



## **TENDER T-2025-30**

### **Dark Bay Road Bridge Replacement**

**DATE: March 20<sup>th</sup>, 2025**

#### **ADDENDUM #1**

**This addendum will become part of the Tender T-2025-30**

#### **Part 1 – Revisions to Contract Documents**

1. A revised FT-4.2 Schedule of Prices has been appended to this addendum with the following changes:
  - a. Item #09 – Granular A or Clear Stone Bedding has been deleted from the Contract Documents
  - b. Items #10-#19 have been renumbered.
  - c. The quantity for Item #12 – Topsoil and Seed has been increased to reflect potential placement at slope flattening locations.
  - d. Item #19 – Slope Flattening has been added.
  
2. The following revisions have been completed to the Special Provisions:
  - a. Earth Excavation SP revised to refer to Slope Flattening SP for management of excess material.
  - b. Items #10-#19 have been renumbered.
  - c. Dewatering SP revised to remove references to temporary flow passage.
  - d. SP added for Slope Flattening.
  
3. The available geotechnical information has been appended for reference.

## **Part 2 - Questions Received**

**Q1.** For Item 8; Geogrid and Geotextile, is this being installed at the bottom of the excavation prior to granular backfill within the culvert area?

**R1.** Geogrid and geotextile are to be installed along the limits of the entire culvert excavation, including below the bedding material and along the limits of the frost taper. This is to be completed prior to granular backfill.

**Q2.** Is the granular shouldering being paid under item #11 “Granular A – Roadway Material”?

**R2.** All costs associated with granular shouldering shall be included in the unit price for Item #11 – Granular A – Roadway Material.

**Q3.** SP 31 states that excess materials are to be used for slope flattening along North Shore Road but Item No. 3 states that excess materials are to be used for slope flattening within the project limits or along Dark Bay Road. Can you confirm the disposal location? Or is there another preferred disposal location besides the locations previously listed? Does the excess soil need to be spread/graded at the disposal location(s), or will the Township take care of this?

**R3.** The Contractor is advised that SP 31 shall not apply for this Contract. Additionally, the Earth Excavation Special Provision has been amended, and a new Item and Special Provision have been added for Slope Flattening. Material will be disposed of within the road right of way as slope flattening within 10 km of the project limits. Hauling and spreading of the excess soil is to be included in the submitted bid for the slope flattening item.

**Q4.** Please confirm that rock blasting will not be required.

**R4.** Use of explosives for rock removal shall not be permitted. If required, rock removal is to be completed by mechanical means.

**Q5.** Item No. 4 states that pipe bedding and embedment material is to be included but Item No. 9 covers this. Is this correct?

**R5.** Item No. 9 - has been deleted from the Contract Documents, and a revised Schedule of Prices has been appended. Pipe bedding and embedment is to included under the costs for Item No.4.

**Q6.** Item No. 4 has a quantity of 19.0 m but drawing C2 says 16.0 m. Which number is correct?

**R6.** The quantity for Item No. 4 is 19.0 m. The note on the profile view of Sheet C2 will be updated on an updated set of drawings issued at the completion of the question period.

**Q7.** What is the estimated water depth on the upstream and downstream end of the culvert?

**R7.** Water depths immediately at the ends of the culvert were approximately 1.2 m at the time of Survey (July 2023). Information beyond the culvert ends is not available, and contractors should review the site to confirm field conditions prior to bidding.

**Q8.** Can you please provide a geotechnical report?

**R8.** The geotechnical report for this project has been attached for reference.

**Q9.** Does the contractor need to maintain flow (temporary diversion culvert) in the open trench while work is taking place? If so, what size pipe is required? Page C-12, #29 says that water shall not be diverted, but Page E-9 mentions a temporary flow passage system. Please confirm as there are no flow rates or additional information given to determine what is required.

