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REPORT OF BOREHOLE: CRR 206

SHEET: 1 OF 9

CLIENT: Aecom Australia Pty Ltd

COORDS: 503408.54 m E 6960791.47 m N MGA94 56

DRILL RIG: FOX B40

PROJECT: Cross River Rail

SURFACE RL: 3.90 m DATUM: AHD

CONTRACTOR: Schneider Drilling Pty Ltd

LOCATION: Riverbank Park

INCLINATION: -50° DIRECTION: 235°

LOGGED: MGM DATE: 19/8/10

JOB NO: 107632034

HOLE DEPTH: 78.85 m

CHECKED: NK DATE: 18/10/10

Drilling				Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	STRUCTURE AND ADDITIONAL OBSERVATIONS
HMLC	M		0	3.90	0.00-1.30 m			SM	Gravelly Silty SAND fine to coarse grained, dark brown, angular concrete and crushed rock debris in silty sand matrix, dry, loose to medium dense (FILL)	D	Drilled H-casing to 2 m then cleaned out and switched to rock roller bit to verify bedrock contact at approx. 2 m. Retained sample from casing. After drilling completed, H-sized PVC casing installed to approximately 1.6 m for use of acoustic televiewer. Locking gatic cover installed
			1								
			2						For Continuation Refer to Sheet 2		
			3								
			4								
			5								
			6								
			7								
			8								
			9								
			10								

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GAP gINT FN. F01a
RL3



REPORT OF BOREHOLE: CRR 206

SHEET: 2 OF 9

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Riverbank Park
JOB NO: 107632034

COORDS: 503408.54 m E 6960791.47 m N MGA94 56
SURFACE RL: 3.90 m DATUM: AHD
INCLINATION: -50° DIRECTION: 235°
HOLE DEPTH: 78.85 m

DRILL RIG: FOX B40
CONTRACTOR: Schneider Drilling Pty Ltd
LOGGED: MGM DATE: 19/8/10
CHECKED: NK DATE: 18/10/10

Drilling					Field Material Description				Defect Information			
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH Is(50) MPa	DEFECT DESCRIPTION & Additional Observations		FRACTURE FREQUENCY (Defects per unit metre length)
				0								
				1								
				1.30			Continuation of Sheet 1					
				2.90			CORE LOSS					
				1.60								
				2.67			TUFF fine to coarse grained, brown grey and red with orange, along joints (BRISBANE TUFF)	MW - SW		1.83: J, 50°, Pl, Sm, Sn 1.86: J, 50°, St, Ro, Sn 1.89: J, 40°, St, Ro, Sn		
		90	35	2						2.40-2.61: FZ		
				3						2.61: J, 55°, Pl, Sm, Sn-Vr, open joint 2.67: J, 50°, Un-St, Ro, Cn, open 2.85: J, 40°, Un-St, Ro, Sn 2.95: J, 35°, Un, Ro, Sn 3.02: J, 65°, Pl, Sm, Sn-Vr 3.11: J, 40°, Pl, Sm, Sn 3.18: J, 35°, Pl-Un, Sm, Sn 3.38: J, 30°, Pl-Un, Sm, Sn 3.43: J, 50°, Pl, Sm, Sn		
				4						3.71-3.80: CS, St, Ro, angular tuff gravels in orange, fine to coarse sand matrix 4.01-4.21: J, 40°, Un, Ro, Vr 4.14-4.34: J, 45°, Pl, Sm, Sn-Vr 4.23-4.43: J, 40°, Un, Sm, Sn-Vr 4.23-4.43: J, 10°, St, Sn, closed 4.36-4.56: J, 50°, Pl, Sm, Sn-Vr, trace silty sand infill 4.60-4.80: J, 25°, Pl, Sm, Sn-Vr, trace silty sand infill 4.77-4.97: J, 50°, St, Sm, Sn-Vr, trace silty sand infill		
		95	45	5						5.14-5.35: J, 75°, Pl, Sm, Sn-Vr 5.32-5.52: J, 50°, St, Ro, Sn-Vr 5.48-5.68: J, 55°, Un, Ro, Vr, trace silty sand infill 5.54-5.60: CS, 40°, Pl, Sm, 30 mm, silty sand and fine gravel 5.67-5.87: J, 30°, Un, Sm, Vr 5.71-5.91: J, 50°, St, Sm, Sn		
				6			CORE LOSS			6.20: J, 30°, Pl, Sm, Sn-Vr, Manganese oxide staining 6.36: J, 70°, Pl-Un, Ro, Vr, open joint 6.49: J, 40°, Un, Ro, Sn 6.67: J, 30°, Pl, Sm, Sn-Vr 6.85-7.00: J, 70°, Pl, Sm, Sn, open		
		100	35	7			TUFF fine to coarse grained, brown orange and grey some red, iron and manganese oxide staining, localised silty sand or clay infilling in and along joints	SW		7.20: J, 40°, Pl, Ro, Sn 7.42: J, 20°, Pl, Sm, Cn-Sn		
				8						7.71: J, 10°, Un, Sm, Sn 7.79: J, 50°, St, Sm, Sn, open 7.82: J, 50°, St, Sm, Cn, open 8.03: J, 25°, Pl, Sm, Sn		
				9						8.25: J, 45°, St, Ro, Sn 8.33: J, 40°, Pl, Ro, Cn-Sn, open to silty sand infill		
				10						8.79: J, 35°, Pl, Sm, Sn 9.00-9.14: J, 90°, Un, Ro, Sn, open, likely continues along joint noted at 9.14-9.38 m 9.14-9.38: J, 90°, Un, Ro, Sn, open 9.46-9.52: J, 60°, Pl-St, Ro, Sn, open 9.85: J, 60°, Un, Ro, Sn-Vr		

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GAP gINT FN. F02b
RL3



REPORT OF BOREHOLE: CRR 206

SHEET: 3 OF 9

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Riverbank Park
JOB NO: 107632034

COORDS: 503408.54 m E 6960791.47 m N MGA94 56
SURFACE RL: 3.90 m DATUM: AHD
INCLINATION: -50° DIRECTION: 235°
HOLE DEPTH: 78.85 m

DRILL RIG: FOX B40
CONTRACTOR: Schneider Drilling Pty Ltd
LOGGED: MGM DATE: 19/8/10
CHECKED: NK DATE: 18/10/10

Drilling					Field Material Description				Defect Information			
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH Is(50) MPa	DEFECT DESCRIPTION & Additional Observations		FRACTURE FREQUENCY (Defects per unit metre length)
NQ3			90	25	10		TUFF fine to coarse grained, brown orange and grey some red, iron and manganese oxide staining, localised silty sand or clay infilling in and along joints	SW		9.94: J, 65°, Pl, Sm, Sn-Vr 10.11: J, 60°, Pl, Sm, Sn-Vr 10.29: J, 45°, Pl, Sm, Sn 10.58: J, 50°, Pl, Sm, Sn		
					11			MW		10.89: J, 50°, Un, Ro, Sn 11.02: IS, 55°, Pl, Sm, Sn 11.02-11.24: CZ 11.47: J, 35°, Pl, Sm, Sn-Vr 11.60: J, 30°, Pl, Sm, 2 mm, orange silty sand infill 11.66: J, 70°, Un, Sm, Sn-Vr 11.68: J, 70°, Pl, Sm, Sn-Vr 11.83: J, 30°, Pl, Sm, Cn-Vr 12.01: J, 35°, St, Ro, Vr, trace silty sand infill 12.04: J, 35°, St, Ro, Vr, trace silty sand infill 12.12-12.19: CS 12.25: J, 30°, Pl, Sm, 2 mm, open to trace silty sand infill 12.34-12.50: J, 90°, Un, Ro, Sn		
					12							
					13		CORE LOSS					
					14		TUFF fine to coarse grained, orange grey and brown, locally crusehd zones, trace silty sand infilling along joints	MW - SW		12.90: J, 40°, Pl, Ro, Sn 13.10: J, 45°, St, Ro, Ct 13.22: J, 25°, Pl-Un, Sm, Sn 13.40-13.44: CS, 50°, Pl, Sm, Cn-Ct, silty sand and crushed rock, bottom of defect 40 degree dip 13.64: J, 20°, Pl, Sm, Sn-Ct 13.70: J, 10°, Pl, Sm, Sn 13.72: J, 10°, Pl, Sm, 4 mm, silty sand infill 13.73-13.85: CS, 10°, Pl, Sm, Sn, crushed gravel, bottom of defect 70 degree dip 13.87: J, 60°, Pl, Sm, Sn 13.90: J, 30°, Un, Sm, Sn, 30 degree then 60 degree dip 13.95: J, 40°, Pl, Sm, Sn 14.04: J, Un, Sm, Sn 14.40-14.49: J, Pl, Sm, Sn 14.70: J, 25°, Pl, Sm, Sn 14.92: J, 65°, Pl, Ro, Sn 15.20: J, 60°, Pl, Sm, Sn 15.34: J, 60°, Pl, Sm, Sn 15.54-15.97: J, 70°, Un, Ro, Cn, 70 degrees at top then vertical, then 60 degree dip at bottom		
			100	45	15							
					16							
			85	0	17					16.85: J, 50°, Pl, Sm, Sn 17.07: J, 50°, Pl, Sm, Sn 17.16: J, 60°, Pl, Sm, Sn 17.33: J, 50°, Pl, Ro, Sn		
					18		TUFF fine to coarse grained, orange brown and grey, localised crushed zones and trace silty sand or clay infill along joints	MW - SW		17.77-17.89: J, 80°, Pl, Ro, 4 mm 17.89: J, 50°, Pl, Sm, Sn 18.12-18.18: J, 65°, Pl-Un, Ro, Sn 18.62-18.73: J, 80°, Pl, Ro, Sn 18.74: J, 45°, St, Sm, Sn 18.96: J, 30°, Pl, Sm, Sn		
			100	10	19			SW		19.28: J, 25°, Pl, Sm, Vr, trace silty sand infill 19.32: J, 60°, Pl, Sm, Sn 19.66: J, 60°, Pl, Sm, Sn-Vr 19.80-20.00: J, 70°, Un, Sm, Sn, dip up to 90 degrees, broken section		
NMLC			80	25	19.39 -10.95		CORE LOSS					
					19.66 -11.16							

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GAP gINT FN. F02b
RL3



REPORT OF BOREHOLE: CRR 206

SHEET: 4 OF 9

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Riverbank Park
JOB NO: 107632034

COORDS: 503408.54 m E 6960791.47 m N MGA94 56
SURFACE RL: 3.90 m DATUM: AHD
INCLINATION: -50° DIRECTION: 235°
HOLE DEPTH: 78.85 m

DRILL RIG: FOX B40
CONTRACTOR: Schneider Drilling Pty Ltd
LOGGED: MGM DATE: 19/8/10
CHECKED: NK DATE: 18/10/10

