CT	Cable Tool Rig	EX	Tracked Hydraulic Excavator
DTC	Diatube Coring	NDD	Non-Destructive Digging	EE	Existing Excavation
WB	Washbore or Bailer	SON	Sonic Drilling	HAND	Excavated by Hand Methods

WATER

▼ Water level at date shown

GROUNDWATER NOT OBSERVED The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.

GROUNDWATER NOT ENCOUNTERED The borehole/test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/test pit been left open for a longer period.

SAMPLING AND TESTING

SPT	Standard Penetration Test to NZS4402 Test 6.5.1:1998
2,3 / 3,4,4,4	2,3 / 3,4,4,4 = Blows per 75 mm.
N = 15	N = Blows per 300 mm penetration following 150 mm seating
30/60 mm	Where practical refusal occurs, the blows and penetration for that interval are reported
RW	Penetration occurred under rod weight only
HW	Penetration occurred under the hammer and rod weight only
HB	Hammer double bouncing on anvil
DS	Disturbed sample
BDS	Bulk disturbed sample
G	Gas sample
W	Water sample
FP	Field permeability test over section noted
FV	Field vane shear test expressed as uncorrected shear strength s_v = peak value, s_r = residual value
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket penetrometer test expressed as instrument reading in kPa
U50	Thin walled tube sample – number indicates nominal sample diameter in millimetres
WPT	Water pressure tests
DCP	Dynamic cone penetration test
CPT	Static cone penetration test
CPTu	Static cone penetration test with pore pressure (u) measurement

CORE RECOVERY

TCR = Total Core Recovery (%)

$$= \frac{\text{Length of core recovered}}{\text{Length of core run}} \times 100$$

APPENDIX E

Borehole Photos



CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 40 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1612932 – N 5296222.6
SURFACE RL: 663 m DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 14.8 m bgl

DEPTH RANGE: 0.0 – 4.8 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 3/12/2018
CHECKED: TJM DATE: 19/12/2018



Box 1: 0.0 m to 2.13 m



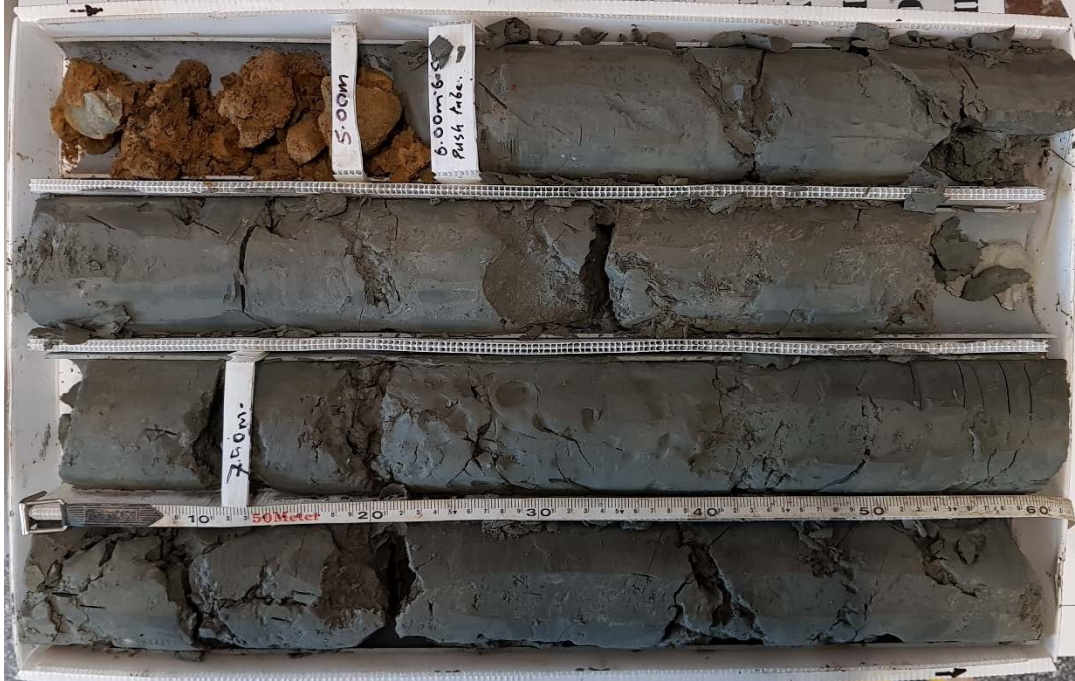
Box 2: 2.13 m to 4.8 m



CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 40 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1612932 – N 5296222.6
SURFACE RL: 663 DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 14.8 m bgl

