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May 6, 2010

Ref: OTCD00019023B

Mr. Paul Clow
Project Co-ordinator
City of Iqaluit
P.O. Box 460
Iqaluit, ON X0A 0H0

**Field Review Services Report
Allangua Culvert Replacement**

Dear Mr. Clow:

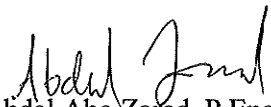
Please accept the following letter as a report on the construction of the Allangua Road culvert replacement project.

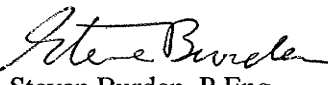
Works on the culvert replacement commenced on October 15, 2007 and were completed on October 26, 2007. Works were undertaken by Tower Arctic, a local general contracting company. During the course of construction, Trow Associates Inc. (Trow) provided field review services in the form of periodical site visits by Mr. Abdal Abo Zarad, P.Eng. as well as compaction testing by a certified geotechnical technician Mr. Abed Onisey. In addition, daily turbidity analyses were undertaken upstream and downstream of the construction. A copy of the daily construction diaries, results of compaction testing of the bedding and backfill, along with the turbidity analysis are attached.

Based on the above referenced field review services, Trow hereby certifies the works undertaken by Tower Arctic conform to the intent of the detail design and tender documents.

Should you have any questions or require additional information please do not hesitate to contact Steven Burden at 63-225-9940 ext. 257.

Yours truly,
Trow Associates Inc.


Abdal Abo Zarad, P.Eng.
Project Engineer
Infrastructure Services


Steven Burden, P.Eng.
Senior Project Manager
Infrastructure Services

Enclosures: Daily Construction Diaries
Compaction Testing Results
Turbidity Analysis

Date: 15 October 2007

Job No.: 19023 B

Weather: Clear, sunny - +2°C

Page No.:

Contractor: Tower Arctic

Hours Worked:

Labour/Equipment/Material Deliveries:

1 Excavator + operator.

1 Foreman

1 Loader + operator.

3 Labourers.

1 Dump truck

Site Visitors:

Progress and Comments:

* At 1:00 pm Contractor started work at the site

* Cabin Baskets are delivered to the site.

* 3 workers are opening and assembling the Baskets.

* Clear stone bedding material and Fill material is been delivered to the site.

* Contractor built the Floor Diversion Bench at the Inlet and at the outlet.

* silt Fence has been installed at the outlet for phase I of the work.

* 1800mm LWP Culverts. have been delivered to the site.

Inspector: A. Foul

Date: 16 October 2007

Job No.: 19023 B

Weather: Snow - windy (-6°C)

Page No.:

Contractor: Towne Arctic Ltd

Hours Worked:

Labour/Equipment/Material Deliveries:

1 Excavator + Operator.

1 Foreman

1 Loader + Operator.

1 Dump Truck.

Site Visitors:

Progress and Comments:

* Excavating for phase I, Gabion Basket at the Culvert Inlet.

* Preparing the location for First Row of Gabion Baskets.

* placed the First gabion basket at the East side Phase 1 - Inlet. North.

* Contractor was requested to Fix the silt Fence which was displaced because of the wind.

* placed second gabion basket from the East side phase I Inlet.

* Culvert Inlet is slightly damaged by the excavator but water is partly flowing back into the gabion baskets location.

* water covered the last 2 Baskets on location completely.

* Culvert damage has been fixed, the water is flowing through the culvert again. Right.

* The Excavated area left side of the inlet started to be filled with water.

* Contractor was requested to pump out the water and to work on dry area.

* Water samples were taken upstream and down stream

Inspector: J. Fand of the working Area.

Date: 17 October 2007

Job No.: 19023 B

Weather: Windy -3°C

Page No.:

Contractor: Tower Arctic.

Hours Worked:

Labour/Equipment/Material Deliveries:

2 Excavators + 1 Operator.

1 Foreman.

1 4" Pump.

2 Labourers.

1 Dump Truck.

Site Visitors: DFO, Amy Live, Bradley Flynn, Keith Pelley.

Progress and Comments:

- * Started pumping the water out of the 'Inlet Phase I', Gabion Baskets. location.
- * Town Inspector requested the contractor to pump the water to a distance as been requested by DFO letter of instruction.
- * DFO office in Igloodit has been consulted and the upmentioned personal visited the site and requested the contractor to provide more distance, indicated on the site for pumping to be allowed.
- * Contractor excavated at the outlet phase I to install the first row of gabion baskets.
- * Elevation is provided on site for the contractor.
- * First row of baskets has been installed on 10" clear stone bedding in a wet base.
- * Water on the hole at the inlet kept is still on high level. One 4" pump was not enough to dry up the hole.
- * Water samples were taken upstream and downstream.
- * The contractor is to provide 2 more pumps. tomorrow to be able to pump the water out of the hole.

