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September 7, 2010

Jim Millard, M. Sc., P. Geo.  
Environmental Superintendent  
Mary River Project  
Baffinland Iron Mines Corporation  
Suite 1016, 120 Adelaide Street West  
Toronto, Ontario M5H 1T1

Dear Jim,

**RE:**

**MARY RIVER PROJECT  
MARY RIVER LANDFILL  
QA/QC REPORT (As-Built Report)  
OUR REFERENCE NO. 09-162**

Genivar Consultants LP (Genivar) was retained by Baffinland Iron Mines Corporation (BIMC) to design the Solid Waste Landfill and its associated access road in Nunavut, provide QA/QC services during construction and subsequently to compile the required documentation of as-built conditions of the facility.

## **BACKGROUND**

Part J, Part J (3), of the Water Licence (#2BB-MRY0710) for the Mary River Project issued by the Nunavut Water Board (NWB) states that:

*"The Licensee shall provide as-built plans and drawings, stamped and sealed by a professional Engineer registered in Nunavut, within ninety (90) days of completion of all construction works, ..."*

Additionally, Qikiqtani Inuit Association (QIA) in their letter of August 27, 2009 entitled "QIA Response, BIMC Request to Commence Inert Landfill Construction and Operation" have made some requirements for As-Built conditions of the landfill which is the subject of this report.

The Construction of the Access Road and the landfill commenced in the first week of July 2010 and was completed within 3 weeks.

## **PROPOSED DESIGN OF THE ACCESS ROAD AND LANDFILL**

Figure 1 shows the site map indicating the Mary River Project sites from Steensby in the south to Mary River Camp in the north and Milne Inlet Camp in the north. Figure 2 shows the site plan arrangements of the Access Road and Landfill at Mary River Site.

As shown in the related drawings in Appendix 1, the Access Road was designed to take off from the existing Explosives Magazine Road. This access road crosses two low areas where culverts were needed to allow for drainage. The Access Road was designed to be constructed of granular material from the nearby borrow pits and the quality of the granular materials were to be observed visually by the site engineer performing QA/QC during construction.

The landfill was designed to have containment berms constructed of granular material. The containment berms are approximately 2-m in height with 3:1 inside slopes and 2:1 outside slopes.

## **AS-CONSTRUCTED CONDITIONS OF THE FACILITY**

Genivar provided full-time QA/QC inspection of the construction activities for the Access Road and the Landfill containment berms. Attached in Appendix 2 are the As-Constructed Drawings and photographs of construction activities.

### *Access Road construction*

The Access Road was constructed in general conformance to the design. Granular material was brought in from nearby borrow pits and placed and compacted. Two culverts at station 0+118 and at station 0+383 were constructed. It should be noted that from Station 0+500 to station 0+600, the road was constructed of blasted inert waste rock for better compaction and drainage. For details on the as-built profile and sections of the Access Road, please refer to drawings AC1 and AC2 in Appendix 2.

### *Containment construction*

The containment for the Landfill Facility was constructed in general conformance with the design. For details on the plans and sections of the containment construction, please refer to drawings AC1 and AC2 in Appendix 2.

The material used for the containment berms and base was obtained from nearby borrow sources. The material was free of any deleterious substances and was reviewed by Genivar QA/QC inspector.

It is our opinion that the Landfill Facility containment was designed and built in general conformance with our original design.

We trust this report is satisfactory and meets your requirements. However, should you have any questions, please do not hesitate to contact the undersigned for further discussion.

Yours truly,

**Genivar Consultants LP**

  
Barry H. Martin, P. Eng., MRAIC





## **APPENDIX 1**

- **DESIGN BRIEFS**
- **DESIGN DRAWINGS**



834 Mountjoy Street South  
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August 7, 2009

Dick Matthews  
Director, Technical Services  
Baffinland Iron Mines Corporation  
Suite 1016, 120 Adelaide Street West  
Toronto, Ontario M5H 1T1

Dear Dick,

**RE:**

**MARY RIVER PROJECT  
ACCESS ROAD TO SOLID WASTE DISPOSAL SITE  
DESIGN REPORT  
OUR REFERENCE NO. 09-162**

Genivar Consultants LP (Genivar) has been retained by Baffinland Iron Mines Corporation (BIMC) to design the access road to the solid waste disposal site at their Mary River Camp site in Nunavut. The purpose of this report is to provide you with the design parameters as well as the methodology in the construction of the access road.

## **PROPOSED DESIGN OF THE FACILITIES AT MARY RIVER CAMP SITE**

Figure C01 shows the site plan including a key map indicating the access road to the proposed solid waste disposal site. Figures C02 to C05 show the plan, profiles and sections of the road including the culverts associated with our design.

The access road shall be built over relatively flat stony surfaced areas of the tundra with two lower areas where water may migrate under the road.

The intent is not to excavate into the tundra but to build on top of the stony surface on the flat areas and the minor organics in the depressed areas.

This should minimize to the melting of wedge ice or tabular ice below the surface of the road if it should exist in the permafrost.

Although there is no specification available for the select granular fill, the Contractors have been constructing roads on site with this material including the road to the bulk sample pit on top of the ore body as well as roads about the site.

There are two types of fill found in the borrow pits that have been used in construction in the past. One is a sandy fill with little gravel and the other is a well graded gravel with just adequate fines to construct a stable base that packs readily with the travel from the bulldozers and trucks. This material is what we term as select granular fill and it was identified in the nearby designated borrow pit to mine personnel and was approved by the engineer to be used on the road base and wearing surface.

As shown in the related drawings in Appendix 1, the access road requires two culverts to be installed at two locations to ensure proper drainage away from the road. These culverts were sized based on the precipitation information provided from the nearest measuring station (Pond Inlet) and the availability of culverts at the site. We enclose our design basis for the calculation of culverts to this letter.

The following is a summary of the required material for the proposed access road:

Road Length:	660 meters
Culverts:	1 @ 1-m dia. CSP culverts 11 meters
	1 @ 0.3 m dia. CSP culvert 10 meters
Cut:	0 C.M.
Fill (Road base aggregate)	2332 C.M. select granular fill.

The 1.0m culvert being utilized is considerably larger than required but is used due to availability on site.

An explosive magazine designed for 20,000 kg of explosive is located approximately 70 meters from the proposed access road to the solid waste disposal (SWD) site.

Although a majority of the 20,000 kg of explosives were used during the bulk sampling program in 2008, we have ensured that the access road to the SWD site meets the guidelines for Quality Distance to Explosives storage as set out by Natural Resources Canada (NRC).

We trust this report is satisfactory and meets your requirements. However, should you have any questions, please do not hesitate to contact the undersigned for further discussion.

Yours truly,

**Genivar Consultants LP**



Barry H. Martin, P. Eng., MRAIC  
BHM/jw

c.c. Derek Chubb  
Dave McCann





# **APPENDIX 1**

## **DRAWINGS**

**(Forwarded July 20, 2009)**



Describe: Elements and Nature	Date	Id

 GENIVAR

Project  
**MARY RIVER PROJECT**  
**BAFFINLAND IRON**  
**MINES CORPORATION**  
Baffin, NWT  
Drawing  
**NEW ROAD TO LANDFILL**  
**SITE PLAN VIEW**

Date	JUNE 2003	CAD/PA Number	09-162
Subj	AS NOTED	Alt Number	
Drawn	S.S.	Drawing Number	C01
Checked	B.M.		
Approved	B.M.		



This drawing is an instrument of service and shall remain the property of GENIVAR. It shall not be used for any other project without the written consent of GENIVAR. The user shall be responsible for the accuracy of the information and the consequences of its use. GENIVAR shall not be liable for any damages or losses resulting from the use of this drawing.