Drilling					Field Material Description				Defect Information			
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH Is(50) MPa	DEFECT DESCRIPTION & Additional Observations		FRACTURE FREQUENCY (Defects per unit metre length)
NMLC			80 25	20			TUFF fine to coarse grained, orange and green grey some red	SW		20.15: J, 50°, Un, Ro, Cn 20.30: J, 35°, Pl, Ro, Sn		
			100 25	21						20.57: J, 35°, Pl, Sm, Sn 20.64: J, 10°, Pl, Sm, Sn 20.72: J, 20°, Pl, Sm, Sn 20.72: J, 65°, Pl, Sm, Sn-Ct 20.85: J, 65°, St, Ro, 4 mm, silty sand infill 20.92: J, 60°, Pl, Sm, Sn 20.93: J, 65°, Pl, Sm, Sn 21.00: J, 30°, Pl, Sm, Sn 21.06: J, 40°, Pl, Sm, Sn, open <1mm 21.30: J, 20°, Pl, Sm, Sn 21.31: J, 20°, Pl, Sm, Sn 21.41: J, 40°, Pl, Sm, Sn 21.63: J, 30°, Pl, Sm, Sn 21.70: J, 10°, Pl, Ro, Sn, 2 mm, sandy silt infill 21.82: J, 10°, Pl-Un, Sm, Sn, Manganese oxide 21.88: J, 30°, Un, Ro, Sn, Manganese oxide 22.00: J, 50°, Pl, Sm, Sn 22.17-22.24: J, 35°, Pl, Sm, Sn, 3 joint set 22.34: J, Un, Sm, Sn-Vr 22.36: J, 50°, Pl, Sm, Sn-Vr 22.47: J, 40°, Pl, Sm, Sn 22.66: J, 30°, Pl, Sm, Sn, core broken up to previous joint, likely mechanical breakage 22.81: J, 30°, Pl, Sm, Sn 22.82: J, 30°, Pl, Sm, Sn 22.86: J, 40°, Pl, Sm, Sn 23.05-23.23: SZ, 50°, Pl, Ro, small, crushed angular rock fragments along defect, then dark orange, locally altered to clay, 35 degree dip at bottom, not as well defined 23.23-23.67: CZ 23.82-23.83: SS, soft, plastic clay in contact with rock below, core loss from 23.05-23.82 above, possible shear zone 24.01: J, 45°, St, Ro, Sn 24.06: J, 35°, Pl, Ro, Sn 24.16: J, Pl, Sm, Sn-Vr 24.19: J, Pl, Sm, Sn-Vr 24.24-24.42: CZ, 50°, Pl, Sm, Sn-Vr 24.42: J, 35°, Pl, Sm, Sn 24.53: J, 35°, Pl, Sm, Sn 24.64: J, 35°, Pl, Sm, Sn 24.77-24.88: CS, 35°, Pl, Sm, Sn 24.88: J, 70°, Pl, Sm, Sn 24.91: J, 45°, Pl, Ro, Sn, 3 mm, silty sand infill 24.97: J, 50°, Pl, Ro, Sn 25.29: J, 45°, Pl, Sm, Sn 25.32: J, 45°, Pl, Sm, Sn 25.39-25.42: CS, 25°, Pl, Sm, Sn, crushed rock 25.60: J, 40°, Pl, Sm, Sn 25.64: J, 40°, Pl-Un, Sm, Sn-Vr, fine silty sand infill 25.74: J, 20°, Pl, Sm, Sn-Vr 25.83: J, 10°, Un, Sm, Sn 25.85: J, 15°, Pl, Sm, Sn 26.03: J, 40°, Pl-Un, Sm, Sn 26.12: J, Pl-Un, Sm, Sn 26.18: J, 15°, Pl, Ro, Sn 26.28: J, 35°, Pl, Sm, Sn-Vr, silty fine sand infill 26.28-26.58: CZ, some natural joints, some mechanical, too broken to measure dip 26.58-26.79: CZ, 45°, Pl, Sm, Sn, dip is along bottom of zone, crushed rock and coarse sand above 26.88: J, 40°, Pl, Sm, Sn 26.93: J, 35°, Pl-St, Sm, Sn 27.23-27.38: CZ 27.38-27.44: CS, 65°, Pl, Sm, Sn, dip is along bottom of defect 27.54-27.69: J, 90°, Un, Ro, Sn 27.60: J, 60°, Pl, Sm, Sn 27.63-28.79: J, 85°, Pl-Un, Ro, 3 mm, locally open or filled with up to 3 mm of silty fine sand, dip is 85 degrees to vertical, 10 mm wide dark orange band of staining parallels joint 27.77: J, 65°, Pl-Un, Ro, Sn 28.03: J, 45°, Pl, Sm, Sn 28.09: 45°, Pl, Sm, Sn 28.24: J, 45°, Pl, Sm, Sn 28.39: J, 45°, Pl, Sm, Sn 28.94-29.21: J, 90°, St, Ro, crushed and weathered, orange sandy silty infill 29.26: J, 35°, Pl, Sm, Sn		
			90 20	22								
				23				MW - SW				
								SW				
			100 0	24	23.67 23.82 -14.35		CORE LOSS					
							TUFF fine to coarse grained, orange and dark green grey, trace silty sand infilling along joints	SW				
			100 30	25				SW - FR				
				26								
			85 0	27	27.00 -16.78 27.23 -16.96		CORE LOSS					
							TUFF fine to coarse grained, dark green grey occasional orange, along joints	SW - FR				
			100 0	28								
				29				FR				
			100 70	30								

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GAP gINT FN. F02b
RL3



REPORT OF BOREHOLE: CRR 206

SHEET: 5 OF 9

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Riverbank Park
JOB NO: 107632034

COORDS: 503408.54 m E 6960791.47 m N MGA94 56
SURFACE RL: 3.90 m DATUM: AHD
INCLINATION: -50° DIRECTION: 235°
HOLE DEPTH: 78.85 m

DRILL RIG: FOX B40
CONTRACTOR: Schneider Drilling Pty Ltd
LOGGED: MGM DATE: 19/8/10
CHECKED: NK DATE: 18/10/10

Drilling					Field Material Description				Defect Information			
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH Is(50) MPa	DEFECT DESCRIPTION & Additional Observations		FRACTURE FREQUENCY (Defects per unit metre length)
								EL 0.03 VL 0.1 J 0.1 M 0.3 H 1 VH 3 EH				mm
NMLC			100	70	30		TUFF fine to coarse grained, dark green grey occasional orange, along joints	FR		30.15-30.22: J, Pl, Sm, Vr		
					31					30.85-31.04: J, 90°, St, Ro, Sn, closed then open at bottom end of defect, <1mm		
					31.65 -20.35					31.34: J, 40°, St, Ro, Sn		
					31.94 -20.57		TUFF fine to coarse grained, green grey, comprised of approximately 20-30 mm thick tuff beds interbedded with soft, grey, medium plasticity clay	FR				
					32		TUFF fine to coarse grained, green grey to dark grey with occasional, irregular shaped voids up to 5mm in size					
			100	75	33					33.00-33.17: J, 90°, St, Ro, Cn, open		
					33.42							
					33.65 -21.88		CH, CLAY, medium to high plasticity, trace angular tuff clasts <2mm in size, soft, wet	FR				
					34		TUFFACEOUS SANDSTONE fine to coarse grained, green grey to black clastic interbeds and occasional black claystone			33.80: B, 10°, Pl, Ro 33.81: B, 40°, Un, Ro 33.88: J, 35°, Un, Ro, Vr 34.16: J, 50°, Pl, Sm, Vr 34.34: J, 40°, Pl, Sm, Cn		
			100	75	35							
NO3			100	90	35		MUDSTONE fine grained, green grey to black, laminated to bedded	FR				
					35.13 -23.01		CORE LOSS					
			60	30	35.42 -23.23		MUDSTONE fine grained, black and green grey, laminated to bedded, dip of beds typically in range of 30 to 40 degrees, jointing most commonly observed along bedding plane	FR				
					36		CONGLOMERATE fine to coarse grained, green grey, subangular to subrounded clasts of varying composition in coarse sandstone matrix	SW				
					36.05 -23.72					36.38: B, 20°, Pl, Sm		
					36.28 -23.89		SANDSTONE fine to medium grained, green grey to black, sandstone interlaminated to bedded with siltstone, trace coarse sand interbeds	FR		36.62: B, 30°, Pl, Sm		
			100	70	37					37.08: J, 30°, Pl, Sm 37.20: C, 30°, Un, Ro		
					37.20 -24.60		CONGLOMERATE fine to coarse grained, grey, subangular to subrounded gravel to cobble sized clasts in tight coarse grained sandstone matrix, largely clast supported, no obvious bedding			37.68: J, 30°, St, Ro, Cn		
					38							
					38.40 -25.52		approximate start of cobbles that have weathered to clay			38.92: B, 40°, Pl, Sm, Vr, trace clay infilling		
NMLC			100	80	39							
					40			SW - FR				

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GAP gINT FN. F02b
RL3



REPORT OF BOREHOLE: CRR 206

SHEET: 6 OF 9

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Riverbank Park
JOB NO: 107632034

COORDS: 503408.54 m E 6960791.47 m N MGA94 56
SURFACE RL: 3.90 m DATUM: AHD
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DRILL RIG: FOX B40
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LOGGED: MGM DATE: 19/8/10
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Drilling					Field Material Description				Defect Information			
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH Is(50) MPa	DEFECT DESCRIPTION & Additional Observations		FRACTURE FREQUENCY (Defects per unit metre length)
								EL 0.03 VL 0.1 J 0.1 M 0.3 H 1 VH 10 E				mm/mm/m
NMLC			100	95	40		CONGLOMERATE fine to coarse grained, grey, subangular to subrounded gravel to cobble sized clasts in tight coarse grained sandstone matrix, largely clast supported, no obvious bedding	SW - FR		40.00-40.17: J, 75°, St, Ro, Cn, dip 75 degrees to vertical, open, material on half of defect washed out		
					41							
			100	80	42							
					42.57 -28.71		TUFFACEOUS SILTSTONE fine grained, green, interlaminated with fine grained sandstone, possible tuffaceous zone, undulatory contact with overlying conglomerate	FR		42.58: C, 35°, Pl, Sm, Cn, Breccia/Siltstone		
					43.00							
			65	0	-29.11		CORE LOSS	FR		43.18: B, 50°, Pl, Sm, Cn		
					-29.15		SILTSTONE fine grained, green, interlaminated with fine grained sandstone, possibly tuffaceous			43.68: B, 40°, Pl, Sm, Cn		
			100	90	43.56		trace quartz veins to 43.56 m			44.00: C, 35°, Pl, Sm, Cn		
					-29.47		siltstone locally interlaminated with dark grey to black mudstone, trace clay veneer infill, can break easily with fingers					
					43.76							
NO3					-29.62		SANDSTONE fine grained, green, sandstone interlaminated with siltstone, predominantly green, local green grey lamina, gradational contact with overlying mudstone/siltstone, trace coarse grained sand,	SW				
			90	75	44.08 -29.87		CONGLOMERATE coarse grained, grey and green grey, subangular to subrounded clasts of varying composition in coarse sandstone matrix, trace coal lamina					
					44.80 -30.42		approximate start of matrix becoming more weathered, locally altered to clay, some pockets of soft clay that can be readily removed with fingernail					
					45.08 -30.63		contains interbeds/laminae of fine sand and coarse sand and coal?, undulatory bedding					
					45.58 -31.02		CORE LOSS	SW				
					45.80 -31.18		CONGLOMERATE coarse grained, grey to green grey, subangular to subrounded gravel to cobble sized clasts, largely clast supported with little coarse sand matrix, localised clasts weathered to clay					
					47.74 -32.67		SANDSTONE fine to coarse grained, grey to green, coarse sand to approximately 47.8 m then fine to coarse sand interlaminated with trace siltstone and coal lenses up to 5mm thick			47.87-47.94: B, 50°, Pl, 5 mm, coal lens?		
			100	95	48.10 -32.95		1-2 mm thick coal lenses dipping at approx. 30 degrees, continue to 48.56m			48.11-48.13: B, 35°, Pl, Sm, sandstone and coal? interbed. Coal up to 2 mm thick, parallel to bedding typically <1 to 2mm thick		
					48.56 -33.30		CONGLOMERATE coarse grained, grey, subangular to subrounded clasts of varying composition	SW - FR		48.56: C, 30°, Un		
					48.86 -33.53		MUDSTONE fine grained, dark grey to black, interlaminated mudstone/siltstone with trace fine to coarse sand interbeds, trace veins, predominant 30 degree dip			48.86: C, 20°, Un		
NMLC			100	90	49.39 -33.93					49.27: J, 50°, Pl, Sl, Cn-Vr		
										49.40: B, 35°, Pl, Sm, 4 mm, coal interbed		
					50							

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GAP gINT FN. F02b
RL3

GAP 8.03 LIB GLE Log GAP CORED BOREHOLE 107632034_ACO.GPJ <<DrawingFile>> 29/11/2010 13:52 8.2.007



REPORT OF BOREHOLE: CRR 206

SHEET: 7 OF 9

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Riverbank Park
JOB NO: 107632034

COORDS: 503408.54 m E 6960791.47 m N MGA94 56
SURFACE RL: 3.90 m DATUM: AHD
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HOLE DEPTH: 78.85 m

DRILL RIG: FOX B40
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CHECKED: NK DATE: 18/10/10

Drilling					Field Material Description				Defect Information			
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $I_{s(50)}$ MPa	DEFECT DESCRIPTION & Additional Observations		FRACTURE FREQUENCY (Defects per unit metre length)
								EL 0.03 VL 0.01 J 0.1 M 0.3 H 1 VH 3 EH 10				50 51 52 53 54 55 56 57 58 59 60
NMLC			100	90	50		CONGLOMERATE fine to coarse grained, green grey with brown beds, subangular to subrounded gravel, interbedded with approx. 4-16 cm thick fine to coarse grained sandstone, bedding consistently in range of 20 to 40 degrees	SW - FR		50.63: B, 30°, Pl, Sm, Vr 50.69: B, 30°, Pl, Sm, Vr		
					51					51.65: B, 30°, Un, Ro, Cn, possible mechanical		
					52					52.29-52.35: CS, crushed angular gravel in soft clay matrix		
					53							
			100	100	53.11 -36.78		greyish brown mudstone/claystone interbed or large cobble					
					54							
					55					54.75: B, 25°, Pl, Sm, Vr		
					55.00 -38.23		localised grey brown claystone clasts, bedding not as apparent, but typically steeper (approx. 55 degrees, undulatory where observed)					
			100	100	56							
					57							
					58			FR		57.91: B, 45°, Un		
			100	95	59							
					60							