**R9.** Given the limited size of the contributing catchment area and the duration of construction, it is not anticipated that temporary flow passage will be required. The Special Provision for Dewatering has been updated to reflect this.

**(A signed copy of this addendum must be included in Tender submission and shall be acknowledged and listed under Part III – Form of Tender Section 1.1 of the Tender)**

I /WE hereby acknowledge receipt of this addendum.

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*(Signature of Contractor)*

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*(Company Name)*

**PLEASE SIGN AND INSERT WITH TENDER SUBMISSION**

**FT-4.2 SCHEDULE OF PRICES – ADDENDUM #01**

<b>CONTRACT NUMBER Contract # T-2025-30 Dark Bay Bridge Replacement</b>						
Item	Spec. Code	Item Description	Unit	Quantity	Unit Price	Total
1	OPSS 510, SP	Removal and Disposal of Existing CSP Arch Culvert	LS	1		
2	OPSS 510, SP	Asphalt Removal – Full Depth	m <sup>2</sup>	665		
3	OPSS 206, SP	Earth Excavation, Grading	LS	1		
4	OPSS 422, SP	5050 mm x 3330 mm Poly laminate CSP Arch Culvert	m	19		
5	OPSS 721, OPSD 912.186	Steel Beam Guide Rail	m	107		
6	OPSS 732	Steel Beam Energy Attenuating Terminal System	ea	1		
7	OPSS 511, SP	R10 Rip Rap with Non-Woven Geotextile	m <sup>2</sup>	234		
8	OPSS 511, SP	MacGrid EG-30 Geogrid and Non-Woven Geotextile	m <sup>2</sup>	1266		
9	OPSS 314, SP	Granular B Type 2 – Roadway Material	tonne	592		
10	OPSS 314, SP	Granular A – Roadway Material	tonne	272		
11	OPSS 310, SP	HL3 Surface Course Asphalt	tonne	90		

12	OPSS 802, 804, SP	Topsoil and Seed (Provisional)	m <sup>2</sup>	1000		
13	OPSS 517, SP	Dewatering	LS	1		
14	OPSS 182, 805, SP	Environmental Protection	LS	1		
15	OPSS 904, SP	Construction of Concrete Garbage Receptacle Pad	LS	1		
16	OPSS 706, SP	Traffic Control	LS	1		
17	OPSS 201	Clearing and Grubbing (Provisional)	LS	1		
18	OPSS 206, 403	Rock Excavation (Provisional)	m <sup>3</sup>	20		
19	SP	Slope Flattening	LS	1		
Total Tender Price (Transfer Amount to FT-3.3 of the Tender)						
Tenderer's HST Registration Number:						

- 4.3 All prices to be shown excluding HST.
- 4.4 It is understood that the estimated quantities in the foregoing schedule are solely for the purpose of facilitating the comparison of bids and the Tenderer's compensation will be computed upon the basis of the actual quantities in the completed work, whether they be more or less shown herein.
- 4.5 The quantities shown in this Tender are an estimate only and are not a guarantee of amount of material to be supplied under this contract. The Township of Muskoka Lakes reserves the right to adjust quantities without a change in the tendered unit price.
- 4.6 The unit price shall govern whenever the total amount bid for an item does not agree with the extension of the quantity and the unit price, and the total item amount from Section FT-4.2 and the Total Tender Price in Section FT-3.3 and FT-4.2 shall be corrected accordingly.

by the Contract Administrator prior to beginning any work, and provide maintenance as required to ensure its intended performance during this project.

All materials removed under this item must be disposed from site immediately following excavation. Removal of materials off site shall be in accordance with OPSS 180 & O. Reg. 406/19: ON-SITE AND EXCESS SOIL MANAGEMENT. Materials cannot be stockpiled on site unless written approval has been received from the Contract Administrator. Soils generated from this item shall be assumed to be table 2 and therefore not suitable for disposal on a private residential site and/or farm. Excess fill generated is to be used for slope flattening within the road ROW where possible. Extreme care must be taken to ensure that no wetlands are adversely affected during this process.