DEPTH RANGE: 4.8 – 10.8 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 3/12/2018
CHECKED: TJM DATE: 19/12/2018



Box 3: 4.8 m to 8.5 m



Box 4: 8.5 m to 10.8 m



CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 40 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1612932 – N 5296222.6
SURFACE RL: 663 DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 14.8 m bgl

DEPTH RANGE: 10.8 – 14.8 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 3/12/2018
CHECKED: TJM DATE: 19/12/2018



Box 5: 10.8 m to 13.0 m



Box 6: 13.0 m – 14.8 m E.O.H



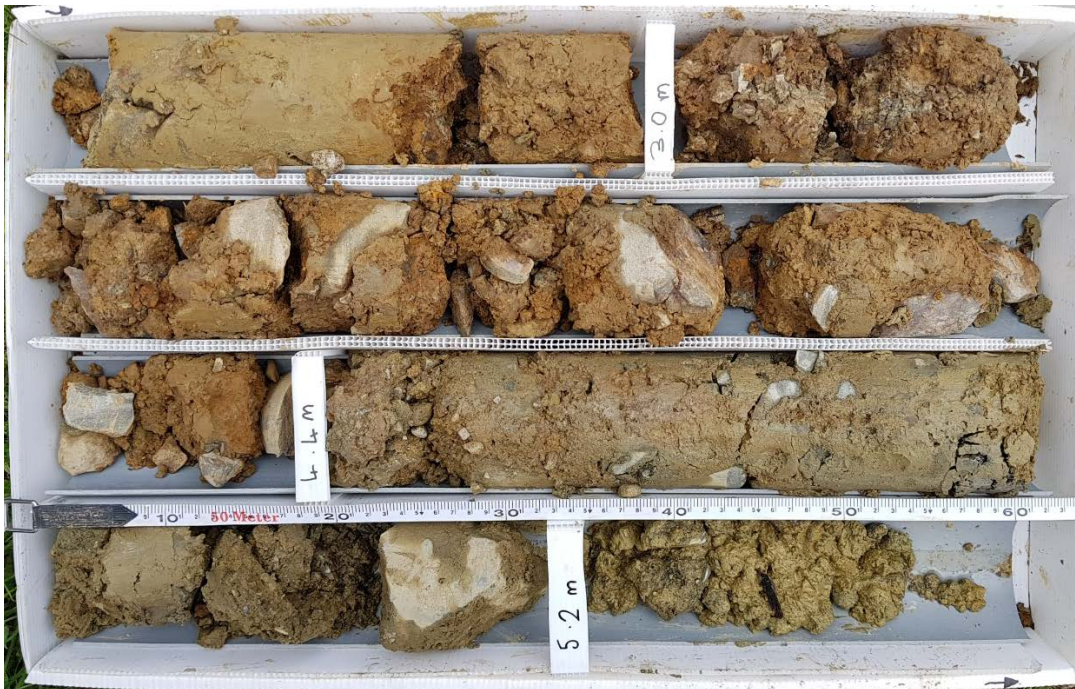
CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 87 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1612630.5 – N 5296164
SURFACE RL: 679 m DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 9.0 m bgl

DEPTH RANGE: 0.0 – 5.4 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 4/12/2018
CHECKED: TJM DATE: 19/12/2018



Box 1: 0.0 m to 2.5 m



Box 2: 2.5 m to 5.4 m



CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 87 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1612630 – N 5296164
SURFACE RL: 679 m DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 9.0 m bgl

DEPTH RANGE: 5.4 – 9.0 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 4/12/2018
CHECKED: TJM DATE: 19/12/2018



