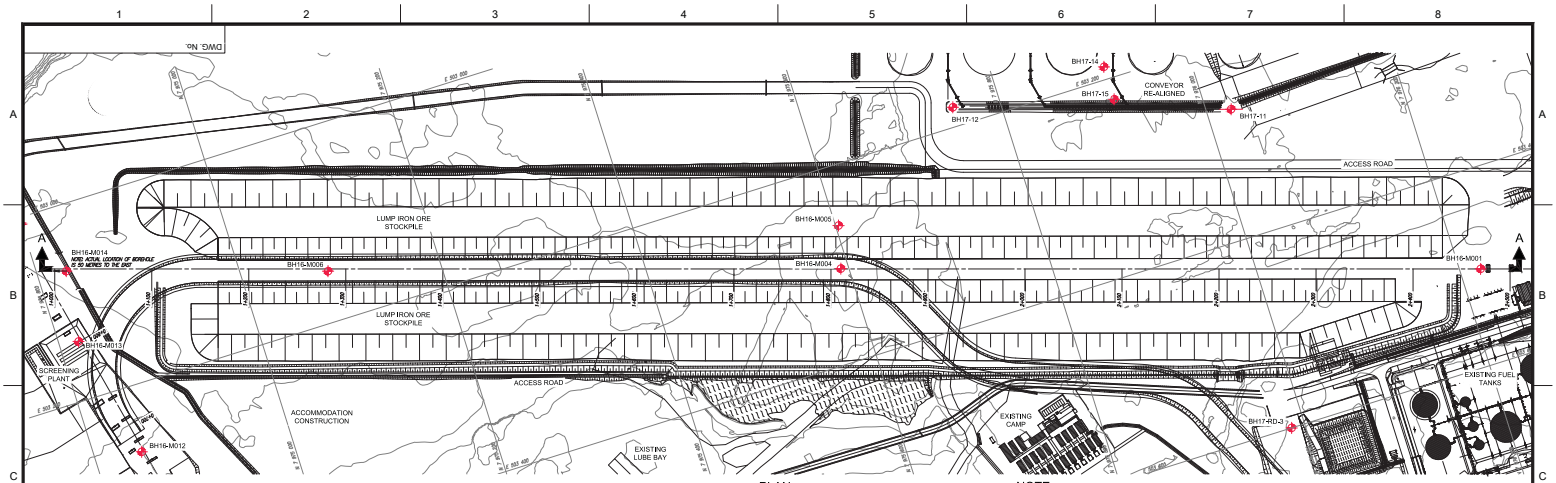


PLAN

0 50 100 150 200 METRES

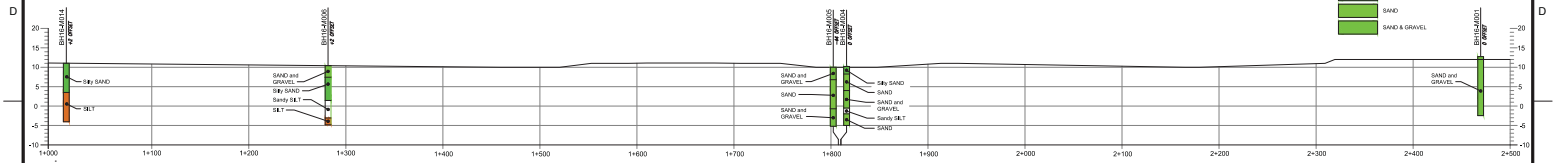
SCALE: 1:2000

NOTE

PROCESSING LINE LAYOUT UPDATED LAST ON FEBRUARY 6TH., 2018

LEGEND

- SILT
- Sandy SILT
- Silty SAND
- SAND
- SAND & GRAVEL



SECTION A-A

1:2000 HORIZONTAL 0 50 100 150 200 METRES

1:500 VERTICAL 0 10 20 30 40 50 METRES

DRAWING No.	DRAWING TITLE
REFERENCE DRAWINGS	

NAME

SIGNATURE

ENG REG NUMBER

REVISION DATE

ORIGINAL DATE

REGISTERED PROFESSIONAL

No.	DESCRIPTION	BY	CHK'D	DATE

REVISIONS

HATCH

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	T BEREKOWSKI	NR	26/01/2018
DESIGNER		NR	
CHECKER			2018-02-07
DESIGN COORD.			
RESP. ENG.	G QU		
LEAD DISC. ENG.			
ENG. MANAGER			
PROJ. MANAGER			

DRAWING APPROVAL STATUS: INTERNAL REVIEW

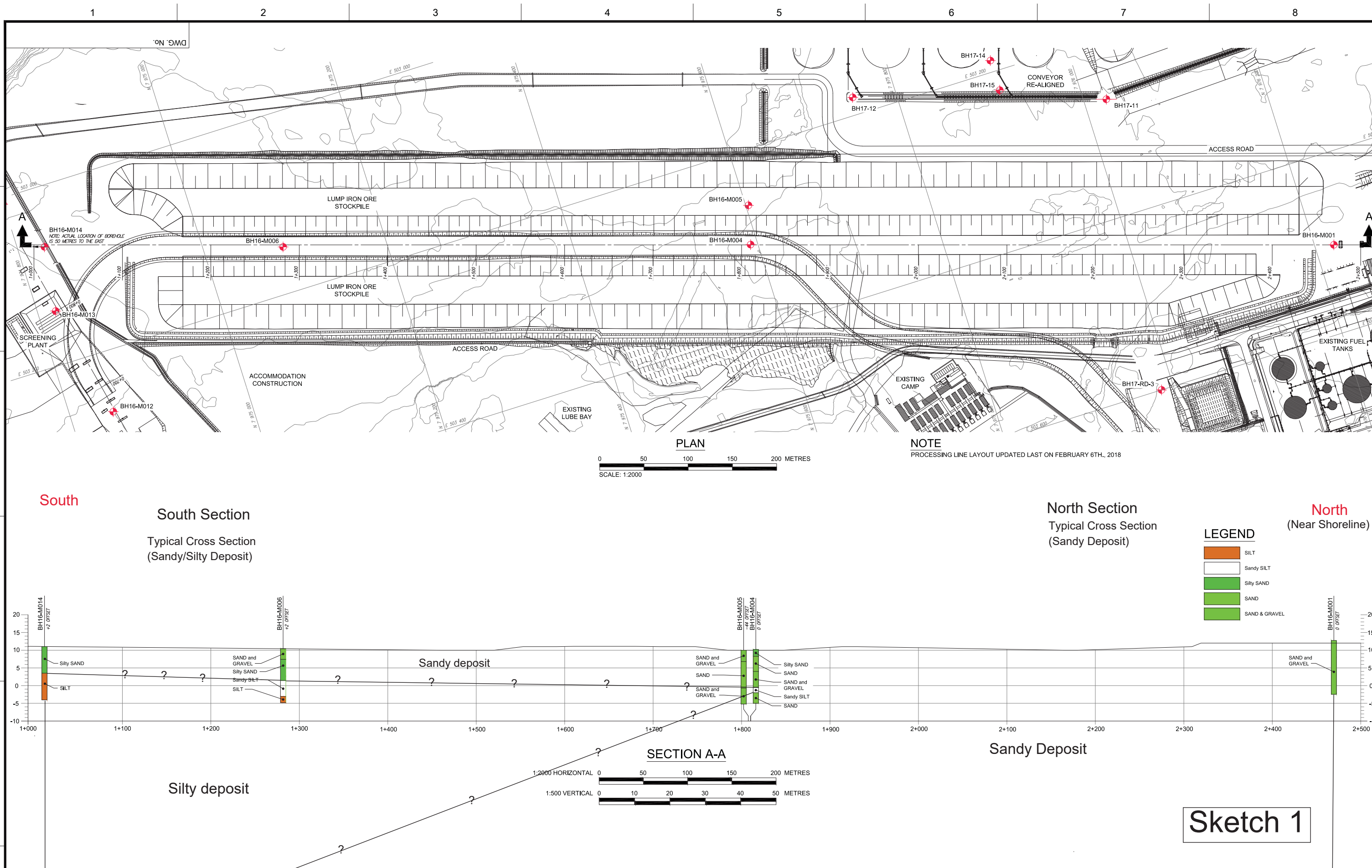
Baffinland

BAFFINLAND EXPANSION 12 MTPA MINE OPTION
PRE FEASIBILITY STUDY

PORT SITE
LUMP IRON ORE STOCKPILE
GEOLOGICAL PROFILE

SCALE	DWG. No.	REV
1:2000 UNLESS NOTED	H352034-GEOSKT-229-292-0012	A

$USERNAME$
$DATE$
$TIME$


DWG. No.
BH17-14
BH17-15
BH17-12
BH17-11
CONVEYOR
RE-ALIGNED
ACCESS ROAD
LUMP IRON ORE
STOCKPILE
BH16-M005
BH16-M014
NOTE: ACTUAL LOCATION OF BOREHOLE IS 50 METRES TO THE EAST
BH16-M006
BH16-M004
BH16-M001
BH16-M013
SCREENING
PLANT
ACCESS ROAD
ACCOMMODATION
CONSTRUCTION
EXISTING
LUBE BAY
EXISTING
CAMP
BH17-RD-3
EXISTING FUEL
TANKS
BH16-M012
PLAN
0 50 100 150 200 METRES
SCALE: 1:2000
NOTE
PROCESSING LINE LAYOUT UPDATED LAST ON FEBRUARY 6TH., 2018
South
South Section
Typical Cross Section
(Sandy/Silty Deposit)
North Section
Typical Cross Section
(Sandy Deposit)
North
(Near Shoreline)
LEGEND
SILT
Sandy SILT
Silty SAND
SAND
SAND & GRAVEL
Silty SAND
SILT
SAND and GRAVEL
Silty SAND
Sandy SILT
SILT
Sandy deposit
SAND and GRAVEL
SAND
SAND and GRAVEL
Silty SAND
SAND
SAND and GRAVEL
Sandy SILT
SAND
SAND and GRAVEL
1+000
1+100
1+200
1+300
1+400
1+500
1+600
1+700
1+800
1+900
2+000
2+100
2+200
2+300
2+400
2+500
SECTION A-A
1:2000 HORIZONTAL 0 50 100 150 200 METRES
1:500 VERTICAL 0 10 20 30 40 50 METRES
Sandy Deposit
Silty deposit
Sketch 1
EL
-55
Till (Inferred)
(See Sketch 2 for details)

DRAWING No.	DRAWING TITLE
REFERENCE DRAWINGS	

NAME
SIGNATURE
ENG REG NUMBER
REVISION DATE
ORIGINAL DATE
REGISTERED PROFESSIONAL

No.	DESCRIPTION	BY	CHK'D	DATE
REVISIONS				

HATCH

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	T BEREKOWSKI	NR	26/01/2018
DESIGNER		NR	
CHECKER			2018-02-07
DESIGN COORD.			
RESP. ENG.	G QU		
LEAD DISC. ENG.			
ENG. MANAGER			
PROJ. MANAGER			

DRAWING APPROVAL STATUS: INTERNAL REVIEW

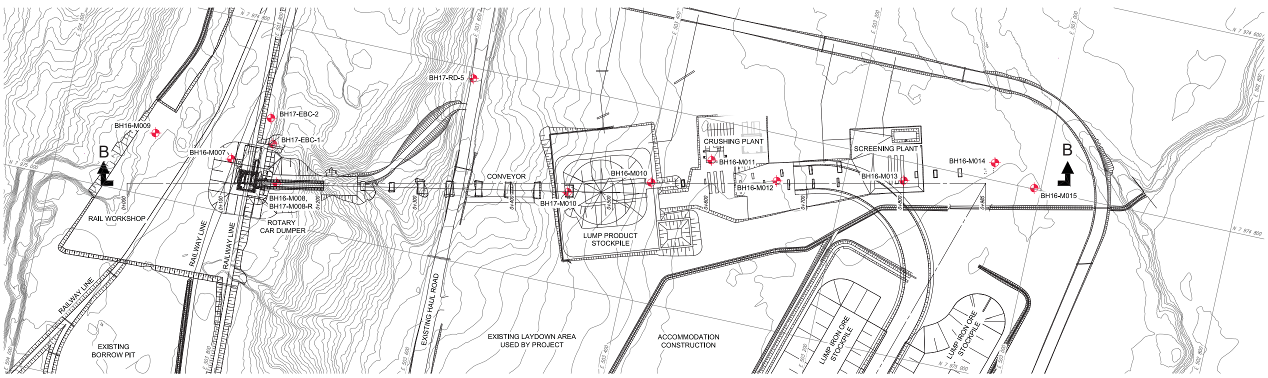
Baffinland

BAFFINLAND EXPANSION 12 MTPA MINE OPTION
PRE FEASIBILITY STUDY

PORT SITE
LUMP IRON ORE STOCKPILE
GEOLOGICAL PROFILE

SCALE 1:2000 OR AS NOTED | DWG. No. H352034-GEOSKT-229-292-0012 | REV A

$USERNAME$ $DATE$ $FILE$ $TIME$



B
B
BH16-M009
BH16-M007
BH17-EBC-2
BH17-EBC-1
BH16-M008, BH17-M008-R
ROTARY CAR DUMPER
RAIL WORKSHOP
RAILWAY LINE
EXISTING BORROW PIT
BH17-RD-5
CONVEYOR
BH17-M010
BH16-M010
LUMP PRODUCT STOCKPILE
CRUSHING PLANT
BH16-M011
BH16-M012
SCREENING PLANT
BH16-M013
BH16-M014
BH16-M015
EXISTING HAUL ROAD
EXISTING LAYDOWN AREA USED BY PROJECT
ACCOMMODATION CONSTRUCTION
LUMP IRON ORE STOCKPILE

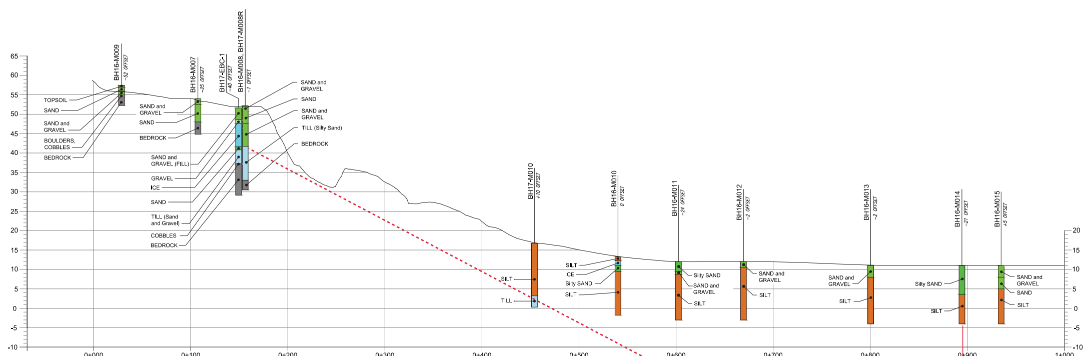
PLAN

0 50 100 150 200 METRES

SCALE: 1:2000

NOTE

PROCESSING LINE LAYOUT UPDATED LAST ON FEBRUARY 6TH,, 2018



BH16-M009
BH16-M007
BH17-EBC-1
BH16-M008, BH17-M008R
TOPSOIL
SAND
SAND and GRAVEL
BOULDERS, COBBLES
BEDROCK
SAND and GRAVEL (FILL)
GRAVEL
ICE
TILL (Sand and Gravel)
COBBLES
TILL (Silty Sand)
BH17-M010
BH16-M010
BH16-M011
BH16-M012
BH16-M013
BH16-M014
BH16-M015
SILT
TILL
Silty SAND
0+000
0+100
0+200
0+300
0+400
0+500
0+600
0+700
0+800
0+900
1+000

SECTION B-B

Silty Deposit

1:2000 HORIZONTAL 0 50 100 150 200 METRES

1:500 VERTICAL 0 10 20 30 40 50 METRES

Inferred Till Interface

Inferred Till Elevation @ BH 16-M014: ~ 55 m

LEGEND

- TOPSOIL
- SILT
- Silty SAND
- SAND
- SAND & GRAVEL
- TILL
- ICE
- BOULDERS, COBBLES
- BEDROCK

Sketch 2

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HATCH

Baffinland

BAFFINLAND EXPANSION 12 MTPA MINE OPTION
PRE FEASIBILITY STUDY

PORT SITE
PROCESSING LINE
GEOLOGICAL PROFILE

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	T BEREKOWSKI	NR	26/01/2018
DESIGNER		NR	
CHECKER			2018-02-07
DESIGN COORD.			
RESP. ENG.	G QU		
LEAD DISC. ENG.			
ENG. MANAGER			
PROJ. MANAGER			

DRAWING APPROVAL STATUS: INTERNAL REVIEW

SCALE 1:2000 OR AS NOTED

DWG. No. H352034-GEOSKT-229-292-0011

REV A1

No.	DESCRIPTION	BY	CHK'D	DATE

REVISIONS

NAME
SIGNATURE
ENG REG NUMBER
REVISION DATE
ORIGINAL DATE
REGISTERED PROFESSIONAL

DRAWING No.	DRAWING TITLE

REFERENCE DRAWINGS

DWG. No.