Inspector:

ABR3.

Date: Thu 18 October 2007

Job No.: 19023 B

Weather: Clear -4°C

Page No.:

Contractor: Tower Arctic Ltd.

Hours Worked:

Labour/Equipment/Material Deliveries:

2 Excavators + 1 operator.

1 Foreman.

1 plate packer.

3 Labourers.

2 - 4" pumps.

1 Dump truck.

Site Visitors:

Progress and Comments:

* Contractor placed 3" minus granula bedding for the East Culvert.

* 2 section of the Culvert were placed on site.

* the 2 sections were connected with the Culvert coupling.

* 3rd section of the East Culvert was not possible to place as the inlet section Area is still full of water.

* 1 pump is not keeping up with the requirement to dry the inlet area.

* Running to 4" pumps to try to dry the area.

* Water level has been lowered at the Inlet Area.

* 3 Caibion basket at the Inlet Area, bottom Row has been Installed.

* 3rd Pipe Culvert section at the inlet has been installed in place.

* Section is connected with the Culvert coupling.

* Water Samples were taken at the Inlet and at the Upstream and Down stream of the works Area.

Inspector: ABRF

Date: Friday 19 October 2024

Job No.: 19023 B

Weather: Clear -5°C

Page No.:

Contractor: TOWER ARCTIC Ltd.

Hours Worked:

Labour/Equipment/Material Deliveries:

2 Excavators + 1 Operator.

1 FORMAN

1 Loader.

3 LABOURERS

1 Dump Truck.

2 - 4" pumps.

Site Visitors:

Progress and Comments:

- * Installing second Row of the Gabion baskets at the Outlet East side of the East Culvert.
- * Started to back fill East side of the East Culvert
- * Compacting using plate packer to 95% DD.
- * Installing second Row of Gabion Baskets at the Inlet, East side of the East Culvert.
- * Installing 3rd Row of the Gabion Baskets at the Inlet East side of the East Culvert. Complete with the filter cloth as required.
- * Water samples were taken at upstream and down stream of the working Area.

Inspector: ARZ

Date: Sat 20 Oct 2007

Job No.: 19023 B

Weather: Clear -3°C

Page No.:

Contractor: Tower Arctic

Hours Worked:

Labour/Equipment/Material Deliveries:

2 Excavators + 1 Operator.

1 Foreman

1 Loader

3 Labourers.

1 Dump Truck.

1 Plate packer.

Site Visitors:

Progress and Comments:

* Flow is being ~~switched~~ converted to run through the new installed East side Culvert.

* ~~At~~ water flow is plugged at the upstream of the ~~exist~~ Existing ~~of~~ Culvert.

* Existing Culvert is being demolished and removed from location.

* Gabion baskets, bottom row at the outlet is being installed, west side.

* Second row of gabion baskets at the outlet west side is installed.

* Third row of gabion baskets at the outlet west side is installed.

* Bedding is being installed for west side culvert.

* First esp pipe is being placed on location at the outlet.

* Second esp pipe is being placed on location.

* The 2 Pipes has been joined.

* Water sample has been taken upstream and downstream of the culvert.

*

Inspector: AB5123

Date: Sunday 21 October 2007

Job No.: 19023 B

Weather: clear - 5°C

Page No.:

Contractor: Towne Arctic Ltd.

Hours Worked:

Labour/Equipment/Material Deliveries:

2 Excavators + 1 operator

1 FOREMAN

1 Loader

3 Labourers

1 Dump Truck

1 Plate Packer

Site Visitors:

Progress and Comments:

* 3rd pipe section is installed at the inlet west side.

* Pipe is being connected.

* Granular material $3/4"$ is being delivered to the site for ~~the~~ fill between the culverts and around.

* plate compactor is being used to pack the material.

* Caution baskets are being installed between the culverts and the rest of location to the top of culverts level.

* Granular materials is been filled to the top of pipe level.

* Water samples has been taken upstream and downstream of the culverts.

Inspector: ABR3

Date: Monday 22 October 2007

Job No.: 19023 B

Weather: Windy -9°C

Page No.:

Contractor: Towar Arctic Ltd.

