

~~GEOPHYSICS~~ No: 30M3-63-1

72-11096

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

72-216

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. I-1
SITE West Service Building - Instrumentation Hole SHEET No. 1 OF 5
CONTRACTOR: Becker Drills and STARTED M. May 26, 19 73
Heath & Sherwood FINISHED M. May 26, 19 73
METHOD SOIL CASING DIAM.
OF
DRILLING: ROCK Diamond Drill CORE DIAM. HX
LOCATION: LATITUDE CH. 54+38.8 ELEVATIONS: DATUM MTC
DEPARTURE 58.4 South centre line DRILL PLATFORM
BEARING - GROUND SURFACE 564.8
INITIAL DIP 90 degrees ROCK SURFACE
OTHER DIPS BOTTOM OF HOLE
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0	Dolomite	Light gray, crystalline, well jointed, vuggy locally, vugs generally filled with gypsum. RQD - 0.0 to 2.0 ft: 40 per cent 2.0 to 4.0 ft: 98 per cent 4.0 to 9.0 ft: 83 per cent 9.0 to 19.5 ft: 82 per cent	95
23.8 to 51.0	Shaly Limestone	23.8 ft - 30.9 ft - Medium gray, fossiliferous, partings along the bedding plane. RQD - 19.5 to 30.0 ft: 93 per cent 30.9 ft - 37.5 ft - Dark gray to black, fossiliferous, fissile RQD - 80 per cent 37.5 ft - 51.0 ft - Medium gray, fossiliferous, fine- to coarse-grained, laminated RQD - 90 per cent	96 97

INSPECTOR T. Sigvary

APPROVED

LOGGED BY M. A. MacFadyen

DATE

February 1974

ACRES CONSULTING SERVICES LIMITED

NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) JOB No. P2499.05

PROJECT Thorold Tunnel Remedial Works

HOLE No. I-1

SITE West Service Building - Instrumentation Hole

SHEET No. 2 OF 5

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	LENGTH OF RUN	% CORE
51.0	Limestone	End of hole		

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DRILLING REPORT
(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO I-1

SITE West Service Building - Instrumentation

SHEET NO 3 OF 5

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION											MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING		
0.3	Joint	90°		x	x									
2.5	Joint	90°		x	x									
4.7	Fracture			x					x					
6.0	Solution cavities up to 1-in diameter													
7.8	Joint	90°	x		x									
7.9	Gypsum-filled cavity 1-in diameter													
9.0	Fracture			x				x						
9.5	Joint			x	x									
9.9	Parting							x						
10.1	Joint	90°	x		x									
12.0	Fracture	90°		x				x						
13.6	Joint	90°	x		x					C				
15.0	Bedding joint	90°	x		x					C				
15.7	Bedding joint	90°	x		x					Sh				
16.8	Joint	90°	x		x									
19.0	Joint	55°		x	x					C				
19.8	Parting	85°		x	x									

Sh = Shale

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT
(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO I-1

SITE West Service Building Instrumentation Hole

SHEET NO 4 OF 5

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
22.0	Joint	90°		X	X								
22.5	Gypsum-filled solution cavity, approximate diameter 3 in												
23.4	Joint	90°		X	X								
23.6	Parting	90°		X	X								
24.6	Parting	90°		X	X								
27.8	Joint	90°		X	X								
30.0	Joint along the bedding	90°	X		X								
32.5 to 34.0	Numerous partings	90°	X		X								
35.6	Joint	90°		X	X								
36.1	Joint	90°		X	X								
36.5	Joint	90°		X	X								
36.7	Joint	90°		X	X								
36.8	Joint	90°		X	X								
37.2	Joint	90°		X	X								
37.5	Joint	90°		X	X								
38.1	Joint	90°		X	X								
38.9	Joint	90°		X	X								

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ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO I-1

SITE West Service Building Instrumentation Hole

SHEET NO 5 OF 5

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION											MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING		
39.1	Fracture	85°		x			x							
40.9	Joint	90°		x	x									
41.3	Joint	70°		x	x									
46.3	Joint	90°		x	x									
46.4	Parting	90°					x							
47.2	Gypsum-filled cavity, approximate diameter 1 in													
48.1	Joint	90°		x	x									
51.0	End of hole													

C = CARBONATE H = HEMATITE K = CHLORITE

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ACRES CONSULTING SERVICES LIMITED

NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) JOB No. P2499.05

PROJECT Thorold Tunnel Remedial Works

HOLE No. I-2

SITE West Service Building

SHEET No. 2 OF 5

DEPTH	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	LENGTH OF RUN	% CORE
50.0		RQD - 90 per cent 49.8 ft - 50.0 ft - Black, massive, unfossiliferous, muddy limestone End of hole		100

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO I-2

SITE West Service Building

SHEET NO 3 OF 5

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION											MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING		
0.5	Joint	45°	x		x									
1.2	Joint	85°		x	x									
1.6	Joint	90°		x	x									
1.9	Joint	90°		x	x									
2.4	Joint	90°		x	x									
6.1	Parting			x			x		K					
7.0	Joint	80°		x	x				Gyp					
8.0	} Open fractures, exhibit solutioning	90°	x											
8.9						x			C					
9.2														
9.4														
12.0	Small calcite/galena-filled cavity, 1 in													
12.1	Fracture		x				x							
13.6	} Closely-spaced joints. Evidence of solutioning	90°	x	x					C					
13.7														
13.8														
14.9	Joints, solutioning evident	90°		x	x				C					
15.6	Parting	85°		x			x		K					
16.7	Fracture			x			x		K					
17.6	Joint	50°	x		x									

Gyp = Gypsum

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ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT
(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works (Ont.)

HOLE NO I-2

SITE West Service Building

SHEET NO 4 OF 5

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
17.9	Two joints continue to 18.0 ft	90°			x	x							
20.0	Core, closely fractured							x					
21.0	Gypsum-filled cavities up to 1-in diameter												
22.1	Parting	90° ±					x	x		Gyp			
23.3	Fracture			x			x			Gyp			
23.8	Fracture			x			x			Gyp			
24.1	Fracture			x			x			Gyp			
25.1	Fracture			x				x					
27.0	Joint continues to 28.0 ft	5°			x	x							
29.0	Joint	30°			x	x							
29.3	Joint along the bedding plane	90°		x		x							
30.5	Joint	90°		x		x							
31.4	Joint	90°		x		x							
31.7	Joint	90°		x		x							
32.9	Joint	90°		x		x							
33.0	Joint	90°		x		x							
33.6	Joint	90°		x		x							
35.9	Joint	90°		x		x							

Gyp = Gypsum

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DRILLING REPORT
(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO I-2

SITE West Service Building

SHEET NO 5 OF 5

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
36.5	Joint	90°	x		x								
41.5	Joint	90°	x		x								
41.8	Bedding plane between coarse limestone above and fine shaly limestone below	80°			x								
43.0	Parting	90°	x		x								
43.9	Parting	90°	x		x								
44.3	Parting	90°	x		x								
45.4	Parting	90°					x						
47.3	Joint along bedding plane	90°	x		x								
47.5	Joint along bedding plane	90°	x		x								
48.0	Joint along bedding plane	90°	x		x								
49.8	Fracture					x							
50.0	End of hole												

C = CARBONATE H = HEMATITE K = CHLORITE

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ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) JOB No. P2499.05
 PROJECT Thorold Tunnel Remedial Works HOLE No. I-3
 SITE West Service Building SHEET No. 1 OF 4

CONTRACTOR: Becker Drills and Heath & Sherwood STARTEDM. 19
 FINISHEDM. 19

METHOD OF DRILLING: SOIL Becker Drill CASING DIAM. 6-inch
 ROCK Diamond Drill CORE DIAM. HX

LOCATION: LATITUDE CH. 54+32.0 ELEVATIONS: DATUM MTC
 DEPARTURE 56.0 North centre line DRILL PLATFORM
 BEARING - GROUND SURFACE 587.5
 INITIAL DIP 90 degrees ROCK SURFACE
 OTHER DIPS BOTTOM OF HOLE
 WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 21.0		Rockfill	
21.0 to 22.8		Concrete Deck	
22.8 to 49.3	Dolomite	Light gray, open joints inclined at 90 degrees to core axis, with carbonate and gypsum infilling. Cavities up to 1-in. diameter partially filled with gypsum. RQD - 62 per cent	85
49.3 to 73.0	Shaly Limestone	49.3 ft - 52.3 ft - Light gray, crystalline, dense, fossiliferous 52.3 ft - 58.5 ft - RQD - 95 per cent 58.5 ft - 73.0 ft - Medium- to fine-grained, numerous partings	100