$USERNAME$ $DATE$ $FILE$ $TIME$

Appendix A2
Borehole Data

BOREHOLE REPORT

BH16-M001

Sheet 1 of 1

Client: Baffinland Iron Mines

Project: Mary River Expansion Study Stage 2

Location: Milne Inlet (Reclaimer Berm)

Project No.: H352034

Datum: NAD83

Platform: Ground

Easting: 503,504.0 m

Northing: 7,976,237.0 m

Surface Elevation: 12.75 m

Bottom Elevation: -2.45 m

Total Depth: 15.2 m

Logged By: MR

Reviewed By: SH/WH

Contractor: Boart Longyear

Driller: Michael Scott

Rig Type/ Mounting: MiniSonic Rig

Hole Diameter (mm): 96

Date Logged: 12/8/2016

Date Reviewed: 2/10/2017

Water	Elevation (m)	Depth (m)	Method	Casing	Graphic Log	Soil Description: TYPE; plasticity or particle characteristics (size, grading, shape, roundness), colour, structure, accessory components.	Frozen Soil Description	Recovery	Sample Type	Moisture Content Profile (0)	Field Water Content	Percent Gravel	Percent Sand	Percent Fines	Liquid Limit	Plastic Index	Other Tests
Unobserved due to Permafrost	10.8	2.0	Vibracore	H-Casing		GRAVELLY SAND, trace COBBLES: Light brown to grey, fine to medium grained sand, rounded to subangular gravel	Nf										
						1.50 m to 2.00 m: Trace gravel and silt, rounded gravel	Vx Nbe				18						
	8.8	4.0					Vc				18						
						4.60 m to 6.10 m: Trace silt	Vc										
	6.8	6.0				6.10 m to 9.10 m: Some silt, fine to coarse grained sand	Nbe				19	0	82	17			
	4.8	8.0									16						
						9.10 m to 10.60 m: Some gravel					16						
	2.8	10.0				10.60 m to 12.10 m: With gravel, trace excess ice	Nbe				16						
	0.8	12.0				12.10 m to 13.70 m: Trace gravel and silt, rounded to subangular gravel	Nbe				18						
	-1.3	14.0				13.70 m to 15.20 m: Some silt, some gravel	Nbe				16						
				[15.2]													
	-3.3	16.0				To Target Depth. **Drillhole BH16-M001 terminated at 15.2m.**											
	-5.3	18.0															
	-7.3	20.0															

Notes:

BOREHOLE REPORT

BH16-M004

Sheet 1 of 1

Client: Baffinland Iron Mines

Project: Mary River Expansion Study Stage 2

Location: Milne Port Reclaimer Berm

Project No.: H352034

Datum: NAD83

Platform: Ground

Easting: 503,302.0 m

Northing: 7,975,591.0 m

Surface Elevation: 10.20 m

Bottom Elevation: -5.00 m

Total Depth: 15.2 m

Logged By: UK

Reviewed By: SH/WH

Contractor: Boart Longyear

Rig Type/ Mounting: MiniSonic Rig

Date Logged: 12/8/2016

Driller: E.Beachamp

Hole Diameter (mm): 96

Date Reviewed: 2/10/2017

Water	Elevation (m)	Depth (m)	Method	Casing	Graphic Log	Soil Description: TYPE; plasticity or particle characteristics (size, grading, shape, roundness), colour, structure, accessory components.	Frozen Soil Description	Recovery	Sample Type	Moisture Content Profile (0)	Field Water Content	Percent Gravel	Percent Sand	Percent Fines	Liquid Limit	Plastic Index	Other Tests
Unobserved due to Permafrost	10.2	0.0	Vibracore	H-Casing		SILTY SAND with GRAVEL: Grey, coarse grained sand, angular gravel	Nf				19						
	8.2	2.0				SAND, trace SILT: Coarse grained sand	Nbe					0	95	4			
	6.2	4.0				5.50 m to 6.10 m: Trace to some SILT	Nf										
	4.2	6.0				SAND and GRAVEL, some SILT: Grey, coarse grained sand, angular gravel	Nf				14						
	2.2	8.0															
	0.2	10.0				SANDY SILT: Dark grey, mottled black, fine organic material	Nf										
	-1.8	12.0				SAND, some SILT: Grey, coarse grained sand	Vc Vc										
	-3.8	14.0		[15.2]													
	-5.8	16.0				To Target Depth. **Drillhole BH16-M004 terminated at 15.2m.**											
	-7.8	18.0															
	-9.8	20.0															

Notes:

BOREHOLE REPORT

BH16-M005

Sheet 1 of 1

Client: Baffinland Iron Mines

Project: Mary River Expansion Study Stage 2

Location: Milne Port Reclaimer Berm

Project No.: H352034

Datum: NAD83

Platform: Ground

Easting: 503,270.0 m

Northing: 7,975,696.0 m

Surface Elevation: 10.00 m

Bottom Elevation: -5.20 m

Total Depth: 15.2 m

Logged By: UK

Reviewed By: SH/WH

Contractor: Boart Longyear

Rig Type/ Mounting: MiniSonic Rig

Date Logged: 12/8/2016

Driller: E.Beachamp

Hole Diameter (mm): 96

Date Reviewed: 2/10/2017

Water	Elevation (m)	Depth (m)	Method	Casing	Graphic Log	Soil Description (TYPE; plasticity or particle characteristics (size, grading, shape, roundness), colour, structure, accessory components.)	Frozen Soil Description	Recovery	Sample Type	Moisture Content Profile (0)	Field Water Content	Percent Gravel	Percent Sand	Percent Fines	Liquid Limit	Plastic Index	Other Tests
Unobserved due to permafrost	8.0	2.0	Vibracore	H-Casing		SAND and GRAVEL, Some SILT: Grey, angular to rounded gravel	Nf										
	6.0	4.0				SAND, some SILT: Grey, fine to coarse grained sand	Nf				13	35	53	12			
	4.0	6.0									20						
	2.0	8.0									16						
	0.0	10.0				GRAVELLY SAND, Trace SILT: Grey, subangular gravel, coarse grained sand	Nf										
	-2.0	12.0				SANDY GRAVEL: Grey, angular to sub-angular and well graded gravel	Nf										
	-4.0	14.0		[15.2]													
	-6.0	16.0				To Target Depth. **Drillhole BH16-M005 terminated at 15.2m.**											
	-8.0	18.0															
	-10.0	20.0															

Notes:

BOREHOLE REPORT

BH16-M006

Sheet 1 of 1

Client: Baffinland Iron Mines

Project: Mary River Expansion Study Stage 2

Location: Milne Port Reclaimer Berm

Project No.: H352034

Datum: NAD83

Platform: Ground

Easting: 503,136.0 m

Northing: 7,975,081.0 m

Surface Elevation: 10.00 m

Bottom Elevation: -5.20 m

Total Depth: 15.2 m

Logged By: MR

Reviewed By: SH/WH

Contractor: Boart Longyear

Rig Type/ Mounting: MiniSonic Rig

Date Logged: 12/8/2016

Driller: Michael Scott

Hole Diameter (mm): 96

Date Reviewed: 2/10/2017

Water	Elevation (m)	Depth (m)	Method	Casing	Graphic Log	Soil Description: TYPE; plasticity or particle characteristics (size, grading, shape, roundness), colour, structure, accessory components.	Frozen Soil Description	Recovery	Sample Type	Moisture Content Profile (0)	Field Water Content	Percent Gravel	Percent Sand	Percent Fines	Liquid Limit	Plastic Index	Other Tests
	8.0	2.0	Vibracore	H-Casing		GRAVELLY SAND, some SILT, some COBBLES: Grey to light brown, subangluar to rounded gravel	Nf				9	32	55	13			
	6.0	4.0				SILTY SAND: Brown, coarse grained	Vc				18						
	4.0	6.0				4.90 m to 5.80 m: Some GRAVEL	Nf										
	2.0	8.0				SILT, some SAND, trace GRAVEL: Grey, coarse grained and angular gravel	Nbn										
	0.0	10.0															
	-2.0	12.0															
	-4.0	14.0				SILT, trace to some SAND	Nbn										
				[15.2]													
	-6.0	16.0				To Target Depth. **Drillhole BH16-M006 terminated at 15.2m.**											
	-8.0	18.0															
	-10.0	20.0															

Notes:

BOREHOLE REPORT

BH16-M007
Sheet 1 of 2

Client: Baffinland Iron Mines
Project: Mary River Expansion Study Stage 2
Location: Milne Port Train Unloading

Project No.: H352034
Datum: NAD83
Platform: Ground

Easting: 503,822.0 m
Northing: 7,974,945.0 m
Surface Elevation: 54.00 m
Bottom Elevation: 44.86 m
Total Depth: 9.1 m
Logged By: UK
Reviewed By: SH/WH

Contractor: Boart Longyear
Driller: E.Beachamp
Rig Type/ Mounting: MiniSonic Rig
Hole Diameter (mm): 96
Date Logged: 10/3/2016
Date Reviewed: 2/10/2017

Water	Elevation (m)	Depth (m)	Method	Casing	Graphic Log	Soil Description (TYPE; plasticity or particle characteristics (size, grading, shape, roundness), colour, structure, accessory components.)	Frozen Soil Description	Recovery	Sample Type	Moisture Content Profile (0)	Other Tests
Unobserved due to Permafrost	52.0	2.0	Vibracore	H-Casing		SAND and GRAVEL: Grey, coarse grained sand, angular to sub-angular gravel	Nf				
	50.0	4.0				SAND: Grey, coarse grained 4.70 m to 6.10 m: Some GRAVEL	Nbn Nf				
	48.0	6.0		[6.1]		***Start of Coring at 6.1m.*** ***Continued on Rock Core Log sheet.***					
	46.0	8.0									
	44.0	10.0									
	42.0	12.0									
	40.0	14.0									
	38.0	16.0									
	36.0	18.0									
	34.0	20.0									

Notes:

BOREHOLE REPORT

BH16-M008
Sheet 1 of 3

Client: Baffinland Iron Mines
Project: Mary River Expansion Study Stage 2
Location: Milne Port Train Unloading

Project No.: H352034
Datum: NAD83
Platform: Ground

Easting: 503,771.0 m
Northing: 7,974,959.0 m
Surface Elevation: 52.00 m
Bottom Elevation: 30.66 m
Total Depth: 21.3 m
Logged By: UK
Reviewed By: SH/WH

Contractor: Boart Longyear
Driller: E.Beachamp
Rig Type/ Mounting: MiniSonic Rig
Hole Diameter (mm): 96
Date Logged: 10/4/2016
Date Reviewed: 2/10/2017

Water	Elevation (m)	Depth (m)	Method	Casing	Graphic Log	Soil Description TYPE; plasticity or particle characteristics (size, grading, shape, roundness), colour, structure, accessory components.	Frozen Soil Description	Recovery	Sample Type	Moisture Content Profile 0	Other Tests
Unobserved due to Permafrost	50.0	2.0	Vibracore	H-Casing		SANDY GRAVEL: Rounded to sub angular gravel, coarse grained sand, well graded	Nf				
						SAND: Coarse to fine grained	Nf				
	48.0	4.0				3.00 m to 4.60 m: Some SILT	Nbn				
						SAND and GRAVEL: Coarse grained sand	Nf				
	46.0	6.0				6.90 m to 7.60 m: Zone of inferred cobbles					
	44.0	8.0									
	42.0	10.0				SILTY SAND, some GRAVEL: Fine to coarse, subangular gravel	Nbn				
	40.0	12.0				12.20 m to 12.60 m: GRAVELLY SILTY SAND					
	38.0	14.0				13.80 m to 15.40 m: SILTY SAND					
	36.0	16.0									
	34.0	18.0		[18.8]							
	32.0	20.0				***Start of Coring at 18.8m.*** ***Continued on Rock Core Log sheet.***					

Notes:

BOREHOLE REPORT

BH16-M009
Sheet 1 of 2

Client: Baffinland Iron Mines
Project: Mary River Expansion Study Stage 2
Location: Milne Port Train Unloading

Project No.: H352034
Datum: NAD83
Platform: Ground

Easting: 503,904.0 m
Northing: 7,974,935.0 m
Surface Elevation: 57.50 m
Bottom Elevation: 52.32 m
Total Depth: 5.2 m
Logged By: MR
Reviewed By: SH/WH

Contractor: Boart Longyear
Driller: Samuel Flynn
Rig Type/ Mounting: MiniSonic Rig
Hole Diameter (mm): 96
Date Logged: 10/4/2016
Date Reviewed: 2/10/2017

Water	Elevation (m)	Depth (m)	Method	Casing	Graphic Log	Soil Description (TYPE; plasticity or particle characteristics (size, grading, shape, roundness), colour, structure, accessory components.)	Frozen Soil Description	Recovery	Sample Type	Moisture Content Profile	Other Tests
Unobserved due to Permafrost	55.5	2.0	Vibracore	H-Casing		ORGANICS: Organic soil				0	
						GRAVELLY SAND: Light brown to grey, angular to subgranular gravel, medium to coarse grained sand	Nf				
						SAND and GRAVEL: Grey to light brown, Fine to coarse grained sand, angular to subangular gravel	Nbn				
				[3.7]		Inferred BOULDERS with SAND: Coarse to fine grained sand					
	53.5	4.0				***Start of Coring at 3.7m.*** ***Continued on Rock Core Log sheet.***					
	51.5	6.0									
	49.5	8.0									
	47.5	10.0									
	45.5	12.0									
	43.5	14.0									
	41.5	16.0									
	39.5	18.0									
	37.5	20.0									

Notes:

BOREHOLE REPORT

BH16-M010

Sheet 1 of 1

Client: Baffinland Iron Mines

Project: Mary River Expansion Study Stage 2

Location: Milne Port Crusher

Project No.: H352034

Datum: NAD83

Platform: Ground

Easting: 503,394.0 m

Northing: 7,974,877.0 m

Surface Elevation: 13.30 m

Bottom Elevation: -1.90 m

Total Depth: 15.2 m

Logged By: MR

Reviewed By: SH/WH

Contractor: Boart Longyear

Rig Type/ Mounting: MiniSonic Rig

Date Logged: 12/9/2016

Driller: Michael Scott

Hole Diameter (mm): 96

Date Reviewed: 2/10/2017

Water	Elevation (m)	Depth (m)	Method	Casing	Graphic Log	Soil Description: TYPE; plasticity or particle characteristics (size, grading, shape, roundness), colour, structure, accessory components.	Frozen Soil Description	Recovery	Sample Type	Moisture Content Profile (0)	Field Water Content	Percent Gravel	Percent Sand	Percent Fines	Liquid Limit	Plastic Index	Other Tests
	13.3	0.0	Vibrocore	H-Casing		SILT, some SAND: Brown, moist	Vc										
						ICE: Soft, white, cloudy texture	ICE				28	0	16	84			
	11.3	2.0				GRAVELLY SILTY SAND: Light brown and grey	Nf										
						SILT and SAND: Organic silt, brown, moist	Vx										
	9.3	4.0				SILT, trace SAND: Organic, dark grey to brown, moist	Vx				100	0	4	96			
											32						
	7.3	6.0					Nbn										
	5.3	8.0					Nf										
							Vx										
	3.3	10.0					Nf										
	1.3	12.0					Nbn										
	-0.7	14.0					Nf										
		[15.2]															
	-2.7	16.0				To Target Depth. **Drillhole BH16-M010 terminated at 15.2m.**											
	-4.7	18.0															
	-6.7	20.0															

Notes:

HATCH BOREHOLE REPORT

BH16-M011

Sheet 1 of 1

Client: Baffinland Iron Mines

Project: Mary River Expansion Study Stage 2

Location: Milne Port Crusher

Project No.: H352034

Datum: NAD83

Platform: Ground

Easting: 503,339.0 m

Northing: 7,974,868.0 m

Surface Elevation: 12.00 m

Bottom Elevation: -3.20 m

Total Depth: 15.2 m

Logged By: MR

Reviewed By: SH/WH

Contractor: Boart Longyear

Driller: Michael Scott

Rig Type/ Mounting: MiniSonic Rig

Hole Diameter (mm): 96

Date Logged: 12/4/2016

Date Reviewed: 2/10/2017

Water	Elevation (m)	Depth (m)	Method	Casing	Graphic Log	Soil Description: TYPE; plasticity or particle characteristics (size, grading, shape, roundness), colour, structure, accessory components.	Frozen Soil Description	Recovery	Sample Type	Moisture Content Profile (0)	Field Water Content	Percent Gravel	Percent Sand	Percent Fines	Liquid Limit	Plastic Index	Other Tests
	10.0	2.0	Vibrocore	H-Casing		SILTY SAND: Light brown, moist	Nf										
							Nbn				16	0	68	32			
							Nf										
							Nbn										
						SAND and GRAVEL: Light brown, moist, subangular gravel	Vx				10						
	8.0	4.0				SILT, trace SAND: Dark grey, moist	Nbe										
							Vc										
	6.0	6.0					Nf										
	4.0	8.0					Nf										
	2.0	10.0					Nf										
	0.0	12.0					Nbn										
	-2.0	14.0		[15.2]			Nbn										
							Nbn										
	-4.0	16.0				To Target Depth. **Drillhole BH16-M011 terminated at 15.2m.**											
	-6.0	18.0															
	-8.0	20.0															

Notes:

BOREHOLE REPORT

BH16-M012

Sheet 1 of 1

Client: Baffinland Iron Mines

Project: Mary River Expansion Study Stage 2

Location: Milne Port Generator

Project No.: H352034

Datum: NAD83

Platform: Ground

Easting: 503,268.0 m

Northing: 7,974,848.0 m

Surface Elevation: 12.00 m

Bottom Elevation: -3.20 m

Total Depth: 15.2 m

Logged By: MR

Reviewed By: SH/WH

Contractor: Boart Longyear

Rig Type/ Mounting: MiniSonic Rig

Date Logged: 12/8/2016

Driller: Michael Scott

Hole Diameter (mm): 96

Date Reviewed: 2/10/2017

Water	Elevation (m)	Depth (m)	Method	Casing	Graphic Log	Soil Description: TYPE; plasticity or particle characteristics (size, grading, shape, roundness), colour, structure, accessory components.	Frozen Soil Description	Recovery	Sample Type	Moisture Content Profile (0)	Field Water Content	Percent Gravel	Percent Sand	Percent Fines	Liquid Limit	Plastic Index	Other Tests
	10.0	2.0	Vibrocore	H-Casing		SAND and GRAVEL, some SILT, trace COBBLES: Light brown, rounded	Nf				6	39	45	17			
						SILT, some SAND: Dark grey	Vx										
	8.0	4.0					Nbn				21	0	16	84			
							Vx										
	6.0	6.0					Nbn										
	4.0	8.0															
	2.0	10.0					Nf										
	0.0	12.0															
	-2.0	14.0		[15.2]													
	-4.0	16.0				To Target Depth. **Drillhole BH16-M012 terminated at 15.2m.**											
	-6.0	18.0															
	-8.0	20.0															