Revisión	Fecha	Por

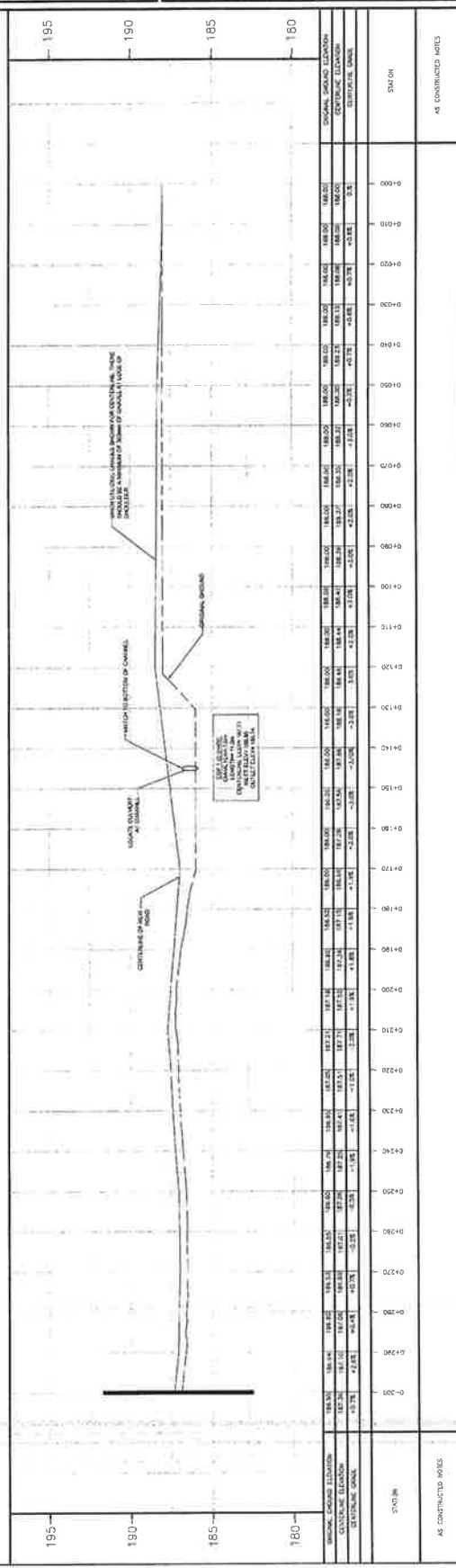
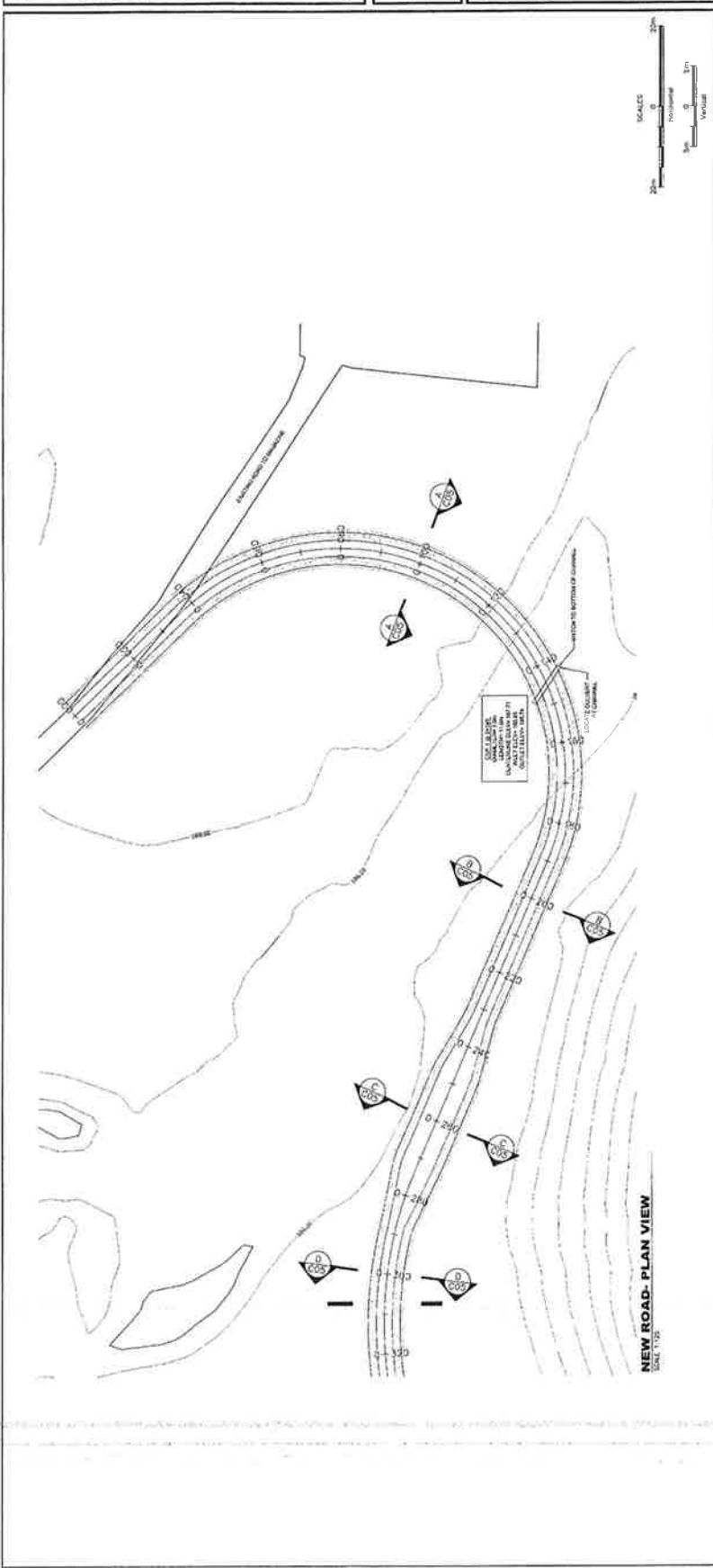


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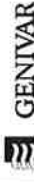
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STATION	EXISTING ELEVATION	PROPOSED ELEVATION	GRADE	VERTICAL CURVE DATA
0+00	180.00	180.00	0.00%	
0+10	180.00	180.00	0.00%	
0+20	180.00	180.00	0.00%	
0+30	180.00	180.00	0.00%	
0+40	180.00	180.00	0.00%	
0+50	180.00	180.00	0.00%	
0+60	180.00	180.00	0.00%	
0+70	180.00	180.00	0.00%	
0+80	180.00	180.00	0.00%	
0+90	180.00	180.00	0.00%	
0+100	180.00	180.00	0.00%	
0+110	180.00	180.00	0.00%	
0+120	180.00	180.00	0.00%	
0+130	180.00	180.00	0.00%	
0+140	180.00	180.00	0.00%	
0+150	180.00	180.00	0.00%	
0+160	180.00	180.00	0.00%	
0+170	180.00	180.00	0.00%	
0+180	180.00	180.00	0.00%	
0+190	180.00	180.00	0.00%	
0+200	180.00	180.00	0.00%	
0+210	180.00	180.00	0.00%	
0+220	180.00	180.00	0.00%	
0+230	180.00	180.00	0.00%	
0+240	180.00	180.00	0.00%	
0+250	180.00	180.00	0.00%	
0+260	180.00	180.00	0.00%	
0+270	180.00	180.00	0.00%	
0+280	180.00	180.00	0.00%	
0+290	180.00	180.00	0.00%	
0+300	180.00	180.00	0.00%	

[illegible]

GENUIN 44 Anthony Way, Suite 100 Houston, Texas 77059 Tel. 713/661-1100 Telex 150000		ARCHITECT	MECHANICAL	ELECTRICAL
		_____	_____	_____

**Project**  
**MARY RIVER PROJECT**  
**BAFFINLAND IRON**  
**MINES CORPORATION**  
**BAFFINLAND**  
**Drilling**


Date	24MAY 2009	COCOS File Number	and Address (Name and address)
Source	AS-107110	Job Number	09-162
Display	5-B	Drawing Number	C03
Checked			
Approved			