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GAP gINT FN. F02b
RL3



REPORT OF BOREHOLE: CRR 206

SHEET: 8 OF 9

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Riverbank Park
JOB NO: 107632034

COORDS: 503408.54 m E 6960791.47 m N MGA94 56
SURFACE RL: 3.90 m DATUM: AHD
INCLINATION: -50° DIRECTION: 235°
HOLE DEPTH: 78.85 m

DRILL RIG: FOX B40
CONTRACTOR: Schneider Drilling Pty Ltd
LOGGED: MGM DATE: 19/8/10
CHECKED: NK DATE: 18/10/10

Drilling					Field Material Description				Defect Information			
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH Is(50) MPa	DEFECT DESCRIPTION & Additional Observations		FRACTURE FREQUENCY (Defects per unit metre length)
				60			CONGLOMERATE fine to coarse grained, green grey with brown beds, subangular to subrounded gravel, interbedded with approx. 4-16 cm thick fine to coarse grained sandstone, bedding consistently in range of 20 to 40 degrees	FR		59.92-60.07: J, 45°, St, Ro, Vr, crushed along previously infilled, healed joint		
			100 90	61								
				62								
				63								
			100 100	63.68 -44.88								
				64	64.00 -45.13		MUDSTONE fine grained, grey brown to black, mudstone with grey fine to medium grained sandstone lamina and interbeds, bedding typically dipping at approx. 25 degrees bedding becomes slightly steeper with bedding dip typically 40 degrees			64.02: B, 30°, Pl, Sm, Cn 64.18: B, 40°, Pl, Sm, Vr 64.47: B, 40°, Pl, Ro, Vr, broken 64.87: B, 40°, Pl, Sm, Vr		
				65								
			100 100	66								
				67								
				68						67.40: J, 30°, Pl, Sm, Cn, possible mechanical break		
			100 95	69						68.61: J, 40°, Pl, Sm, 5 mm, along quartz band, parallel to bedding		
				70						69.46: B, 40°, Pl, Sm, Vr 69.82: J, 30°, Pl, Sm, Cn		

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F02b
RL3



REPORT OF BOREHOLE: CRR 206

SHEET: 9 OF 9

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Riverbank Park
JOB NO: 107632034

COORDS: 503408.54 m E 6960791.47 m N MGA94 56
SURFACE RL: 3.90 m DATUM: AHD
INCLINATION: -50° DIRECTION: 235°
HOLE DEPTH: 78.85 m

DRILL RIG: FOX B40
CONTRACTOR: Schneider Drilling Pty Ltd
LOGGED: MGM DATE: 19/8/10
CHECKED: NK DATE: 18/10/10

Drilling						Field Material Description				Defect Information			
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH Is(50) MPa	DEFECT DESCRIPTION & Additional Observations		FRACTURE FREQUENCY (Defects per unit metre length)	
				70			MUDSTONE fine grained, grey brown to black, mudstone with grey fine to medium grained sandstone lamina and interbeds, bedding typically dipping at approx. 25 degrees	FR		70.09: B, 30°, Pl, Sm, Cn			
				71						70.59: J, 30°, Pl, Sm, Cn, dip opposite bedding			
		100	100	72									
				72.79	-51.86								
				73			still predominantly mudstone but contains sandstone interbeds up to 9 mm but typically laminated			72.74: J, 30°, Pl, Sm, Vr, black clay veneer, dip parallel to bedding 72.94: B, 30°, Pl, Sm, Cn, 5mm thick quartz and sandstone interbed 73.04-73.22: J, 80°, Pl, Sm, Vr, 1mm thick quartz			
				74						73.54: J, 50°, Pl, Sm, Cn, dip opposite bedding			
		100	85	75						74.50: B, 35°, Pl, Sm, Cn			
				76						75.14: B, 35°, Pl, Sm, quartz band 75.41: J, 35°, Pl, Sm, Cn			
				76.22	-54.49								
				77			20mm thick grey sand lens, appears to be minor increase in sand content, dip in range of 30 to 40 degrees			76.38: J, 30°, Pl, Sm, 4 mm, silty clay infill to open, parallel to bedding			
				77.02: J, 30°, Pl, Sm, Vr, soft grey clay infill									
		100	95	78						77.69: J, 50°, Pl, Sm, Vr			
				77.54	-55.80		SANDSTONE fine to coarse grained, dark grey						
				77.83	-55.72		coarse clastic sandstone interbed						
				78			MUDSTONE fine grained, black with grey, interlaminated sandstone and mudstone						
				78.15	-55.97		SANDSTONE fine grained, grey green to pale green, sandstone with green siltstone lamina, trace black lamina, bedding typically 30 degrees						
				78.85	-56.50		END OF BOREHOLE @ 78.85 m						
				79									
				80									

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GAP gINT FN. F02b
RL3



REPORT OF CORE PHOTOGRAPHS: CRR 206

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Kangaroo Point
JOB NO: 107632034

COORDS: 56J 0503408m E 6960791m N
SURFACE RL: 3.90 DATUM: AHD
INCLINATION: -50° DIRECTION: 235°
HOLE DEPTH: 78.85m

DEPTH RANGE: 1.0-19.0m
DRILL RIG: Fox B40
DRILLER: Schneider Drilling Pty Ltd
LOGGED: MGM DATE: 19/08/10
CHECKED: NK DATE: 4/10/10



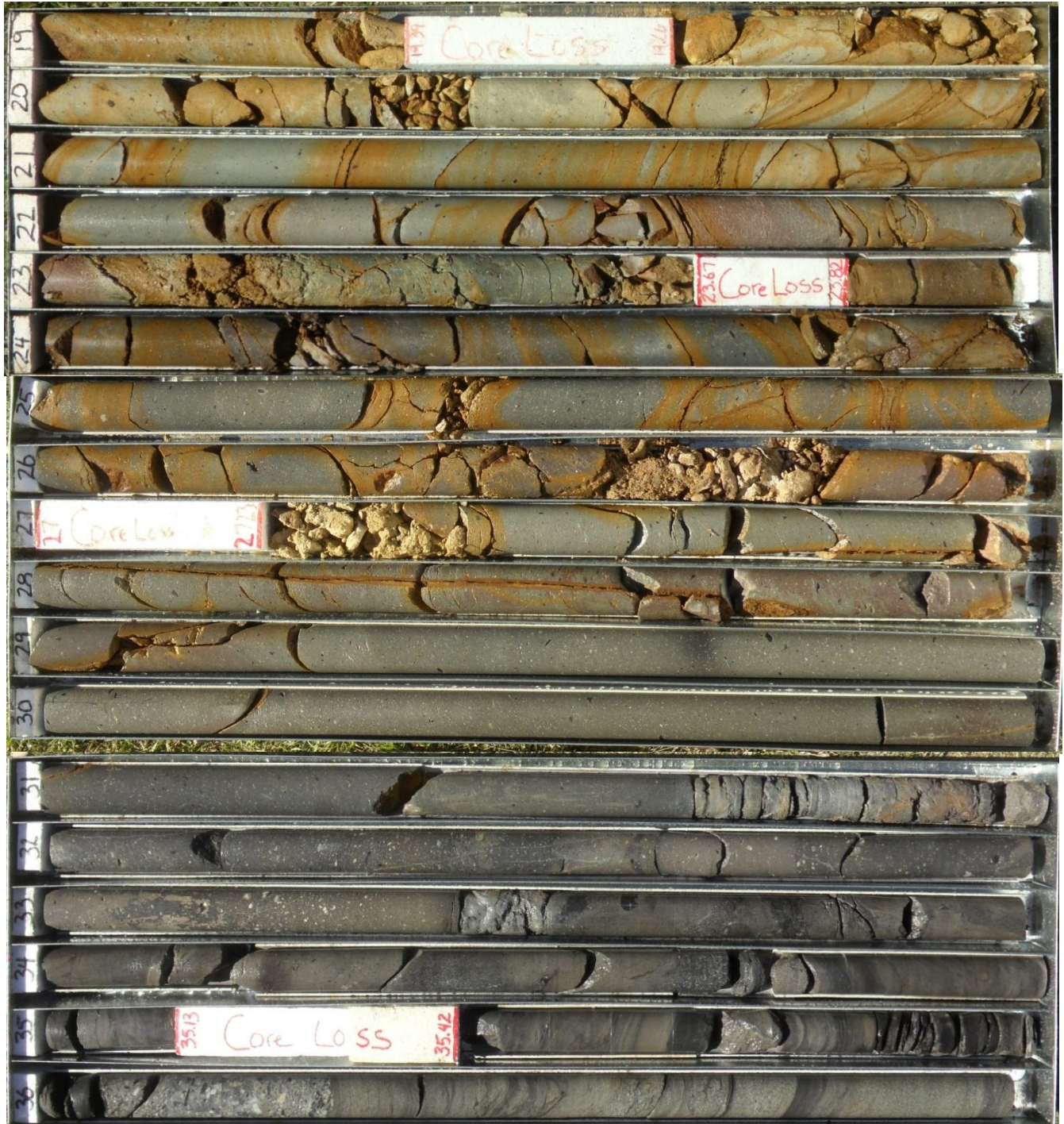


REPORT OF CORE PHOTOGRAPHS: CRR 206

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Kangaroo Point
JOB NO: 107632034

COORDS: 56J 0503408 m E 6960791 m N
SURFACE RL: 3.90 DATUM: AHD
INCLINATION: -50° DIRECTION: 235°
HOLE DEPTH: 78.85m

DEPTH RANGE: 19.0-37.0m
DRILL RIG: Fox B40
DRILLER: Schneider Drilling Pty Ltd
LOGGED: MGM DATE: 19/08/10
CHECKED: NK DATE: 4/10/10



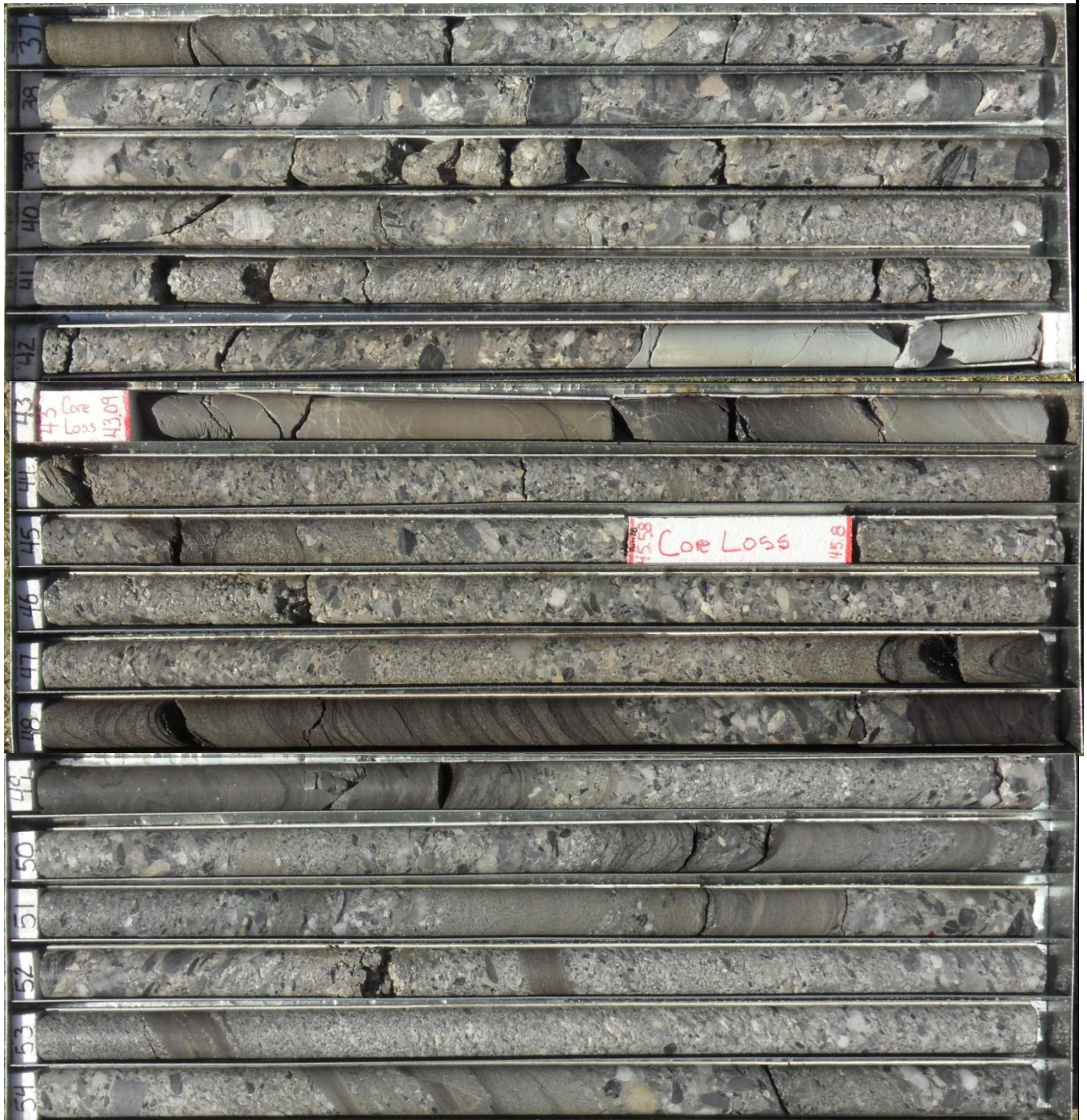


REPORT OF CORE PHOTOGRAPHS: CRR 206

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Kangaroo Point
JOB NO: 107632034