Notes:

BOREHOLE REPORT

BH16-M013
Sheet 1 of 1

Client: Baffinland Iron Mines
Project: Mary River Expansion Study Stage 2
Location: Milne Port Screening

Project No.: H352034
Datum: NAD83
Platform: Ground

Easting: 503,140.0 m
Northing: 7,974,820.0 m
Surface Elevation: 11.00 m
Bottom Elevation: -4.20 m
Total Depth: 15.2 m
Logged By: MR
Reviewed By: SH/WH

Contractor: Boart Longyear
Driller: Michael Scott
Rig Type/ Mounting: MiniSonic Rig
Hole Diameter (mm): 96
Date Logged: 12/5/2016
Date Reviewed: 2/10/2017

Water	Elevation (m)	Depth (m)	Method	Casing	Graphic Log	Soil Description: TYPE; plasticity or particle characteristics (size, grading, shape, roundness), colour, structure, accessory components.	Frozen Soil Description	Recovery	Sample Type	Moisture Content Profile (0)	Field Water Content	Percent Gravel	Percent Sand	Percent Fines	Liquid Limit	Plastic Index	Other Tests
	9.0	2.0	Vibrocore	H-Casing		Organic soil and GRAVEL	Vx										
						GRAVELLY SAND, some SILT: Light brown, medium to coarse grained sand, rounded to subangular gravel					25	32	48	20			
	7.0	4.0				SILT, some SAND: Dark grey	Vc				21	5	33	61			
	5.0	6.0					Nf										
	3.0	8.0					Nbn										
							Nf										
	1.0	10.0					Nbn										
							Nf										
	-1.0	12.0					Nbn										
							Nf										
	-3.0	14.0					Nbn										
				[15.2]													
	-5.0	16.0				To Target Depth. **Drillhole BH16-M013 terminated at 15.2m.**											
	-7.0	18.0															
	-9.0	20.0															

Notes:

BOREHOLE REPORT

BH16-M014
Sheet 1 of 1

Client: Baffinland Iron Mines
Project: Mary River Expansion Study Stage 2
Location: Milne Port Tail Pulley

Project No.: H352034
Datum: NAD83
Platform: Ground

Easting: 503,052.0 m
Northing: 7,974,782.0 m
Surface Elevation: 11.00 m
Bottom Elevation: -4.20 m
Total Depth: 15.2 m
Logged By: MR
Reviewed By: SH/WH

Contractor: Boart Longyear
Driller: Michael Scott
Rig Type/ Mounting: MiniSonic Rig
Hole Diameter (mm): 96
Date Logged: 12/5/2016
Date Reviewed: 2/10/2017

Water	Elevation (m)	Depth (m)	Method	Casing	Graphic Log	Soil Description: TYPE; plasticity or particle characteristics (size, grading, shape, roundness), colour, structure, accessory components.	Frozen Soil Description	Recovery	Sample Type	Moisture Content Profile (0)	Field Water Content	Percent Gravel	Percent Sand	Percent Fines	Liquid Limit	Plastic Index	Other Tests
	9.0	2.0	Vibrocore	H-Casing		GRAVELLY SILTY SAND: Grey to brown, angular to subangular gravel	Nf				6	22	52	26			
	7.0	4.0				SILTY SAND: Grey	Nbn				21	0	78	22			
	5.0	6.0					Nf										
							Nbn										
	3.0	8.0				SILT, some SAND: Dark grey, fine grained sand	Nf										
							Nbn										
	1.0	10.0					Nf										
	-1.0	12.0															
	-3.0	14.0		[15.2]			Nbn										
	-5.0	16.0				To Target Depth. **Drillhole BH16-M014 terminated at 15.2m.**											
	-7.0	18.0															
	-9.0	20.0															

Notes:

BOREHOLE REPORT

BH16-M015

Sheet 1 of 1

Client: Baffinland Iron Mines

Project: Mary River Expansion Study Stage 2

Location: Milne Port Tail Pulley Alt.

Project No.: H352034

Datum: NAD83

Platform: Ground

Easting: 503,007.0 m

Northing: 7,974,799.0 m

Surface Elevation: 11.00 m

Bottom Elevation: -4.20 m

Total Depth: 15.2 m

Logged By: MR

Reviewed By: SH/WH

Contractor: Boart Longyear

Rig Type/ Mounting: MiniSonic Rig

Date Logged:

Driller: Michael Scott

Hole Diameter (mm): 96

Date Reviewed: 2/10/2017

Water	Elevation (m)	Depth (m)	Method	Casing	Graphic Log	Soil Description: TYPE; plasticity or particle characteristics (size, grading, shape, roundness), colour, structure, accessory components.	Frozen Soil Description	Recovery	Sample Type	Moisture Content Profile (0)	Field Water Content	Percent Gravel	Percent Sand	Percent Fines	Liquid Limit	Plastic Index	Other Tests
	9.0	2.0	Vibrocore	H-Casing		SAND and GRAVEL, trace SILT, trace COBBLES: Light brown to grey, fine to coarse grained sand, rounded gravel	Nf				1	32	59	10			
	7.0	4.0				SAND, trace SILT: Light brown, fine to coarse grained sand,	Nf				14	15	71	14			
	5.0	6.0				SILT, some SAND: Dark grey to brown	Nbn										
	3.0	8.0					Nf										
	1.0	10.0															
	-1.0	12.0									24						
	-3.0	14.0															
		[15.2]									27						
	-5.0	16.0				To Target Depth. **Drillhole BH16-M015 terminated at 15.2m.**											
	-7.0	18.0															
	-9.0	20.0															

Notes:

Appendix A3
Thermal Analyses Methodology

Appendix A3

Thermal Analyses

Two-dimensional finite element modelling, with commercially available software (Temp/W), was used to predict the thermal regime for the tunnel foundation.

The air temperature is based on the mean monthly air temperature from Milne Inlet Port, NU (2006-2015) extracted from RWDI's response document to Crown-Indigenous Relations and Northern Affairs Canada titled "181234 CIRNAC IR 14" (RWDI, 2019), see Table A-3-1.

The global warming effect was taken into account according to the Intergovernmental Panel on Climate Change (IPCC) long term climate change studies. A temperature adjustment was applied considering to global warming for the period spanning from 2010 to 2039 (Hatch 2018).

Table A-3-1: Mean Monthly Temperatures for Milne Inlet Port, NU (2006-2015)

Month	Temperature
January	-29.5
February	-30.8
March	-28.9
April	-19.6
May	-6.9
June	3.5
July	10.2
August	7.4
September	-0.9
October	-7.7
November	-17.9
December	-25.1

Surface boundary conditions at the site were obtained based on the n-factors which was used to correlate air temperatures to ground surface temperatures during cold seasons (n_f) and thaw seasons (n_t). Values of n_t and n_f used in the analysis were summarized in Table A-3-2 Typically, n_f is less than 1 considering the impact of snow accumulation/insulation over ground surface during winter while n_t is more than 1 considering the impact of radiation.

Inside the tunnel, the n factor of 1 was used assuming that the ground surface temperature is same as the air temperature. It is noted that in summer the air temperature in the tunnel could be colder than the air temperature outside while in winter, the inside air temperature in the tunnel becomes is likely warmer than the outside air temperature. There is no sufficient data/study to quantify the two opposite effects. As such, this study assumed that the air temperature in tunnel is same.

The available thermistor data from the Mary River site (Hatch, 2012) indicate that ground temperature reaches equilibrium (at -10° C) below 15m depth, thus the bottom boundary was assumed to be 15m below the ground surface, with a constant temperature of -10° C.

The results are shown in the figures in this appendix.

Table A-3-2: N-factors to be Used in Modelling

Material	N – factors	
	Freezing (n_f)	Thawing (n_t)
Native Sand	0.7	1.2
Native Silt	0.5	1.2
Rockfill / Granular Backfill	0.8	1.5

Appendix A4
Settlement Analyses Methodology

Appendix A4

Settlement Analyses

Two-dimensional finite element modelling, with commercially available software (Sigma/W), was used to predict the displacement.

Figure A-4-1 and Table A-4-2 shows the engineering parameters for unfrozen soil, frozen silt and frozen till used in the analyses.

In the model, the creep deformation was modeled using a long-term strength envelope and equivalent long-term deformation modulus (see details in Hatch 2018).

For the soil beyond structures/facilities, the following simplified soil profile was used as per the warmest envelope from the thermistor monitoring data (see the figure below).

a. 0 m to 3 m depth: Soil in Active Zone*

b. 3 m to 7 m depth: Frozen Soil (above - 7° C)

c. Below 7 m depth: Frozen Soil (below - 7° C)

Note: * The properties of the unfrozen soil was used for the soil between 2 m to 3 m depth as a conservative assumption.

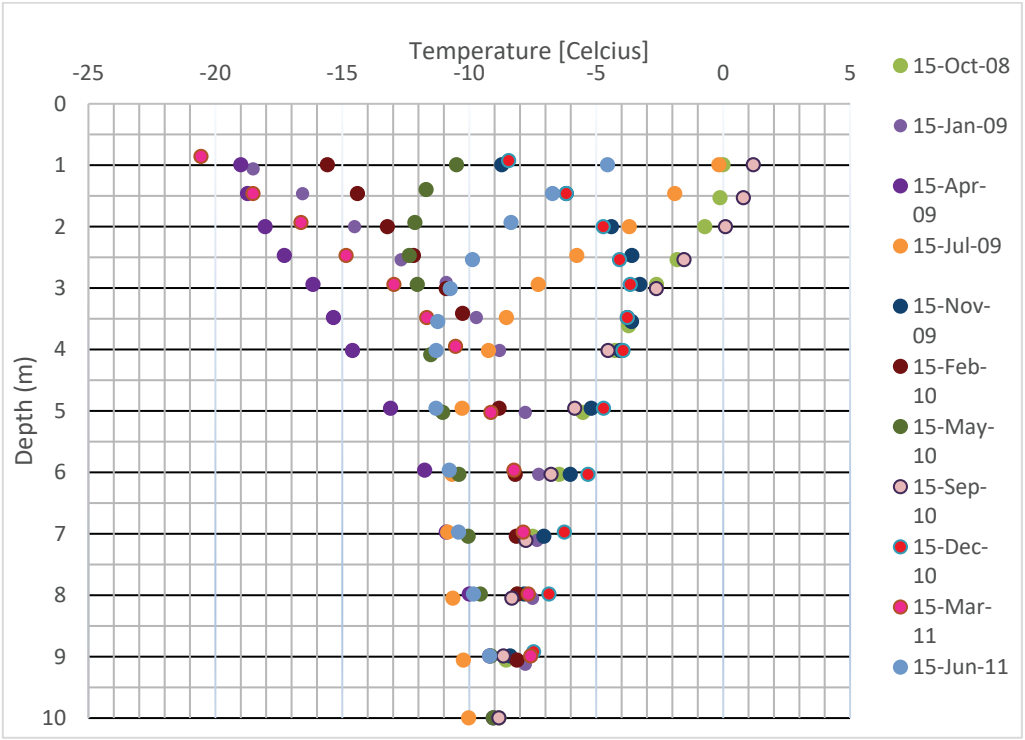


Figure: A-1: Temperature Profiles containing Numerical and Recorded Data Overlain

(Thermistor data from BH2007-10, reported by Knight Piesold, 2008)

Table A-4-1: General Design Parameters

Materials	Elastic Young's Modulus	Poisson's Ratio	Unit Weight	Strength Parameters	
	Es, (MPa)		kN/m^3	c' (kPa)	ϕ' (Degrees)
Ore	30	0.33	26	0	40°
Engineered Fill (compacted crushed rockfill)	70	0.33	22	0	40°
Rockfill	70	0.33	22	0	40°
Native Silt	8 (unfrozen condition)	0.33	18	0	30°
Native Sand	15 (unfrozen condition)	0.33	18	0	32°

Table A-4-2: Design Parameters for Frozen Silty Permafrost

Temperature	Long-term Deformation Modulus	Poisson's Ratio	Unit Weight	Strength Parameters For Creep Analyses (20-year design life)	
	Ec, (MPa)		kN/m^3	c'_{LT} (kPa)	ϕ'_{LT}
Above - 7° C	22	0.33	18	0	30°
Below -7° C	44	0.33	18	0	30°

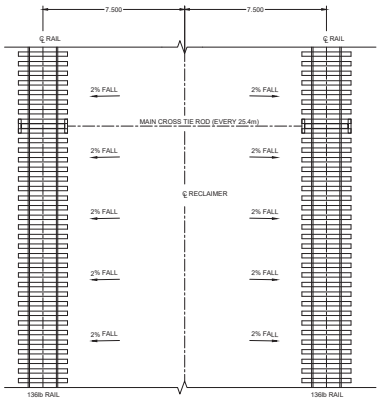
Note: The underlying till material is considered very stiff in its hard frozen state (< - 7°C) with a high deformation modulus of 1,000 MPa.

Table A-4-3: Design Parameters for Frozen Sandy Permafrost

Temperature	Long-term Deformation Modulus	Poisson's Ratio	Unit Weight	Strength Parameters For Creep Analyses (20-year design life)	
	Ec, (MPa)		kN/m^3	c'_{LT} (kPa)	ϕ'_{LT}
Above - 7° C	80	0.33	18	0	32°
Below -7° C	160	0.33	18	0	32°

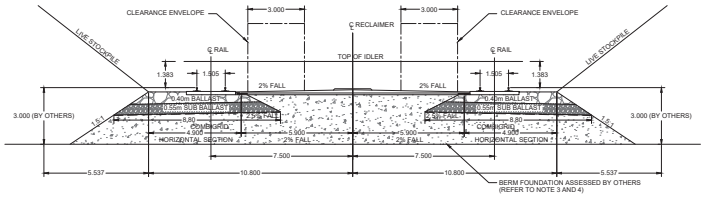
Note: The underlying till material is considered very stiff in its hard frozen state (< - 7°C) with a high deformation modulus of 1,000 MPa.

Appendix B
Reclaimer/Stacker Drawings



STOCKPILE BERM PLAN

SCALE: 0.100 m



CROSS SECTION THROUGH STOCKPILE BERM

SCALE: 0.100 m

BERM FILL

PROOF ROLL WITH A MINIMUM OF FOUR PASSES (2 IN EACH IN PERPENDICULAR DIRECTIONS) WITH A MINIMUM 8 TONNE VIBRATING SMOOTH DRUM ROLLER TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER. REPLACE SOFT, WET OR HEAVING AREAS WITH GRANULAR FILL TO PROVIDE A STABLE PLATFORM.

CRUSHED GRAVEL BALLAST

1. GRADATIONS TO BE WITHIN LIMITS SPECIFIED (IRRICANA PIT).
   (SPEC NOTE: SEEK APPROVAL OF GEOTECHNICAL ENGINEER FOR ALL GRADATIONS)

SIEVE SIZE	PERCENT PASSING
45.3 mm (1 - 3/4")	100
32.0 mm (1 - 1/4")	70 - 95
25.4 mm (1")	50 - 80
19.0 mm (3/4")	30 - 60
12.7 mm (1/2")	10 - 30
4.76 mm (No. 4)	0 - 3
74 micron (No. 200)	0 - 1

2. PERCENTAGE OF CRUSHED PARTICLES IN SIZE RANGE SHALL NOT BE LESS THAN 70% BY WEIGHT OF ALL PARTICLES IN THAT SIZE RANGE. PARTICLES HAVING ONE OR MORE FRACTURED FACES WILL BE USED IN CALCULATING THIS PERCENTAGE.
3. MATERIAL IN SAMPLE FINER THAN NO. 4 (4.76 MICRON) SIEVE WILL NOT BE CONSIDERED IN DETERMINING THE PERCENTAGE OF FRACTURED FACES.
4. GRADING OF CRUSHED GRAVEL BALLAST SHALL BE DETERMINED BY ASTM C316, LATEST EDITION.
5. AMOUNT OF MATERIAL FINER THAN NO. 200 (74 MICRON) SHALL BE DETERMINED BY ASTM C117, LATEST EDITION.

SUB-BALLAST

1. COMPACT TO 98% OF STANDARD PROCTOR MAXIMUM DENSITY.
2. MATERIAL TO BE CRUSHED OR SCREENED PIT RUN GRAVEL, CONTAINING NO MORE THAN THREE PERCENT (3%) ORGANICS BY WEIGHT AS DETERMINED BY ASTM C-123.
3. MATERIAL GREATER THAN 5 mm TO CONTAIN A MINIMUM OF FIFTY PERCENT (50%) BY WEIGHT FRACTURED MAERIAL (TWO (2) FRACTURED FACES).
4. GRADATIONS TO BE WITHIN LIMITS SPECIFIED.

SIEVE SIZE	PERCENT PASSING
75 mm (3")	100
25 mm (1")	60 - 90
4.75 mm (#4)	35 - 60
425 micro m (#40)	10 - 40
80 micro m (#200)	0 - 5

COMBIGRID

1. COMBIGRID TO BE COMBIGRID 40/40 Q1 151 GRK3 (OR APPROVED EQUIVALENT).
2. TO BE INSTALLED IN THE INTERFACE BETWEEN THE BERM AND SUB-BALLAST. PER PRODUCT SPECIFICATION.