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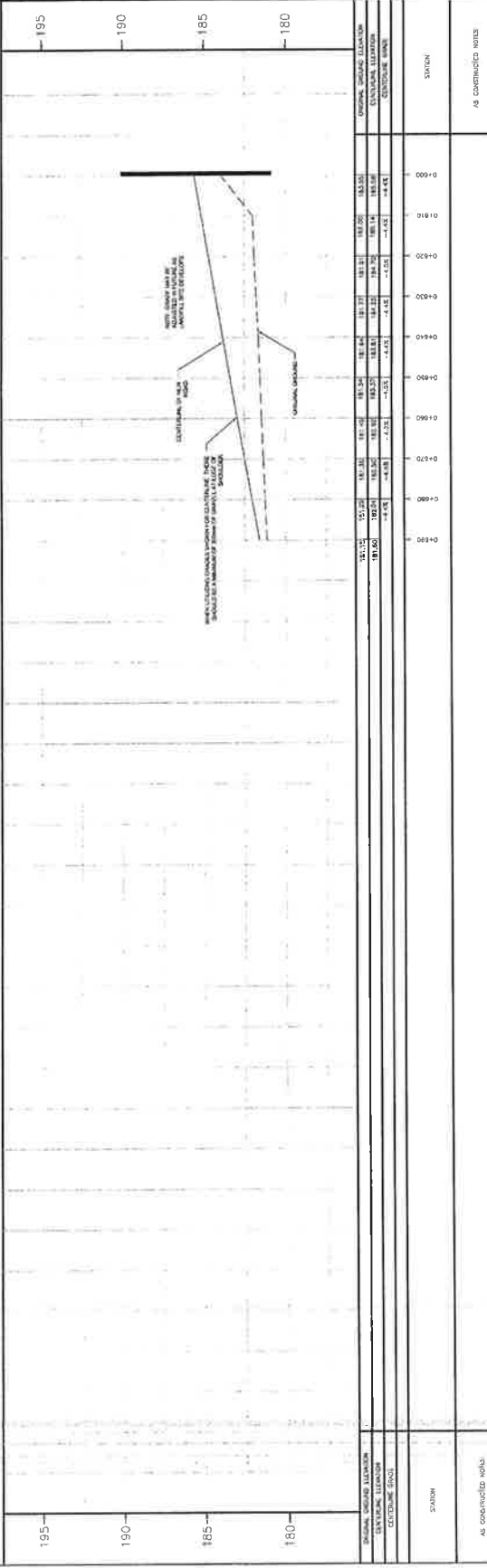
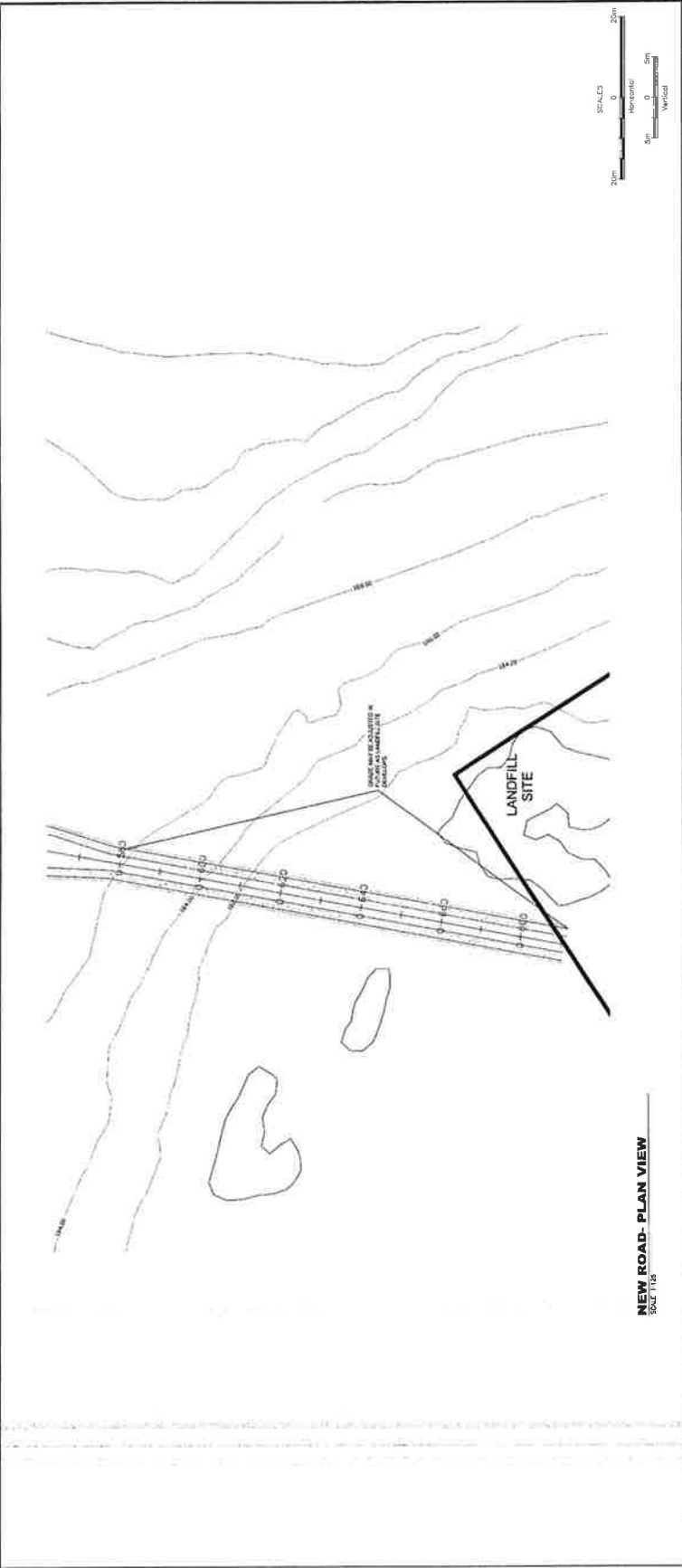
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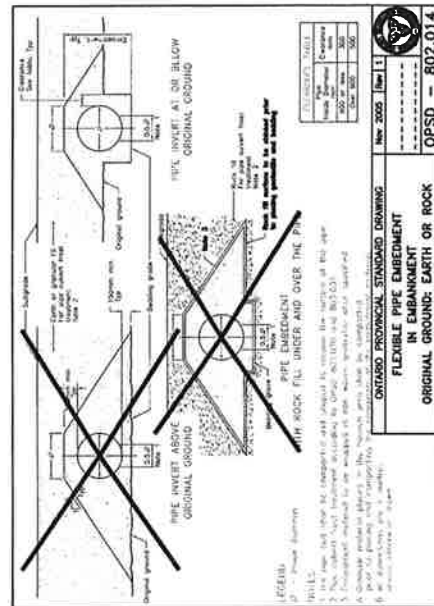
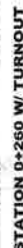
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<b>ARCHITECT</b>		<b>Mechanical</b>	_____

Project  
**MARY RIVER PROJECT**  
**BAFFINLAND IRON**  
**MINES CORPORATION**  
BAFFINLAND  
NUNAVUT

Drawing  
**PLAN AND PROFILE**  
**STA. 0+000 to 0+690**

Date	Suball 2003	CAD001a Number Serializing year and jurisdiction	09-162
Date	AS NOTED	Alt Number	
Drawn	U.S.	Drawing Number	C04
Checked			
Approved			





Pharmacokinetic Values	
Phase	Characteristic
Initial Distribution	10-20 min
Elimination	1-2 hr

Nov 2005	Rev	1
		
QPSD - 802.014		

ONTARIO PROVINCIAL STANDARD DRAWING  
FLEXIBLE PIPE EMBEDMENT  
IN EMBANKMENT  
ORIGINAL GROUND: EARTH OR ROCK

1. *Algebra* is a branch of mathematics that deals with the study of mathematical symbols and the rules for manipulating these symbols. It is a fundamental part of many scientific and engineering disciplines.