INSPECTOR T. Sigvary

LOGGED BY M. A. MacFadyen

APPROVED

DATE

J. B. ...

February 1974

DRILLING REPORT

SHEET No. 2 OF 4

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO I-3

SITE West Service Building

SHEET NO 3 OF 4

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
23.3	Joint	90°		x	x					Br			
23.5	Joint	90°		x	x								
25.0 to 25.5	Core closely fractured			x			x						
27.5	Joint with shaly infilling	90°		x	x					Sh			
31.0	Joint	90°	x		x					Br			
31.2	Joint	20°	x		x								
31.4	Joint	90°	x		x					Br			
31.6	Cavities, 0.5-in diameter												
37.9	Joint	90°	x		x					Br			
40.8	Fracture						x			C			
42.0 to 43.0	Core Fractured						x						
43.5	Joint	40°	x		x								
45.5	Joint	5°		x	x								
45.5	Gypsum-filled cavity, 2-in diameter												
46.4	Joint	75°		x	x					Gyp			
47.3	Joint	70°		x	x								

Sh = Shale Gyp = Gypsum

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ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO I-3

SITE West Service Building

SHEET NO 4 OF 4

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
50.5	Joint	90°		x	x								
52.1	Joint	90°		x	x								
53.0	Joint	90°	x		x								
55.1	Joint	90°	x		x								
58.0	Joint	50°		x	x								
59.0	Joint	50°		x	x								
59.5	Parting	90°	x		x								
60.0	Joint	45°		x	x								
62.0	Fracture						x		Sh				
63.3	Fracture						x		Sh				
65.5	Joint	90°		x	x				Sh				
66.6	Joint	90°		x	x								
72.0	Core badly fractured during							x					
73.0	to the drillings; some												
73.0	evidence of grinding												
73.0	End of hole												

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ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) **JOB No.** P2499.05

PROJECT Thorold Tunnel Remedial Works **HOLE No.** I-4

SITE West Service Building - Instrumentation Hole **SHEET No.** 1 **OF** 4

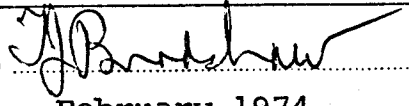
CONTRACTOR: Becker Drills and Heath & Sherwood **STARTED** 7:00 a .M. May 23, 19 73
FINISHED 3:00 p .M. May 24, 19 73

METHOD OF DRILLING: **SOIL** Becker Drill **CASING DIAM.** 6-inch
ROCK Diamond Drill **CORE DIAM.** HX

LOCATION: **LATITUDE** CH.54+75.0 **ELEVATIONS: DATUM** MTC
DEPARTURE 56.0 North centre line **DRILL PLATFORM**
BEARING - **GROUND SURFACE** 587.5 ft
INITIAL DIP 90 degrees **ROCK SURFACE**
OTHER DIPS **BOTTOM OF HOLE**
 WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN. CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 24.0		Rockfill	
24.0 to 46.8	Dolomite	Light gray, open horizontal joints and gypsum-filled cavities up to 2-in. diameter RQD - 70 per cent	85
46.8 to 72.0	Shaly Limestone	Medium gray to dark in color, fossiliferous, laminated. 46.8 ft - 52.7 ft - Open joints and vertical hairline fractures. 52.7 ft - 59.0 ft - Black, fissile along bedding planes, fossiliferous. RQD - 79 per cent 59.0 ft - 69.6 ft - Crystalline, fine to coarse-grained, some shaly irregular intercalations. RQD - 85 per cent	99 99

INSPECTOR T. Segvary
LOGGED BY M. A. MacFadyen

APPROVED 
DATE February 1974

ACRES CONSULTING SERVICES LIMITED

NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. I-4
SITE West Service Building - Instrumentation Hole SHEET No. 2 OF 4

DEPTH	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	LENGTH OF RUN	% CORE
72.0		69.6 ft - 72.0 ft - Dark gray, fine-grained, bedded limestone, fractured, generally tight End of hole		

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT ..Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT ..Thorold Tunnel Remedial Works

(Ont.)

HOLE NO I-4

SITE ..West Service Building - Instrumentation Hole

SHEET NO 3 OF 4

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
24.7	Joint	10°	x		x								
24.0 to 28.0	Core closely fractured						x						
28.6	Minor solution cavities, 0.5-in diameters												
31.7 to 33.0	Joints spaced at 1 to 2 inches	90°		x	x					Br			
34.5	Joint	90°		x	x								
35.9	Joint	90°		x	x								
36.8	Joint	90°		x	x								
37.0	Cavity - partially gypsum filled - 2-in diameter												
37.5	Joint	90°		x	x								
38.0 to 38.5	Core, closely fractured						x						
39.0	Joint	90°		x	x					Br			
39.2	Fracture			x			x			Br			
42.0	Joint	90°		x	x								
42.5	Fracture						x			Br			
45.5	Joint	10°		x	x								

C = CARBONATE H = HEMATITE K = CHLORITE

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ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO I-4

SITE West Service Building - Instrumentation Hole

SHEET NO 4 OF 4

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
46.5	Joint	10°		x	x								
48.0	Joint	90°		x	x								
49.0	Joint	90°		x	x								
51.7	Fracture	0 to 10°		x			x						
52.0 to 58.0	Several bedding plane joints at 2- to 6-in intervals	90°	x			x							
61.5	Joint	80°	x			x					Br		
62.4	Joint	90°	x			x							
62.8	Cavity, gypsum-filled 3 in x 1 in x 1 in												
64.0	Joint, exhibits weathering	90°		x	x								
65.0 to 66.0	Joints	90°		x	x								
69.6	Joint along bedding plane	90°				x							
70.5	Joint along bedding plane	90°		x			x						
71.0	Joint along bedding plane	90°		x	x								
72.0	End of hole												

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NIAGARA FALLS, CANADA

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. I-5
SITE West Service Building - Instrumentation Hole SHEET No. 1 OF 3
CONTRACTOR: Becker Drills and STARTED 12:00 a.m. May 25, 19 73
Heath & Sherwood FINISHED 9:30 p.m. May 25, 19 73
METHOD SOIL Becker Drill CASING DIAM.
OF
DRILLING: ROCK Diamond Drill CORE DIAM. HX
LOCATION: LATITUDE CH. 54+44.7 ELEVATIONS: DATUM MTC
DEPARTURE 104.3 South centre line DRILL PLATFORM
BEARING - GROUND SURFACE 586.39 ft
INITIAL DIP 90 degrees ROCK SURFACE
OTHER DIPS BOTTOM OF HOLE
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 23.0		Overburden	
23.0 to 24.0		Concrete	
24.0 to 47.0	Dolomite	Light gray, dense, cavities up to 1-in. diameter common. RQD - 70 per cent	82
47.0 to 71.5	Shaly Limestone	Medium gray to dark in color; fossiliferous, fissile, shaly intercalations. 54.6 ft - 59.0 ft - Black, fissile along bedding plane RQD - 95 per cent 59.0 ft - 71.5 ft - RQD - 86 per cent	81 99
71.5		End of hole	

INSPECTOR T. Segvary

LOGGED BY M. A. MacFadyen

APPROVED *J. B. [Signature]*

DATE February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO I-5

SITE West Service Building - Instrumentation Hole

SHEET NO 2 OF 3

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
26.8	Parting - black shaly hairline	90°					x		K				
28.5 to 28.7	Joint with some iron oxide staining	0°	x		x								
29.9	Parting	90°					x		K				
30.1	Small cavities - 0.5- to 1.0- in diameter						x						
31.0	Fracture				x		x		K				
31.0 to 32.0	Fracture	0°			x		x						
33.0	Joint	80°			x	x							
38.3	Gypsum-lined, solution cavity 1.5-in diameter												
38.9	Fracture with gypsum infilling	45°			x		x						
44.0	Joint	90°			x	x							
45.0 and 45.4	Bedding joint	85°	x				x						
46.1	Bedding joint	90°	x				x						
47.7	Gypsum-filled, solution cavity 1-in diameter												

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT (CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO I-5