NOTES:

1. DIMENSIONS ARE IN METERS, ELEVATIONS AND STATIONS ARE IN METERS, UNLESS NOTED OTHERWISE.
2. THIS DESIGN DOES NOT ACCOUNT FOR ANY JACKING OR SETTLEMENT DUE TO PERMAFROST IN THE FOUNDATION. DESIGN THICKNESS OF THE BERM BY OTHERS.
3. THIS DESIGN ASSUMES THE BALLAST STRUCTURE IS OVERLYING A BERM (DESIGN BY OTHERS) WHICH IS DESIGNED WITH A MINIMUM CBR OF 10.
4. THE DESIGN LOADING AT THE BASE OF THE SUB-BALLAST IS 350 KPa.
5. FOR WHEEL LOAD DETAILS REFER TO THE PRELIMINARY WHEEL LOADS DRAWING NUMBER 4934009. PER LOAD CASE III :
   - MAX VERTICAL LOAD IS 445KN (+/- 10%)
   - MAX HORIZONTAL LOAD IS 45KN (+/- 10%)
6. FOR RAIL TRACK MAIN CROSS TIE SEE DRAWING A05212A04 DRAWING 102 ON DOCUMENT 4500001466-B05-0002-002.

DOCUMENT NUMBER : 4500001466-B07-0001-001

KCB APPLIED FOR A NWT STAMP AND ONCE RECEIVED PROPOSE TO RE SUBMIT THE STAMPED DRAWINGS.

DRAWING REVISIONS

-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
1	RE-ISSUED FOR CONSTRUCTION	2017-09-12	RM	KC/AB	PF	TK
0	ISSUED FOR CONSTRUCTION	2017-08-29	RM	KC/AB	PF	TK
REVISION	DESCRIPTION OF REVISION	DATE (YYYY-MM-DD)	DRAWN	DESIGNED	CHECKED	APPROVED

ORIGINAL ISSUE	
DRAWN:	RM
DESIGNED:	KC
CHECKED:	PF
APPROVED:	TK
DATE:	2017-08-18

CLIENT

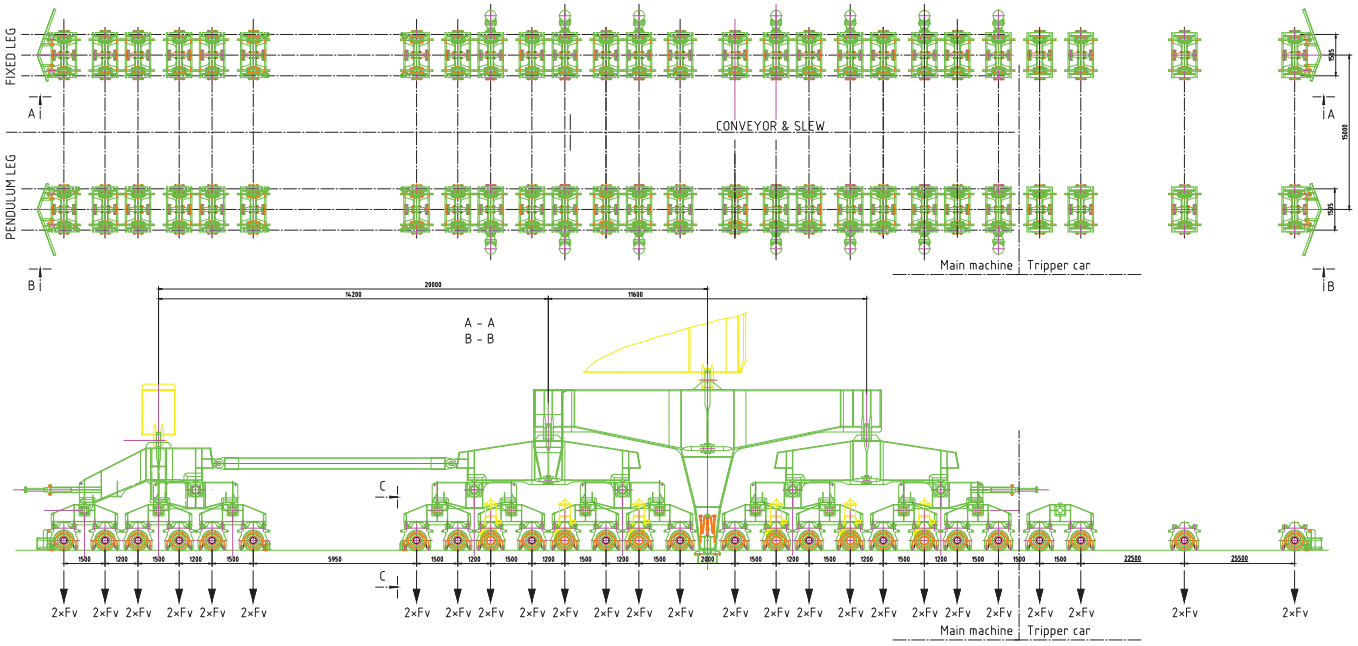
Thyssenkrupp | A&B RAIL SERVICES LTD.

Kleinn Crippen Berger

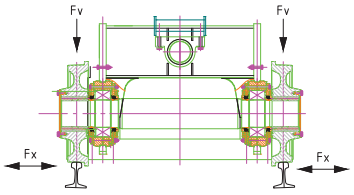
PROJECT
BAFFINLAND IRON MINES LP
MARY RIVER EXPANSION STAGE 3

TITLE
STACKER, RECLAIMER AND CONVEYOR BALLAST AND SUB BALLAST DETAILS

SCALE:	PROJECT No.:	DWG. No.:	REV.:
1:100	A05212A04	101	1



C - C
Two-wheel bogie
Fixed side



Max. Wheel Loads (±10% Tolerance)		Fixed Leg	Pendulum Leg
No.of Wheels		12 + 32 + 4 + 2 + 2	12 + 32 + 4 + 2 + 2
LOAD CASE I: in operation, main loads			
Vertical wheel load	Fv	322 KN	322 KN
Horizontal load	Fx	32 KN	
LOAD CASE II: in operation, main loads with additional loads			
Vertical wheel load	Fv	350 KN	350 KN
Horizontal load	Fx	35 KN	
LOAD CASE III: in- and out of operation, main-, additional- and special loads			
Vertical wheel load	Fv	445 KN	445 KN
Horizontal load	Fx	45 KN	

REFERENCE DRAWING

DRAWING NOTES

Preliminary

KEY PLAN

ENG STAMP

PERMIT STAMP

CLIENT INFO

STATUS IFC

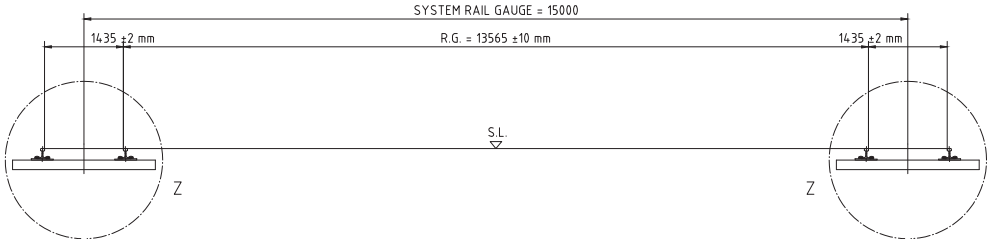
E353004-CH001-240-272-4006

PRELIMINARY WHEEL LOADS

BUCKET WHEEL RECLAIMER

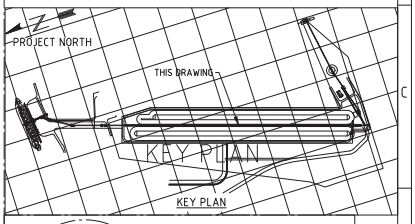
CBILB BAFFINLAND

4934009



REFERENCE DRAWING	
DRAWING NO.	TITLE

DRAWING NOTES

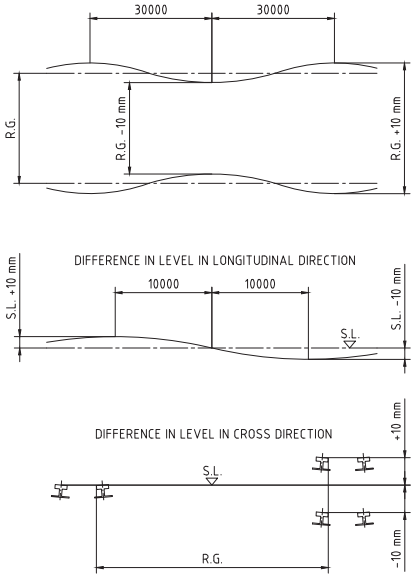


ENG STAMP

PERMIT STAMP

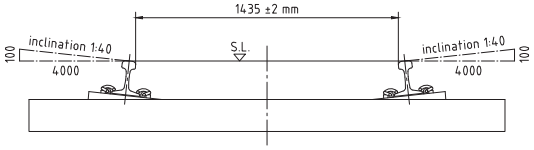
CLIENT INFO

ADMISSIBLE TOLERANCES FOR RAIL LAYING



R.G. = RAIL GAUGE = 13565
S.L. = STANDARD LEVEL

Detail Z (1:15)



thyssenkrupp Industrial Solutions
St. Ingbert, Germany

Tolerances for welded constructions	DIN EN ISO 13920 Tolerance classification B / F
Tolerances for machined surfaces	DIN ISO 2768 part 1/2 Tolerance classification m / k
Weld seams	external state DIN EN ISO 5817 NDT - ISO 17640 "B", ISO 11666 "2"
Group of valuation	B | C
Valuation group	B 2
Tolerance setting	ISO 8015
Scale	1:50
Weight	kg
Hatch No.	
Material	WB
Surface EN ISO 1302	E RA 912235.11
No. of marks	
List of Material	

	Name	Dep.	Date
Drawn	KELKEL		13.07.17
Checked	KLUKAS		14.07.17
Statc			
Approved			

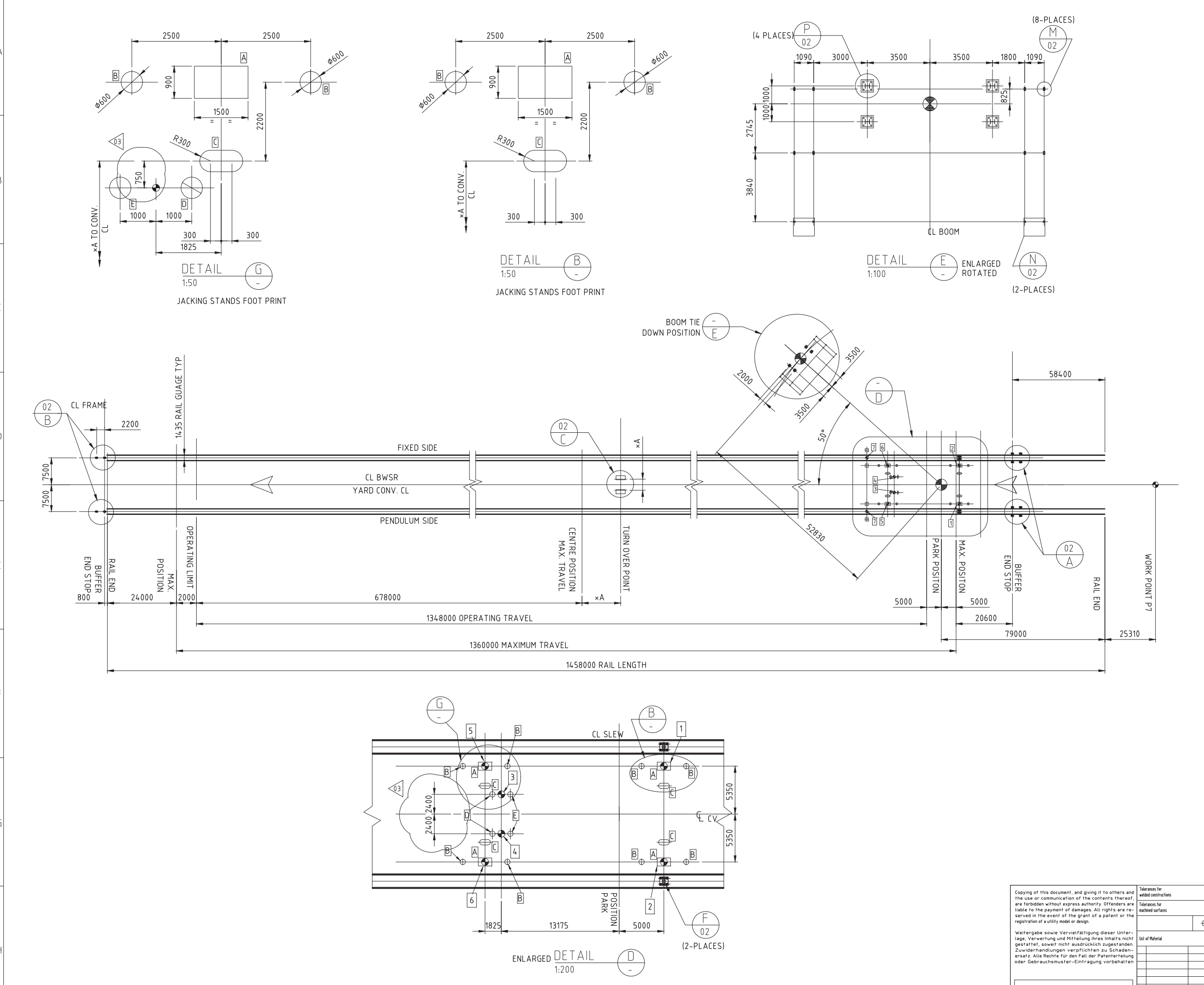
thyssenkrupp

RAIL TOLERANCES
STACKER/RECLAIMER
BAFFINLAND

Drawing-Ident No.	Ch.	Key-No.	F	Sheet 1
4935166			2	
	CAD			1 Sheets

Index	Revision	Date	Name	Checked
01	LONGITUDINAL TOLERANCE	14.07.17	KELKEL	KLUKAS

Origine | Used instead of: | Replaced by:



REFERENCE DRAWING

DRAWING NO.	TITLE

NOTE:

1. MAXIMUM TRAVEL DISTANCE IS WITH BUFFER BUFFER COMPRESSED.

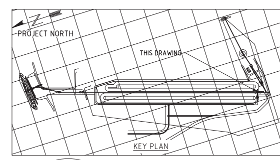
JACKING POSITION RECLAIMER	VERTICAL LOADS (kN)				
	A	B	C	D	E
1	10400	710	±710		
2	12100	825	±825		
3				1300 ±185	1300 ±185
4				1300 ±185	1300 ±185
5	3500	240	±240		
6	3500	240	±240		

ALL GIVEN LOADS ARE FOR MACHINE WITH THE BOOM AT 50° (TIE DOWN ANGLE)

TOP OF CONCRETE TO BE -200mm FROM TOP OF RAIL FOR JACKING PADS

×A
to be informed later

Preliminary
not for construction



STATUS IFC

thyssenkrupp Industrial Solutions
St. Ingbert, Germany

Tolerances for welded constructions — DIN EN ISO 13920 Tolerance classification — B / F
Tolerances for machined surfaces — DIN ISO 2768 part 1/2 Tolerance classification — m / k
Weld seams — external state DIN EN ISO 5817 — Group of valuation B|C
NDT - ISO 17640:"B", ISO 11666:"2" — Valuation group B 2
Tolerance setting ISO 8015
E KN 912235.11 — No. of marks — Surface EN ISO 1302
list of Material
Scale 1:20 — Weight kg
Hatch No. E353004-CM001-230-272-4007-0001
Material WB

	Date	Name	Dep.
Drawn			
Checked			
Static			
Approved			

Index	Revision	Date	Name	Checked
03	STATUS	21.07.17	ZITTM	KILIANJ
02	Hatch No.	17.07.17	ZITTM	KILIANJ
01		27.06.17	ZITTM	KILIANJ

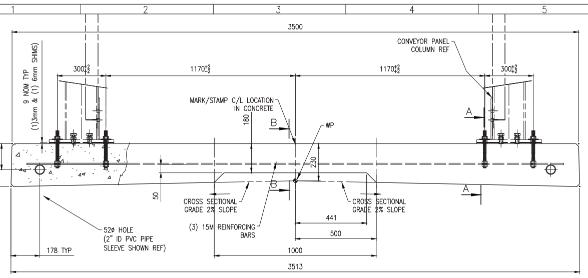
TRACK INSTALLATION

PRELIMINARY

12848 BAFFINLAND

Drawing-Ident No. 4934437 — CH. — Key-No. — F 1 — Sheet 1 — CAD — Sheets

Origine — Used instead of: — Replaced by:

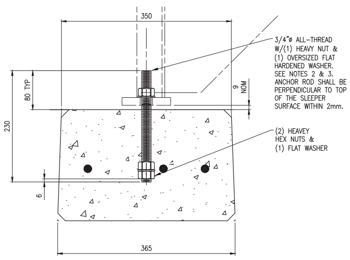


ELEVATION – SLEEPER
2% SLOPE BOTH SIDES
1:12
(QTY REQUIRED 532)

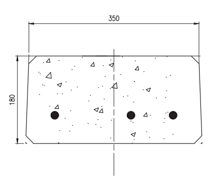
REFERENCE DRAWING	
DRAWING NO.	TITLE
BCSY-A-500	STOCKPILE #2 YARD CONVEYOR 4122-CV-001 – GENERAL ARRGN'T SHT 1
BCSY-S-520	STOCKPILE #2 YARD CONVEYOR 4122-CV-001 – CONVEYOR TABLE
	STANDARD YARD CONVEYOR TABLE – STRUCTURAL ARRGN'T
BCSY-S-520	STOCKPILE #2 YARD CONVEYOR 4122-CV-001 – CONVEYOR TABLE
	STANDARD YARD CONVEYOR TABLE – DETAILS

NOTES:

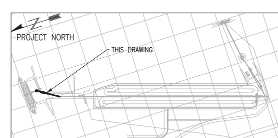
1. REINFORCING STEEL AND ANCHORING BARS SHALL BE DEFORMED BARS CONFORMING TO CAN/CSA G30.18 BILLET STEEL BARS, GRADE 400 HOT DIPPED GALVANIZED TO ASTM A767.
2. ANCHOR RODS SHALL BE ASTM A302 L7, HOT DIPPED GALVANIZED.
3. HARDENED WASHERS SHALL BE ACCORDING TO ASTM F436 & HEAVY HEX NUTS SHALL BE ACCORDING TO ASTM A563. ALL SHALL BE HOT DIPPED GALVANIZED.
4. MINIMUM CONCRETE COVER SHALL BE 50mm.
5. MINIMUM CONCRETE STRENGTH, 30 MPa AT 28 DAYS.
6. PROVIDE 15mm CHAMFER FOR ALL EDGES.
7. SLEEPERS SHALL BE MANUFACTURED IN ACCORDANCE WITH CSA A 23.4. A CLASS OF EXPOSURE OF F-2 SHALL BE IMPLEMENTED IN DETAILING AND FABRICATION.
8. DO NOT COMMENCE FABRICATION BEFORE SHOP DRAWINGS ARE REVIEWED AND RELEASED FOR CONSTRUCTION.
9. FABRICATOR TO SUPPLY THE SLEEPER W/ THE TOP NUTS & WASHERS NOT INSTALLED. THOSE SHALL BE SUPPLIED IN SEPARATE PALLETS.
10. ALL ANCHOR RODS SHALL BE ALIGNED ALONG THE SLEEPER CENTRE LINE WITHIN 2mm.
11. SLEEPER DETAILS ARE BASED ON CROSS SECTIONAL GRADE SLOPE SURFACE OF 2% EACH SIDE OF CONVEYOR CENTER.
12. ALL DIMENSIONS ARE IN MILLIMETERS.
13. DESIGN IS BASED ON A FACTORED BEARING RESISTANCE OF 200 kPa.