A. Quinlan, *professor in the  
dept. of psychology and  
the department of  
neuroscience at the*

<p>This drawing is not intended to be used as a guide for construction. It is for informational purposes only. It is not intended to be used as a basis for construction. It is not intended to be used as a basis for construction. It is not intended to be used as a basis for construction.</p>	<p>Drawings are not to be used as a basis for construction.</p>	<p>Drawings are not to be used as a basis for construction.</p>	<p>Drawings are not to be used as a basis for construction.</p>	<p>Drawings are not to be used as a basis for construction.</p>	<p>Drawings are not to be used as a basis for construction.</p>	<p>Drawings are not to be used as a basis for construction.</p>	<p>Drawings are not to be used as a basis for construction.</p>
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1001



North

Scale: 1:100,000



**GEMME**  
and  
**STRUCTURALS**

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San Francisco, CA 94109  
Tel. (415) 774-2200  
Telex 980000  
Fax (415) 774-2200



**ANCHORLET** \_\_\_\_\_

**ELECTRICAL** \_\_\_\_\_

**MECHANICAL** \_\_\_\_\_

Project	MARY RIVER PROJECT BAFFINLAND IRON MINES CORPORATION
Drawing	CROSS SECTIONS & CULVERT DETAIL

Date JUNE 2008	CACS Fee Number Springfield road widening	
State AS NOTED	Job Number <b>09-162</b>	
Drawn B.S.	Drawing Number <b>C05</b>	
Checked	Approved	

**Design Chart 1.07: Runoff Coefficients (Continued)****- Rural**

Land Use & Topography <sup>3</sup>	Soil Texture		
	Open Sand Loam	Loam or Silt Loam	Clay Loam or Clay
<b>CULTIVATED</b>			
Flat 0 - 5% Slopes	0.22	0.35	0.55
Rolling 5 - 10% Slopes	0.30	0.45	0.60
Hilly 10- 30% Slopes	0.40	0.65	0.70
<b>PASTURE</b>			
Flat 0 - 5% Slopes	0.10	0.28	0.40
Rolling 5 - 10% Slopes	0.15	0.35	0.45
Hilly 10- 30% Slopes	0.22	0.40	0.55
<b>WOODLAND OR CUTOVER</b>			
Flat 0 - 5% Slopes	0.08	0.25	0.35
Rolling 5 - 10% Slopes	0.12	0.30	0.42
Hilly 10- 30% Slopes	0.18	0.35	0.52
<b>BARE ROCK</b>	<b>COVERAGE<sup>3</sup></b>		
	30%	50%	70%
Flat 0 - 5% Slopes	0.40	0.55	0.75
Rolling 5 - 10% Slopes	0.50	0.65	0.80
Hilly 10- 30% Slopes	0.55	0.70	0.85
<b>LAKES AND WETLANDS</b>	0.05		

<sup>2</sup> Terrain Slopes<sup>3</sup> Interpolate for other values of % imperviousness

Sources: American Society of Civil Engineers - ASCE (1960)  
U.S. Department of Agriculture (1972)

## **CULVERT @ STATION 0+145**

Total Area= 4.85 ha

Two Areas

Area 1 (A1)= 2.40 ha

Area 2 (A2)= 2.45 ha

Flow Line

A1= 172m

A2= 224m

A1 Slope (Equivalent Slope Method):

Elevation	Fall (m)	Length (m)	Sn (m/m)	Sn <sup>-0.5</sup>
212.00	1.22	43	0.028	5.98
210.78	4.07	43	0.095	3.24
206.71	17.89	43	0.416	1.55
188.82	2.82	43	0.066	3.89
186.00				
<b>Total</b>	<b>26.00</b>	<b>172</b>		<b>14.66</b>

Sw:

$$\begin{aligned} &= 100 (n/S_{n\text{total}}^{-0.5})^2 \\ &= 100 \times (4 / 14.66)^2 \\ &= 7.45\% \end{aligned}$$

Time of Concentration (tc):

$$\begin{aligned} &= (0.057 \times L) / (S^{0.2} \times A^{0.1}) \\ &= (0.057 \times 172) / (7.45^{0.2} \times 2.40^{0.1}) \\ &= 6.01 \text{ minutes} \end{aligned}$$

A2 Slope (Equivalent Slope Method):

Elevation	Fall (m)	Length (m)	Sn (m/m)	Sn <sup>-0.5</sup>
190.00	0.58	56	0.010	10.00
189.42	0.66	56	0.012	9.13
188.76	0.76	56	0.014	8.45
188.00	2.00	56	0.036	5.27
186.00				
<b>Total</b>	<b>4.00</b>	<b>224</b>		<b>32.85</b>

Sw:

$$\begin{aligned} &= 100 (n/S_{n\text{total}}^{-0.5})^2 \\ &= 100 \times (4 / 32.85)^2 \end{aligned}$$

$$= 1.48\%$$

Time of Concentration (tc):

$$\begin{aligned} &= (0.057 \times L) / (S^{0.2} \times A^{0.1}) \\ &= (0.057 \times 224) / (1.48^{0.2} \times 2.45^{0.1}) \\ &= 10.79 \text{ minutes} \end{aligned}$$

Weighted Average tc:

$$\begin{aligned} &= [(2.40 \times 6.01) + (2.45 \times 10.79)] / (2.40 + 2.45) \\ &= 8.43 \text{ minutes} \end{aligned}$$

Using IDF Curve, Rainfall Intensity= 9.6 mm/hr

$$\begin{aligned} \text{Flow, Q:} &= 2.78 \times A_t \times I \times C \\ &= 2.78 \times 4.85 \times 9.6 \text{ mm/hr} \times 0.22 \\ &= \mathbf{28.48 \text{ L/s}} \\ &= \mathbf{0.029 \text{ m}^3/\text{s}} \end{aligned}$$



All calculator output should be verified prior to design use

Entered Data:

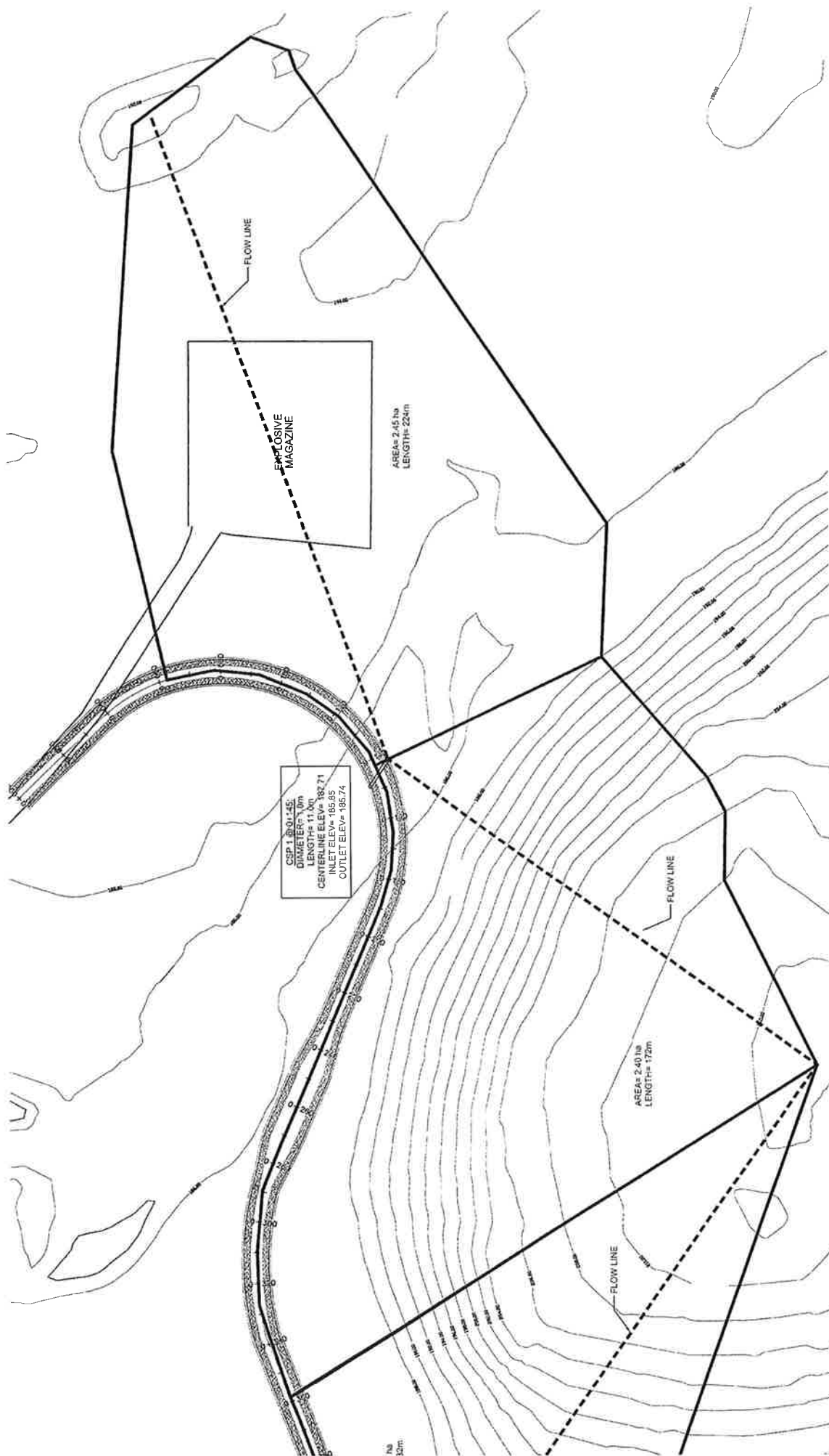
Shape .....	Circular
Number of Barrels .....	1
Solving for .....	Headwater
Chart Number .....	2
Scale Number .....	3
Chart Description .....	CORRUGATED METAL PIPE CULVERT
Scale Description .....	PIPE PROJECTING FROM FILL
Overtopping .....	Off
Flowrate .....	0.0290 cms
Manning's n .....	0.2600
Roadway Elevation .....	187.7100 m
Inlet Elevation .....	185.8500 m
Outlet Elevation .....	185.7400 m
Diameter .....	1000.0000 mm
Length .....	11.0000 m
Entrance Loss .....	0.0000
Tailwater .....	1.0000 m

Computed Results:

Headwater .....	186.7465 m	Outlet Control
Slope .....	0.0100 m/m	
Velocity .....	0.0369 mps	

Messages:

Outlet head > Inlet head.  
Computing Outlet Control headwater.  
Outlet submerged.  
Full flow.  
Headwater depth computed using FHWA equation.  
Headwater: 186.7465 m



### **CULVERT @ STATION 0+450**

Total Area= 1.84 ha

Flow Line= 232m

Slope (Equivalent Slope Method):

Elevation	Fall (m)	Length (m)	Sn (m/m)	Sn <sup>-0.5</sup>
212.00	1.5	58	0.026	6.20
210.50	5.5	58	0.095	3.24
205.00	12.5	58	0.216	2.15
192.50	4.9	58	0.085	3.43
187.60				
<b>Total</b>	<b>24.40</b>	<b>232</b>		<b>15.02</b>

Sw:

$$\begin{aligned} &= 100 (n/S_{n\text{total}}^{-0.5})^2 \\ &= 100 \times (4 / 15.02)^2 \\ &= 7.09\% \end{aligned}$$

Time of Concentration (tc):

$$\begin{aligned} &= (0.057 \times L) / (S^{0.2} \times A^{0.1}) \\ &= (0.057 \times 232) / (7.09^{0.2} \times 1.84^{0.1}) \\ &= 8.41 \text{ minutes} \end{aligned}$$

Using IDF Curve, Rainfall Intensity= 9.6 mm/hr

$$\begin{aligned} \text{Flow, Q:} &= 2.78 \times A_t \times I \times C \\ &= 2.78 \times 1.84 \times 9.6 \text{ mm/hr} \times 0.22 \\ &= 10.80 \text{ L/s} \\ &= 0.011 \text{ m}^3/\text{s} \end{aligned}$$

All calculator output should be verified prior to design use

Entered Data:

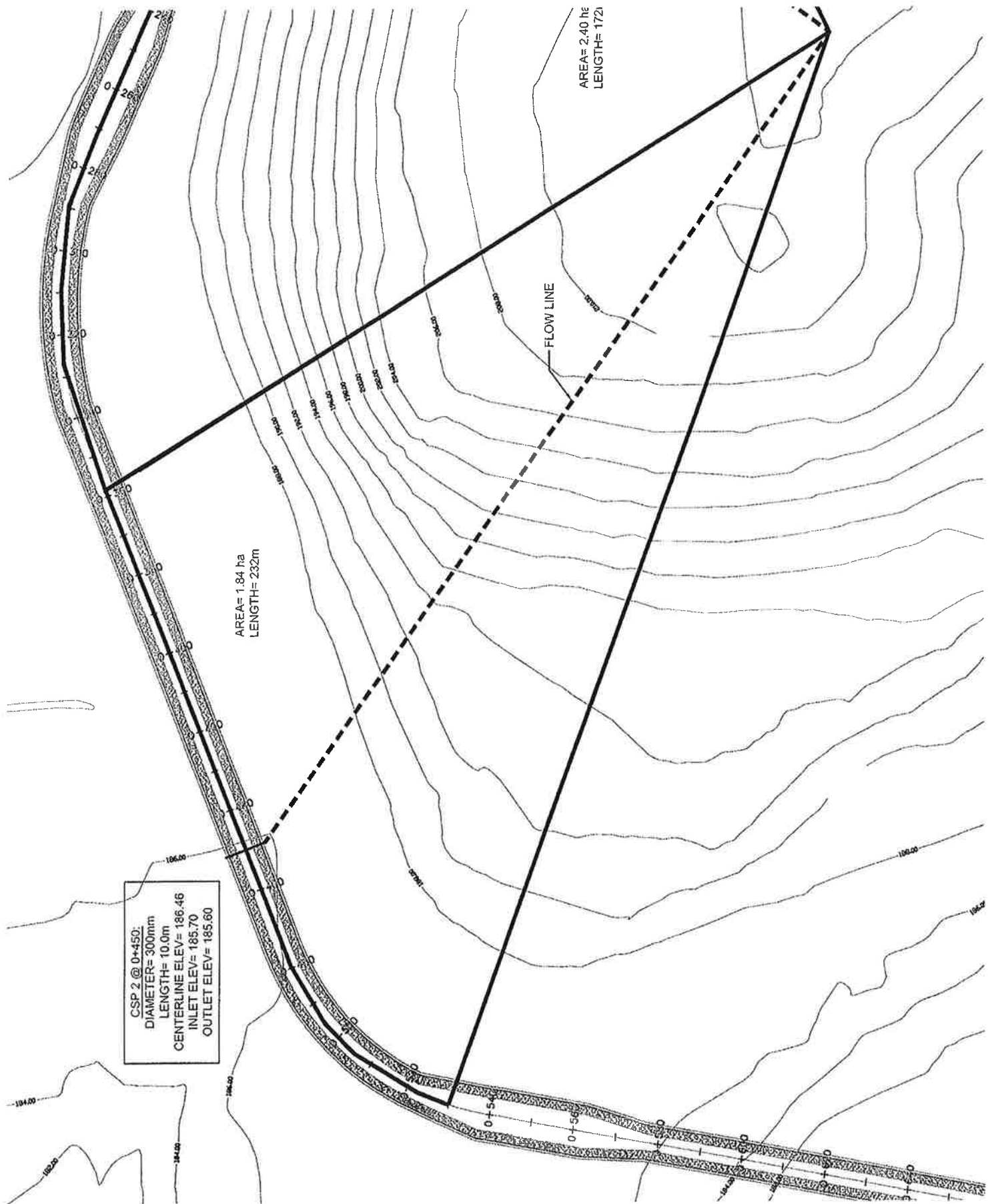
Shape .....	Circular
Number of Barrels .....	1
Solving for .....	Headwater
Chart Number .....	2
Scale Number .....	3
Chart Description .....	CORRUGATED METAL PIPE CULVERT
Scale Description .....	PIPE PROJECTING FROM FILL
Overtopping .....	Off
Flowrate .....	0.0110 cms
Manning's n .....	0.2600
Roadway Elevation .....	186.4600 m
Inlet Elevation .....	185.7000 m
Outlet Elevation .....	185.6000 m
Diameter .....	300.0000 mm
Length .....	10.0000 m
Entrance Loss .....	0.0000
Tailwater .....	0.3000 m