COORDS: 56J 0503408 m E 6960791 m N
SURFACE RL: 3.90 DATUM: AHD
INCLINATION: -50° DIRECTION: 235°
HOLE DEPTH: 78.85m

DEPTH RANGE: 37.0-55.0m
DRILL RIG: Fox B40
DRILLER: Schneider Drilling Pty Ltd
LOGGED: MGM DATE: 19/08/10
CHECKED: NK DATE: 4/10/10





REPORT OF CORE PHOTOGRAPHS: CRR 206

CLIENT: Aecom Australia Pty Ltd
PROJECT: Cross River Rail
LOCATION: Kangaroo Point
JOB NO: 107632034

COORDS: 56J 0503408 m E 6960791 m N
SURFACE RL: 3.90 DATUM: AHD
INCLINATION: -50° DIRECTION: 235°
HOLE DEPTH: 78.85m

DEPTH RANGE: 55.0-73.0m
DRILL RIG: Fox B40
DRILLER: Schneider Drilling Pty Ltd
LOGGED: MGM DATE: 19/08/10
CHECKED: NK DATE: 4/10/10





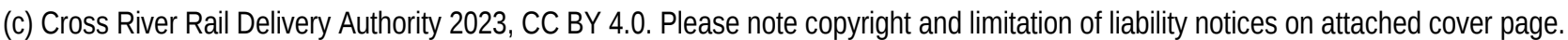
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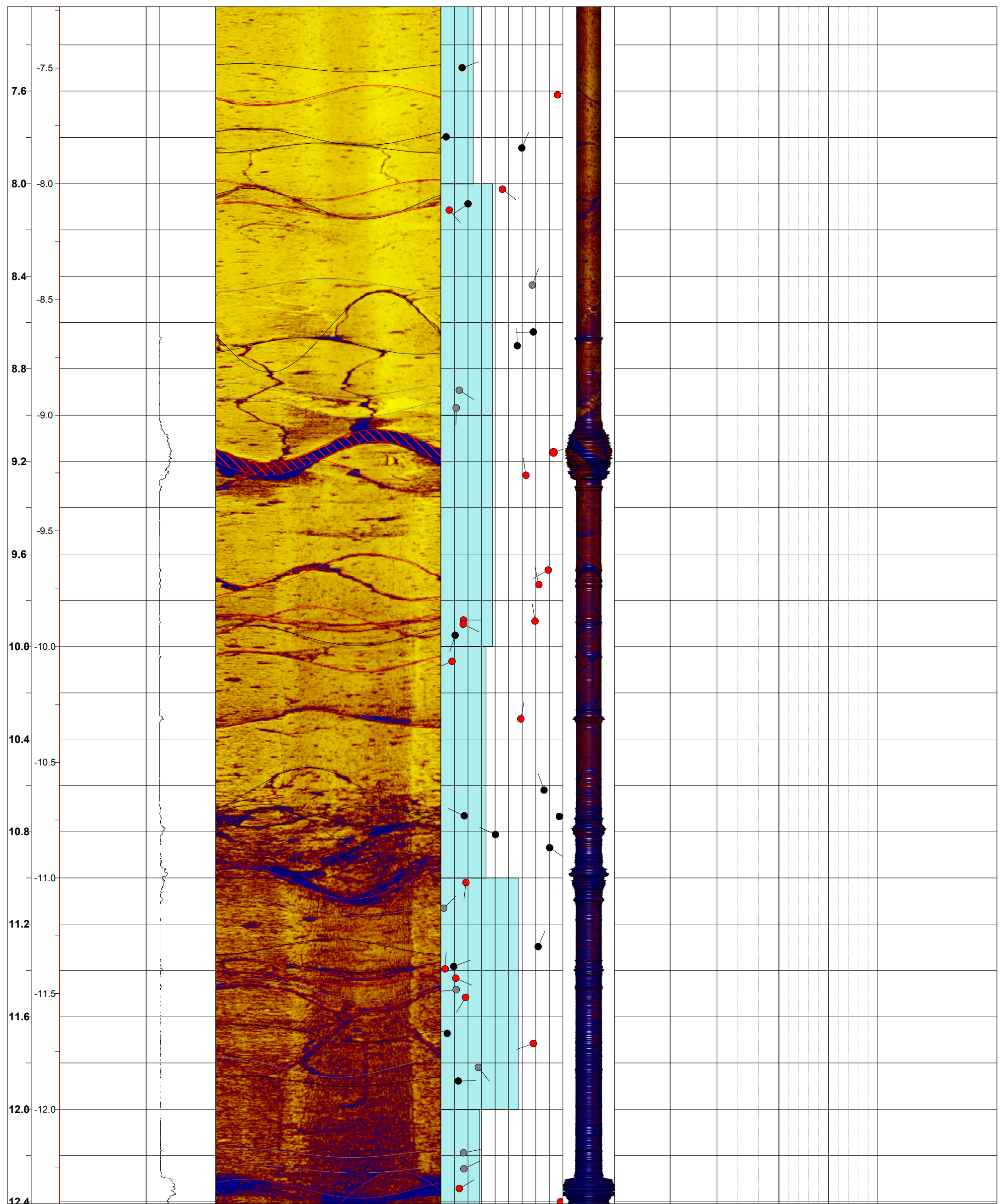
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PROJECT: Cross River Rail
LOCATION: Kangaroo Point
JOB NO: 107632034

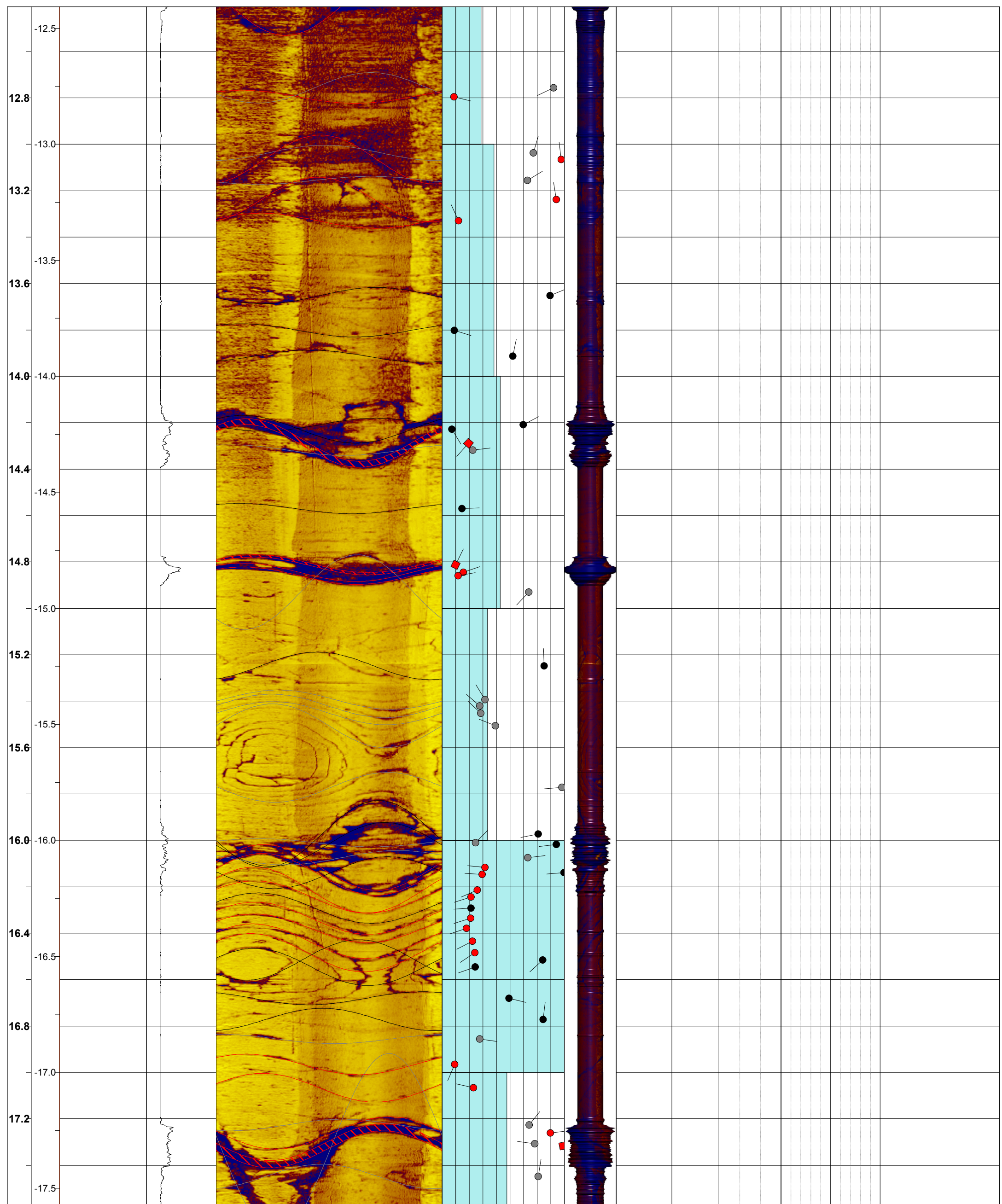
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SURFACE RL: 3.90 DATUM: AHD
INCLINATION: -50° DIRECTION: 235°
HOLE DEPTH: 78.85m

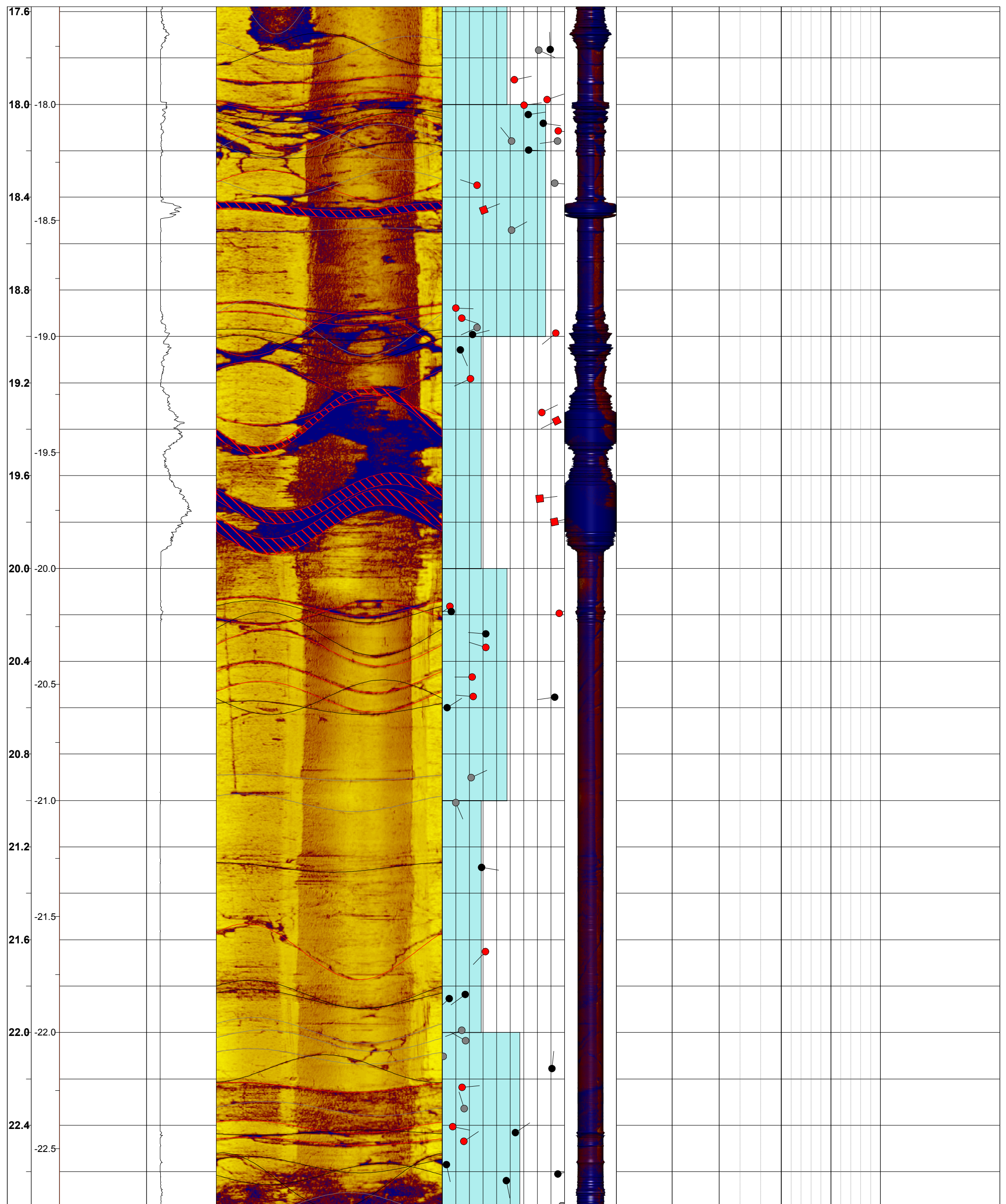
DEPTH RANGE: 73.0-78.85m
DRILL RIG: Fox B40
DRILLER: Schneider Drilling Pty Ltd
LOGGED: MGM DATE: 19/08/10
CHECKED: NK DATE: 4/10/10