SECTION: A–A
ANCHOR ROD
1:4



SECTION: B–B
1:4



KEY PLAN

CLIENT DRAWING NUMBER:
E353004-CM001-230-260-0062

tkIS (Canada) Inc.

Index	Revision	Date (YY-MM-DD)	Name	Checked
B	ISSUED FOR QUOTATION	17-11-27	DCM	NR
A	ISSUED FOR QUOTATION	17-09-13	DCM	NR

Tolerances for machined surfaces: ISO 2768 part 1/2 Tolerance classification m/K
Tolerances for welded constructions: ISO 13920 Tolerance classification B/F
Surface ISO 1302
Scale
Weight 605 kg
Bill of Material
Material

	Date (YY-MM-DD)	Name
Drawn	17-09-06	DCM
Checked	17-09-12	
Designed	17-09-06	N. RIZKALLA
Approved	17-09-13	N. RIZKALLA

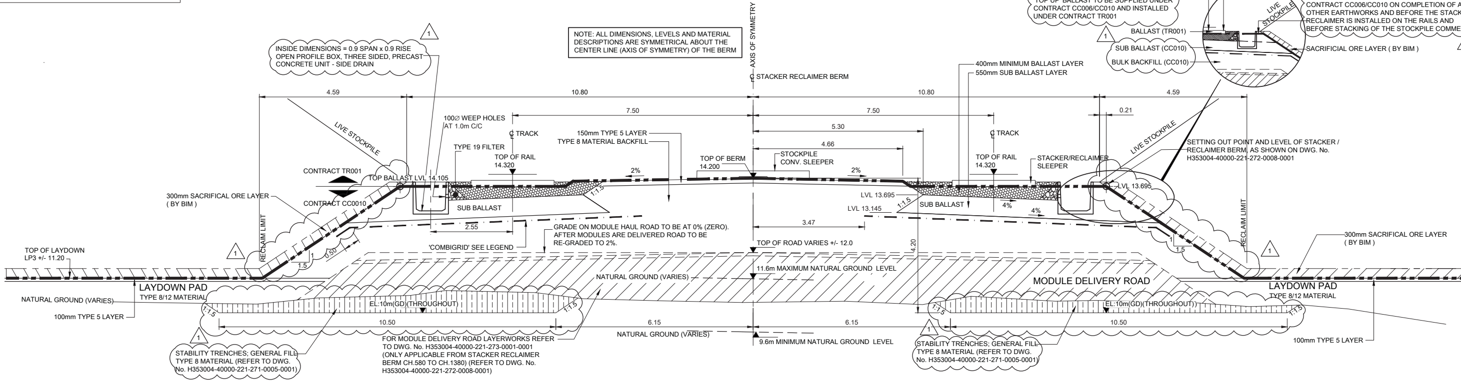
BAFFINLAND IRON MINES – MARY RIVER EXPANSION PROJECT
STOCKPILE #2 YARD CONVEYOR 4211-CV-001
SLEEPER DETAILS

thyssenkrupp

Drawing-Ident No. BSCY-S-560
CH.
Key-No.
Size A1
Sheet
CAD
Sheets
Origin:
Supercedes:
Superceded by:

PLOT DATE: 27 November 2017 FILE: G:\BAF\BCSY\DRAWINGS\TEMPORARY ARCHIVE\BCSY-S-560_B.DWG

DWG. No. H353004-40000-221-272-0004-0001



INSIDE DIMENSIONS = 0.9 SPAN x 0.9 RISE OPEN PROFILE BOX, THREE SIDED, PRECAST CONCRETE UNIT - SIDE DRAIN
NOTE: ALL DIMENSIONS, LEVELS AND MATERIAL DESCRIPTIONS ARE SYMMETRICAL ABOUT THE CENTER LINE (AXIS OF SYMMETRY) OF THE BERM
AXIS OF SYMMETRY
STACKER RECLAIMER BERM
4.59
10.80
7.50
5.30
4.66
0.21
100Ø WEEP HOLES AT 1.0m C/C
TRACK
150mm TYPE 5 LAYER
TYPE 8 MATERIAL BACKFILL
TYPE 19 FILTER
TOP OF RAIL 14.320
TOP OF BERM 14.200
LIVE STOCKPILE
CONTRACT TR001
TOP BALLAST LVL 14.105
CONTRACT CC0010
300mm SACRIFICAL ORE LAYER (BY BIM)
SUB BALLAST
2.55
'COMBIGRID' SEE LEGEND
GRADE ON MODULE HAUL ROAD TO BE AT 0% (ZERO). AFTER MODULES ARE DELIVERED ROAD TO BE RE-GRADED TO 2%.
RECLAIM LIMIT
TOP OF LAYDOWN LP3 +/- 11.20
LAYDOWN PAD
TYPE 8/12 MATERIAL
NATURAL GROUND (VARIES)
100mm TYPE 5 LAYER
EL:10m(GD)(THROUGHOUT)
10.50
6.15
STABILITY TRENCHES; GENERAL FILL TYPE 8 MATERIAL (REFER TO DWG. No. H353004-40000-221-271-0005-0001)
FOR MODULE DELIVERY ROAD LAYERWORKS REFER TO DWG. No. H353004-40000-221-273-0001-0001 (ONLY APPLICABLE FROM STACKER RECLAIMER BERM CH.580 TO CH.1380) (REFER TO DWG. No. H353004-40000-221-272-0008-0001)
STOCKPILE CONV. SLEEPER
STACKER/RECLAIMER SLEEPER
400mm MINIMUM BALLAST LAYER
550mm SUB BALLAST LAYER
LVL 13.695
LVL 13.145
3.47
TOP OF ROAD VARIES +/- 12.0
11.6m MAXIMUM NATURAL GROUND LEVEL
9.6m MINIMUM NATURAL GROUND LEVEL
4.20
MODULE DELIVERY ROAD
SETTING OUT POINT AND LEVEL OF STACKER / RECLAIMER BERM, AS SHOWN ON DWG. No. H353004-40000-221-272-0008-0001
STACKER RECLAIMER RAIL SLEEPER AND 'TOP UP' BALLAST TO BE SUPPLIED UNDER CONTRACT CC006/CC010 AND INSTALLED UNDER CONTRACT TR001
BALLAST (TR001)
SUB BALLAST (CC010)
BULK BACKFILL (CC010)
THIS AREA OF THE DRAIN / SIDE SLOPE AND ORE SACRIFICIAL LAYER IS TO BE CONSTRUCTED UNDER CONTRACT CC006/CC010 ON COMPLETION OF ALL OTHER EARTHWORKS AND BEFORE THE STACKER / RECLAIMER IS INSTALLED ON THE RAILS AND BEFORE STACKING OF THE STOCKPILE COMMENCES
SACRIFICIAL ORE LAYER (BY BIM)

BALLAST AND SUB BALLAST MATERIALS SPECIFICATION:

CRUSHED GRAVEL BALLAST:

GRADATIONS TO BE WITHIN LIMITS SPECIFIED, APPROVAL TO BE PROVIDED BY GEOTECHNICAL ENGINEER FOR ALL GRADATIONS.

SIEVE SIZE	PERCENT PASSING
45.3mm (1 - 3/4")	100
32.0mm (1 - 1/4")	70 - 95
25.4mm (1")	50 - 80
19.0mm (3/4")	30 - 60
12.7mm (1/2")	10 - 30
4.75mm (No. 4)	0 - 3
75 micron (No. 200)	0 - 1

PERCENTAGE OF CRUSHED PARTICLES IN SIZE RANGE SHALL NOT BE LESS THAN 70% BY WEIGHT OF ALL PARTICLES IN THAT SIZE RANGE. PARTICLES HAVING ONE OR MORE FRACTURED FACES WILL BE USED IN CALCULATING THIS PERCENTAGE.

MATERIAL IN SAMPLE FINER THAN No. 4 (4.76 MICRON) SIEVE WILL NOT BE CONSIDERED IN DETERMINING THE PERCENTAGE OF FRACTURED FACES.

GRADING OF CRUSHED GRAVEL BALLAST SHALL BE DETERMINED BY ASTM C316, LATEST EDITION.

AMOUNT OF MATERIAL FINER THAN No. 200 (74 MICRON) SHALL BE DETERMINED BY ASTM C117, LATEST EDITION.

SUB BALLAST:

COMPACT TO 98% OF STANDARD PROCTOR MAXIMUM DENSITY.

MATERIAL TO BE CRUSHED OR SCREENED PIT RUN GRAVEL, CONTAINING NO MORE THAN THREE PERCENT (3%) ORGANICS BY WEIGHT AS DETERMINED BY ASTM C123.

MATERIAL GREATER THAN 5mm TO CONTAIN A MINIMUM OF FIFTY PERCENT (50%) BY WEIGHT FRACTURED MATERIAL [TWO (2) FRACTURED FACES]

SIEVE SIZE	PERCENT PASSING
75mm (3")	100
25mm (1")	60 - 90
4.75mm (No. 4)	35 - 60
425 micron (No. 40)	10 - 40
75 micron (No. 200)	0 - 5

NOTES ON OPERATION OF STACKING AND RECLAIMING:

THE FOLLOWING IS RECOMMENDED TO BE CONSIDERED FOR THE OPERATION OF STACKING AND RECLAIMING:

- INSPECT THE BERM EVERY SEASON DURING EVERY THAW, PARTICULARLY IN THE FIRST TWO SEASONS, FOR SETTLEMENT AND SIDE SLOPE SLUMPING.
- MAINTAIN SYMMETRY OF THE TWO LUMP ORE STOCKPILES TO THE BERM DURING OPERATION, TO MINIMIZE THE POTENTIAL DIFFERENTIAL SETTLEMENT IN THE CROSS SECTIONAL PLANE.
- TOP OF STABILITY LAYER TO BE CLEANED BEFORE FRESHET AND RAINY SEASON, ANY PONDING WATER ON THE BERM TO BE PUMPED OUT.
- SNOW TO BE REMOVED TO AVOID ACCUMULATION.
- SIDE DRAIN TO BE KEPT CLEAN OF IRON ORE AND OTHER DEBRIS, PARTICULARLY BEFORE FRESHET AND RAINY SEASON.

NOTES ON BERM STABILITY TRENCH: (1)

- OVER EXCAVATION TO BE AT ELEVATION OF 10m GD AND BACKFILLED WITH TYPE 8 MATERIAL PRIOR TO CONSTRUCTION OF LP3 LAYDOWN AREA.

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED.

NOTES ON LAYERWORKS:

1. THE PROPERTIES OF ALL FILL MATERIALS TO SATISFY THE REQUIREMENTS IN THE HATCH SPECIFICATION H353004-00000-280-078-0002 UNLESS OTHERWISE NOTED.
2. ALL MATERIALS TO BE PLACED AND COMPACTED IN STRICT ACCORDANCE WITH HATCH SPECIFICATION H353004-00000-221-078-0001 AND THE GEOTECHNICAL RECOMMENDATIONS IN DOCUMENT H353004-00000-229-230-0004,
3. (1) EXISTING GROUND BENEATH THE BERM TO BE SHAPED TO ENSURE A MINIMUM DEPTH OF 2.88m OF ROCKFILL IS ACHIEVED PLUS 1.5m OF STABILITY TRENCH AS INDICATED ON THE SECTION.
4. SUB BALLAST LAYER = 0.55m,
5. BALLAST LAYER = 0.40m MINIMUM,
6. ROADWAY = MINIMUM 0.40m .

CONSTRUCTION SEQUENCE:

1. FOUNDATION PREPARATION TO BE DONE IN ACCORDANCE WITH HATCH SPECIFICATIONS H353004-00000-221-028-0001 AND H353004-00000-280-078-0002,
2. (1) CONSTRUCT STABILITY TRENCHES,
3. CONSTRUCT MODULE ROAD WITH TYPE 8 AND TYPE 5 MATERIAL,
4. CONSTRUCT LAYDOWN PADS,
5. PLACE AND COMPACT TYPE 8 FILL UP TO BOTTOM OF SUB BALLAST LEVEL, 4% CROSS SLOPE,
6. INSTALL 'COMBIGRID' TYPE 40/40 Q1 151 GRK3 OR SIMILAR APPROVED BELOW SUB BALLAST,
7. PLACE AND COMPACT SUB BALLAST,
8. PLACE AND COMPACT 0.55m INFILL BETWEEN SUB BALLAST LAYERS AT BERM CENTRE,
9. PLACE BALLAST,
10. PLACE AND COMPACT BERM MATERIAL IN CENTRE TO LEVEL 13.65 AT CENTRELINE,
11. INSTALL RAIL TIES,
12. ADD FINAL BALLAST,
13. COMPLETE TOP OF BERM, 2% CROSS SLOPE.

LEGEND:

— · — · — - 'COMBIGRID' TYPE 40/40 Q1 151 GRK3 OR SIMILAR APPROVED

CONTRACT TR001

CONTRACT CC006/CC010 - BATTERY LIMIT

(1) GD - GEODETIC DATUM

PERMIT TO PRACTICE
HATCH LTD.
Signature ____________
Date ____________
PERMIT NUMBER: P 512
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

DRAWING No.	DRAWING TITLE
H353004-40000-221-271-0005-0001	LAYDOWN AREA LP3 - PLAN AND PROFILES
H353004-00000-280-078-0002	QUARRIED FILL MATERIALS REQUIREMENTS
H353004-00000-221-078-0001	PLACEMENT OF FILL
H353004-40000-221-272-0008-0001	STOCKPILE 2 STACKER RECLAIMER BERM - SECTIONS
4500001466-B07-0001-001	KRUPP / KLOHN CRIPPEN BERGER - BALLAST AND SUB BALLAST DETAILS
H353004-00000-229-230-0004	GEOTECHNICAL RECOMMENDATIONS FOR STACKER RECLAIMER BERM
H353004-40000-223-271-0007-0004	MODULE DELIVERY ROAD - PLAN AND PROFILE SHEET 4 OF 4
H353004-40000-223-271-0007-0003	MODULE DELIVERY ROAD - PLAN AND PROFILE SHEET 3 OF 4
H353004-40000-223-271-0007-0002	MODULE DELIVERY ROAD - PLAN AND PROFILE SHEET 2 OF 4
H353004-40000-223-271-0007-0001	MODULE DELIVERY ROAD - PLAN AND PROFILE SHEET 1 OF 4
H353004-40000-221-273-0001-0001	MODULE, PRIMARY AND SECONDARY ROADS - TYPICAL CROSS SECTIONS

REFERENCE DRAWINGS

REG. PROFESSIONAL

FOR CONSTRUCTION

HATCH

No.	DESCRIPTION	BY	CHK'D	DATE
1	STABILITY TRENCH ADDED AND GEOMETRY UPDATED	JM	FH	13/02/2019
0	APPROVED FOR CONSTRUCTION	IHB	FH	28/06/2018

REVISIONS

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	I BARNARD	NR	07/06/2018
DESIGNER	I BARNARD	NR	07/06/2018
CHECKER	F HUGO		
DESIGN COORD.	R GOOSEN		
RESP. ENG.	R HALIM		
LEAD DISC. ENG.	A GROBBELAAR		
AREA LEAD	V LAVRIC		
ENG. MANAGER	R GOOSEN		
AREA MANAGER	T ATIBA		