SITE West Service Building - Instrumentation Hole

SHEET NO 3 OF 3

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
47.8	Bedding joint	90°	x			x							
48.9	Bedding joint	90°	x			x							
49.8 to 50.5	Core - closely fractured			x			x						
56.8	Joint along bedding plane	90°	x			x							
57.0	Parting along bedding plane	90°	x			x							
59.5	Joint along bedding plane	90°	x			x							
60.0	Joint along bedding plane	90°	x			x							
68.8	Joint, exhibits gypsum infilling	90°	x			x			Gyp.				
69.0	Joint, exhibits gypsum infilling	90°	x			x			Gyp.				
71.0	Joint, shaly infilling	90°		x	x				Sh				
71.7	End of hole												

Gyp = Gypsum

Sh = Shale

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN

+ Gy = GRAY

**ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA**

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) JOB No. P2499.05

PROJECT Thorold Tunnel Remedial Works HOLE No. I-6

SITE West Service Building - Instrumentation Hole SHEET No. 1 OF 4

CONTRACTOR: Becker Drills and STARTED 12:30 p.m. May 28, 1973
Heath & Sherwood FINISHED .m. May 29, 1973

METHOD SOIL Becker Drill CASING DIAM. _____
OF _____
DRILLING: ROCK Diamond Drill CORE DIAM. HX

LOCATION: LATITUDE CH.54+62.5 ELEVATIONS: DATUM MTC
DEPARTURE 52.18 South centre line DRILL PLATFORM
BEARING - GROUND SURFACE 586.01 ft
INITIAL DIP 90 degrees ROCK SURFACE
OTHER DIPS BOTTOM OF HOLE
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 22.6		Overburden	
22.6 to 24.0		Concrete	
24.0 to 53.6	Dolomite and Dolomitic Limestone	Light gray, small gypsum- filled cavities; horizontal, irregular, pitted, solution joint surfaces frequent. RQD - 72 per cent	82
53.6 to 70.0	Shaly Limestone	Black, thinly bedded, fossiliferous, highly fissile (53.6 to 53.9 ft and 55.9 to 59.0 ft) 58.8 ft - 59.8 ft - Core removed for lab tests 53.6 ft - 53.9 ft - RQD - 91 per cent	99

INSPECTOR T. Segvary

LOGGED BY M. A. MacFadyen

APPROVED

DATE

February 1974

ACRES CONSULTING SERVICES LIMITED

NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) JOB No. P2499.05

PROJECT Thorold Tunnel Remedial Works

HOLE No. I-6

SITE West Service Building - Instrumentation Hole

SHEET No. 2 OF 4

DEPTH	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	LENGTH OF RUN	% CORE
70.0		59.5 ft - 70.0 ft - Detrital, medium-grained, shaly partings approximately 1-in. thick RQD - 99 per cent End of hole		100

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

CLIENT Ministry of Transportation and Communications
(CORE DETAILS)
(Ont.)

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

HOLE NO I-6

SITE West Service Building - Instrumentation Hole

SHEET NO 3 OF 4

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION											MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING		
28.5	Fracture			x			x							
32.2	Fracture			x			x							
33.0	Joint, gypsum infilling	90°	x		x					Gyp				
35.5	Fracture			x			x							
40.1	Parting, shaly infilling	90°					x			Gyp				
42.0	Fracture			x			x							
42.5	Fracture			x			x							
42.9	Fracture			x			x							
44.0	Fracture, Calcite/gypsum infilling			x			x							
51.1	Fracture, Calcite/gypsum infilling			x			x							
53.7	Joint along the bedding plane	90°	x		x									
55.9 to 56.9	Partings along the bedding plane	90°	x		x									
58.1	Joint along the bedding plane	90°	x		x									
59.0	Joint	90°		x	x									
60.8	Joint	85°	x		x									
62.4	Joint	90°		x	x									
64.9	Joint	90°	x		x									

Gyp = Gypsum

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

 CLIENT Ministry of Transportation and Communications
 (CORE DETAILS)
 (Ont.)

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

HOLE NO I-6

SITE West Service Building - Instrumentation Hole

SHEET NO 4 OF 4

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
66.0	Joint	90°	x		x								
68.0	Joint - Calcite filling	90°		x	x								
70.0	End of hole												

Gyp = Gypsum

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN + Gy = GRAY

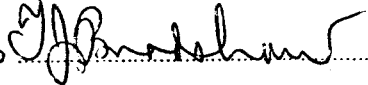
**ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA**

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) JOB No. P2499.05
 PROJECT Thorold Tunnel Remedial Works HOLE No. I-7
 SITE West Service Building - Instrumentation Hole SHEET No. 1 OF 3
 CONTRACTOR: Becker Drills and Heath & Sherwood STARTED 1:30 p.m. May 29, 1973
 FINISHED 7:10 p.m. May 30, 1973
 METHOD OF DRILLING: SOIL Becker Drill CASING DIAM. 6-inch
 ROCK Diamond Drill CORE DIAM. HX
 LOCATION: LATITUDE CH.54+60.0 ELEVATIONS: DATUM MTC
 DEPARTURE 201.76 S. centre line DRILL PLATFORM 584.91 ft
 BEARING - GROUND SURFACE
 INITIAL DIP 90 degrees ROCK SURFACE
 OTHER DIPS - BOTTOM OF HOLE
 WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN. CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 23.0		Overburden	
23.0 to 49.4	Dolomite	Light gray, dense, occasionally vuggy, vugs filled with gypsum. RQD - 70.1 per cent	
49.4 to 71.0	Shaly Limestone	Dark gray to dark in color; thinly bedded 49.4 ft - 51.0 ft - Fossiliferous, impure limestone. 51.0 ft - 52.8 ft - Fissile, fossils exhibit deformation 52.8 ft - 71.0 ft - Dark gray, impure fossiliferous limestone, thin chloritic shaly layers. 50 per cent core lost from 53.0 ft to 60.5 ft. Evidence of grinding at 60.0 ft.	
71.0		End of hole	

INSPECTOR T. Segvary
 LOGGED BY M. A. MacFadyen

APPROVED 
 DATE February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Work

(Ont.)

HOLE NO I-7

SITE West Service Building - Instrumentation Hole

SHEET NO 2 OF 3

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
23.2	Joint	40°			x	x							
23.3	Joint	60°			x	x							
27.0	Stylolite	90°						x					
28.0	Joint - calcite mud on surfaces	85°						x		C			
34.5	Gypsum-filled cavity, 3-inch diameter												
37.0	Joint	90°	x			x							90°
37.0	Fracture				x		x						
38.3	Joint	0°			x	x							
38.5	Fracture				x		x		C				
40.1	Cavity - Gypsum infilling "Honeycomb" effect, carbonate infill has been leached out.												
40.3	Joint continues to 40.6 ft	0°	x			x							
41.0	Fracture exhibits weathering							x		C			
45.0	Parting							x		K			
45.9	Fracture							x		K			
46.6	Cavity, gypsum infill 2-inch diameter							x		K			
48.7	Fracture along shaly intercalation - gypsum infill							x					

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT
(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Work

(Ont.)

HOLE NO I-7

SITE West Service Building - Instrumentation Hole

SHEET NO 3 OF 3

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
51.0 to 60.5	Several partings along bedding plane	90°	x			x							
71.0	End of hole												

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) JOB No. P2499.05

PROJECT Thorold Tunnel Remedial Works HOLE No. BH-1

SITE Thorold Tunnel, South Tube Wall SHEET No. 1 OF 3

CONTRACTOR: Canadian Longyear Ltd. STARTED M. April 6, 19 73
FINISHED M. April 7, 19 73

METHOD Tunnel Diamond Drill CASING DIAM.
OF
DRILLING: ROCK Diamond Drill CORE DIAM. NX

LOCATION: LATITUDE CH. 54+93 ELEVATIONS: DATUM MTC
DEPARTURE
BEARING South
INITIAL DIP 0 degrees
OTHER DIPS
DRILL PLATFORM
GROUND SURFACE 529.76
ROCK SURFACE
BOTTOM OF HOLE
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN. CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 6.2		Tunnel Wall Concrete The tunnel wall concrete is generally intact. Minor leaching of cement is confined to fracture faces. Steel Reinforcing - 0.3 ft	
6.2		Bentonite Seal	
6.2 to 10.3		Bulkhead Concrete Bulkhead concrete is fractured locally, but fractures are generally tight. Minor leaching of cement is exhibited along the fractures.	
10.3 to 16.0	Shaly Limestone	Lockport Formation (Gasport member) Dark gray, fine-grained, dense, fossiliferous, subhorizontal shaly laminations approximately 0.2 in. thick, well developed bedding cleavage; fossils and shaly laminations exhibit deformation in the rock	
16.0		End of hole	

INSPECTOR D. Pettey

APPROVED

LOGGED BY M. Walia

DATE

February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT
(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works (Ont.)