Box 3: 5.4 m to 7.65 m



Box 4: 7.65 m to 9.0 m E.O.H



CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 17 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1613297 – N 5295896.5
SURFACE RL: 597 m DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 7.5 m bgl

DEPTH RANGE: 0.0 – 4.3 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 5/12/2018
CHECKED: TJM DATE: 19/12/2018



Box 1: 0.0 m to 2.1 m



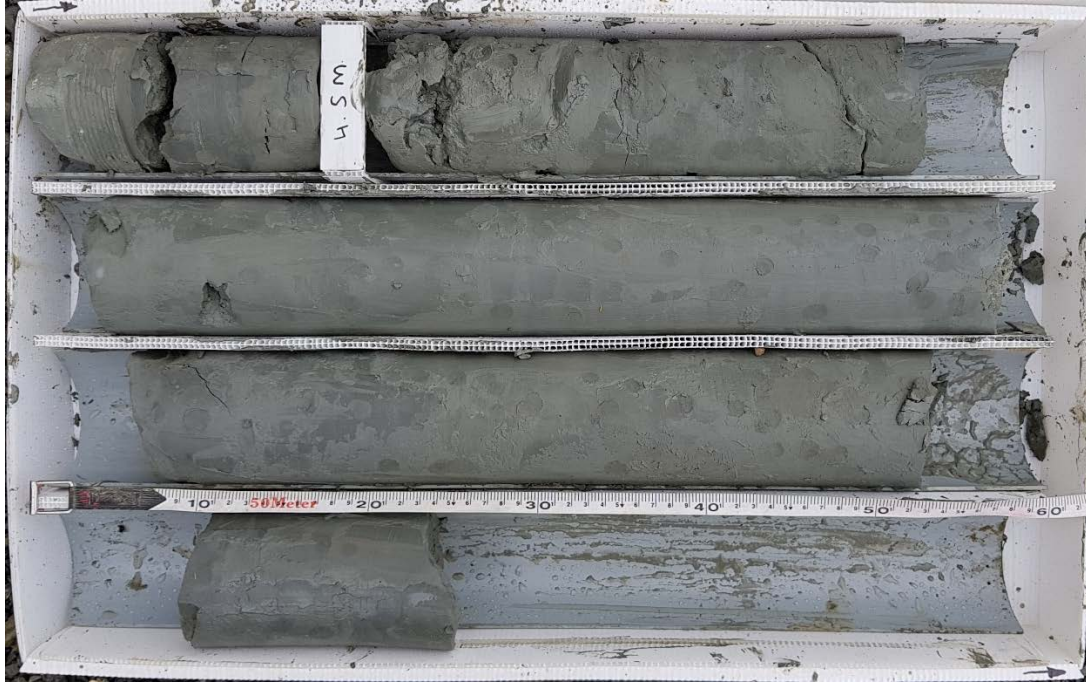
Box 2: 2.1 m to 4.3 m



CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 17 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1613297 – N 5295896.5
SURFACE RL: 597 DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 7.5 m bgl

DEPTH RANGE: 4.3 – 7.5 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 5/12/2018
CHECKED: TJM DATE: 19/12/2018