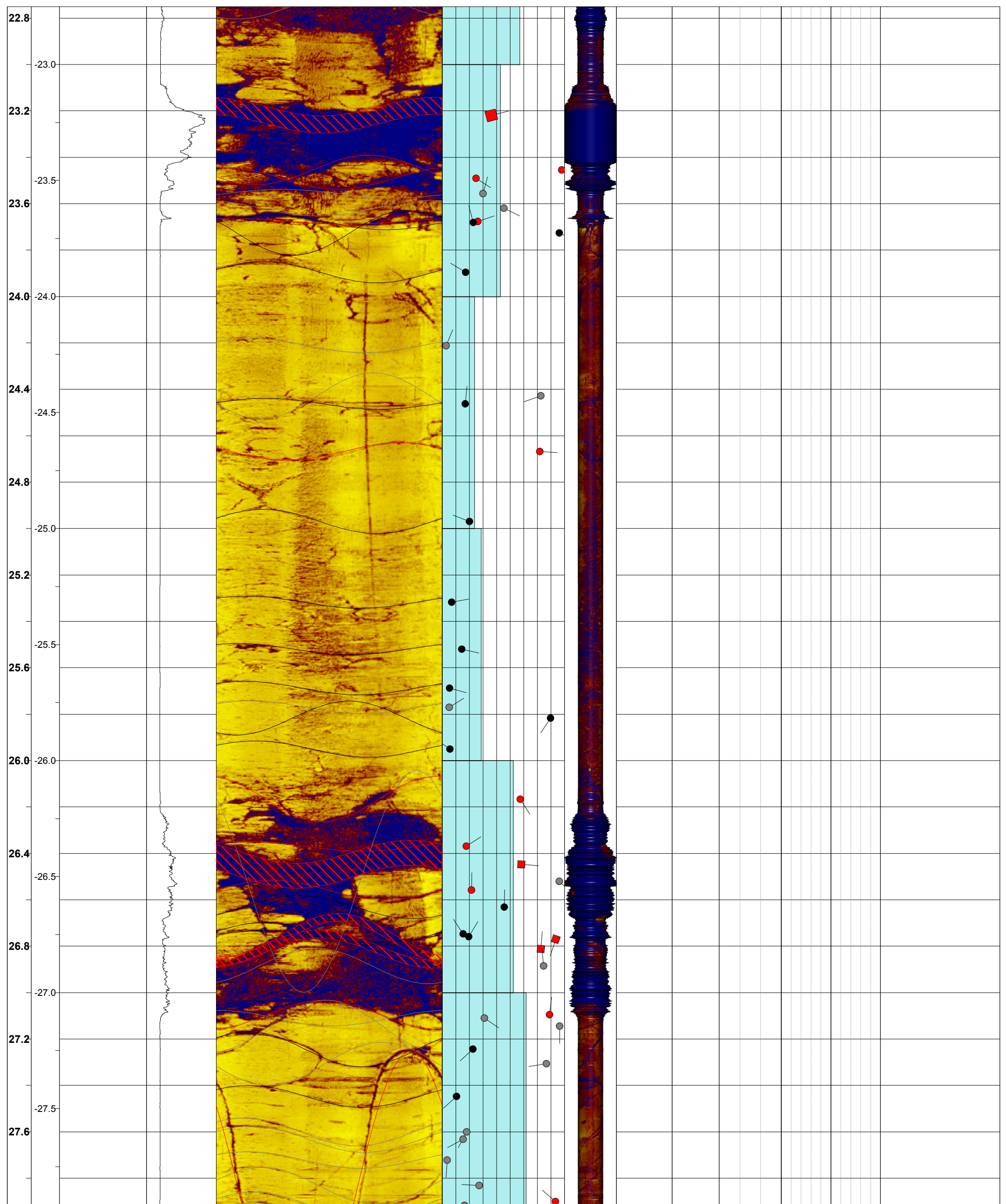


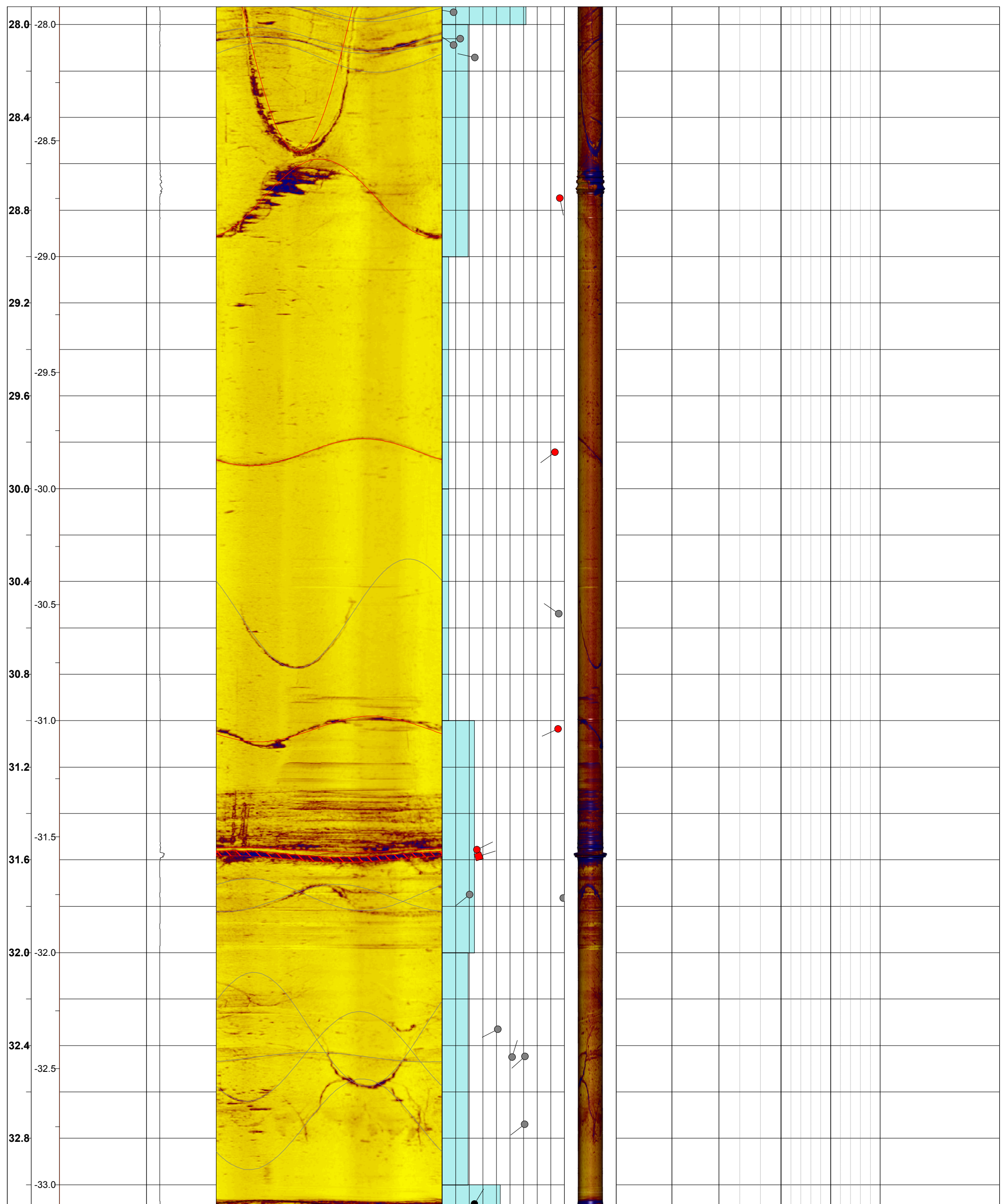


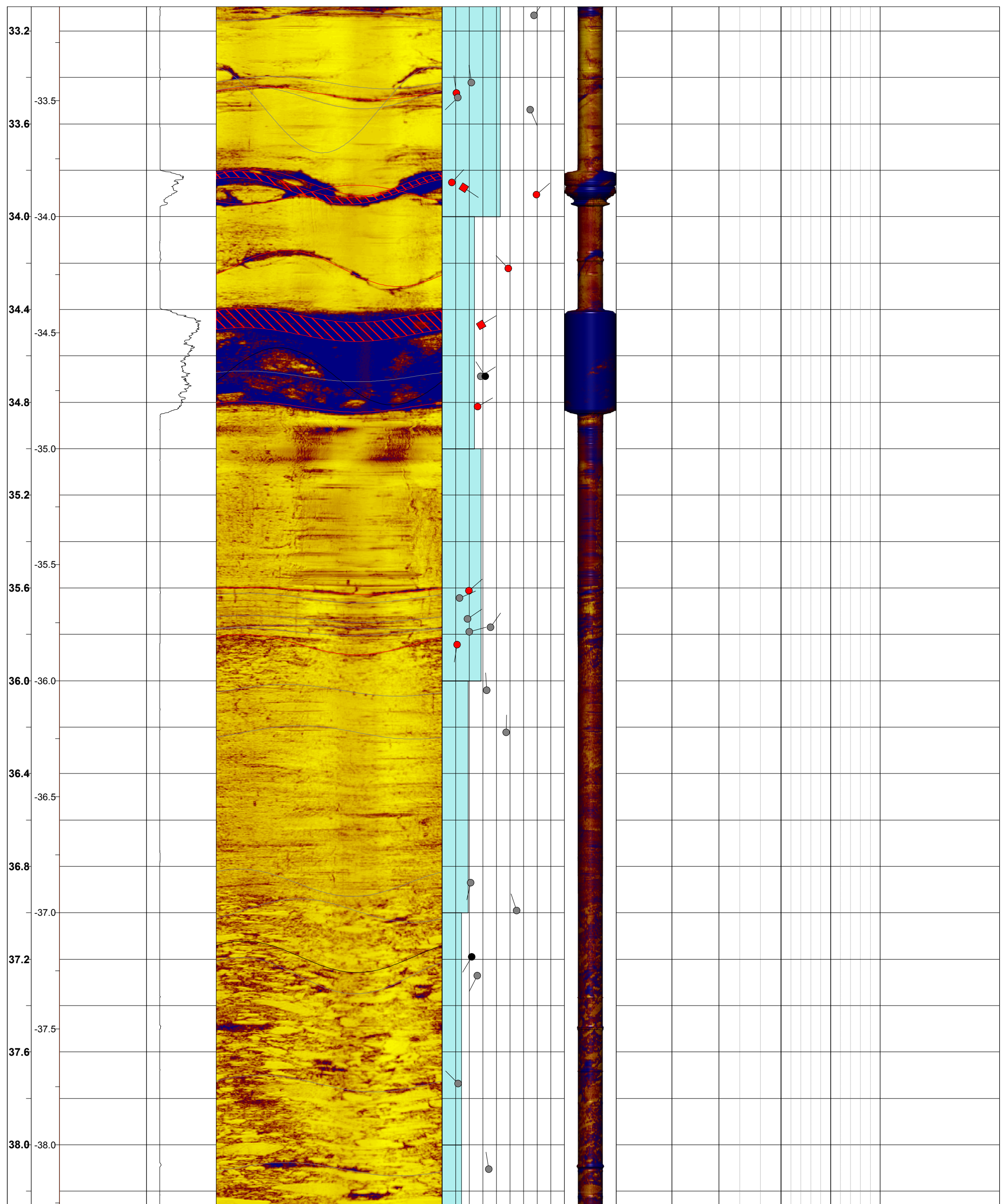


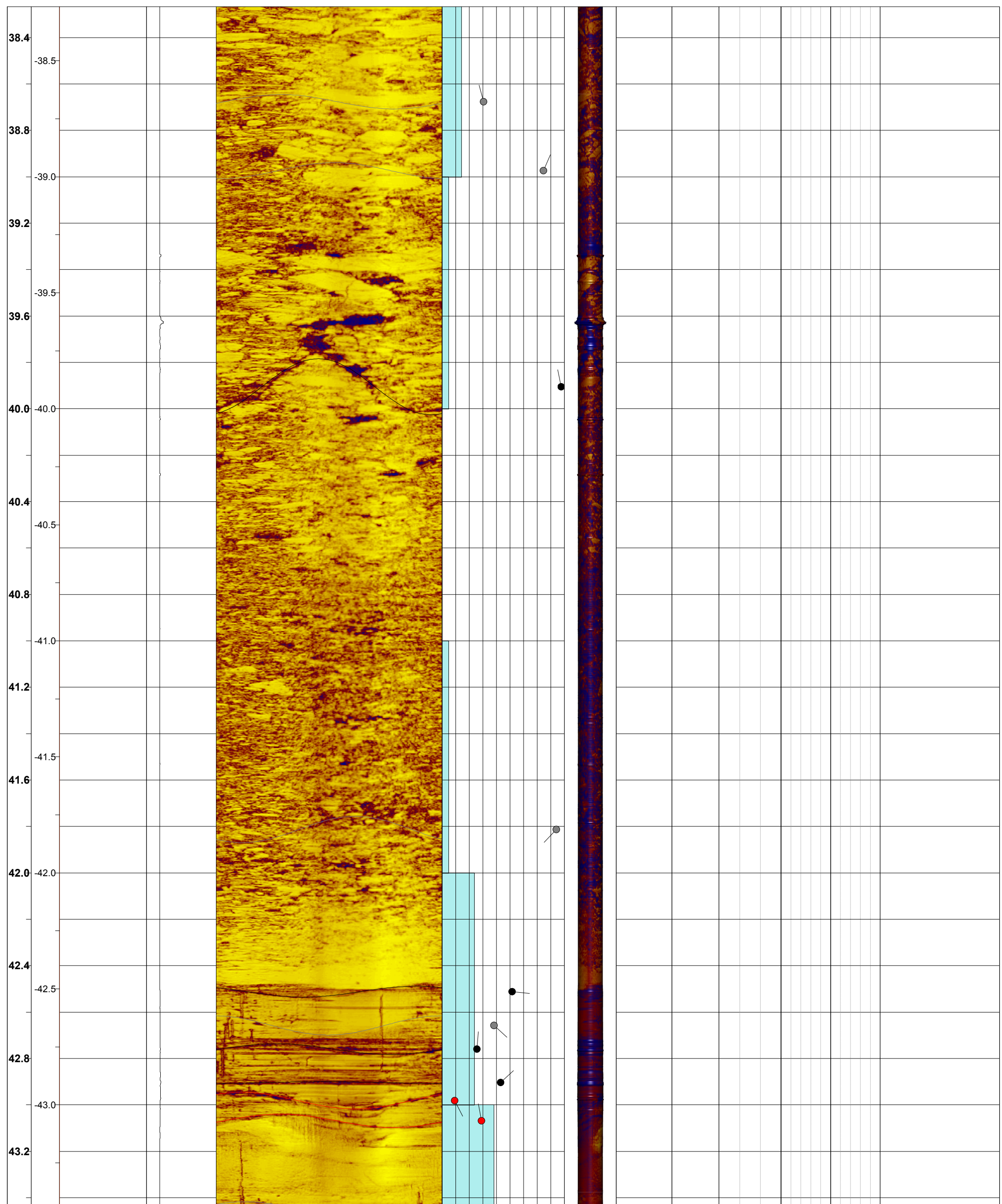


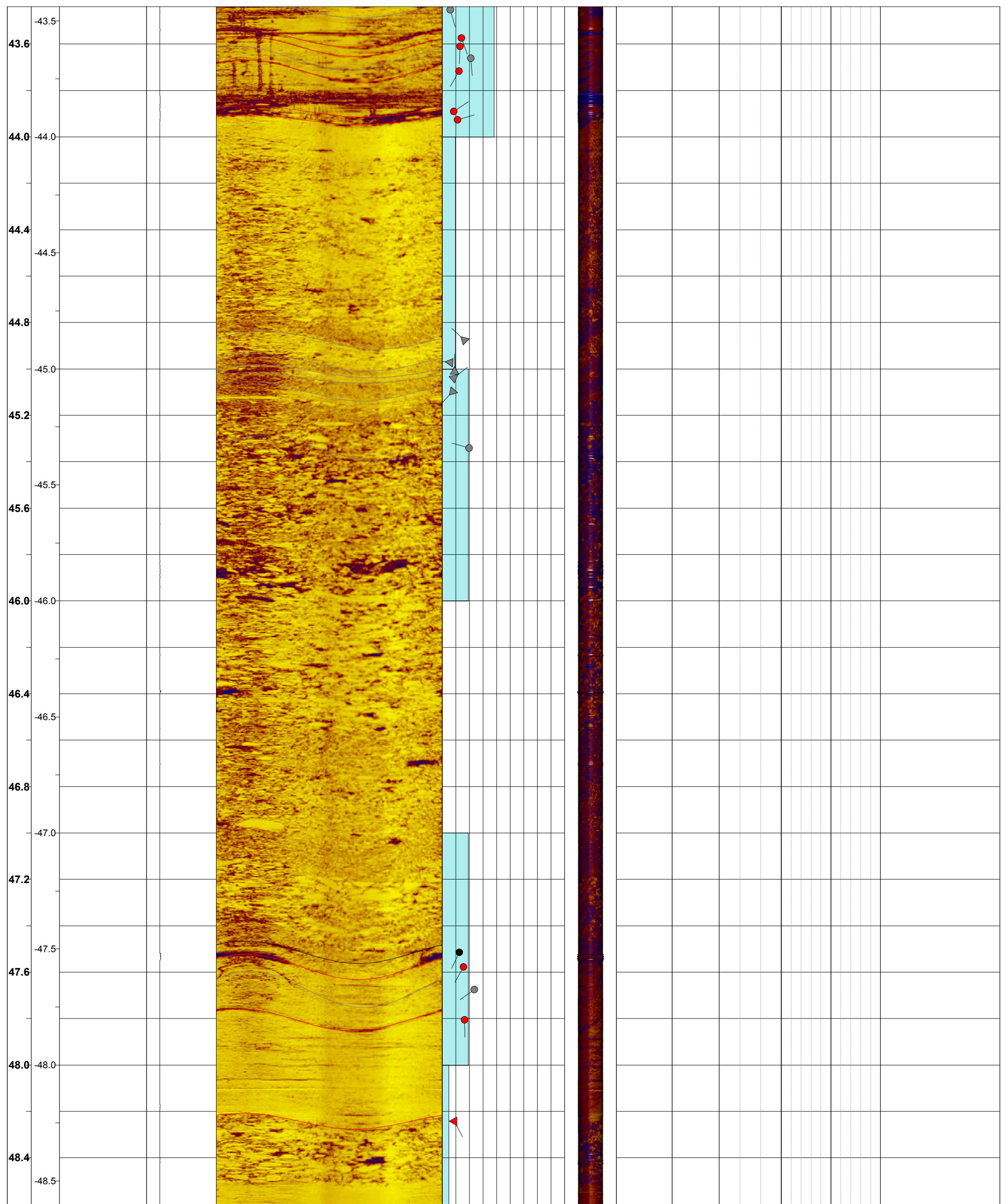


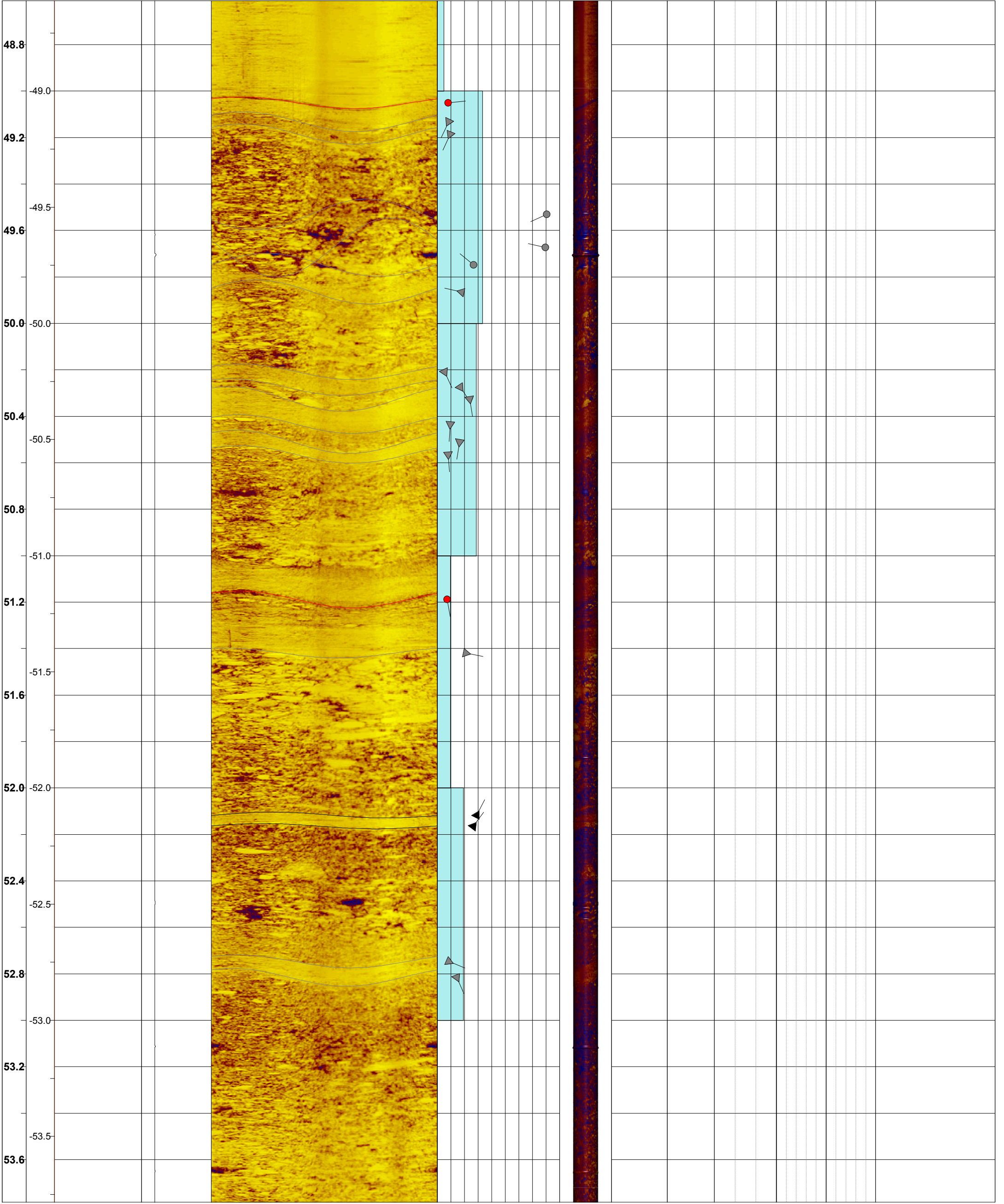


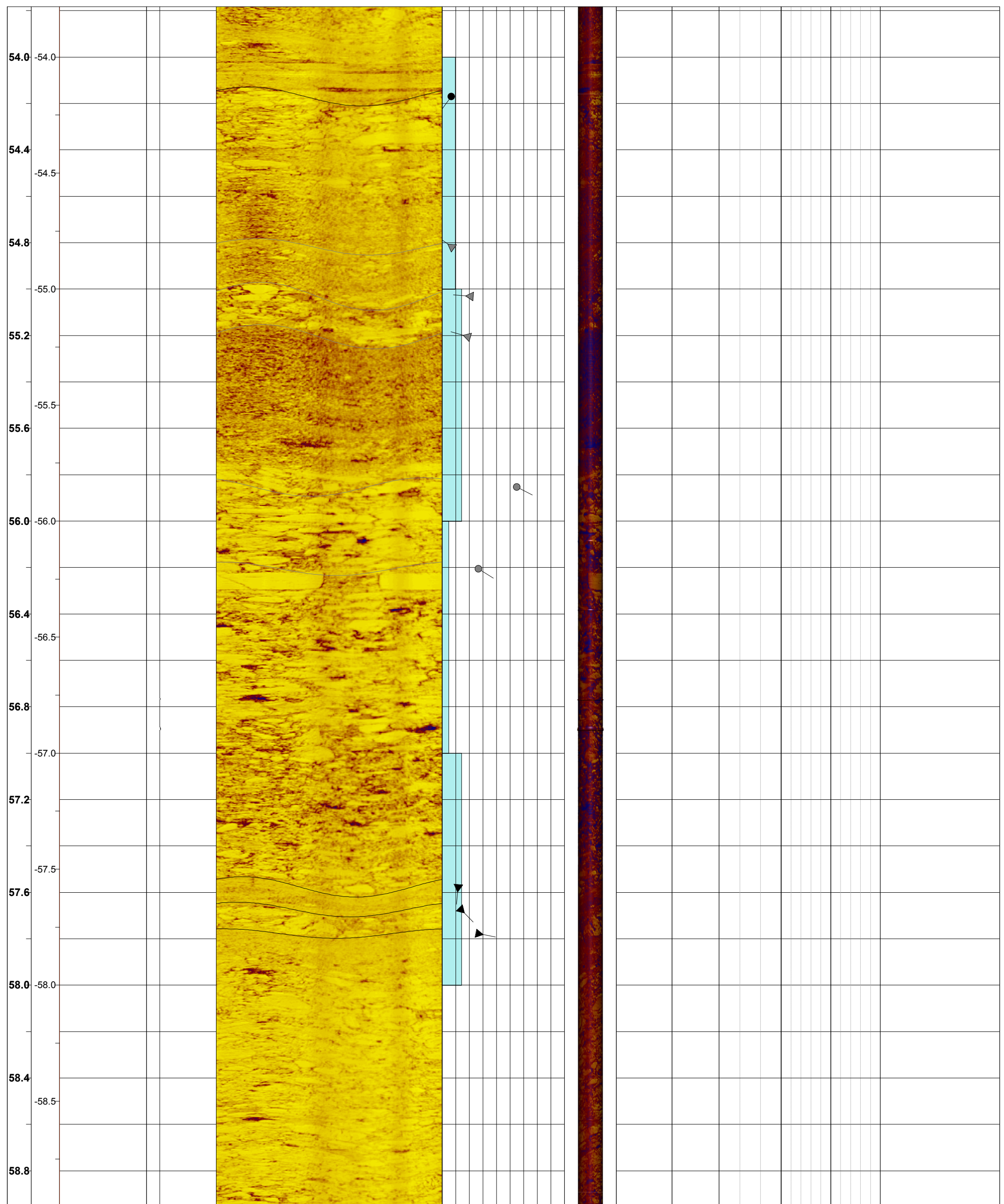


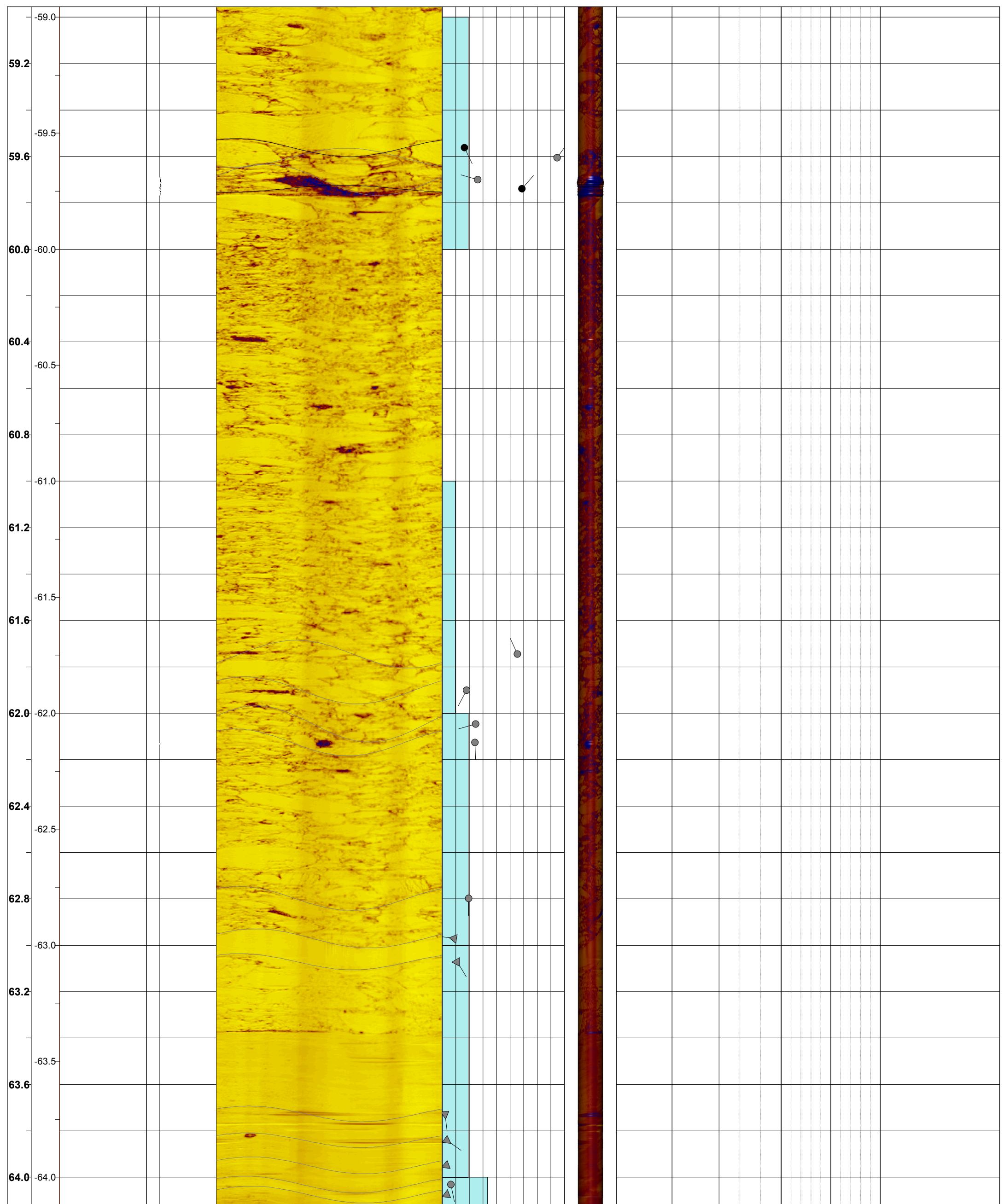


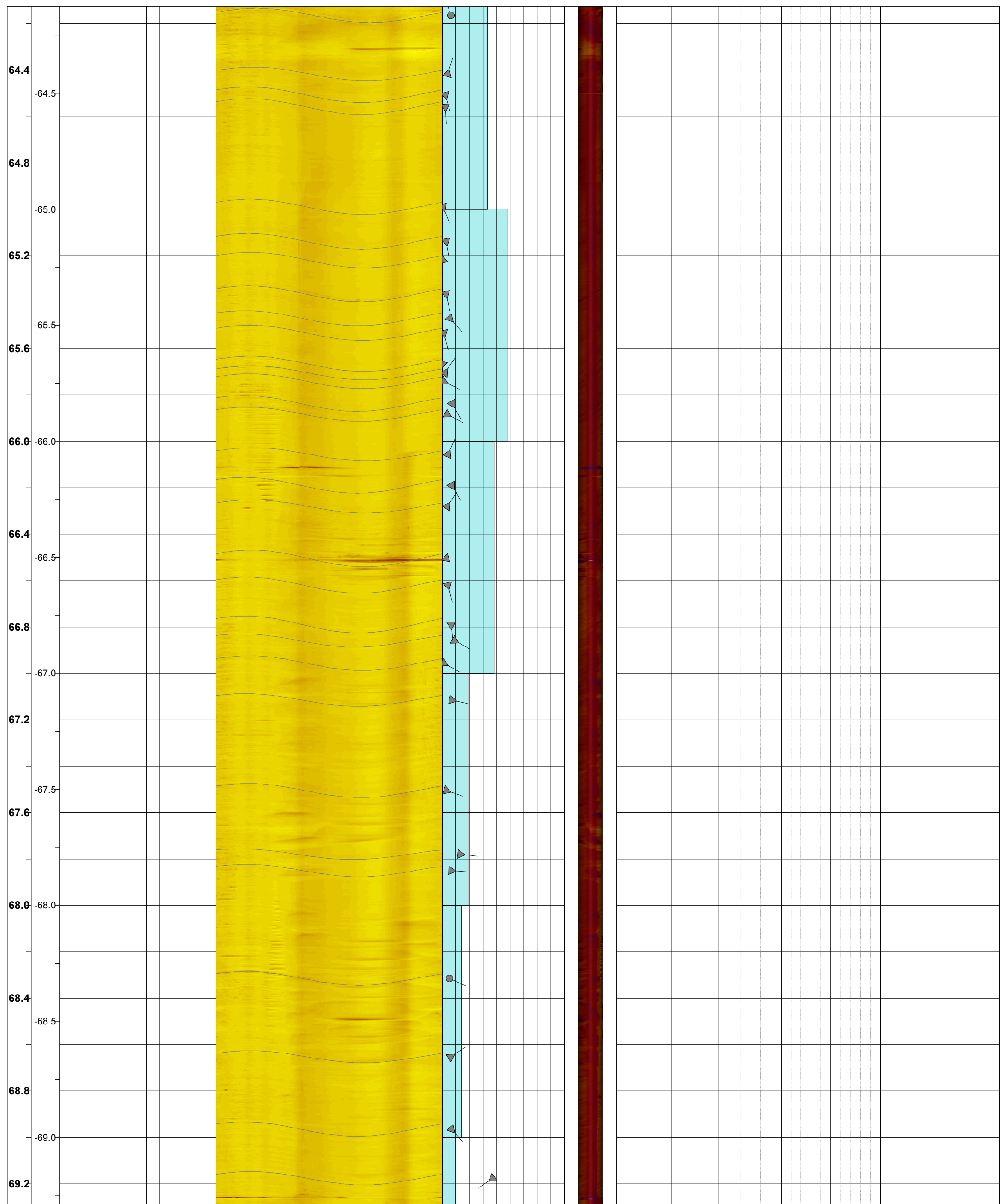


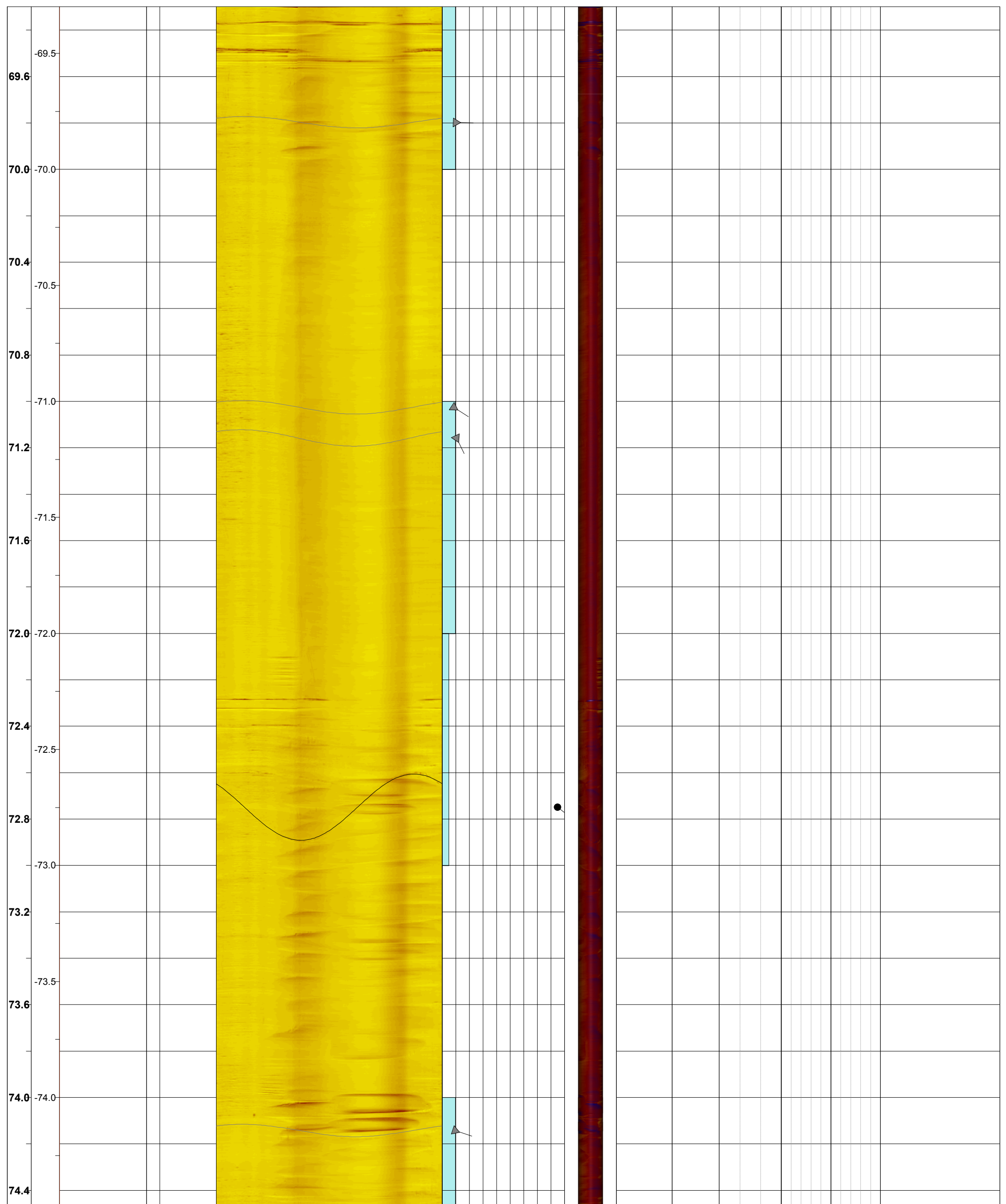


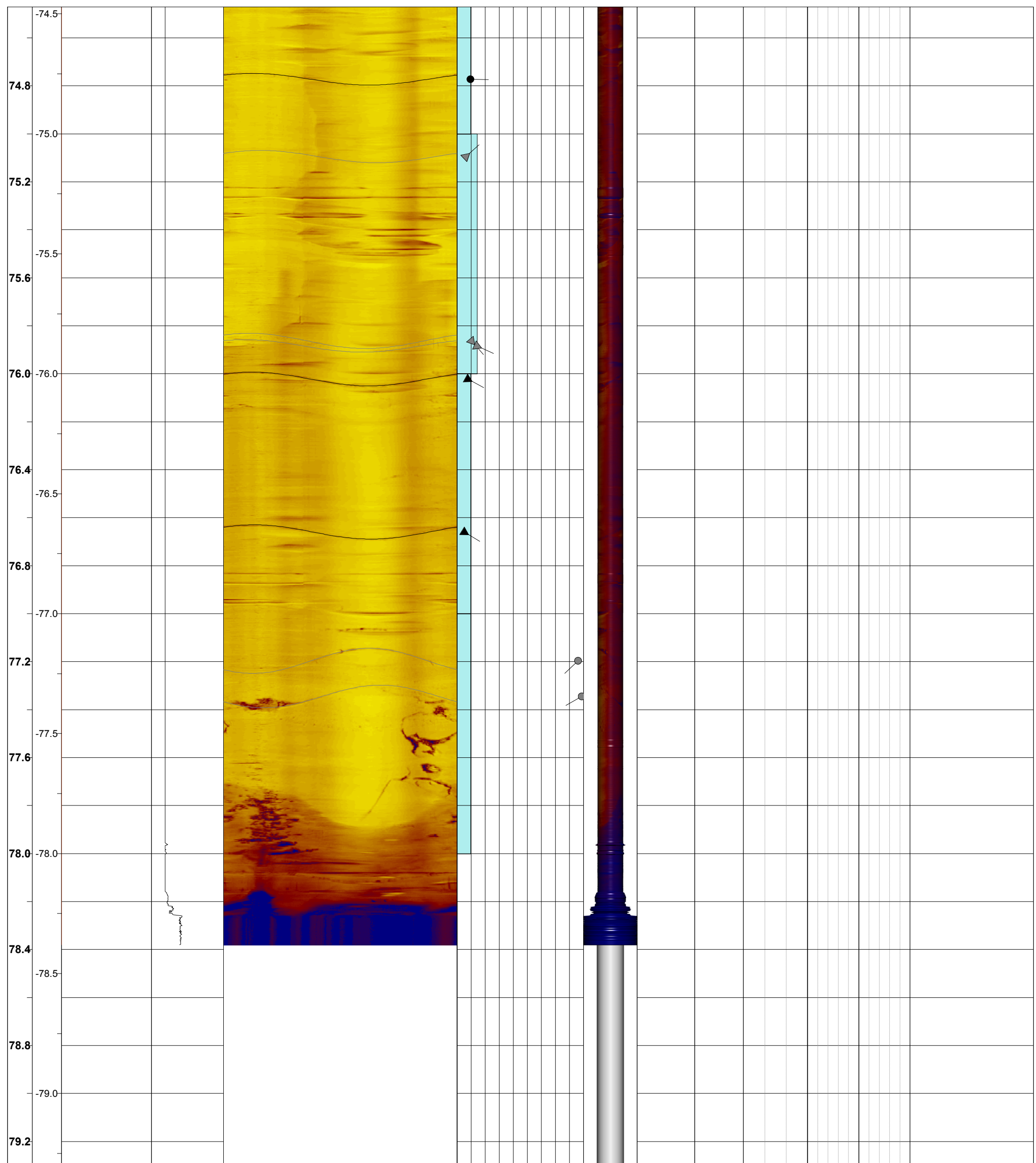












GA-BQ-291 RL1
Issued 31/03/10



WATER PRESSURE TEST

Revision No : 12.00

Job No. : 107632034	Hole No. : CRR206	Drilling Method : NMLC	Vertical depth to Groundwater	Immediately prior to test (m bgl) :
Client : AECOM	Dip (Deg) : -90	Hole Diameter (m) : 0.0757		Used in analysis (m bgl) :
Project : Cross River Rail	Interval Top (m) : 15.00	Tested Length (m) : 6.00		Pressure Gauge Height (m agl) : 1.70
Location : Kangaroo Point	Interval Base (m) : 21.00	Packer Type : Mechanical - Non-Wireline - Single		Presumed Water Temperature : 25
Tested By : MGM	Computed By : MGM	Rock tested :		Casing Inner Diameter (mm) : 60.300
Date : 13/08/2010	Date : 13/08/2010	Water Meter Reading in Litres	Checked By : NK	Date : 28/10/2010

Pressure Stage	Gauge Pressure kPa	No	Actual	Time	Water Meter Readings		Volume	Discharge	Discharge/m	Remarks	