HOLE NO BH-1

SITE Thorold Tunnel, South Tube Wall

SHEET NO 2 OF 3

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
0.5	Fracture			X			X						
1.3	Fracture			X			X						
2.6	Fracture			X			X						
3.2	Fracture, minor leaching of cement			X			X						
3.65	Fracture			X			X						
6.2	Bentonite seal												
7.1	Fracture, exhibits minor leaching			X			X						
7.6	Fracture			X			X						
8.7	Fracture, exhibits moderate leaching of cement			X			X						
9.15	Fracture, moderate leaching of cement			X			X						
10.1	Fracture, exhibits moderate to extensive leaching of cement												
10.3				X			X						
10.3	Fracture			X		X							
11.3	Joint	75°		X	X								
12.3	Joint	70°		X	X								
13.8	Fracture, minor weathering			X			X						

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT
(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works (Ont.)

HOLE NO BH-1

SITE Thorold Tunnel, South Tube Wall

SHEET NO 3 OF 3

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION											MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING		
15.2	Joint	80°	x		x				C	Gy				
16.0	End of hole													

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) **JOB No.** P2499.05
PROJECT Thorold Tunnel Remedial Works **HOLE No.** BH-3
SITE Thorold Tunnel, South Tube Wall **SHEET No.** 1 OF 2

CONTRACTOR: Canadian Longyear Ltd. **STARTED** M. April 10 19 73
FINISHED M. April 11 19 73

METHOD OF DRILLING: Concrete Diamond Drilling **CASING DIAM.**
 ROCK Diamond Drilling **CORE DIAM.**

LOCATION: **LATITUDE** CH 54 + 63.7 **ELEVATIONS:** **DATUM** MTC
DEPARTURE **DRILL PLATFORM**
BEARING Due South **GROUND SURFACE** 536.1 ft
INITIAL DIP 0 Degrees **ROCK SURFACE**
OTHER DIPS **BOTTOM OF HOLE**
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 9.8		Tunnel Wall Evidence of some leaching and Bulkhead : and honeycombing. Concrete	
9.8 to 16.0	Shaly Limestone	Light gray, fossiliferous, core is in good condition and does not exhibit chemical weathering.	
16.0		End of hole	

INSPECTOR D. Pettey

LOGGED BY M.A. Macfadgen

APPROVED

DATE

February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT
(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-3

SITE Thorold Tunnel, South Tube Wall

SHEET NO 2 OF 2

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION											MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING		
0.3	Steel reinforcing			X				X						
2.7	Strong fracturing and leaching of concrete							X						
7.0	Fracture			X				X						
7.3	Fracture			X				X						
16.0	End of hole													

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

**ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA**

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) JOB No. P2499.05

PROJECT Thorold Tunnel Remedial Works HOLE No. BH-4

SITE Thorold Tunnel, South Tube Wall SHEET No. 1 OF 2

CONTRACTOR: Canadian Longyear Ltd. STARTED April 11, 19 73

FINISHED April 12, 19 73

METHOD Concrete Diamond Drill CASING DIAM. _____

OF _____

DRILLING: ROCK Diamond Drill CORE DIAM. AX

LOCATION: LATITUDE CH.54+63.7 ELEVATIONS: DATUM MTC

DEPARTURE _____

BEARING South DRILL PLATFORM _____

INITIAL DIP 0 degrees GROUND SURFACE 526.3 ft

OTHER DIPS _____

ROCK SURFACE _____

BOTTOM OF HOLE _____

WATER TABLE _____

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 2.7		Tunnel Wall Concrete Polyethylene seal	
2.7 to 8.6		Bulkhead Concrete Moderate leaching of cement from 5.6 ft to 8.6 ft	
8.6 to 16.0	Shaly Limestone	Dark gray, fossiliferous, moderately competent with no open fractures.	90
16.0		End of hole	

INSPECTOR D. Pettey

LOGGED BY M.A. MacFadyen

APPROVED

DATE

[Signature]
February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT
(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-4

SITE Thorold Tunnel, South Tube Wall

SHEET NO 2 OF 2

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION											MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING		
7.6	Fracture, exhibits leaching	40°			X		X							
8.4	Fracture, exhibits leaching				X		X							
15.1	Joint				X	X								
16.0	End of hole													

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. BH-5
SITE Thorold Tunnel, South Tube Wall SHEET No. 1 OF 2
CONTRACTOR: Canadian Longyear Ltd. STARTED M. March 28, 19 73
FINISHED M. April 2, 19 73
METHOD OF DRILLING: Concrete: Diamond Drill CASING DIAM.
ROCK : Diamond Drill CORE DIAM. NX
LOCATION: LATITUDE CH. 54+66.2 ELEVATIONS: DATUM MTC
DEPARTURE DRILL PLATFORM
BEARING Due South GROUND SURFACE 531.0
INITIAL DIP 0 degrees ROCK SURFACE
OTHER DIPS BOTTOM OF HOLE
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 8.7		Tunnel Wall Concrete The tunnel wall concrete exhibits local fracturing. Minor leaching of cement is exhibited along the fracture faces	
8.7		Bentonite Seal	
8.7 to 10.7		Bulkhead Concrete Some leaching and "honeycombing" of cement from 9.4 ft to 10.4 ft	
10.7 to 101.0	Shaly Limestone	10.7 ft to 19.0 ft - Black, fine-grained, fossiliferous, well developed bedding plane; pronounced cleavage	100
		70.0 ft - 83.0 ft - Core fractured along the bedding planes; high water inflow.	
101.0		83.0 ft - 101.0 ft - Occasional small cavities.	100
		End of hole	

INSPECTOR D. Pettey
LOGGED BY M. A. MacFadyen

APPROVED *J. Bradshaw*
DATE February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT
(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

HOLE NO BH-5

SITE Thorold Tunnel, South Tube Wall

SHEET NO 2 OF 2

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION											MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING *	STAINING **	BLEACHING		
0.0 to 7.0	Fractures at 6- to 8-in intervals	90°		X		X								
10.7 to 14.0	Joints along bedding planes	0°		X	X									
16.3	Joint	30°		X	X				Gyp					
20.3	Joint	80°		X	X									
47.3	Fracture			X			X							
50.5	Joint along bedding plane	0°		X	X									
56.0	Fracture			X			X							
70.0 to 71.5	Core broken			X			X							
75.5	Joint	15°		X	X									
78.3 to 84.0	Numerous joints along bedding plane; mud deposition along the joint planes	3° to 7°												
85.0	Joint	30°		X	X									
91.0	Joint	0°		X	X									
101.0	End of hole													

Gyp = Gypsum

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. BH-6
SITE Thorold Tunnel, South Tube Wall SHEET No. 1 OF 2
CONTRACTOR: Canadian Longyear Ltd. STARTED .M. April 2, 19 73
FINISHED .M. April 3, 19 73
METHOD Concrete Diamond Drill CASING DIAM.
OF
DRILLING: ROCK Diamond Drill CORE DIAM. NX
LOCATION: LATITUDE CH.54+64.5 ELEVATIONS: DATUM MTC
DEPARTURE
BEARING South
INITIAL DIP 0 degrees
OTHER DIPS
DRILL PLATFORM
GROUND SURFACE 531.1 ft
ROCK SURFACE
BOTTOM OF HOLE
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 5.5		Tunnel Wall Evidence of some leaching Concrete and honeycombing.	
5.5		Bentonite Seal	
5.5 to 7.8		Bulkhead Strongly leached and corroded Concrete by ground water action	
7.8 to 18.0	Shaly Limestone	Black, fossiliferous, fracturing parallel to core axis along fissile bedding planes. Fractures near the bulkhead exhibit wider openings and minor chemical alteration effect.	
18.0		End of hole	

INSPECTOR D. Pettey
LOGGED BY M. A. MacFadyen

APPROVED *[Signature]*
DATE February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-6

SITE Thorold Tunnel, South Tube Wall

SHEET NO 2 OF 2

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
0.5	Steel Reinforcing												
3.0	Fracture in concrete						x						
3.8	Fracture in concrete						x						
4.5	Fracture in concrete						x						
5.5	Steel reinforcing												
6.2	Fracture in concrete						x			Br			
7.5							x			Br			
7.8 to 11.0	Fracture	0°		x			x			Br			
11.5 to 12.3	Fracture	0°		x			x						
14.9 to 16.0	Core badly fractured			x			x						
17.0	Fracture	45°		x		x							
18.0	End of hole												