**Basis of Payment:** Payment for this item shall be lump sum for the full compensation for the provision of all labour, materials and equipment required to complete the work.

### **Item No. 2 Asphalt Removal – Full Depth**

Work shall include the removal of the existing bituminous roadway surface, as per OPSS 510, to the limits shown on the Contract Drawings. The anticipated depth of removal of this material throughout the length of the project is not expected to exceed 150 mm.

\*Note the existing Roadway Bituminous material shall be disposed of at a facility that is approved to accept Bituminous material.

**Basis of Payment:** Payment for the above item shall be by square meter and shall be full compensation for all labour, material and equipment required to complete the work.

### **Item No. 3 Earth Excavation**

The work under this item shall include the equipment and labour required for any excavation, grading, compaction, and backfill (except granular backfill) required for the removal of the road base, removal of overlying material to facilitate replacement of the culvert including frost taper, and stripping side slopes in areas to receive new granular material.

This item shall also include work required for the reinstatement of shoulders and side slopes to final grade and any other grading required as part of the site restoration. Excavation for the proposed roadwork and backfill from the road base material shall be according to OPSS 206.

This item includes the removal of boulders, if present, in the excavation zone. Removal of boulders in excess of 1 m<sup>3</sup> shall be treated as rock excavation and paid under that tender item.

All excess material removed under this item must be disposed from site immediately following excavation. Excess materials cannot be stockpiled on site unless written approval has been received from the Contract Administrator. Any material disposed from site shall be in accordance with O. Reg. 406/19: ON-SITE AND EXCESS SOIL MANAGEMENT. The Contractor is hereby notified that due to winter maintenance operations and the placement of salt

on the roads during the winter months that all soils are considered to be Table 2 soil and excess material is to be used for slope flattening as identified in the Slope Flattening Special Provision. No excess material is to be disposed of on residential and or farmland unless the Contractor Tests the soil and it is deemed to be acceptable for disposal on the preceding i.e. Table 1 soils. Any cost associated with testing and disposal shall be at the contractors expense and no additional cost shall be borne by the Township.

**\*Note at no time shall the Contractor place fill excavated from this project in or around environmentally sensitive areas, wetlands or on private property not suitable for table 2 soils.**

**Basis of Payment:** Payment for the above item shall be by lump sum and shall be full compensation for all labour, material and equipment required to complete the work.

**Item No. 4 Supply & Install 5050 mm W x 3330 mm H Polymer Laminate CSP Arch Culvert**

The work under this item shall require the Contractor to install a new 5050 mm wide x 3300 mm high polymer coated CSP arch culvert. The wall thickness for this culvert shall be 4.0 mm. Supply, delivery and installation are to be included under this item. Installation of the culverts shall conform with the supplier's specifications, applicable OPSS standards including OPSS 401, 421, 1801, and as per the Contract Administrator's directions. The Contractor shall be responsible for protecting and repairing the polymer coating during installation as per the manufacturer's recommendations.

Additionally, this item shall be inclusive of all granular A/clear stone bedding, pipe embedment material and backfill including that specified in OPSD 802.020 (Nov 2015) and as depicted on the Contract Drawings.

Granular B supply, placement and compaction for the frost taper up to the underside of granular B road base material shall be included under this item.

**Basis of Payment:** Payment at the contract price for the above tender item shall be full compensation for all labour, equipment and material required to do the work, including charges for delivery, offloading, construction of lay down area and assembly of the culvert. Measurement for payment shall be by lineal meter measured along the centerline of the culvert.

**Item No. 7 R10 Rip Rap with Geotextile (Class II Non -Woven)**

The work under this item shall include all labour, equipment and materials to install R10 Rip Rap with Class II Non-Woven Geotextile , Rip Rap Stone shall be hand placed at a depth of 300mm , installation shall be as per the Contract drawings and as specified by the Contract Administrator. The gradation of the rip rap shall conform to the requirements of Table 8 in OPSS 1004.