			Time (h:m:s)	Intervals (min)	Reading (Litres)		(L)	(L/min)	(L/min/m)		
P1	28	0	0:00:00	0	770.00		0.00	0.00	0.00	c : 1	
		1	0:01:00	01:00	815.00		45.00	45.00	7.50		
		2	0:02:00	01:00	865.00		50.00	50.00	8.33		
		3	0:03:00	01:00	910.00		45.00	45.00	7.50		
		4	0:04:00	01:00	960.00		50.00	50.00	8.33		
		5	0:05:00	01:00	1010.00		50.00	50.00	8.33		
		6	0:06:00	01:00	1060.00		50.00	50.00	8.33		
		7	0:07:00	01:00	1110.00		50.00	50.00	8.33		
		8	0:08:00	01:00	1160.00		50.00	50.00	8.33		
		9	0:09:00	01:00	1211.00		51.00	51.00	8.50		
		10	0:10:00	01:00	1262.00		51.00	51.00	8.50		
		Total :						492.00	82.00		
		Average:						49.200	8.200		
P2	56	0	0:11:00	0	1262.00		0.00	0.00	0.00	c : 1	
		1	0:12:00	01:00	1328.00		66.00	66.00	11.00		
		2	0:13:00	01:00	1396.00		68.00	68.00	11.33		
		3	0:14:00	01:00	1464.00		68.00	68.00	11.33		
		4	0:15:00	01:00	1528.00		64.00	64.00	10.67		
		5	0:16:00	01:00	1594.00		66.00	66.00	11.00		
		6	0:17:00	01:00	1659.00		65.00	65.00	10.83		
		7	0:18:00	01:00	1726.00		67.00	67.00	11.17		
		8	0:19:00	01:00	1790.00		64.00	64.00	10.67		
		9	0:20:00	01:00	1857.00		67.00	67.00	11.17		
		10	0:21:00	01:00	1920.00		63.00	63.00	10.50		
		Total :						658.00	109.67		
		Average:						65.800	10.967		
P3	84	0	0:22:00	0	1920.00		0.00	0.00	0.00	c : 1	