Computed Results:

Headwater .....	186.4163 m	Outlet Control
Slope .....	0.0100 m/m	
Velocity .....	0.1556 mps	

Messages:

Outlet head > Inlet head.  
Computing Outlet Control headwater.  
Outlet submerged.  
Full flow.  
Headwater depth computed using FHWA equation.  
Headwater: 186.4163 m





baC  
CANADA

**LEGEND:**

  $\Delta T_a$   
WATER

CH'AND'ER SOA  
CAMP LOCATION


 DEPARTMENT OF EDUCATION  
 COMMUNITY

ΔΥσ<sub>υ</sub>  
(αcΔ<sup>c</sup>ΥL<sup>2</sup>)  
SCALE (APPROX)

**†Baffinland**

מִלְכָּה מַרְיָה מְרִיבָה מִלְכָּה מַרְיָה מְרִיבָה MARY RIVER PROJECT

PROJECT LOCATION MAP

P/A NO.	REF.	REV.
---------	------	------

B102-0016173	NR08-01214	0
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MSA-PL-1<sup>st</sup>  
FIGURE 1



## **APPENDIX 2**

- **AS-CON STRUCTED DRAWINGS**
- **CONSTRUCTION PHOTOGRAPHS**





Photo 1: Access Road to landfill from the existing Explosive Magazine



Photo 2: Access Road at the landfill, landfill containment berm seen in background





Photo 3: Access Road at the landfill. The containment berm is seen in the back.



Photo 4: Another view of the completed Access Road



Photo 5: Completed Access Road to landfill, the attendant shack can be seen.



Photo 6: small Culvert at Station 0+118





Photo 7: Large culvert at Station 0+500



Photo 8: Large Culvert at Station 0+500

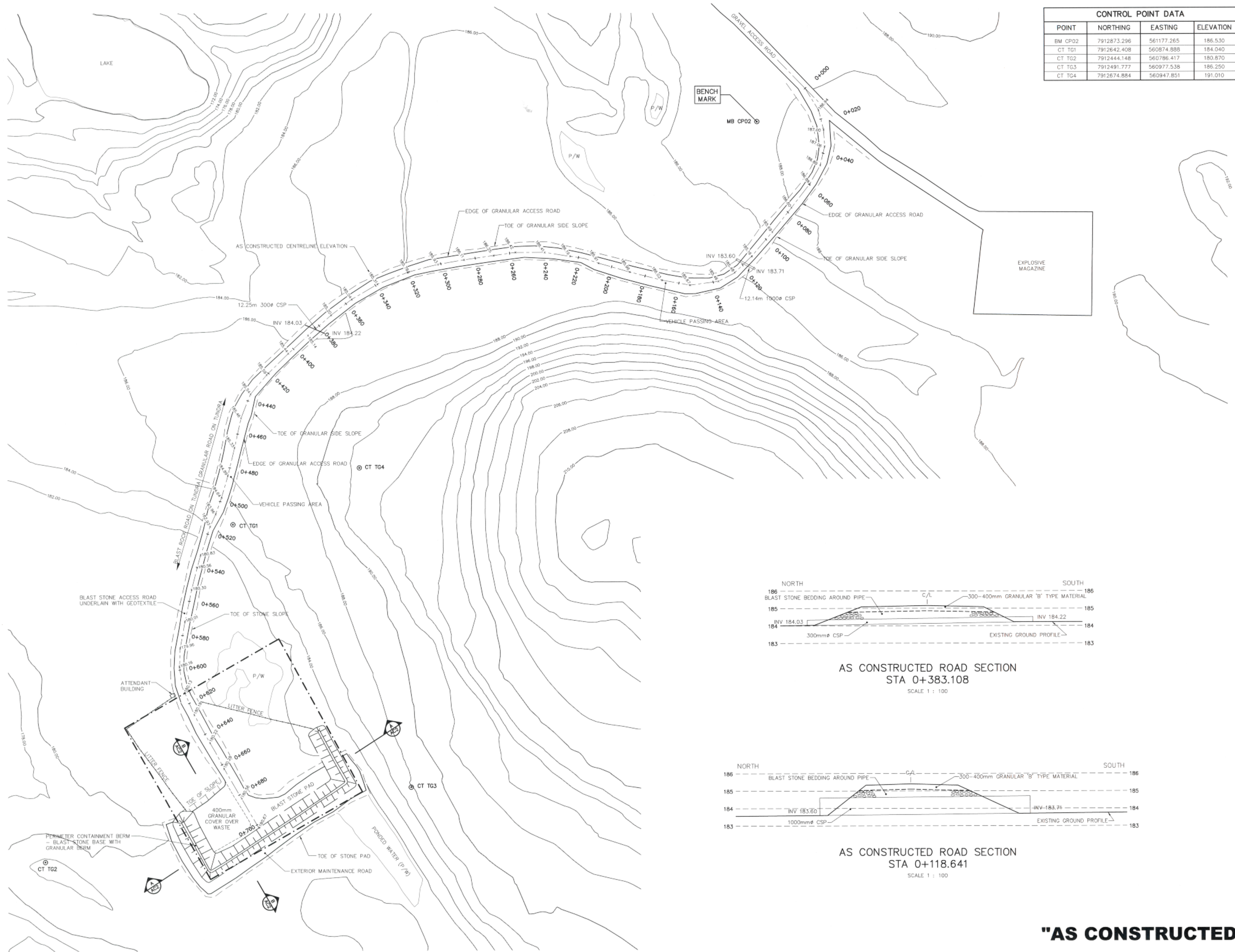


Photo 9: Inside the landfill containment



Photo 10: Landfill access and fence





CONTROL POINT DATA			
POINT	NORTHING	EASTING	ELEVATION
BM CP02	7912873.296	561177.265	186.530
CT T01	7912642.408	560874.888	184.040
CT T02	7912444.148	560786.417	180.870
CT T03	7912491.777	560977.538	186.250
CT T04	7912674.884	560947.851	191.010

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Description	Date	No.
Revisions and Issues		