Hours Worked:

Labour/Equipment/Material Deliveries:

2 Excavators + 1 operator.

1 Foreman

1 Loader

3 Labourers.

1 Dump Truck.

1 Plate Packer.

Site Visitors: FRANK HENDIKSON, Trow Associates.

Progress and Comments:

* Top row of gabion baskets is being installed at the inlet and the outlet.

* City of Iqaluit crew came to the site and fixed the 2 PE pipes on top of the culverts. by shrink taping the damaged pipe jacket.

* Install Few boards of 2" insulation is being placed between the top of west culverts and the 2 PE pipes.

* Sand is placed around the 2 PE pipes and compacted using the plate packer.

* Contractor was instructed to install a filter cloth missing behind the gabion baskets between the culvert at the outlet side.

* Contractor is instructed to compact the fill material to the required 95% DD, as the compaction test failed the compaction.

* plate packer was not enough to compact the fill material.

* Super pack is being used to try to pack the material.

* Contractor was instructed to remove frozen materials from the fill.

* water samples were taken upstream and downstream.

Inspector:

ABR

Date: Tuesday 23 October 2007

Job No.: 19023 B

Weather: Clear -5° C

Page No.:

Contractor: Tower Arctic Ltd.

Hours Worked:

Labour/Equipment/Material Deliveries:

2 Excavators + 1 operator

1 Foreman

1 Loader

3 Labourers

1 Dump truck.

1 Roller Packer with Vibrator

Site Visitors: FRANK HENDRICKSON. TRAD Associates.

Progress and Comments:

* ~~Back~~ Back Fill continued on top of the 2 pipe Culvert with granula material.

* Materials has been compacted by a highway type Roller compactor with vibrator.

* Compaction has been tested and Found to be meeting the required 95% Proctor Density.

* Road backfill continued by using the original Road materials.

* Fill has been completed for the road.

* Contractor is hauling away excess materials from the site.

* Road has been cleared from Access materials.

* Water samples has been taken, Upstream and Downstream of the culvert.

Inspector: ABR3.

Date: Wednesday 24 October 2007

Job No.: 19023 B

Weather: Cloudy -5°C

Page No.:

Contractor: Tovar Arctic Ltd.

Hours Worked:

Labour/Equipment/Material Deliveries:

2 Excavators + 1 operator.

1 Foreman.

1 Loader.

3 Labourers.

1 Dump Truck.

Site Visitors:

Progress and Comments:

* Contractor is completing and shaping the Road side slopes.

* Installing Rip Rap at the ~~inlet~~^{outlet} side-, the size of rip-rap was found to be smaller than the specified size.

* Contractor was instructed to install 12"-16" size Rip Rap. as per specifications.

* Long Boulders installed were also found to be smaller than specified.

* Contractor was instructed to install the right size as per drawing.

* Working on the inlet side. Contractor installed Filter cloth and Rip Rap.

* 2 Truck loads of soils excavated at the inlet side were found to be possibly contaminated with fuel.

* Contractor moved the materials to his lot.

* Slopes at the upstream side were stabilized and covered with 4-6" stones.

*

Inspector: AB RJ.

Date: Thursday 25 October 2007

Job No.: 19023B

Weather: Snow - 7°C

Page No.:

Contractor: Tower Arctic Ltd.

Hours Worked:

Labour/Equipment/Material Deliveries:

1 Excavator

1 Foreman

1 Drilling Machine

3 Labourers

Site Visitors:

Progress and Comments:

* Contractor is drilling for Canidrail posts. both sides of the road, above the culverts.

* Measured the size of rip rap at the outlet and the boulders.

* Info sent to the Trow office in Ottawa.

Inspector: ABRZ.

Date: Friday 26 October 2007.

Job No.: 19023 B

Weather: Snow -7°C

Page No.:

Contractor: Tower Arctic Ltd.

Hours Worked:

Labour/Equipment/Material Deliveries:

1 Driller.

Site Visitors:

Progress and Comments:

* Contractor completed drilling and installing guidrail posts.

* Removed the driller from site @ 10:15 am.

* Guidrail is not installed yet.

* The Road is opened for traffic.

Inspector: ABP3.