		1	0:23:00	01:00	2014.00		94.00	94.00	15.67		
		2	0:24:00	01:00	2116.00		102.00	102.00	17.00		
		3	0:25:00	01:00	2209.00		93.00	93.00	15.50		
		4	0:26:00	01:00	2298.00		89.00	89.00	14.83		
		5	0:27:00	01:00	2378.00		80.00	80.00	13.33		
		6	0:28:00	01:00	2454.00		76.00	76.00	12.67		
		7	0:29:00	01:00	2530.00		76.00	76.00	12.67		
		8	0:30:00	01:00	2604.00		74.00	74.00	12.33		
		9	0:31:00	01:00	2652.00		48.00	48.00	8.00		
		10	0:32:00	01:00	2705.00		53.00	53.00	8.83		
		Total :						785.00	130.83		
		Average:						78.500	13.083		
P4	56	0	0:33:00	0	2705.00		0.00	0.00	0.00	c : 1	
		1	0:34:00	01:00	2762.00		57.00	57.00	9.50		
		2	0:35:00	01:00	2806.00		44.00	44.00	7.33		
		3	0:36:00	01:00	2849.00		43.00	43.00	7.17		
		4	0:37:00	01:00	2890.00		41.00	41.00	6.83		
		5	0:38:00	01:00	2930.00		40.00	40.00	6.67		
		6	0:39:00	01:00	2967.00		37.00	37.00	6.17		
		7	0:40:00	01:00	3003.00		36.00	36.00	6.00		
		8	0:41:00	01:00	3039.00		36.00	36.00	6.00		
		9	0:42:00	01:00	3080.00		41.00	41.00	6.83		
		10	0:43:00	01:00	3119.00		39.00	39.00	6.50		
		Total :						414.00	69.00		
		Average:						41.400	6.900		
P5	28	1	0:44:00	0	3119.00		0.00	0.00	0.00	c : 1	
		2	0:45:00	01:00	3132.00		13.00	13.00	2.17		
		3	0:46:00	01:00	3134.00		2.00	2.00	0.33		
		4	0:47:00	01:00	3140.00		6.00	6.00	1.00		