NORTH

Date Printed




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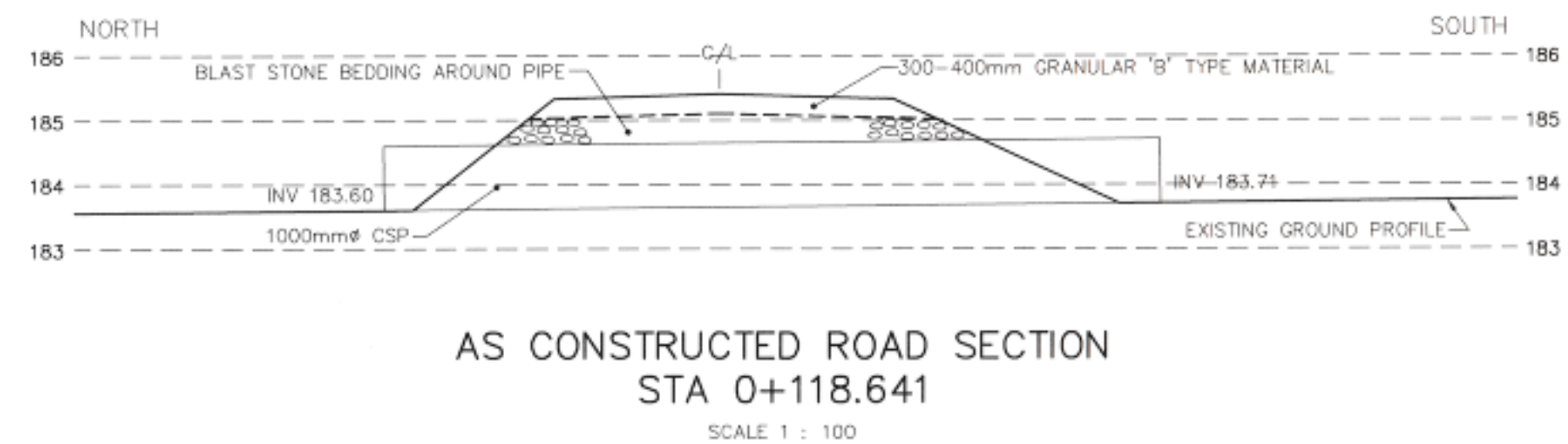
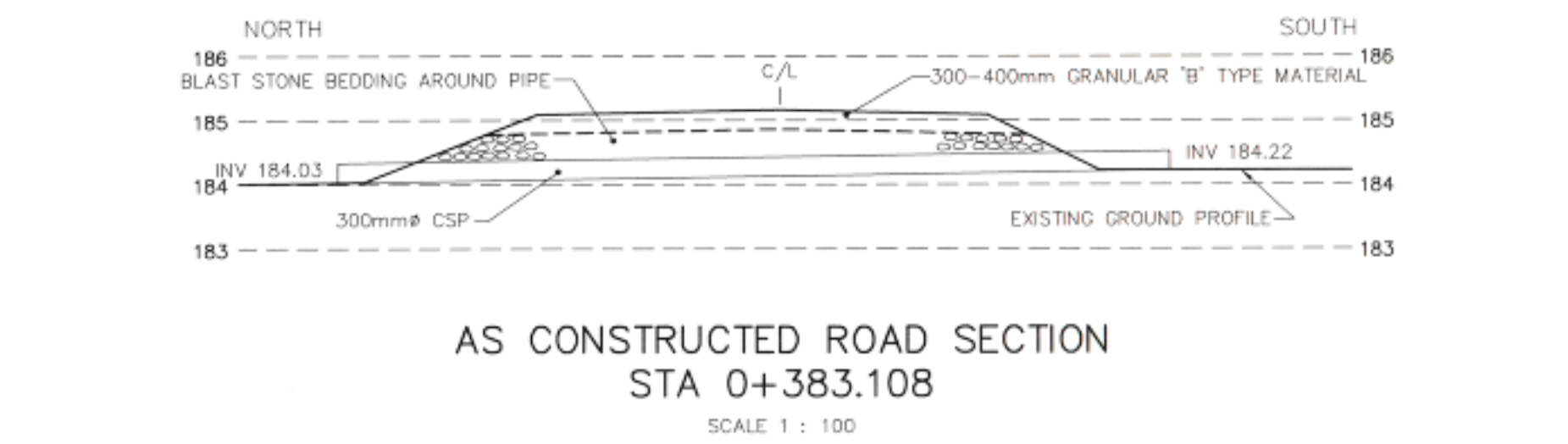
ARCHITECT

STRUCTURAL/CIVIL

MECHANICAL

ELECTRICAL





**"AS CONSTRUCTED"**

Project

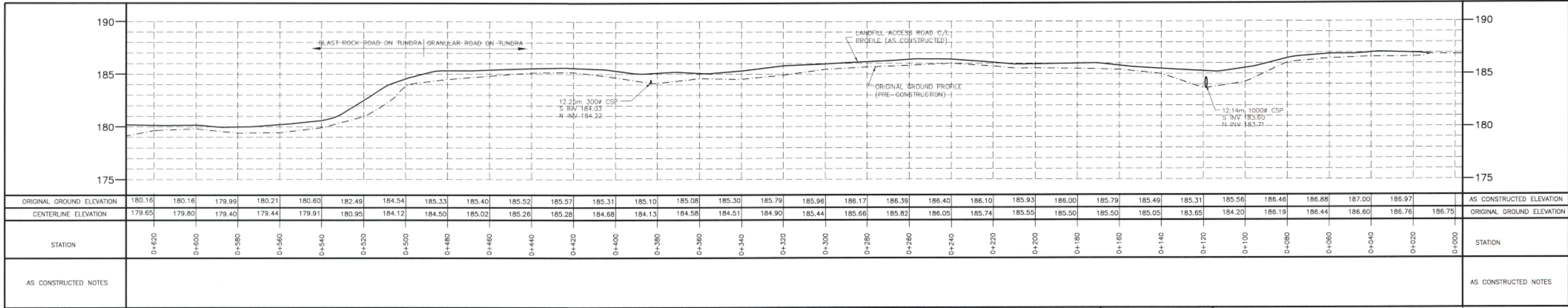
**MARY RIVER PROJECT**  
**NUNAVUT, CANADA**