In Situ Nuclear Density Summary Sheet

Project No.: OTCD0001902313 Date Tested: 06-22-07 Report No.: _____

Project Name: Algonquin Rd. Culvert Rehabilitation Contractor: Trow Associates

Project Location: Igo Rd. N

Type of Material Tested:

- | | | |
|---|---|--|
| 1 ☐ Subgrade | 6 ☐ Granular Subbase | 10 ☐ Retaining Wall Backfill |
| 2 ☒ Trench Backfill | 7 ☐ Granular Base | 11 ☐ Embankment Fill |
| 3 ☐ Engineered Fill | 8 ☐ Binder Asphalt | 12 ☐ Backfill Adjacent to Foundations |
| 4 ☐ Underfloor Fill | 9 ☐ Surface Asphalt | |
| 5 ☐ Other (Describe) _____ | | |

Culvert Backfill

Material Description:

	Opt. M/C %	Reference Density (kg/m³)	Estimated	Lab
A <u>Gr A 3/4 Crush</u>	<u>7</u>	<u>2200</u>	☐	☒
B _____	_____	_____	☐	☐

Test Method:

- ☒ Direct Transmission
☐ Backscatter

Proctor Method

- ☒ Standard
☐ Modified

Material A
 Material B

SPECIFIED AND IN-SITU COMPACTION (%)

Specified

Range Achieved

95 %

95-96

Weather: Snow partly overcast - 4°C

Compaction Equipment: Plate compactor & Smooth Drum Roller

Comments

- | | |
|--|--|
| ☐ Preliminary Report left on site with: _____ | ☐ Soil moisture content requires adjustments |
| ☒ Generally meets specifications | ☐ Sample(s) obtained for laboratory analysis/no. of samples _____ |
| ☐ Generally below specifications | ☐ Asphalt flushing/bleeding noted |
| ☐ Additional Compaction recommended | ☐ Asphalt surface segregation/cracking noted |
| ☐ Contact Trow for retesting | |
| ☐ Other _____ | |

Trow on site to carry out compaction testing at culvert backfill
At least 5 compaction test was below a range
of 95-96 %

Warning: Nuclear results are considered as approximate estimates of in situ density conditions at the test elevation and location indicated. Results based on estimated reference densities are subject to change after actual laboratory density values are obtained. Asphalt densities by nuclear gauge may be higher or lower than the actual density determined by asphalt cores.

Technician: [Signature] Quality Assurance Supervisor: _____

Sheet No. _____



154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Telephone (613) 225-9940
Facsimile (613) 225-7337

Summary of In-Place Density Measurements

Project Name: Algonquin RD Culvert Replacement Project No: OTCD 00019023 B Date: OCT 22 - 07

Site: Back Fill on the top of Culvert Table: _____

Machine Number 4513 Humblit Daily Standard Count Ds = 2752 Ms = 465

Test No.	Location and Depth	Soil Description		In-Place Values			Protor Values		Com-paction %
				Wet Density kg/m ³	Dry Density kg/m ³	Water Content % dry wt.	Max. Dry Density kg/m ³	Optimum Water % dry wt.	
1	1M @ Downstream 3M @ West Culvert 2.5M Below Finish Grade	3/4 Crush	D.C. 7971	2175	2090	3.8	2200	77.1	95
		% Stone:	M.C. 75						
2	3M @ Upstream 1M East of West Culvert 2.5M Below Finish Grade	3/4 Crush	D.C. 1980	2181	2097	3.5	11	11	95
		% Stone:	M.C. 67						
3	5M @ Downstream 1M West of Eastern Culvert 2.0M Below Finish Grade	3/4 Crush	D.C. 1932	2200	2100	3.7	11	11	96
		% Stone:	M.C. 51						
4	1M @ Upstream 0.5 @ Western Culvert 2M Below Finish Grade	3/4 Crush	D.C. 1965	2193	2093	4.0	11	11	95
		% Stone:	M.C. 75						
5	4M @ Upstream On top of Eastern Culvert 1.80M Below Sub Grade	3/4 Crush	D.C. 1971	2103	2091	3.5	11	11	95
		% Stone:	M.C. 71						
			D.C.						
		% Stone:	M.C.						
			D.C.						
		% Stone:	M.C.						
			D.C.						
		% Stone:	M.C.						

COMMENTS:

(a) COMPACTION REQUIRED: 95 Per Cent

SUPERVISOR

In Situ Nuclear Density Summary Sheet

Project No.: 19023B Date Tested: OCT 23-07 Report No.: _____

Project Name: Alounguo RD culvert Right of Way Contractor: Trow Associates

Project Location: Ignat. Nu

Type of Material Tested:

- | | | |
|---|---|--|
| 1 ☐ Subgrade | 6 ☐ Granular Subbase | 10 ☐ Retaining Wall Backfill |
| 2 ☒ Trench Backfill | 7 ☐ Granular Base | 11 ☒ Embankment Fill |
| 3 ☐ Engineered Fill | 8 ☐ Binder Asphalt | 12 ☐ Backfill Adjacent to Foundations |
| 4 ☐ Underfloor Fill | 9 ☐ Surface Asphalt | |
| 5 ☐ Other (Describe) _____ | | |