		5	0:48:00	01:00	3146.70		6.70	6.70	1.12		
		6	0:49:00	01:00	3152.50		5.80	5.80	0.97		
		7	0:50:00	01:00	3158.20		5.70	5.70	0.95		
		8	0:51:00	01:00	3163.90		5.70	5.70	0.95		
		9	0:52:00	01:00	3169.80		5.90	5.90	0.98		
		10	0:53:00	01:00	3175.30		5.50	5.50	0.92		
		11	0:54:00	01:00	3181.20		5.90	5.90	0.98		
		Total :						62.20	10.37		
		Average:						6.220	1.037		

TEST RESULTS

Stage No.	Houlsby (1976) Value	Lugeon Value Curve	Nett Pressures	Pressure Vs Flow	Interpreted Result & Hydraulic Conductivity
P1	292.9		2.7		H _{LOSS} 0.67 kPa Stage No. P5 Gauge Pressure 28 kPa Q 6.22 L/min H 4.5 m Interpreted Result 37 uL Reported k at Stage P5 Analytical Method 1: (ref = Golder geotechnical field notes draft 1997) $k = Q/H \times 6.10889 \times 10^{-6} \times (\log(2L/D))/L$ k = 3.1E-06 m/s Analytical Method 2: (ref = Sharp, J.C 1975 Pit Slope Manual, CANMET report) $k = 1/(2L \times 3.14) \times (Q/H) \ln(R/r)$ m/s (convert L/min to m/s). Assume R = radius of influence of 100m & r = radius of borehole. k = 4.8E-06 m/s
P2	195.8		-2.3		
P3	155.8		-6.0		
P4	123.2		43.0		
P5	37.0		44.0		
Houlsby (1976) method - no pressure corrections for H _f (head losses), nor is the pressure corrected for H _g (location of watertable).					
Flow Type	VOID FILLING	COMMENTS	No Flow		