Box 3: 4.3 m to 6.0 m



Box 4: 6.0 m to 7.5 m E.O.H



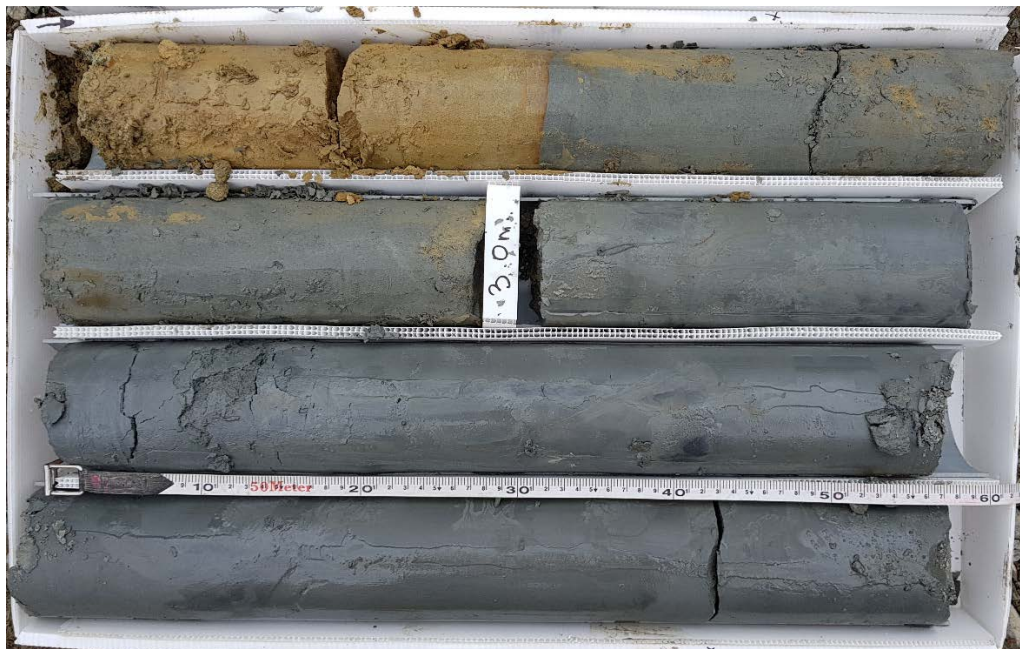
CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 40 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1613697 – N 5295341
SURFACE RL: 506 m DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 28.6 m bgl

DEPTH RANGE: 0.0 – 4.45 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 6/12/2018
CHECKED: TJM DATE: 19/12/2018



Box 1: 0.0 m to 2.3 m



Box 2: 2.3 m to 4.45 m



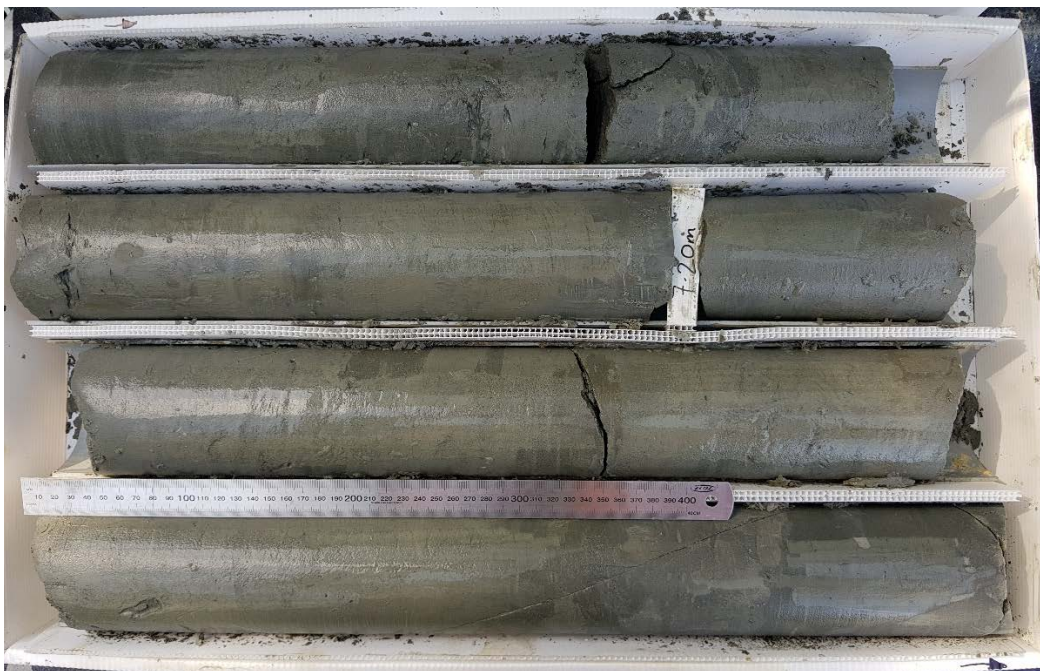
CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 40 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1613697 – N 5295341
SURFACE RL: 506 m DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 28.6 m bgl

DEPTH RANGE: 4.45 – 8.5 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 6/12/2018
CHECKED: TJM DATE: 19/12/2018