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. BH-7
SITE Thorold Tunnel, South Tube Wall SHEET No. 1 OF 2
CONTRACTOR: Canadian Longyear Ltd. STARTED .M. April 3, 19 73
FINISHED .M. April 4, 19 73
METHOD OF DRILLING: Concrete Diamond Drill CASING DIAM.
ROCK Diamond Drill CORE DIAM. NX
LOCATION: LATITUDE CH.54+63 ELEVATIONS: DATUM MTC
DEPARTURE
BEARING Due South
INITIAL DIP 0 degrees
OTHER DIPS
DRILL PLATFORM
GROUND SURFACE 531.2 ft
ROCK SURFACE
BOTTOM OF HOLE
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 5.9		Tunnel Wall Concrete Minor leaching of cement along fracture surface	
5.9		Bentonite seal	
5.9 to 8.4		Bulkhead Concrete Moderate to strong leaching, hairline fractures parallel to core axis at 7.8 ft	
8.4 to 50.5	Shaly Limestone	8.4 ft - 24.5 ft - Black, fine-grained, fissile, fossiliferous. 24.5 ft - 38.0 ft - Sharp contact with crystalline detrital limestone. 38.0 ft - 50.5 ft - Subhorizontal bedding, bands of shaly limestone interbedded in crystalline limestone	100
50.5		End of hole	

INSPECTOR D. Pettey
LOGGED BY M. A. MacFadyen

APPROVED *[Signature]*
DATE February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-7

SITE Thorold Tunnel, South Tube Wall

SHEET NO 2 OF 2

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
1.0	Fracture in concrete				X		X						
5.7	Steel reinforcing												
7.8	Fracture in bulkhead concrete				X		X						
8.4	2-in fragmented zone in shale at contact with bulkhead concrete				X		X						
13.4	Joint along bedding plane	0°			X	X							
15.2	Joint along bedding plane	0°			X	X							
15.2	Joints parallel to the core to axis at 4-to 6-in intervals	0°			X	X							
24.5													
39.0	Joint along bedding plane	3°			X	X							
42.0	Joint along bedding plane	3°			X	X							
49.0	Bedding fracture following 1-in shale band	5°			X	X							
50.5	End of hole												

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Work HOLE No. BH-8
SITE Thorold Tunnel, South Tube Wall SHEET No. 1 OF 4

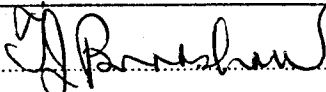
CONTRACTOR: Canadian Longyear Ltd. STARTED .M. April 5 19 73
FINISHED .M. April 6 19 73

METHOD OF DRILLING: Concrete Diamond Drilling CASING DIAM.
ROCK Diamond Drilling CORE DIAM. NX

LOCATION: LATITUDE CH 54 + 61.2 ELEVATIONS: DATUM MTC
DEPARTURE
BEARING Due South
INITIAL DIP 0 Degrees
OTHER DIPS
DRILL PLATFORM
GROUND SURFACE 531.2 ft
ROCK SURFACE
BOTTOM OF HOLE
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 5.9		Tunnel Wall Concrete The tunnelwall concrete is fractured locally. Some leaching of cement in the fracture zones is evident.	
5.9		Bentonite Seal	
5.9 to 8.4		Bulkhead Concrete The bulkhead concrete is generally intact and does not exhibit any deterioration.	
8.4 to 30.0	Shaly Limestone	Lockport Formation (Gasport member) Dark gray, fine grained, dense, closely jointed, well developed sub-horizontal bedding - cleavage, fossiliferous, vuggy locally, shaly laminations are approximately 0.1 - 0.2 inch thick, fossils exhibit deformation in the rock.	

INSPECTOR D. Pettey
LOGGED BY M. Walia

APPROVED 
DATE February 1974

ACRES CONSULTING SERVICES LIMITED

NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Ministry of Transportation and Communications JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. BH-8
SITE Thorold Tunnel, South Tube Wall SHEET No. 2 OF 4

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	LENGTH OF RUN	% CORE
30.0		2 cavities were encountered at the following depths: 28.0 ft - 0.5 inch diameter 29.8 ft - 1.0 inch diameter End of hole		

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-8

SITE Thorold Tunnel, South Tube Wall

SHEET NO 3 OF 4

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
1.0	Fracture minor leaching evident along the fracture faces				X		X						
1.6	Fracture				X		X						
2.8 to 2.9	Core fractured, minor leaching of cement evident				X		X						
3.2	Fracture, minor leaching of cement along fracture faces				X		X						
5.9	Bentonite Seal												
8.7	Joint, continues to 9.3 feet	50°	X			X			S	Gy			
10.7	Joint	40°			X	X			C	Gy			
12.6	Joint	40°			X	X			C	Gy			
13.0 to 13.1	Rock fractured				X		X		C	Gy			
15.1	B-Parting, sub-horizontal.		X			X			C	Gy			
18.3	Joint				X	X			C	Gy			
19.4	Joint	30°			X	X			C	Gy			
21.8	Fracture				X		X		S	Gy			

S=Shale

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications
(Ont.)

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

HOLE NO BH-8

SITE Thorold Tunnel, South Tube Wall

SHEET NO 4 OF 4

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
21.8	Fracture			X			X		S	Gy			
22.4	B-Parting, filled with shaly material continues to 22.9	0° to 5°		X									
25.6	Fracture			X			X						
26.2	Fracture			X			X						
29.2	Joint	5°	X		X				C	Gy			
30.0	End of hole												

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN

+ Gy = GRAY

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) JOB No. P2499.05

PROJECT Thorold Tunnel Remedial Works HOLE No. BH-10

SITE Thorold Tunnel, South Tube Wall SHEET No. 1 OF 3

CONTRACTOR: Canadian Longyear Ltd. STARTED M. April 9, 19 73
FINISHED M. April 10, 19 73

METHOD OF DRILLING: Concrete: Diamond Drill CASING DIAM.
ROCK: Diamond Drill CORE DIAM. NX

LOCATION: LATITUDE CH.54+29.8 ELEVATIONS: DATUM MTC
DEPARTURE
BEARING South DRILL PLATFORM
INITIAL DIP Horizontal GROUND SURFACE 533.1
OTHER DIPS ROCK SURFACE
BOTTOM OF HOLE
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN. CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 6.1		Tunnel Wall Fractures in concrete Concrete exhibit very minor amounts of leaching. Concrete exhibits leaching adjacent to bentonite seal	
6.1		Bentonite Seal	
6.1 to 8.8		Bulkhead Fractures tighter than in Concrete tunnel wall concrete. Minor leaching	
8.8 to 43.0	Shaly Limestone	8.8 ft - 28.9 ft - Black, fine-grained, fissile, fossiliferous, extensively fractured core from 19.0 ft to 24.0 ft	
43.0		28.9 ft - 43.0 ft - Numerous shaly partings End of hole	

INSPECTOR D. Pettey

LOGGED BY M. A. MacFadyen

APPROVED

DATE

February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications
(Ont.)

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

HOLE NO BH-10

SITE Thorold Tunnel, South Tube Wall

SHEET NO 2 OF 3

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION											MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING		
0.5	Steel reinforcing, minor leaching of cement													
1.1	Fracture, minor leaching			X				X						
1.5	Fracture, minor leaching			X				X						
2.1	Fracture, minor leaching							X						
3.9	Fracture, minor leaching							X						
5.0	Fracture, minor leaching							X						
7.0	Fracture, moderate leaching			X				X						
7.2	Fracture, moderate leaching			X				X						
7.8	Fracture, moderate leaching			X				X						
10.9	Cavity 1.5 in x 1 in													
11.8	Joint continues to 12.4 ft	0°		X	X									
13.5	Joint continues to 13.9 ft	0°		X	X									
14.2	Cavity 1 in x 0.5 in								C					
14.6	Fracture			X				X						
15.1	Fracture			X				X						
15.5	Fracture			X				X						
15.5 to 25.0	Core badly broken													

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. BH-11
SITE Thorold Tunnel, South Tube Wall SHEET No. 1 OF 2
CONTRACTOR: Canadian Longyear Ltd. STARTED .M. April 10, 19 73
FINISHED .M. April 11, 19 73
METHOD OF DRILLING: Concrete Diamond Drill CASING DIAM. _____
ROCK Diamond Drill CORE DIAM. NX
LOCATION: LATITUDE CH.54+28.3 ELEVATIONS: DATUM MTC
DEPARTURE _____
BEARING South
INITIAL DIP 0 degrees
OTHER DIPS _____
DRILL PLATFORM _____
GROUND SURFACE 533.1
ROCK SURFACE _____
BOTTOM OF HOLE _____
WATER TABLE _____