DRAWING APPROVAL STATUS: Approved for Construction

Baffinland

BAFFINLAND IRON MINES LP
MARY RIVER EXPANSION PROJECT

PORT SITE
STACKER RECLAIMER BERM
TYPICAL SECTION

SCALE NTS OR AS NOTED

DWG. No. H353004-40000-221-272-0004-0001

REV 1

SHEET SIZE: D

$USERNAME$ $DATE$ $FILE$ $TIME$

Appendix C
Stability Analyses Results

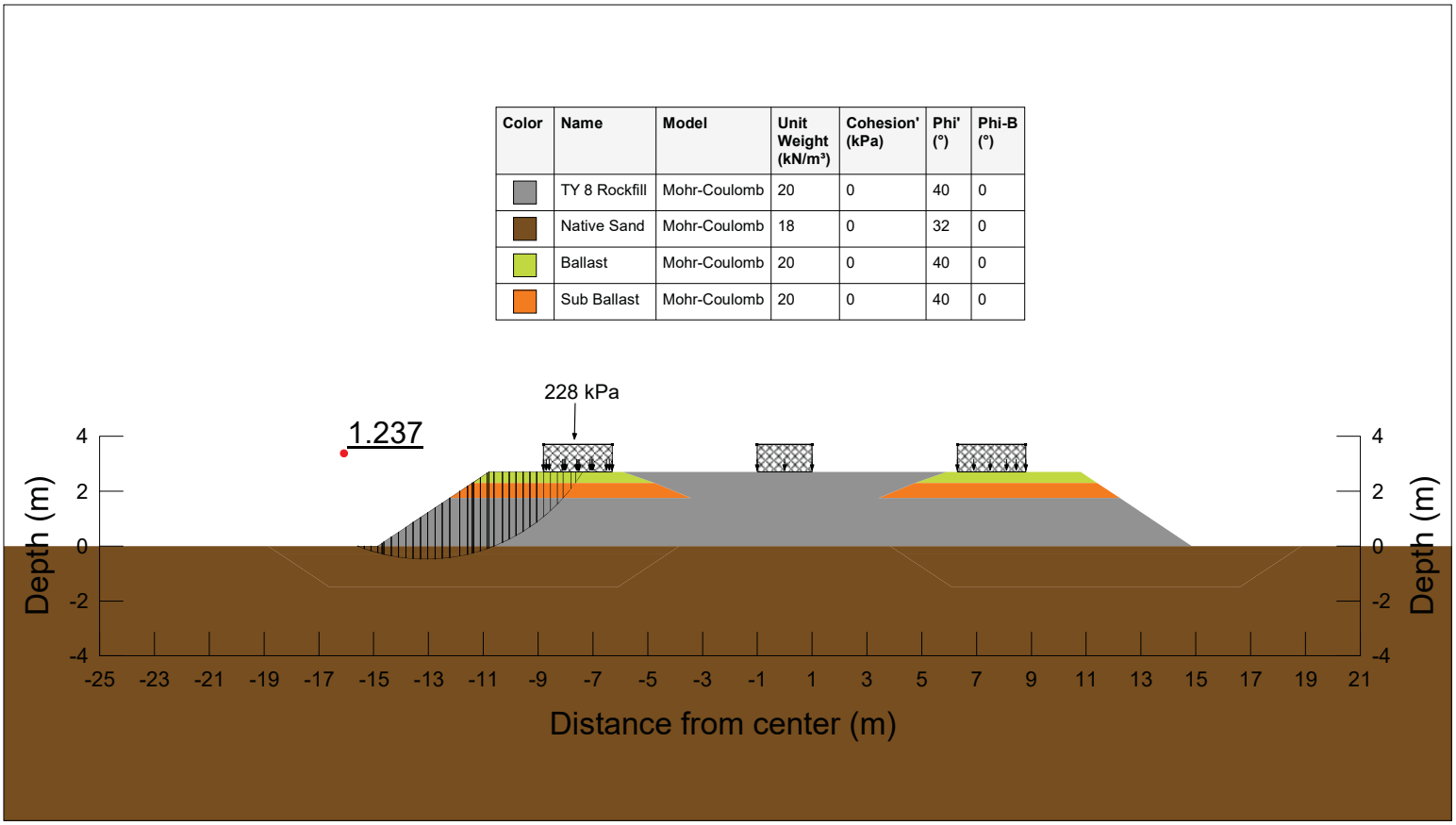


Figure C1B - Long-term Operating Case (Original Berm Configuration)

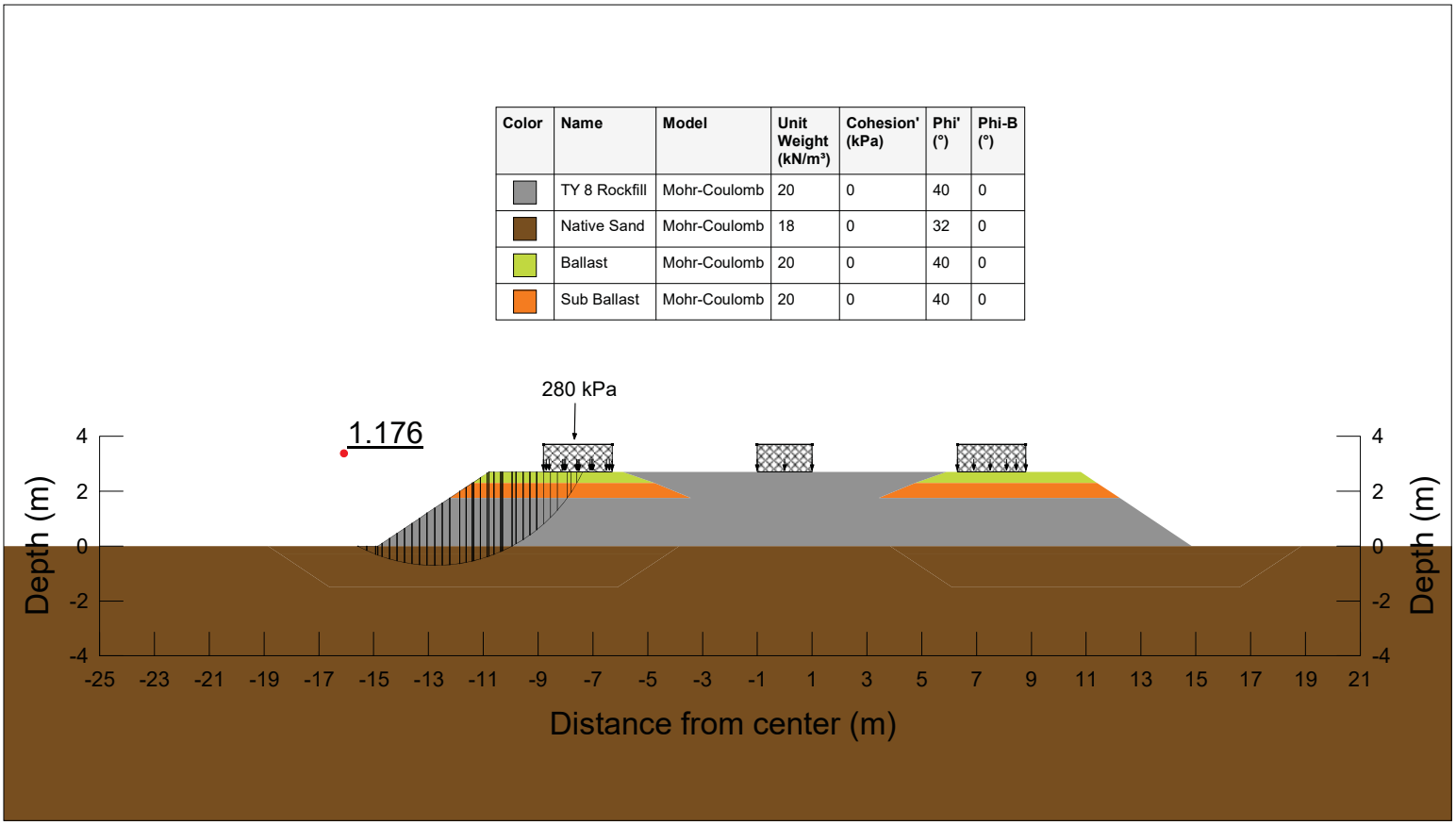


Figure C2B - Short-term Maintenance Case (Original Berm Configuration)

Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)	Phi-B (°)
	TY 5 Rockfill	Mohr-Coulomb	22	0	40	0
	TY 8 Rockfill	Mohr-Coulomb	20	0	40	0
	Native Sand	Mohr-Coulomb	18	0	32	0
	Ballast	Mohr-Coulomb	20	0	40	0
	Sub Ballast	Mohr-Coulomb	20	0	40	0

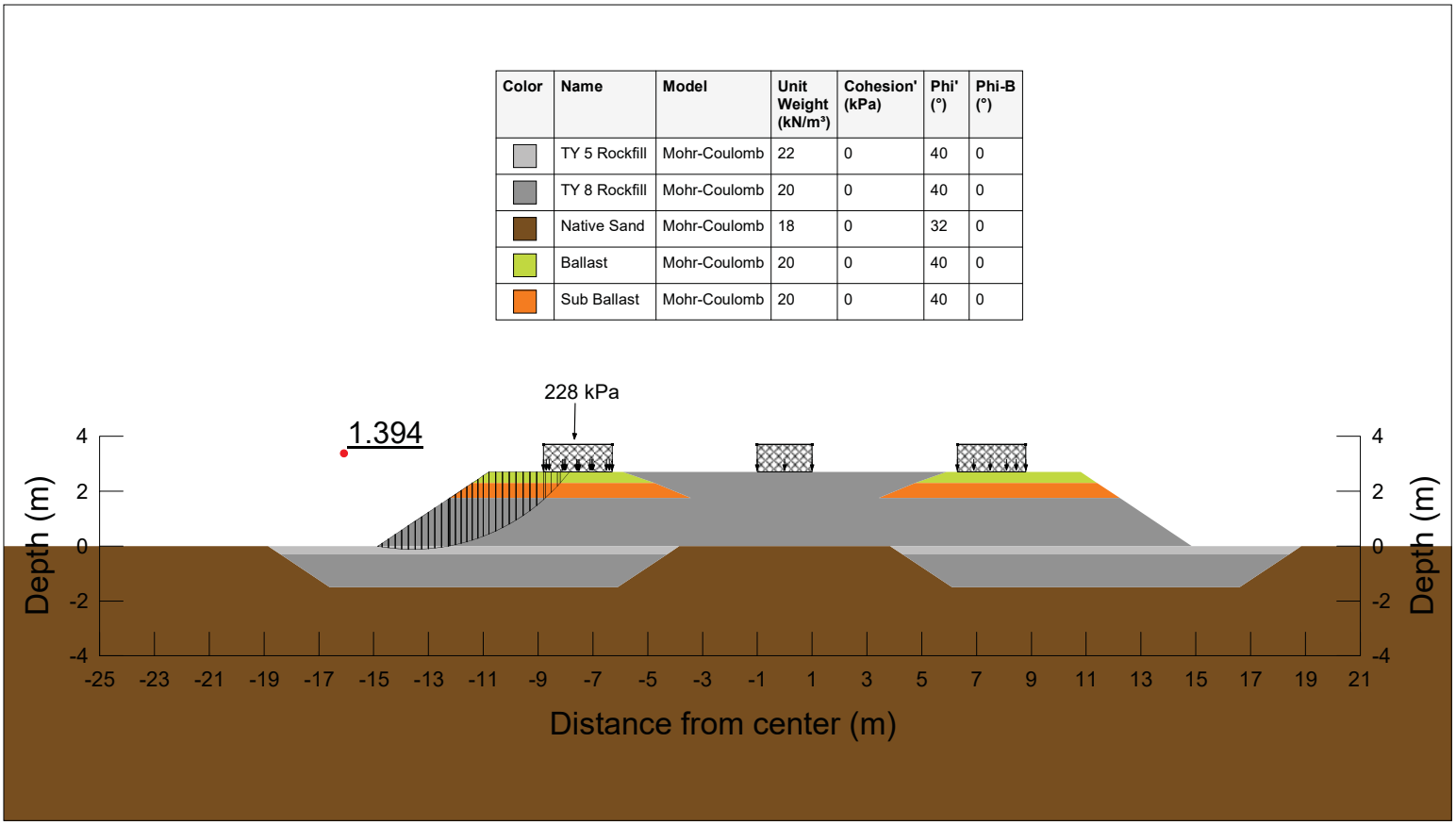


Figure C3 - Long-term Operation Case (with Rockfill Trench)

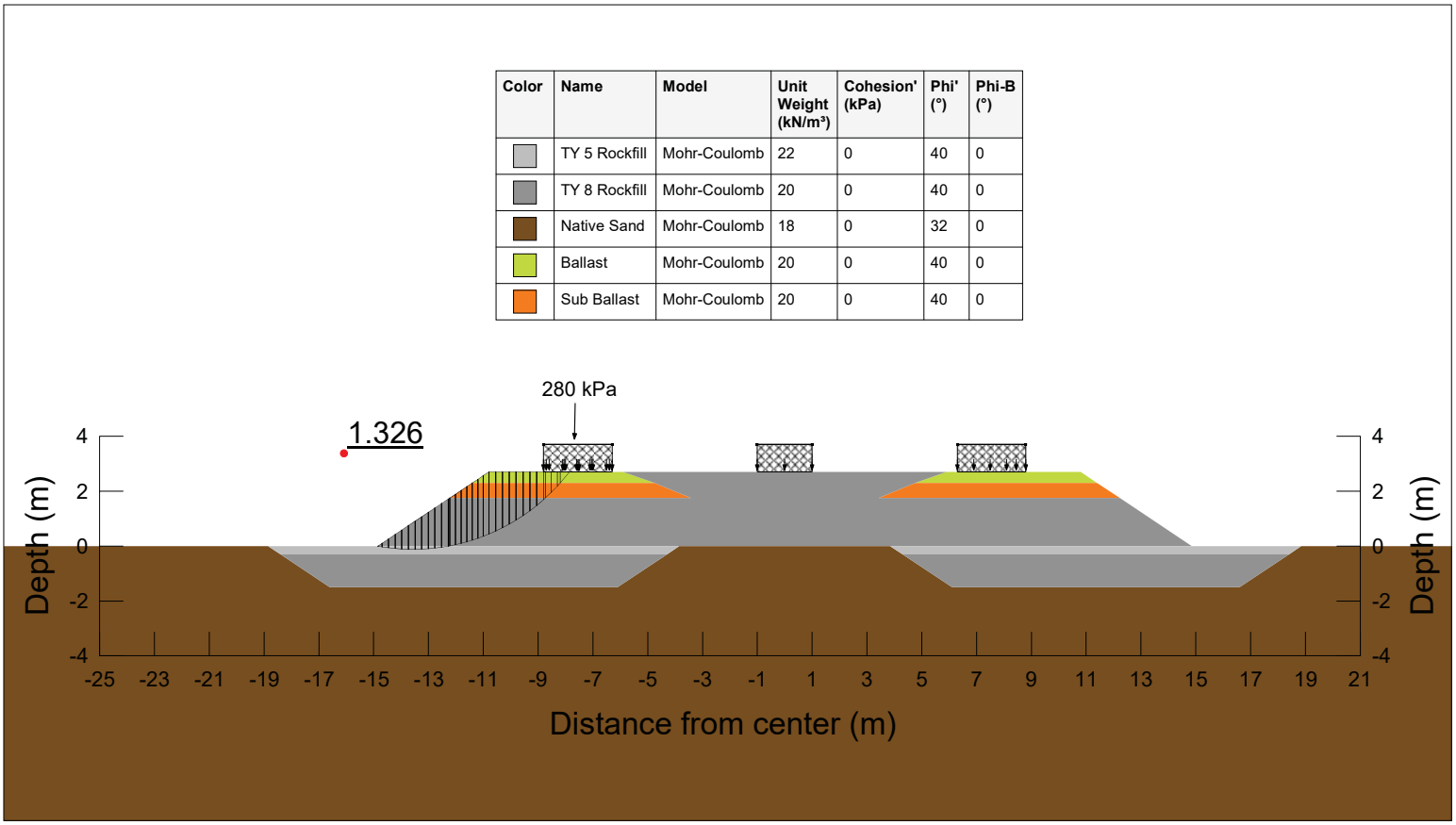


Figure C4 - Short-Term Maintenance Case (with Rockfill Trench)

Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)	Phi-B (°)	Cohesion R (kPa)	Phi R (°)
	TY 5 Rockfill	Mohr-Coulomb	22	0	40	0	0	0
	TY 8 Rockfill	Mohr-Coulomb	20	0	40	0	0	0
	Native Sand	Mohr-Coulomb	18	0	32	0	0	0
	Ballast	Mohr-Coulomb	20	0	40	0	0	0
	Sub Ballast	Mohr-Coulomb	20	0	40	0	0	0