Box 3: 4.45 m to 6.3 m



Box 4: 6.3 m to 8.5 m

CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 40 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1613697 – N 5295341
SURFACE RL: 506 m DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 28.6 m bgl

DEPTH RANGE: 8.5 – 12.75 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 7/12/2018
CHECKED: TJM DATE: 19/12/2018



Box 5: 8.5 m to 10.65 m



Box 6: 10.65 m – 12.75 m



GOLDER

REPORT OF CORE PHOTOGRAPHS: BH04

CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 40 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1613697 – N 5295341
SURFACE RL: 506 m DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 28.6 m bgl

DEPTH RANGE: 12.75 m – 17.05 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 7/12/2018
CHECKED: TJM DATE: 19/12/2018



Box 7: 12.75 m to 14.9 m



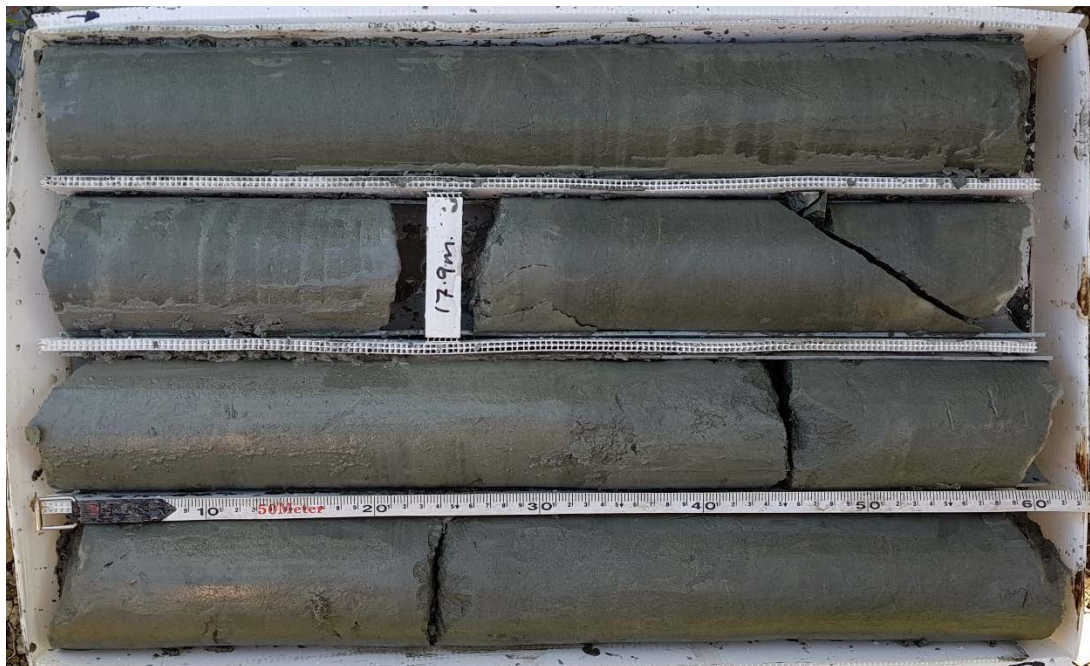
Box 8: 14.9 m – 17.05 m



CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 40 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1613697 – N 5295341
SURFACE RL: 506 m DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 28.6 m bgl

DEPTH RANGE: 17.05 – 21.4 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 7/12/2018
CHECKED: TJM DATE: 19/12/2018