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN. CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 5.9		Tunnel Wall Concrete The concrete at the tunnel wall is generally intact. Minor leaching of cement is confined to fractures occurring locally Steel Reinforcing 0.5 ft 5.6 ft	
5.9		Bentonite Seal	
5.9 to 9.1		Bulkhead Concrete The concrete at the bulkhead is fractured locally; minor amount of leaching of cement is evident.	
9.1 to 16.0	Limestone	Dark grey, fine-grained, dense, thinly laminated, shaly laminations exhibit plastic deformation in the rock. The rock is fossiliferous.	
16.0		End of hole	

INSPECTOR D. Pettey
LOGGED BY M. Walia

APPROVED

DATE

February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-11

SITE Thorold Tunnel, South Tube Wall

SHEET NO 2 OF 2

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
1.2	Fracture			X			X						
2.4	Core fractured; minor amount to of cement is evident			X			X						
2.7													
3.1	Fracture			X			X						
5.9	Bentonite seal												
8.5	Fracture, minor leaching of cement along the faces.			X			X						
9.3	Joint	60°	X		X				C	Gy			
9.9	Joint	85°	X		X				C	Gy			
10.8	Joint	75°	X		X								
12.7	Joint	80°	X		X				C	Gy			
14.0	Fracture			X			X						
15.0	Rock fractured, subhorizontal to fractures			X			X						
16.0													
16.0	End of hole												

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

**ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA**

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) **JOB No.** P2499.05
PROJECT Thorold Tunnel Remedial Works **HOLE No.** BH-12
SITE Thorold Tunnel, North Tube Wall **SHEET No.** 1 OF 2
CONTRACTOR: Canadian Longyear Ltd. **STARTED** M. May 1, 1973
FINISHED M. May 1, 1973
METHOD OF DRILLING: Concrete Diamond Drill **CASING DIAM.**
 ROCK Diamond Drill **CORE DIAM.** NX
LOCATION: **LATITUDE** CH. 54+22.5 **ELEVATIONS:** **DATUM** MTC
DEPARTURE **DRILL PLATFORM**
BEARING North **GROUND SURFACE** 533.1 ft
INITIAL DIP 0 degrees **ROCK SURFACE**
OTHER DIPS **BOTTOM OF HOLE**
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 6.1		Tunnel Wall Concrete The concrete from the tunnel wall is fractured locally; minor weathering is confined to the fracture faces Steel Reinforcing - 0.4 ft - 5.6 ft	
6.1		Bentonite Seal	
6.1 to 10.1		Bulkhead Concrete Bulkhead concrete is fractured locally but fractures are quite tight. Minor weathering is exhibited along the fractures.	
10.1 to 26.0	Shaly Limestone	Lockport Formation (Gasport member) Dark gray, fine-grained, dense, subhorizontal cleavage is well developed, fossiliferous, fossils exhibit deformation locally. Rock is closely fractured occasionally.	
26.0		End of hole	

INSPECTOR D. Pettey
LOGGED BY M. Walia

APPROVED *[Signature]*
DATE February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-12

SITE Thorold Tunnel, North Tube Wall

SHEET NO 2 OF 2

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
0.35	Fracture			X			X						
1.2	Fracture			X			X						
5.6	Fracture			X			X						
6.8	Fracture, minor weathering			X			X						
10.1 to 10.5	Rock closely fractured			X			X						
10.7	Joint	60°		X	X								
11.25	Joint	60°	X		X				C	Gy			
11.75	Fracture			X			X						
12.1	Fracture			X			X						
14.4	Joint, exhibits minor weathering	45°	X		X				C	Gy			
14.5	Joint, exhibits minor weathering	35°	X		X				C	Gy			
14.9	Joint	35°	X		X				C	Gy			
16.0	Joint	65°		X	X				C	Gy			
16.3	Fracture			X			X						
16.9	Joint	75°	X		X				C	Gy			
17.2	Fracture			X			X		C	Gy			
26.0	End of hole												

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. BH-14
SITE Thorold Tunnel, North Tube Wall SHEET No. 1 OF 2

CONTRACTOR: Canadian Longyear Ltd. STARTED M. May 1 19.73
FINISHED M. May 3 19.73

METHOD OF DRILLING: Concrete Diamond Drilling CASING DIAM.
ROCK Diamond Drilling CORE DIAM. NX

LOCATION: LATITUDE CH 54 + 64.2 ELEVATIONS: DATUM MTC
DEPARTURE
BEARING North
INITIAL DIP 0 Degrees
OTHER DIPS
DRILL PLATFORM
GROUND SURFACE 531.0 ft
ROCK SURFACE
BOTTOM OF HOLE
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN. CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 6.1		Tunnel Wall Concrete The concrete core from the tunnel wall is generally intact with no evidence of honeycombing, segregation or deterioration. Steel reinforcing - 0.5 ft - 5.6 ft	
6.1		Bentonite Seal	
6.1 to 9.9		Bulkhead Concrete The bulkhead concrete is generally intact and does not show any deterioration	
9.9 to 51.75	Shaly Limestone	Lockport Formation (Gasport member) Dark gray, fine grained, dense, numerous fossils exhibit deformation, sub-horizontal joints are predominant, minor weathering along the joint faces. Sub-horizontal cleavage is predominant from 30.0 ft to 51.75 ft.	
51.75		End of hole	

INSPECTOR D. Pettey

LOGGED BY M. Walia

APPROVED

DATE

[Signature]

February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-14

SITE Thorold Tunnel, North Tube Wall

SHEET NO 2 OF 2

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
10.4	Joint	70°	x	x					C	Gy			
10.5	Joint	35°	x	x					C	Gy			
10.95	Joint	60°	x	x					C	Gy			
11.0	Joint, exhibits minor weathering	0°		x	x				C	Gy			
12.4	Joint	60°	x	x					C	Gy			
13.0	Fracture			x			x						
18.6	Fracture			x			x						
21.8	Fracture, exhibits minor weathering			x			x						
26.9	Fracture			x			x						
29.8 to 33.2	Fracture, minor weathering	0°		x			x						
42.3 to 42.5	Rock fractured			x			x						
46.5	Joint	20°	x	x					C	Gy			
51.75	End of hole												

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

**ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA**

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) JOB No. P2499.05

PROJECT Thorold Tunnel Remedial Works HOLE No. BH-15

SITE Thorold Tunnel, North Tube Wall SHEET No. 1 OF 2

CONTRACTOR: Canadian Longyear Ltd. STARTED .M. May 2, 1973

FINISHED .M. May 2, 1973

METHOD OF DRILLING: Concrete Diamond Drilling CASING DIAM.

ROCK Diamond Drilling CORE DIAM. N.X.

LOCATION: LATITUDE CH. 54+91.4 ELEVATIONS: DATUM MTC

DEPARTURE DRILL PLATFORM 532.0

BEARING North GROUND SURFACE

INITIAL DIP 0 degrees ROCK SURFACE

OTHER DIPS BOTTOM OF HOLE

WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 6.15		Tunnel Wall Concrete The concrete from the tunnel wall is fractured locally; however, the concrete is intact and does not exhibit deterioration	
6.15		Bentonite Seal	
6.15 to 10.1		Bulkhead Concrete The concrete from the bulkhead is intact and does not show any deterioration.	
10.1 to 10.5	Shaly Limestone	Lockport Formation (Gasport member) Dark grey, fine-grained, fossiliferous, abundant fossils exhibit deformation	
10.5		End of hole	

INSPECTOR D. Pettey

LOGGED BY M. Walia

APPROVED

DATE

J. P. Broadshaw
February 1974

**ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA**

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. BH-16
SITE Thorold Tunnel, Fan Room, North Wall SHEET No. 1 OF 3
CONTRACTOR: Canadian Longyear Ltd. STARTED .M. April 19, 19 73
FINISHED .M. April 23, 19 73
METHOD OF DRILLING: Concrete Diamond Drilling CASING DIAM.
ROCK Diamond Drilling CORE DIAM. NX
LOCATION: LATITUDE CH. 54+32.5 ELEVATIONS: DATUM MTC
DEPARTURE
BEARING North
INITIAL DIP 0 degrees
OTHER DIPS
DRILL PLATFORM 553.0 ft
GROUND SURFACE
ROCK SURFACE
BOTTOM OF HOLE
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN. CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 6.1		Tunnel Wall Concrete The concrete at the tunnel wall is fractured locally; minor to moderate leaching of cement is exhibited along the fracture faces.	
6.1		Bentonite Seal	
6.1 to 10.1		Bulkhead Concrete The bulkhead concrete is fractured locally and exhibits minor leaching of cement along the fracture faces.	
10.1 to 25.9	Dolomite	Lockport Formation (Goat Island/Gasport member) Medium to dark gray, Fine-grained, dense, well jointed; rock fractured locally, vuggy occasionally.	
25.9		End of hole	