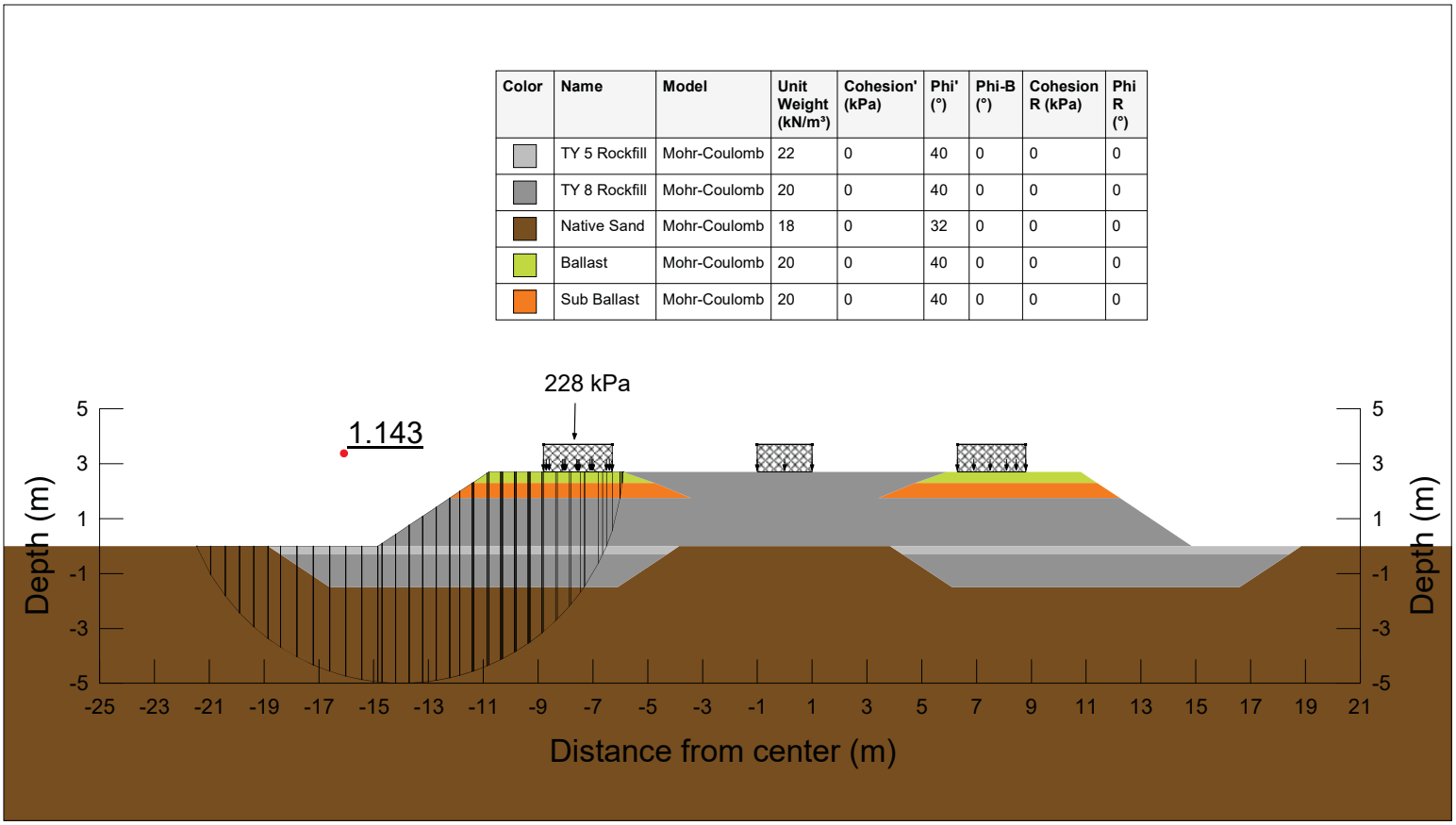


Figure C5 - Pseudo-static Condition (with Rockfill Trench)

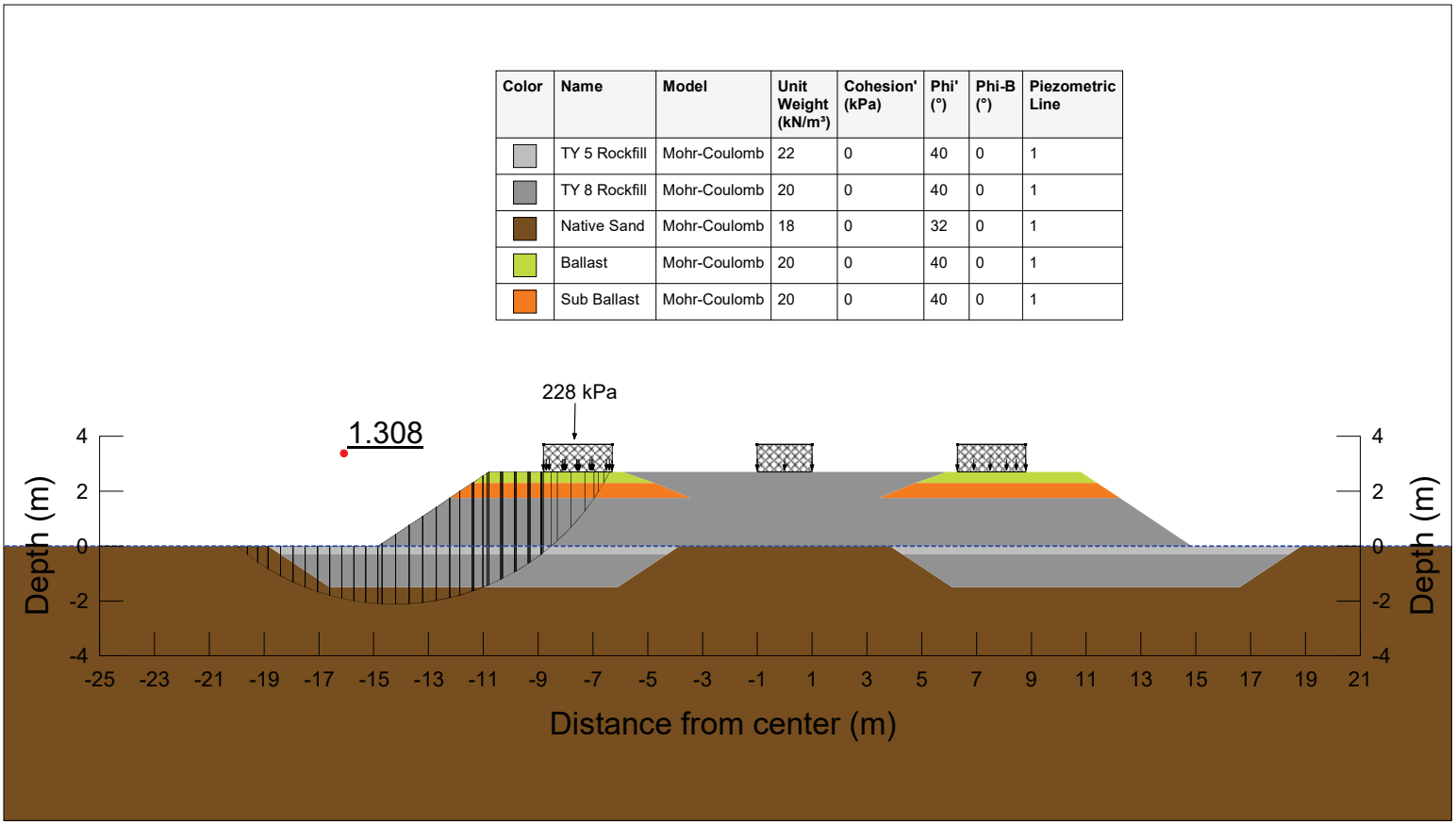


Figure C6 - High Groundwater Case (with Rockfill Trench)

Appendix D
Thermal Analyses Results

Color	Name	Model	Unfrozen Thermal Conductivity (J/sec/m/°C)	Frozen Thermal Conductivity (J/sec/m/°C)	Unfrozen Volumetric Heat Capacity (J/m³/°C)	Frozen Volumetric Heat Capacity (J/m³/°C)	Vol W/C (m³/m³)	Initial Temperature (°C)
	Sand	Simplified Thermal	2	3	2,600,000	2,600,000	0.255	
	Rockfill	Simplified Thermal	3	4.5	3,000,000	2,400,000	0.036	0

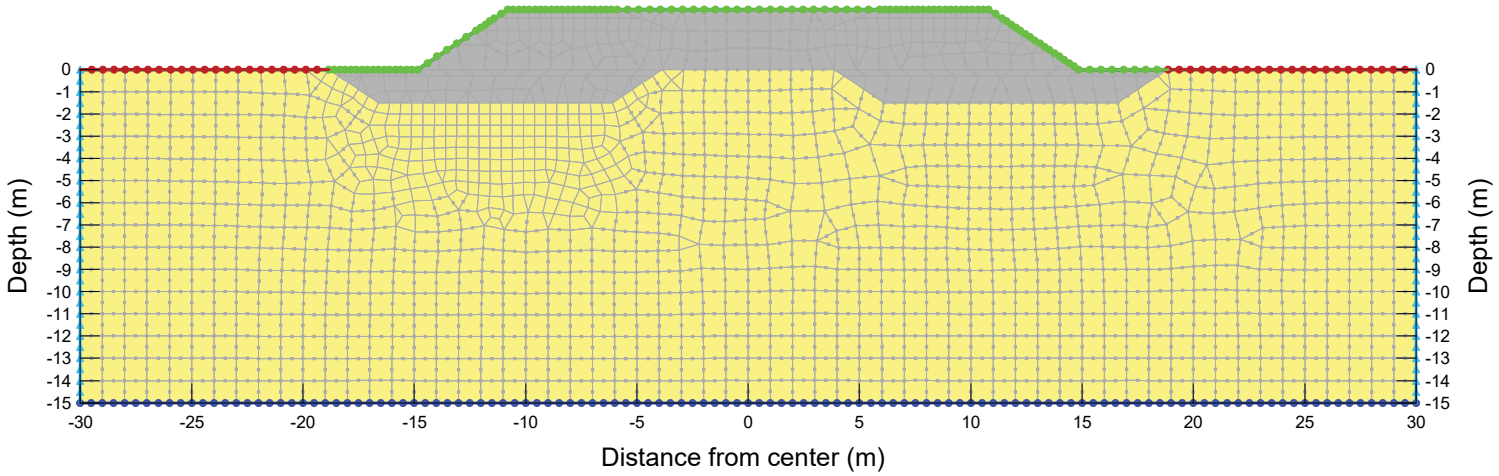


Figure D1 - Thermal Model Geometry

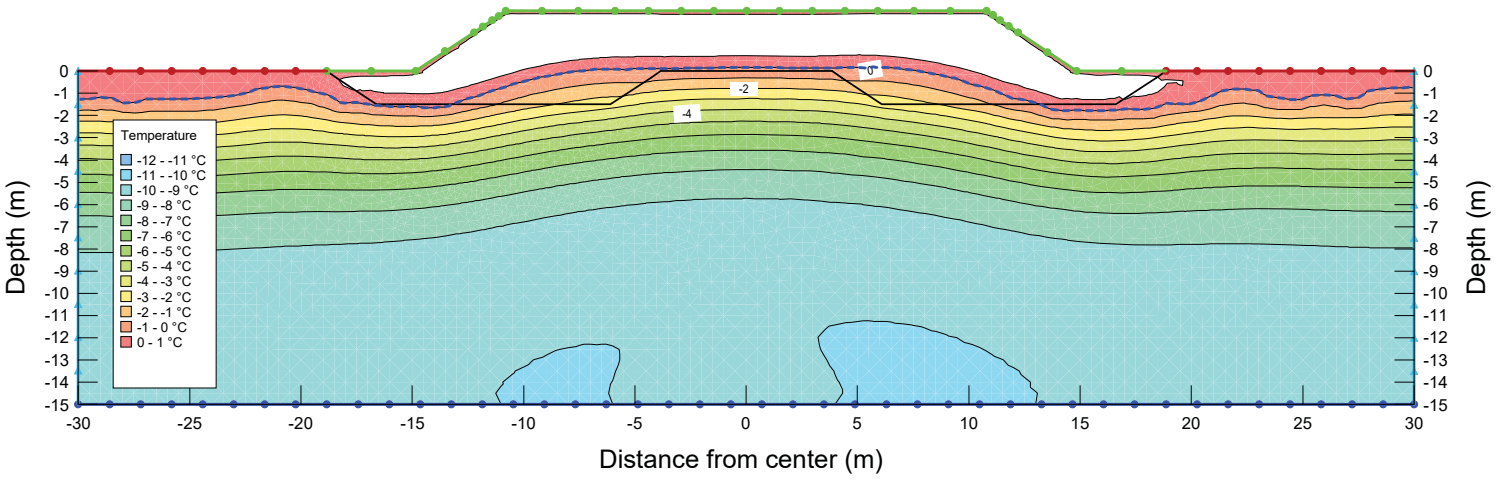


Figure D2 - Summer Temperature Contours (2 years after construction)

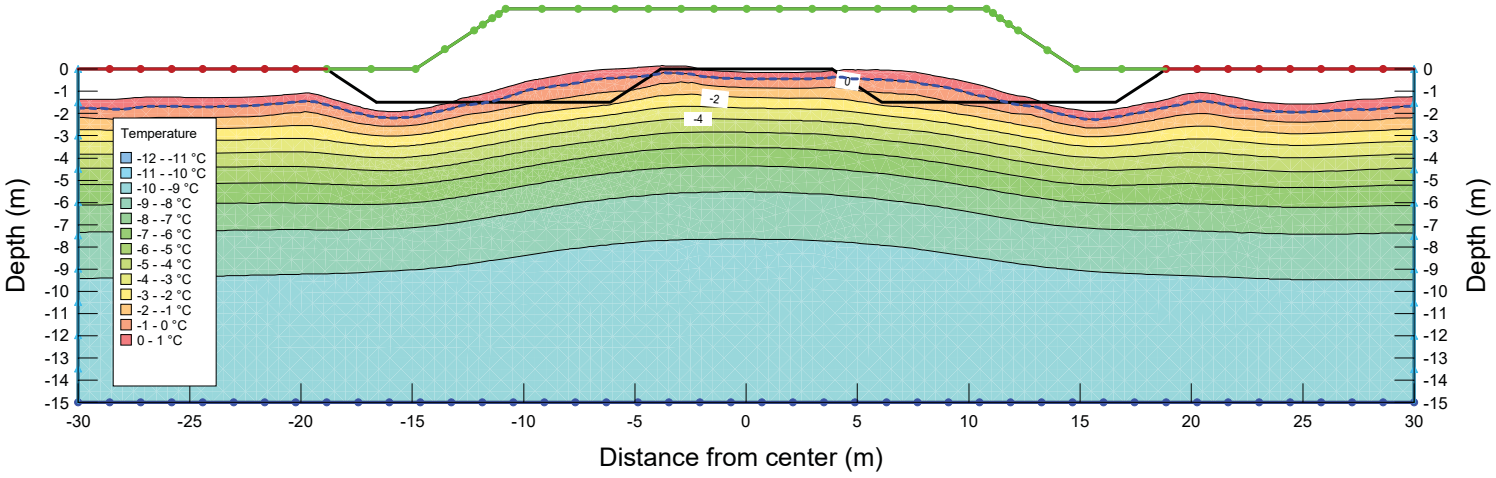
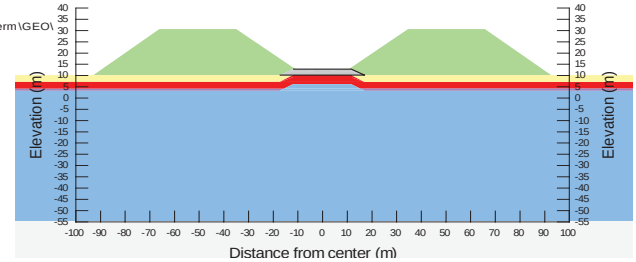


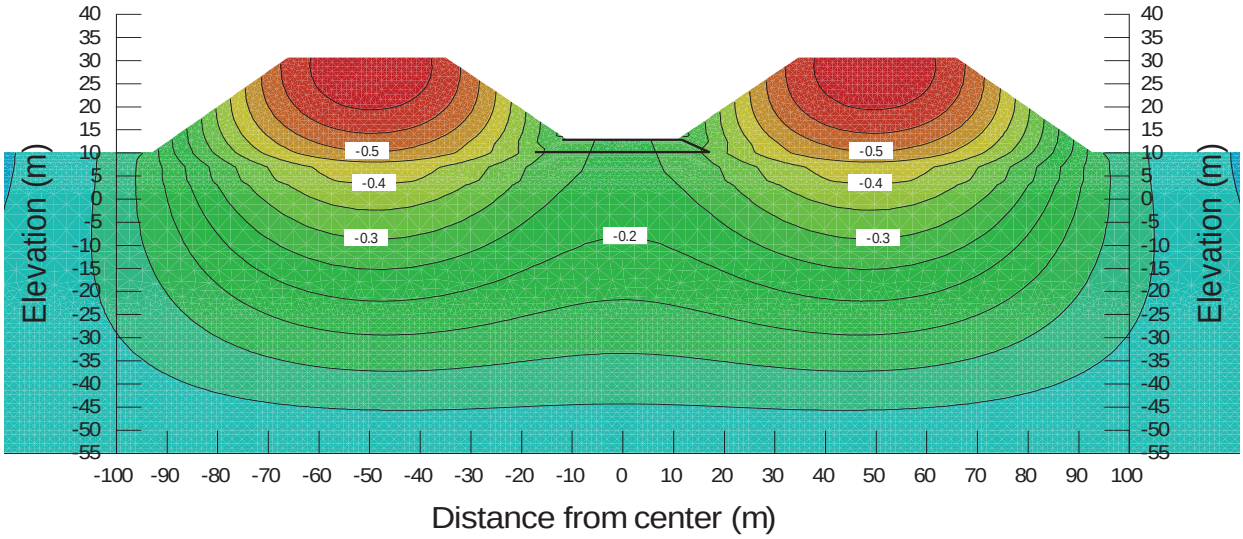
Figure D3 - Summer Temperature Contours (19 years after construction)

Appendix E
Settlement Analyses Results

File Name: Stacker-Settlement Analysis-Updated Geometry V2.gsz
Name: Berm, Lump Stockpile and Surcharge Loads - A1
Date: 3/8/2018
Directory: P:\REDLEAF\335458\SPECIALIST_APPS\02 Marry River\07 Reclaimer Berm\GEO\