Drawing

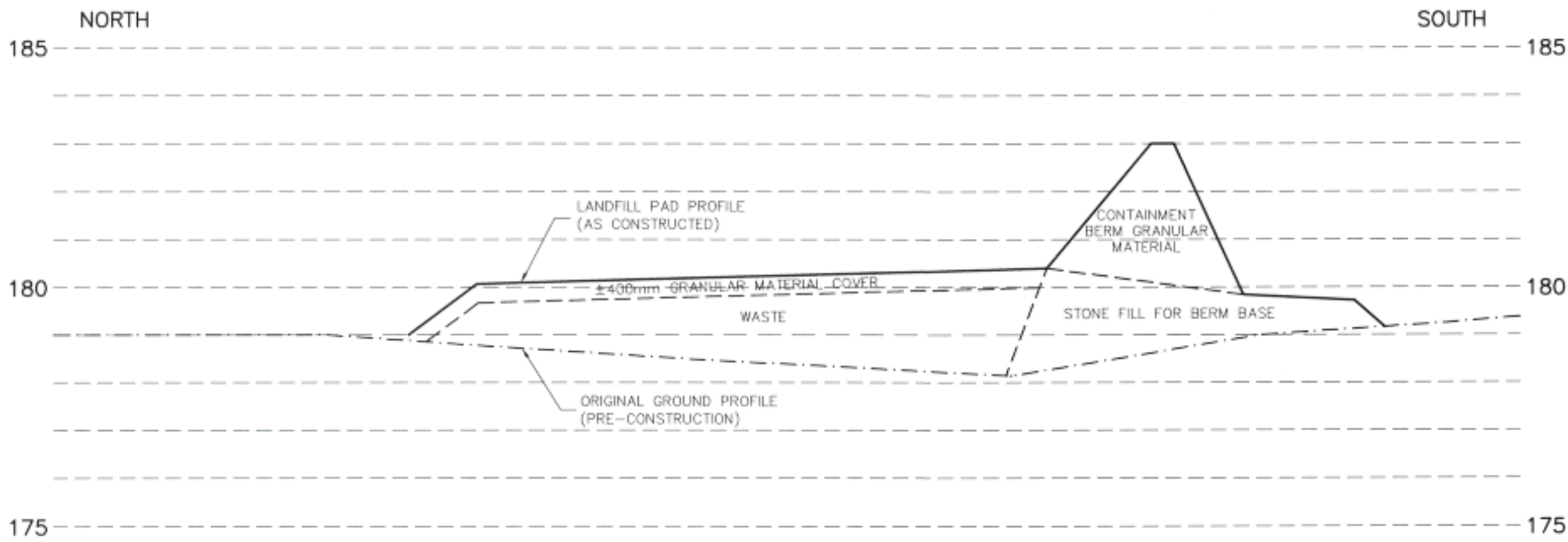
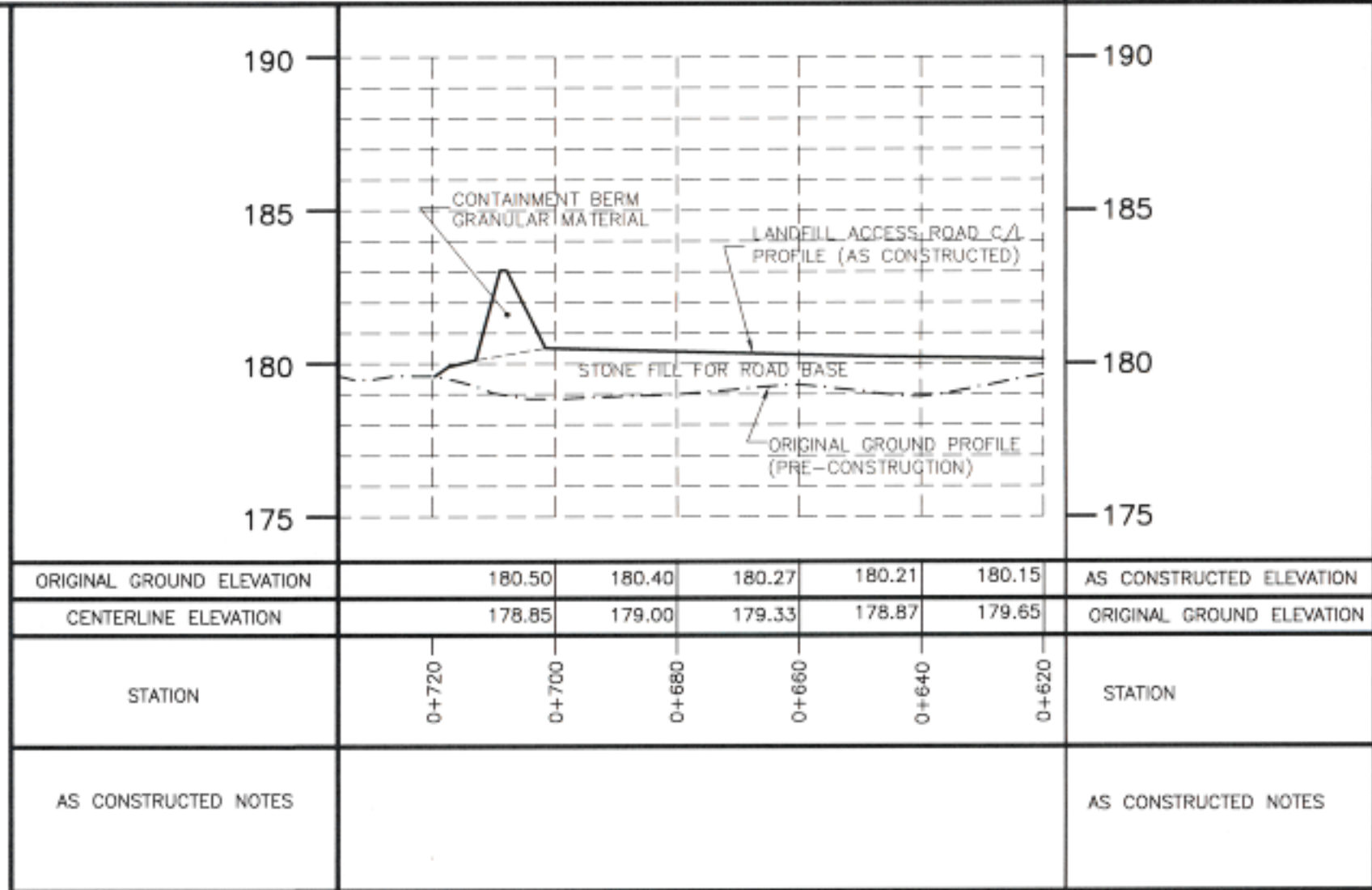
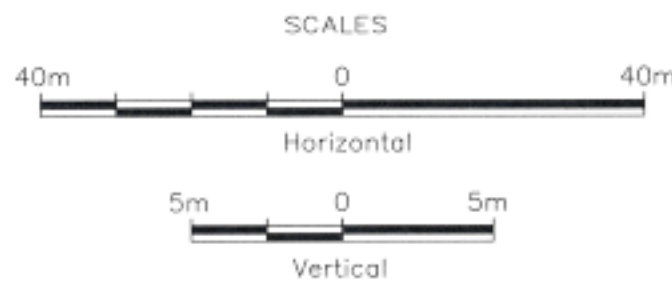
**LANDFILL**  
**ACCESS ROAD AND**  
**CONTAINMENT**

Date	AUG 20, 2010	CADD File Number	0916200-AC1
Scale	1 : 1000	Job Number	
Drawn	T.C.G.	<b>09-162</b>	
Checked		Drawing Number	
Approved	B.H.M.	<b>AC1</b>	



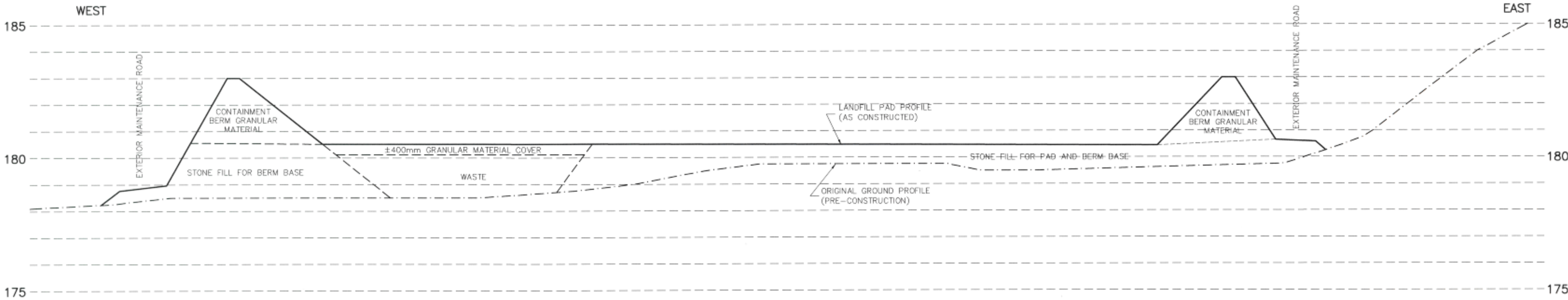


LANDFILL ACCESS ROAD PROFILE



LANDFILL CONTAINMENT BERM SECTION B/AS1

1 : 250 HORIZONTAL  
1 : 100 VERTICAL



LANDFILL CONTAINMENT BERM SECTION A/AS1

1 : 250 HORIZONTAL  
1 : 100 VERTICAL

"AS CONSTRUCTED"

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Description Date No.  
Revisions and Issues



ARCHITECT		STRUCTURAL/CIVIL	
_____	_____	_____	_____
MECHANICAL		ELECTRICAL	
_____	_____	_____	_____

Project  
**MARY RIVER PROJECT**  
**NUNAVUT, CANADA**

Drawing  
**LANDFILL**  
**ACCESS ROAD PROFILE**  
**CONTAINMENT SECTIONS**

Date AUG 20, 2010	CADD File Number 0916200-AC1
Scale 1 : 1000	Job Number <b>09-162</b>
Drawn T.C.G.	Drawing Number <b>AC2</b>
Checked	
Approved B.H.M.	