Box 9: 17.05 m to 19.4 m



Box 10: 19.4 m – 21.4 m



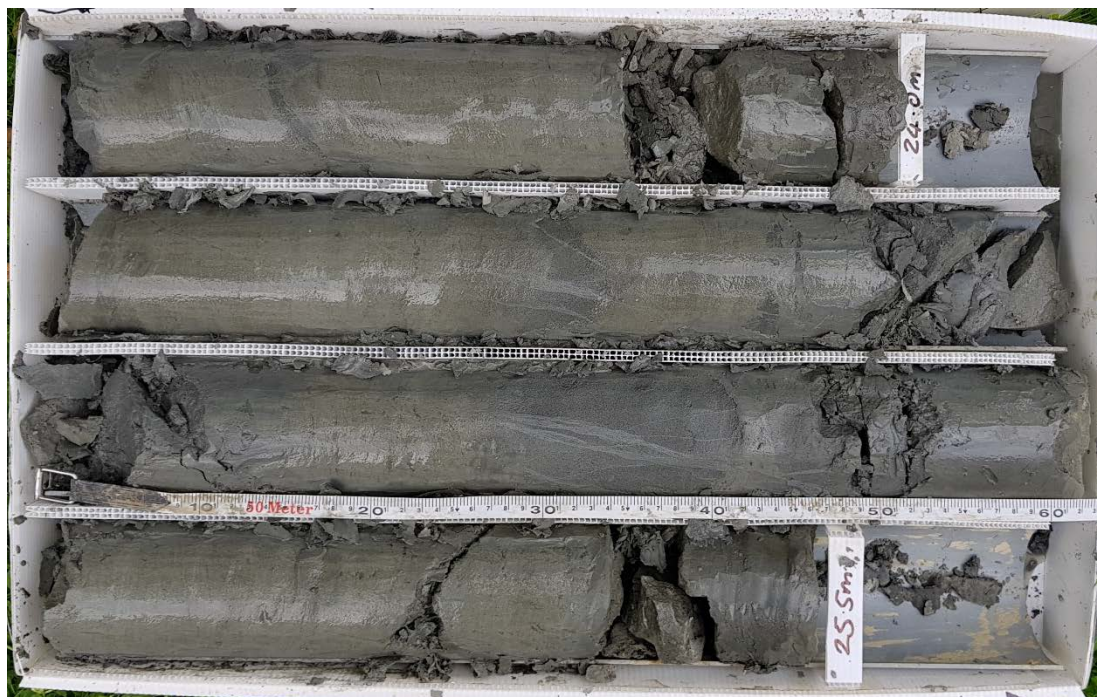
CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 40 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1613697 – N 5295341
SURFACE RL: 506 m DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 28.6 m bgl

DEPTH RANGE: 21.4 – 25.5 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 7/12/2018
CHECKED: TJM DATE: 19/12/2018



Box 11: 21.4 m to 23.55 m



Box 12: 23.55 m – 25.5 m



GOLDER

REPORT OF CORE PHOTOGRAPHS: BH04

CLIENT: Hurunui District Council
PROJECT: Mt Lyford Geological Assessment
LOCATION: Lot 40 – Mt Lyford Village, Hurunui
JOB NO: 1895571

COORDS: E 1613697 – N 5295341
SURFACE RL: 506 m DATUM: NZTM
INCLINATION: -90°
HOLE DEPTH: 28.6 m bgl

DEPTH RANGE: 25.5 – 28.6 m
DRILL RIG: CS1000
CONTRACTOR: SPEIGHT DRILING
LOGGED: HVC DATE: 7/12/2018
CHECKED: TJM DATE: 19/12/2018