INSPECTOR D. Pettey
LOGGED BY M. Walia

APPROVED

DATE

February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-16

SITE Thorold Tunnel, Fan Room, North Wall

SHEET NO 2 OF 3

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
1.2	Fracture, exhibits moderate leaching of the cement along the fracture faces			x			x						
1.7	Fracture, moderate leaching of the cement along the fracture faces			x			x						
3.5	Fracture, minor leaching of cement along the fracture faces			x			x						
6.1	Bentonite Seal												
7.4	Fracture			x			x						
8.8	Fracture			x			x						
10.1	Joint	40°	x		x				C	Gy			
10.3	Joint	80°	x		x				C	Gy			
10.5	Fracture			x			x						
10.7	Joint	65°	x		x				C	Gy			
11.2	Joint	40°	x		x				C	Gy			
11.3	Rock, closely fractured to				x		x						
11.4													
11.8	Fracture, exhibits minor weathering along the fracture faces				x		x						
12.3	Joint	50°	x		x				C	Gy			

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-16

SITE Thorold Tunnel, Fan Room, North Wall

SHEET NO 3 OF 3

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
13.0	Joint	65°	x		x				C	Gy			
13.2	Joint	60°	x		x				C	Gy			
14.2	Joint	65°	x		x				C	Gy			
14.5	Joint	20°	x		x				C	Gy			
15.8	Fracture				x		x						
16.9	Joint	80°	x		x				C	Gy			
18.6	Fracture, minor weathering				x		x						
19.9	Joint, minor weathering	70°	x		x				C	Gy			
21.3	Joint, filled with calcareous material	80°	x		x				C	W			
22.7	Fracture				x		x						
23.6 to 23.7	Rock, closely fractured				x		x						
23.9	Joint	50°	x		x								
24.7	Joint, exhibits minor weathering	80°	x		x								
25.9	End of hole												

W = White

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. BH-17
SITE Thorold Tunnel, Fan Room, North Wall SHEET No. 1 OF 4

CONTRACTOR: Canadian Longyear Ltd. STARTED M. April 23, 19 73
FINISHED M. April 25, 19 73
METHOD OF DRILLING: Concrete Diamond Drilling CASING DIAM. _____
ROCK Diamond Drilling CORE DIAM. NX
LOCATION: LATITUDE CH. 54+63.0 ELEVATIONS: DATUM MTC
DEPARTURE DRILL PLATFORM
BEARING North GROUND SURFACE 553.0 ft
INITIAL DIP 0 degrees ROCK SURFACE
OTHER DIPS BOTTOM OF HOLE
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 8.1		Tunnel Wall Concrete Tunnel wall concrete is fractured locally, and minor amount of leaching is confined to the fracture faces. Concrete generally is in a good condition and does not show any deterioration. Steel Reinforcing: 0.3 ft 7.8 ft	
8.1		Bentonite Seal	
8.1 to 10.1		Bulkhead Concrete Bulkhead concrete is in excellent condition and does not show any deterioration.	
10.1 to 50.9	Dolomite	Lockport Formation (Goat Island/Gasport member), medium-gray, fine-grained, numerous subhorizontal shaly laminations up to 0.5 in. thick.	

INSPECTOR D. Pettey
LOGGED BY M. Walia

APPROVED *[Signature]*
DATE February 1974

ACRES CONSULTING SERVICES LIMITED

NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) Job No. P2499.05

PROJECT Thorold Tunnel Remedial Works

HOLE No. BH-17

SITE Thorold Tunnel, Fan Room, North Wall

SHEET No. 2 OF 4

DEPTH	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	LENGTH OF RUN	% CORE
50.9		Wavy shaped liminations exhibit deformation in the rock, Rock is closely fractured and jointed locally, vuggy occasionally. 31.0 ft - 31.2 ft. - Cavity filled with calcareous material approximately 2 in. in diameter. 34.65 ft. - Abundant corals 40.6 ft. - Cavity approximately 0.5 in. diameter 44.3 ft - Cavity approximately 0.5 in. diameter End of hole		

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT
(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-17

SITE Thorold Tunnel, Fan Room, North Wall

SHEET NO 3 OF 4

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
1.0	Fracture, minor amount of leaching of cement along the fracture faces				x		x						
3.2	Fracture, minor amount of leaching of cement is confined to fracture faces				x		x						
10.5	Joint	50°			x	x				C	Gy		
10.6	Joint	60°	x			x				C	Gy		
11.0	Fracture				x		x						
11.2	Fracture		x				x						
11.8	Joint	70°	x			x				C	Gy		
11.8	Fracture, continues to 12.1 ft				x		x						
12.1	Joint	25°	x			x				C	Gy		
12.3 to 12.6	Rock closely fractured and jointed				x		x						
13.3	Joint	50°	x			x							
14.2	Joint	60°	x			x							
17.3	Joint	50°	x			x							
18.4	Joint	65°	x			x							
19.7	Joint, weathering along the joint faces	60°	x			x				C	Gy		

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works (Ont.)

HOLE NO BH-17

SITE Thorold Tunnel, Fan Room, North Wall

SHEET NO 4 OF 4

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
22.5	Joint	75°	x		x				C	Gy			
24.6	Joint	55°	x		x				C	Gy			
25.5	Joint	65°	x		x				C	Gy			
28.5 to 28.6	Rock, closely fractured			x			x						
30.0	Fracture			x			x						
32.3	Joint	65°	x		x				C	Gy			
33.3	Joint	60°	x		x				C	Gy			
34.7	Joint	65°	x		x								
35.2	Joint	60°	x		x				C	Gy			
36.4	Joint	15°	x		x				C	Gy			
37.4	Joint	75°	x		x				C	Gy			
40.8	Fracture			x			x		C	Gy			
41.6	Fracture			x			x						
44.8	Joint, minor weathering along the joint faces	60°	x		x				C	Gy			
50.2	Joint	65°	x		x				C	Gy			
50.9	End of hole												

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

Ministry of
CLIENT Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. BH-18
SITE Thorold Tunnel, Fan Room, South Wall SHEET No. 1 OF 5
CONTRACTOR: Canadian Longyear Ltd. STARTED .M. April 25 19 73
FINISHED .M. April 26 19 73
METHOD OF DRILLING: Concrete Diamond Drilling CASING DIAM. _____
ROCK Diamond Drilling CORE DIAM. NX
LOCATION: LATITUDE CH 54 + 67.7 ELEVATIONS: DATUM MTC
DEPARTURE _____
BEARING South
INITIAL DIP 0 Degrees
OTHER DIPS _____
DRILL PLATFORM _____
GROUND SURFACE 553.0 ft
ROCK SURFACE _____
BOTTOM OF HOLE _____
WATER TABLE _____

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN. CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 5.5		Tunnel Wall Concrete Concrete at the tunnel wall is fractured locally and minor weathering is confined to the fracture faces. Steel reinforcing - 0.3 ft - 5.9 ft	
5.5		Bentonite Seal	
5.5 to 10.4		Bulkhead Concrete Bulkhead concrete is fractured locally	
10.4 to 51.3	Dolomite	Lockport Formation (Goat Island/Gasport member) Medium to dark gray, fine grained, closely fractured near the bulkhead, concrete face, dense, shaly laminations (wavy in shape) are 0.25 inch thick and exhibit deformation, rock is closely fractured and jointed locally, vuggy occasionally, cavities up to 0.1 inch diameter are present.	