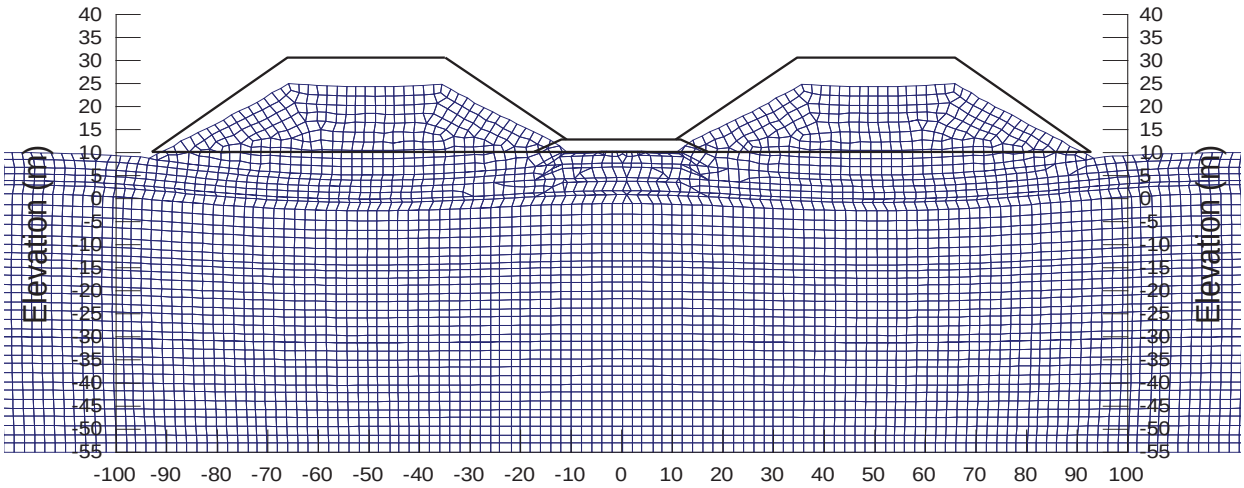
Color	Name
	Pre-Crushed Ore
	Rockfill (Rusher-run)
	Native Sand
	Upper Frozen Sand (E=80 mPa)
	Lower Frozen Silt (E=44 mPa)
	Upper Frozen Silt (E=22 mPa)



Job number	353004			Mary River Expansion Project	BIM
Ref	Reclaimer Berm				
By	Lk	0	14-Mar-18	Case A1 - Settlement Contours	Milne Inlet Port
Revision		A	14-Mar-18		FIGURE E1-1A

HATCH

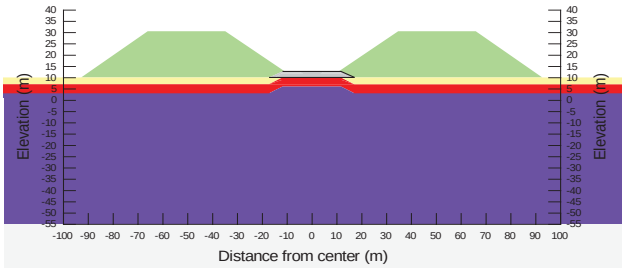
File Name: Stacker-Settlement Analysis-Updated Geometry V2.gsz
Name: Berm, Lump Stockpile and Surcharge Loads - A1
Date: 3/8/2018
Directory: P:\REDLEAF\335458\SPECIALIST_APPS\02 Marry River\07 Reclaimer Berm\GEO\



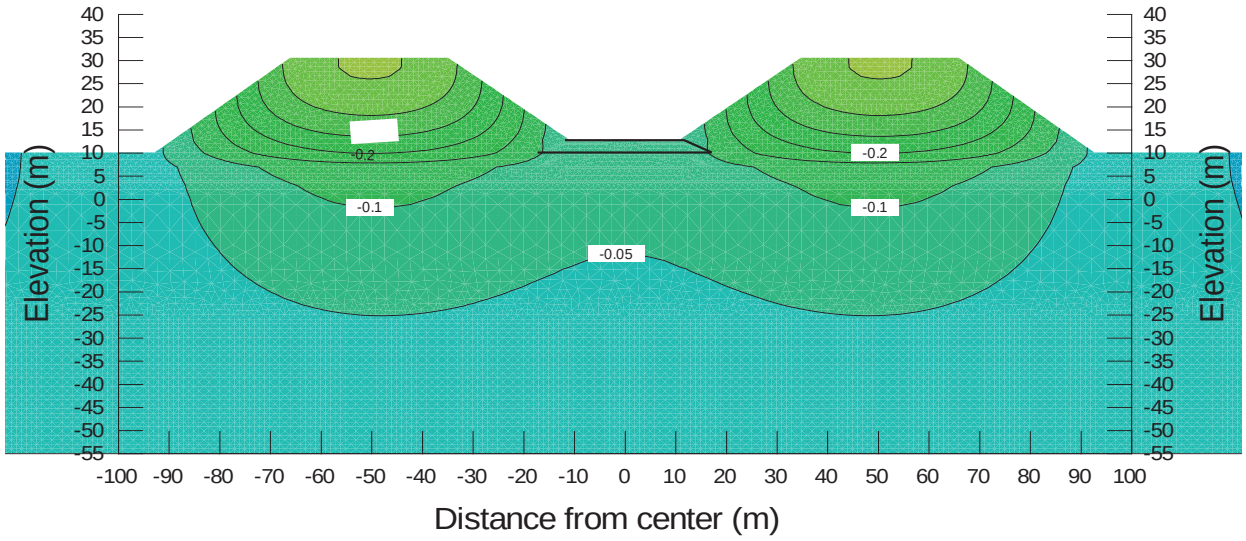
Note: Magnification factor of 10 applied to the deformed mesh

Job number	353004			Mary River Expansion Project	BIM
Ref	Reclaimer Berm			Case A1 - Deformed Mesh	Milne Inlet Port
By	Lk	0	14-Mar-18		FIGURE E1-1B
Revision		A	14-Mar-18		

File Name: Stacker-Settlement Analysis-Updated Geometry V2.gsz
Name: Berm, Lump Stockpile and Surcharge Loads - A2
Date: 3/8/2018
Directory: P:\REDLEAF\335458\SPECIALIST_APPS\02 Marry River\07 Reclaimer Berm\GEO\



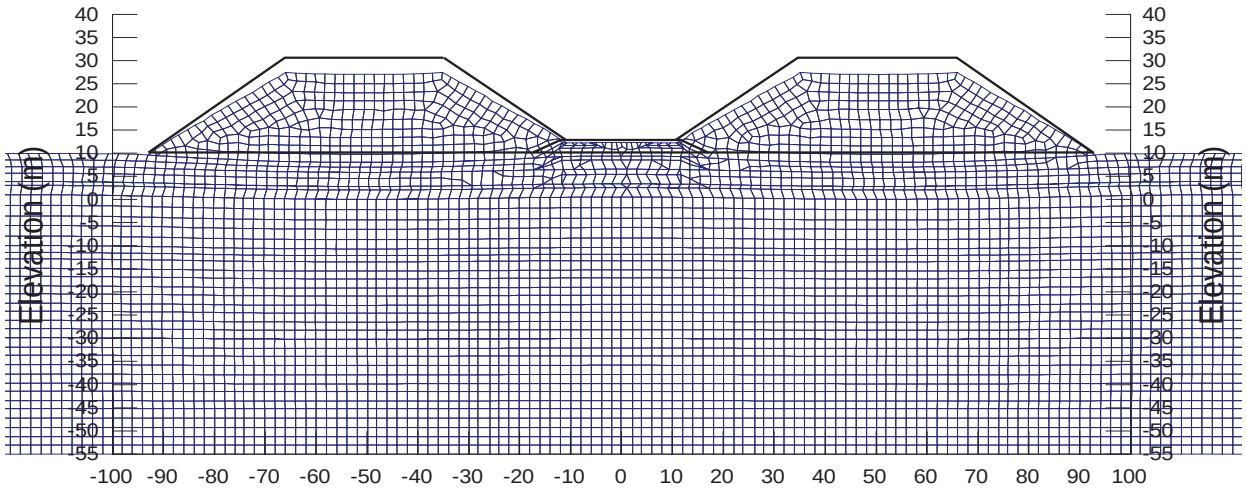
Color	Name
	Pre-Crushed Ore
	Rockfill (Rusher-run)
	Native Sand
	Upper Frozen Sand (E=80 mPa)
	Lower Frozen Sand (E=160 mPa)



Job number	353004			Mary River Expansion Project	BIM
Ref	Reclaimer Berm			Case A2 - Settlement Contours	Milne Inlet Port
By	Lk	0	14-Mar-18		FIGURE E1-2A
Revision		A	14-Mar-18		

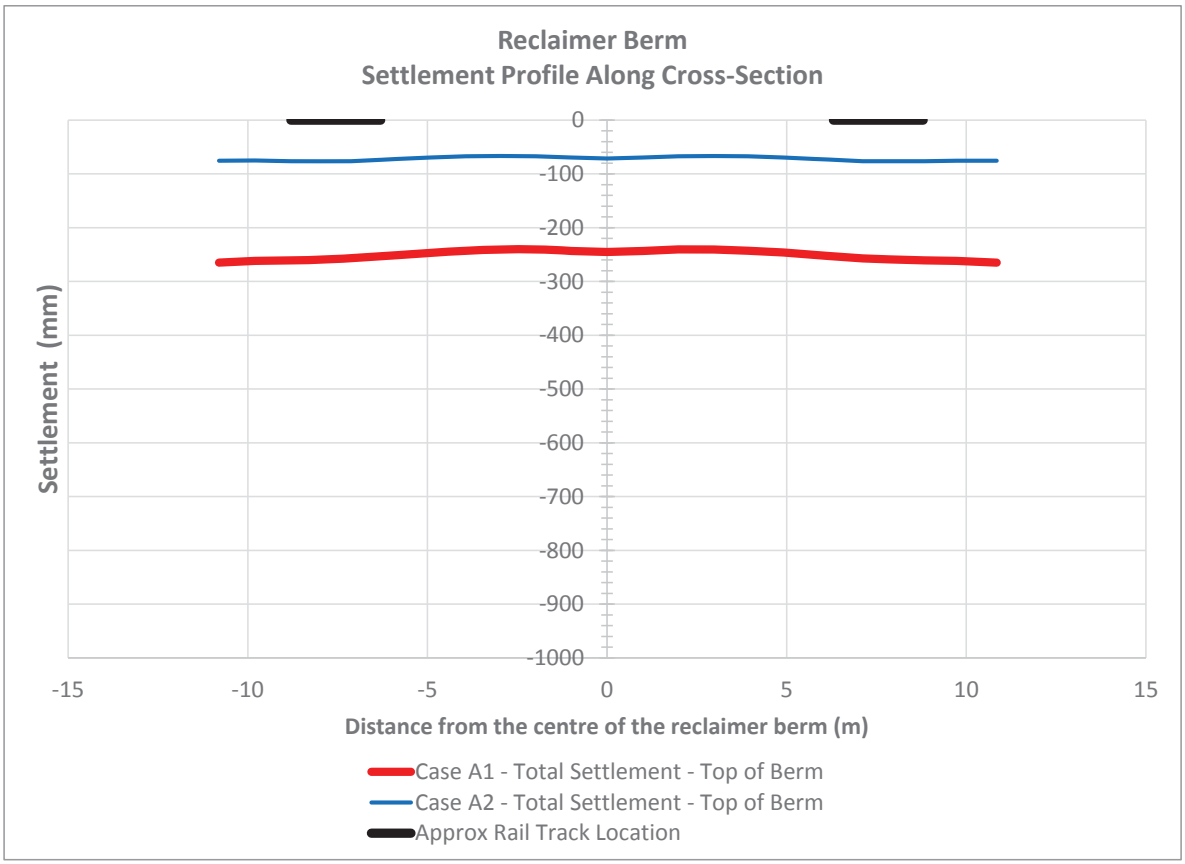
HATCH

File Name: Stacker-Settlement Analysis-Updated Geometry V2.gsz
Name: Berm, Lump Stockpile and Surcharge Loads - A2
Date: 3/8/2018
Directory: P:\REDLEAF\335458\SPECIALIST_APPS\02 Marry River\07 Reclaimer Berm\GEO\



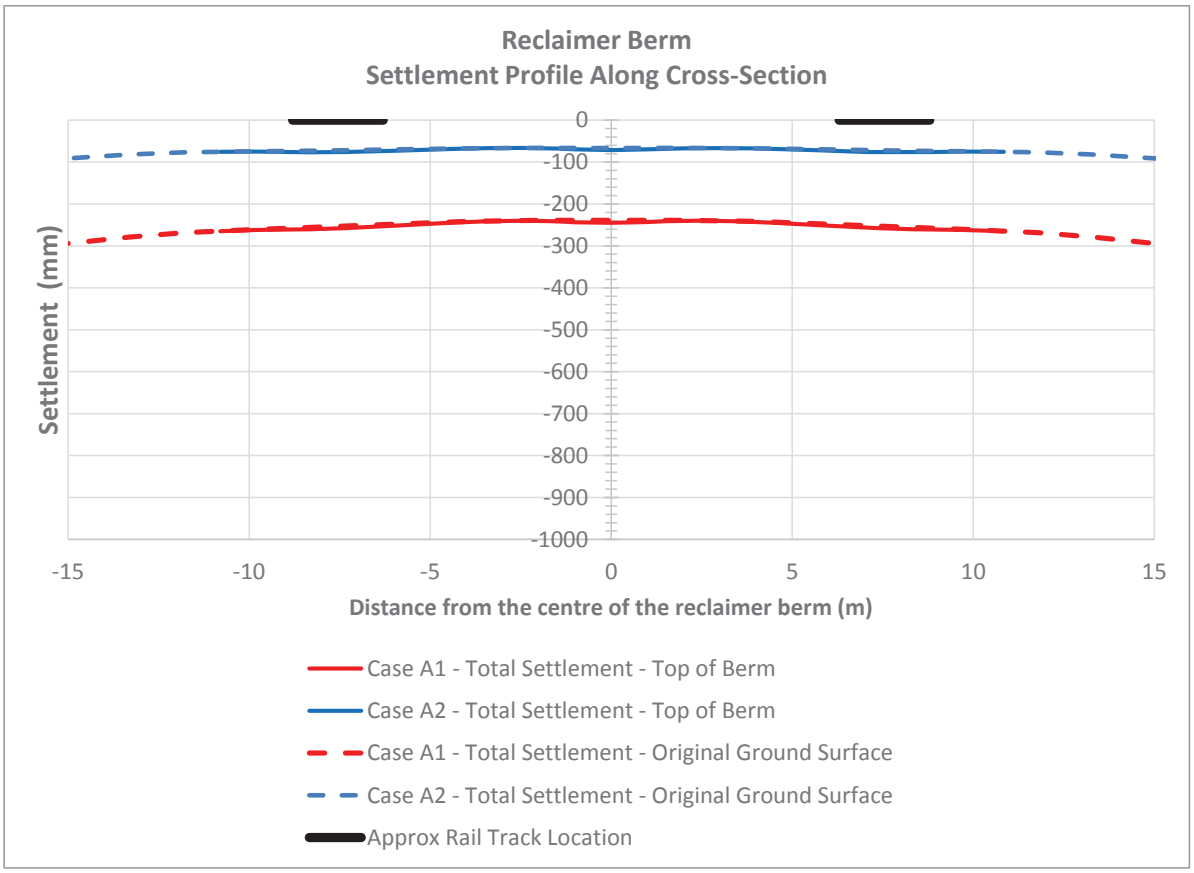
Note: Magnification factor of 10 applied to deformed mesh

Job number	353004			Mary River Expansion Project		BIM
Ref	Reclaimer Berm			Case A2 - Deformed Mesh	HATCH	Milne Inlet Port
By	Lk	0	14-Mar-18			FIGURE E1-2B
Revision		A	14-Mar-18			



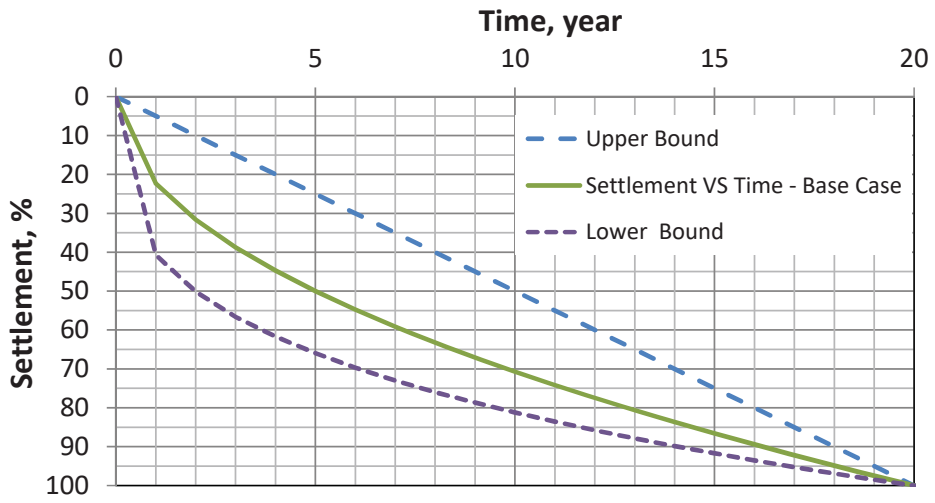
Note: Case A1 and A2 have a model boundary depth of 60 m

Job number	353004		Mary River Expansion Project		BIM
Ref	Reclaimer Berm		Total Settlement - Base Cases (Sections 1 and 2)	HATCH	Milne Inlet Port
By	Lk	0 14-Mar-18			
Revision		A 14-Mar-18			FIGURE E2-1



Note: Case A1 and A2 have a model boundary depth of 60 m

Job number	353004			Mary River Expansion Project	BIM
Ref	Reclaimer Berm			Comparision of Settlement at Top of Berm and Original Ground Surface Level	Milne Inlet Port
By	Lk	0	14-Mar-18		
Revision		A	14-Mar-18		FIGURE E2-2



Job number	353004	Mary River Expansion Project			BIM
Ref	Reclaimer Berm				
By	Lk	0	17-May-18	Creep Settlement - Time Dependency	Milne Inlet Port
Revision		A	17-May-18		FIGURE E3-1