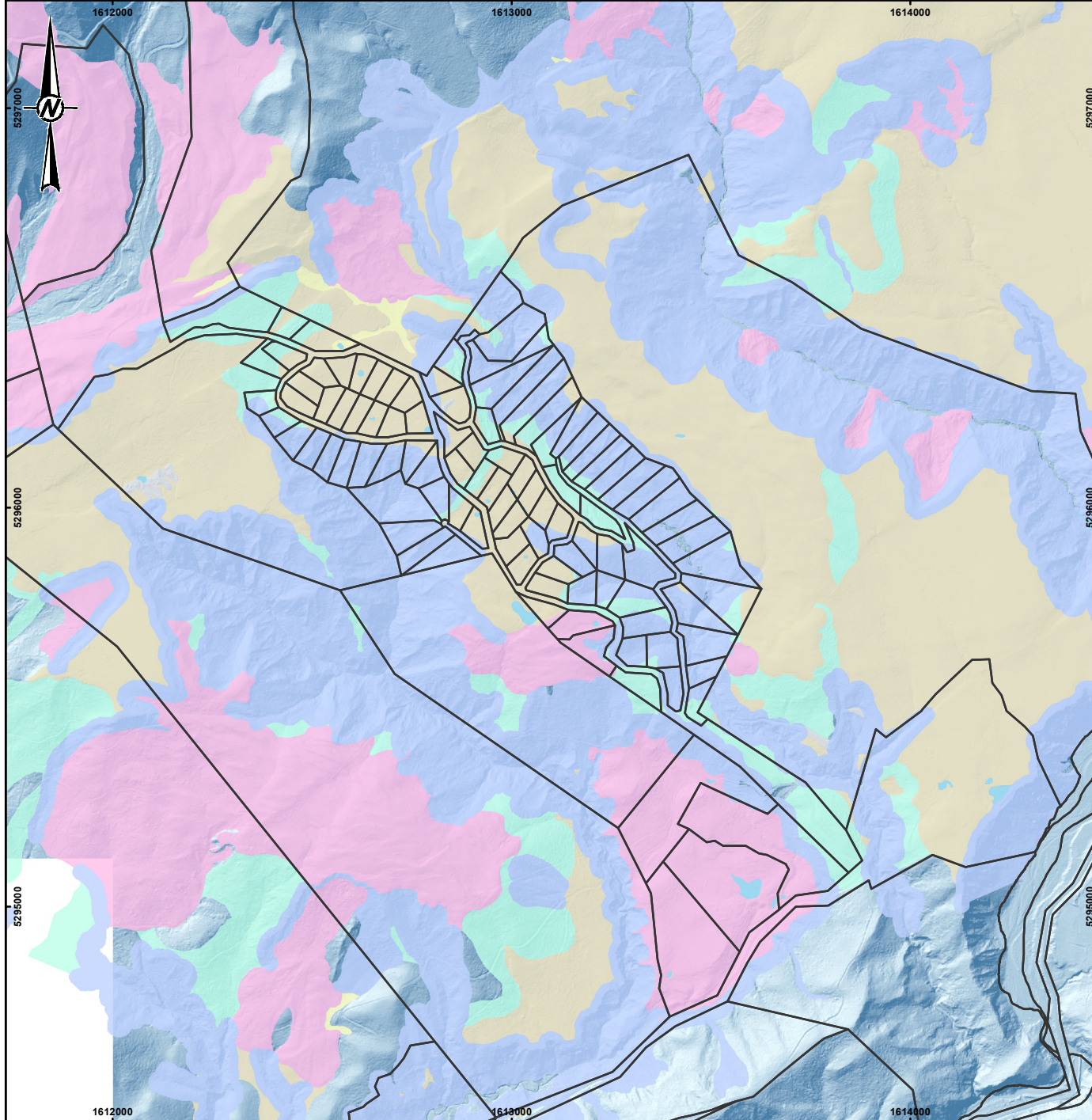
Box 13: 25.5 m to 27.6 m



Box 14: 27.6 m – 28.6 m E.O.H

APPENDIX F

Geotechnical Assessment Zones



LEGEND

- Mt Lyford Village
- Geotechnical Assessment Zones
 - Artificial
 - Desktop Study
 - Geotechnical Assessment A
 - Geotechnical Assessment B
 - Geotechnical Assessment C
 - Swamp
 - Water



NOTES

1. LIDAR Basemap: Environment Canterbury, 2016.
2. Inset map image: LINZ NZTopo Series, CC-BY-3.0-NZ.
3. Schematic only, not to be interpreted as an engineering design or construction drawing.

COPYRIGHT

Information contained in this drawing is the copyright of Golder Associates (NZ) Ltd. Unauthorised use or reproduction of this plan either wholly or in part without written permission infringes copyright. © Golder Associates (NZ) Ltd.



REFERENCE SCALE: 1:15,000 (at A4)
PROJECTION: NZGD 2000 New Zealand Transverse Mercator

CLIENT

HURUNUI DISTRICT COUNCIL

PROJECT

MT LYFORD GEOLOGICAL ASSESSMENT

TITLE

GEOTECHNICAL ASSESSMENT ZONES

CONSULTANT



YYYY-MM-DD 2018-12-20

PREPARED SAT

REVIEWED MCH

APPROVED TJM

PROJECT No.
1895571

REPORT
003

REV.
0

FIGURE
10



golder.com