INSPECTOR D. Pettey
LOGGED BY M. Wallia

APPROVED

DATE

February 1974

ACRES CONSULTING SERVICES LIMITED

NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. BH-18
SITE Thorold Tunnel, Fan Room, South Wall SHEET No. 2 OF 5

DEPTH	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	LENGTH OF RUN	% CORE
51.3		21.2 ft - 23.0 ft - Numerous cavities up to 0.1 inch in diameter 40.0 ft - 41.0 ft - Numerous cavities up to 0.1 inch in diameter Laminations are generally sub-horizontal End of hole		

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-18

SITE Thorold Tunnel, Fan Room, South Wall

SHEET NO 3 OF 5

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION											MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING		
0.3	Fracture, minor leaching of cement			x			x							
1.7	Fracture, exhibits minor leaching			x			x							
5.8	Fracture			x			x							
10.4 to 10.9	Rock closely fractured and jointed			x			x							
10.9	Joint	50°	x		x				C	Gy				
11.2	Joint	80°	x		x									
12.1	Joint	65°	x		x				C	Gy				
12.3 to 12.5	Rock closely fractured and jointed			x			x							
12.5	Fracture, continues to 13.5 feet, shaly along the fracture faces			x			x							
13.5	Joint	80°	x		x				C	Gy				
14.9	Fracture	Vert		x			x		S	Gy				
15.3	Joint	80°	x		x				C	Gy				

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT
(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-18

SITE Thorold Tunnel, Fan Room, South Wall

SHEET NO 4 OF 5

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
15.3	Fracture, continues to 29.4 ft, vuggy locally (21.2 ft - 23.0 ft)						x						
20.5	Fracture				x			x					
22.8	Joint	75°	x			x							
23.4 to 23.6	Rock closely fractured				x			x					
29.4	Fracture, continues to 41.0 ft, this fracture has occurred along a shaly lamination approximately 0.2 inch thick					x		x					
32.3 to 32.5	Rock closely fractured				x			x					
34.9	Joint	70°	x			x			C	Gy			
35.9	Joint	75°	x			x			C	Gy			
37.3	Joint	60°	x			x			C	Gy			
41.4 to 41.5	Rock closely fractured				x			x					
44.4	Joint	60°	x			x							
45.35	Fracture, continues to 46.0 ft	Vert		x				x					

C = CARBONATE H = HEMATITE K = CHLORITE

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ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications
(Ont.)

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

HOLE NO BH-18

SITE Thorold Tunnel, Fan Room, South Wall

SHEET NO 5 OF 5

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
46.0	Joint	15°	x		x								
50.0	Fracture			x				x					
51.3	End of hole												

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN

+ Gy = GRAY

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. BH-19
SITE Thorold Tunnel, Fan Room, South Wall SHEET No. 1 OF 4

CONTRACTOR: Canadian Longyear Ltd. STARTED .M. April 27 19 73

FINISHED .M. April 27 19 73

METHOD Concrete Diamond Drilling CASING DIAM.

OF DRILLING: ROCK Diamond Drilling CORE DIAM. NX

LOCATION: LATITUDE CH 54 + 67.7 ELEVATIONS: DATUM MTC

DEPARTURE DRILL PLATFORM

BEARING South GROUND SURFACE 553.0 ft

INITIAL DIP 0 Degrees ROCK SURFACE

OTHER DIPS BOTTOM OF HOLE

WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN. CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0 to 6.0		Tunnel Wall Concrete Concrete at tunnel wall is locally fractured, minor leaching is confined to the fracture zones only. Concrete, wherever not fractured is in good condition and does not exhibit any deterioration. Steel reinforcing - 0.35 ft	
6.0		Bentonite Seal	
6.0 to 10.7		Bulkhead Concrete Bulkhead concrete is generally intact. At the rock face minor leaching of cement is exhibited.	
10.7 to 17.0	Dolomite	Lockport Formation (Goat Island/Gasport member) Medium gray, fine grained, dense, shaly laminations (wavy in shape) approximately 0.2 inch thick are present throughout. Vuggy locally, closely fractured and jointed occasionally	

INSPECTOR D. Pettey

APPROVED 

LOGGED BY M. Walia

DATE February 1974

ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) JOB No. P2499.05
PROJECT Thorold Tunnel Remedial Works HOLE No. BH-19
SITE Thorold Tunnel, Fan Room, South Wall SHEET No. 2 OF 4

DEPTH	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	LENGTH OF RUN	% CORE
17.0		15.0-ft - cavity approximately 0.5 inch in diameter End of hole		

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications
(Ont.)

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

HOLE NO BH-19

SITE Thorold Tunnel, Fan Room, South Wall

SHEET NO 3 OF 4

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
1.7	Fracture, minor leaching of cement			X			X						
3.3 to 3.5	Concrete closely fractured, minor leaching of cement			X			X						
4.2	Fracture, exhibits minor leaching of cement			X			X						
4.8	Fracture, exhibits minor leaching of cement			X			X						
5.1	Fracture			X			X						
5.6	Fracture			X			X						
6.0	Bentonite Seal												
9.1	Fracture, exhibits minor leaching of cement			X			X						
10.9 to 11.5	Rock closely fractured and jointed			X			X						
11.5	Fracture continues to 11.9 ft			X			X						
12.2 to 13.0	Rock closely fractured			X			X						
13.1	Fracture continues to 13.4 ft, sub-vert			X			X						

C = CARBONATE H = HEMATITE K = CHLORITE

++ Br = BROWN + Gy = GRAY

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2449.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-19

SITE Thorold Tunnel, Fan Room, South Wall

SHEET NO 4 OF 4

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
15.0	Cavity, partially filled with calcareous material, 0.5 inch diameter												
17.0	End of hole												

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN + Gy = GRAY

**ACRES CONSULTING SERVICES LIMITED
NIAGARA FALLS, CANADA**

DRILLING REPORT

CLIENT Ministry of Transportation and Communications (Ont.) JOB No. P2499.05

PROJECT Thorold Tunnel Remedial Works HOLE No. BH-20

SITE Thorold Tunnel, Fan Room, South Wall SHEET No. 1 OF 3

CONTRACTOR: Canadian Longyear Ltd. STARTED M. April 27, 19 73
FINISHED M. April 30, 19 73

METHOD Concrete Diamond Drilling CASING DIAM.
OF
DRILLING: ROCK Diamond Drilling CORE DIAM. NX

LOCATION: LATITUDE CH.54+45.3 ELEVATIONS: DATUM MTC
DEPARTURE
BEARING South
INITIAL DIP 0 degrees
OTHER DIPS
DRILL PLATFORM
GROUND SURFACE 553.0 ft
ROCK SURFACE
BOTTOM OF HOLE
WATER TABLE

DEPTH feet	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	% CORE
0.0		Tunnel Wall Concrete The concrete at the tunnel wall is fractured locally, and minor weathering is exhibited along the fracture faces. Concrete in general is in good condition and does not show deterioration. Steel Reinforcing: 0.35 feet	
5.9		Bentonite Seal	
5.9 to 9.7		Bulkhead Concrete Concrete at bulkhead is generally intact; minor leaching at the rock interface	
9.7 to 17.0	Dolomite	Lockport Formation (Goat Island/Gasport member) Medium-grained, fine-grained, dense, shaly along some of the fractures, sub-horizontal fractures are common. 14.7 ft - 15.2 ft - Vuggy, small cavities up to 0.25 in. diameter	

INSPECTOR D. Pettey

APPROVED

LOGGED BY M. Walia

DATE February 1974

ACRES CONSULTING SERVICES LIMITED

DRILLING REPORT

(CORE DETAILS)

CLIENT Ministry of Transportation and Communications

JOB NO P2499.05

PROJECT Thorold Tunnel Remedial Works

(Ont.)

HOLE NO BH-20

SITE Thorold Tunnel, Fan Room, South Wall

SHEET NO 3 OF 3

DEPTH (FT.)	DISCONTINUITY (JOINT, FAULT, BEDDING PLANES, CLEAVAGE, LINEATION)	ANGLE WITH CORE AXIS	DESCRIPTION										MUTUAL ANGLE
			SLICK	SMOOTH	ROUGH	PLANE	CURVED	IRREGULAR	SLICKENSIDED	FILLING +	STAINING ++	BLEACHING	
0.35	Fracture, exhibits minor weathering			X				X					
1.25	Fracture, minor weathering			X				X					
3.4	Fracture, concrete is slightly weathered and leached along the fracture faces			X				X					
4.9	Fracture, exhibits slight leaching			X				X					
7.9	Fracture			X				X					
8.6	Fracture			X				X					
9.7	Rock closely fractured and to jointed			X				X					
11.0													
11.6	Fracture, continues to 13.2 ft	90°		X				X					
13.6	Fracture			X				X					
14.2	Joint	75°		X		X							
14.7	Fracture, shaly along the fracture faces			X				X		S Gy			
15.0	Joint	60°		X		X				C Gy			
16.3	Joint	70°		X		X				C Gy			
17.0	End of hole												

S = Shaly

C = CARBONATE

H = HEMATITE

K = CHLORITE

++ Br = BROWN + Gy = GRAY