Culvert Backfill

Material Description:

	Material Description	Opt. M/C %	Reference Density (kg/m ³)	Estimated	Lab
A	<u>Gr A 3/4 Crush</u>	<u>7.7</u>	<u>2200</u>	☐	☒
B	_____	_____	_____	☐	☐

Test Method:

- ☒
- Direct Transmission
-
- ☐
- Backscatter

Proctor Method

- ☒
- Standard
-
- ☐
- Modified

Material A _____

Material B _____

SPECIFIED AND IN-SITU COMPACTION (%)

Specified

Range Achieved

95 %
95 %

Weather: Overcast - 5°C

Compaction Equipment: Super Rock

Comments

- | | |
|--|--|
| ☐ Preliminary Report left on site with: _____ | ☐ Soil moisture content requires adjustments |
| ☒ Generally meets specifications | ☐ Sample(s) obtained for laboratory analysis/no. of samples _____ |
| ☐ Generally below specifications | ☐ Asphalt flushing/bleeding noted |
| ☐ Additional Compaction recommended | ☐ Asphalt surface segregation/cracking noted |
| ☐ Contact Trow for retesting | |
| ☐ Other _____ | |

Trow on site to carry out compaction testing / culvert backfill. A total of 7 compaction tests were followed a range of 95-98%.

Warning: Nuclear results are considered as approximate estimates of in situ density conditions at the test elevation and location indicated. Results based on estimated reference densities are subject to change after actual laboratory density values are obtained. Asphalt densities by nuclear gauge may be higher or lower than the actual density determined by asphalt cores.

Technician: Abdul O. Quality Assurance Supervisor: _____

Sheet No. _____



154 Colonnade Road South
Ottawa, Ontario K2E 7J5
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Facsimile (613) 225-7337

Summary of In-Place Density Measurements

Project Name: Alamogordo RD Culvert Replacement Project No: OTCD 00019023 B Date: Oct 23-07
Site: Back Filling the new Culvert Table: _____

Machine Number 4513 Humber Daily Standard Count Ds = 2767 Ms = 467

Test No.	Location and Depth	Soil Description	In-Place Values			Protor Values		Com-paction %
			Wet Density kg/m ³	Dry Density kg/m ³	Water Content % dry wt.	Max. Dry Density kg/m ³	Optimum Water % dry wt.	
1	2M @ upstream Top of Eastern Culvert 1.50M Below Finish Grade	3/4 Crush D.C. 1961 % Stone: M.C. 81	2220	2101	3.2	2200	7.7	95
2	1M @ Downstream Top of Western Culvert 1.60M Below Finish Gr	3/4 Crush D.C. 1971 % Stone: M.C. 83	2231	2093	2.9	"	"	95
3	2M @ Downstream Top of Eastern Culvert 1.2 M Below Finish Gr	3/4 Crush D.C. 1981 % Stone: M.C. 77	2175	2091	3.1	"	"	95
4	3M @ upstream Top of Western Culvert 1 M Below Finish Gr	3/4 Crush D.C. 1961 % Stone: M.C. 73	2194	2091	3.5	"	"	95
5	2M @ Downstream Top of Western Culvert 90M Below Finish Gr	3/4 Crush D.C. 1981 % Stone: M.C. 69	2190	2093	4.1	"	"	95
6	3M @ upstream Top of Eastern Culvert 3.0M Below Finish Grade	3/4 Crush D.C. 1911 % Stone: M.C. 71	2125	2097	3.5	"	"	95
7	4M @ downstream Top of Western Culvert Sub Grad of Road	3/4 Crush D.C. 1951 % Stone: M.C. 81	2191	2093	3.7	"	"	95
		D.C.						
		% Stone: M.C.						

COMMENTS:

(a) COMPACTION REQUIRED: 95 Per Cent

SUPERVISOR

Turbidity Analysis
Allanqua Road Culvert Replacement OTCD00019023B

	<u>Up Stream</u>	<u>Down Stream</u>
Oct 14-07	1.09 NTU	1.25 NTU
Oct 15-07	0.75	0.85
Oct 16-07	1.76	1.78
Oct 17-07	1.46	1.46
Oct 18-07	1.5	1.45
Oct 19-07	1.35	1.38
Oct 20-07	1.2	1.3
Oct 21-07	1.22	1.24
Oct 22-07	0.9	1.1
Oct 23-07	0.85	0.97
Oct 24-07	0.84	0.93