Basis of Payment: Payment at the contract price for the above tender item shall be full compensation for all labour , equipment, excavation and materials to complete the installation. Measurement for payment shall be by the square meter.

**Item No. 8 MacGrid EG-30 Geogrid and Non-Woven Geotextile**

The unit bid price for the above tender item shall be full compensation for all labour, equipment, and material to complete the installation of MacGrid EG-30 Geogrid and non-woven geotextile as per the Contract Drawings and as directed by the Contract Administrator. The entire installation shall be in accordance with OPSS 511.

Measurement for payment shall be by the square meter.

**Basis of Payment:** Payment at the unit price bid per square meter (m<sup>2</sup>) shall constitute full compensation for the provision of all labour, material, and equipment required to complete the work.

**Items No. 9 and 10 Granular A and Granular B Road Base**

Under these items the contractor shall supply all labour, equipment, and material to complete the placement, grading and compaction of the Granular A and Granular B Type 2 roadway granular materials per OPSS 314. Depth of Granular A shall be 150mm and Granular B shall be 300mm as per the Contract Drawings and details.

Under these items the contractor shall supply all labour, equipment, and material to complete the placement, grading and compaction of the Granular A as shouldering along the newly reinstated roadway driving surface.

Water for compaction must also be included in the bid price.

Granular A and B shall conform to OPSS 1010, Granular B shall be Type 2, Granular A shall be 100% crushed quarry material.

\*Note Granular B frost taper material shall not be paid under this item, the contractor must include the frost taper material to be supplied and placed under the culvert unit price.

**Basis of Payment:** Payment for this item shall be full compensation for all labour, material and equipment required to complete the work. Measurement for payment shall be by the metric tonne for both Granular A and Granular B, the contractor must supply material tickets prior to any payment being made, hand written tickets will not be accepted.



### **Item No. 11 – HL3 Surface Course Asphalt**

The work included under these items shall include the production and placement of Hot Mix Asphalt at locations shown on the Contract Drawings. The production of asphalt material shall conform to OPSS 1150. The placement of asphalt material shall conform to OPSS 310.

The Contractor shall, at his own expense, be responsible for the design of asphalt mixes which shall conform to the requirements for the type of asphalt mix specified in the tender items.

Proposed mix designs must be submitted to the Contract Administrator for approval, a minimum of two weeks prior to commencing any hot mix paving.

“Mix Design” means the determination by the Marshall method of mix design of the proportions of aggregates, asphalt cement and additives which, when uniformly mixed will result in a bituminous paving mixture. “Job-Mix Formula” means the percentage passing on each designated sieve of the total mass of aggregate and the amount of asphalt as a percentage of the mixture which are based on a Marshall method of mix design, and when mixed will result in a paving mixture which conforms to the requirements of the Contract.

The Contractor shall be responsible and include costs in unit rate bid for the quality and characteristics of the mixture, and if the hot mix produced is not suitable, hot mix production shall stop and appropriate corrections made to the process. When field testing for Marshall Properties shows that the mix produced with the job mix formula does not meet the Marshall Design requirements, it will be necessary for the Contractor to re-evaluate and redesign the mixture, and a new job mix design and a new job mix formula shall be submitted for approval.

Limit of Construction Joints shall be sawcut square against existing bituminous material. This tender item shall include any saw cutting, sweeping, cleaning, etc., required for Construction Joints.

This item shall include all fine grading necessary to prepare the surface for paving, and any necessary reconstruction of the granular A layer where the Contractor elects to run traffic on it for an extended period of time prior to paving.

Existing pavements shall be saw-cut in smooth straight lines. No separate payment will be made for sawing existing pavements.

The final asphalt product shall conform to all specifications. The materials, mix designs, and application methods specified are of the highest quality in order to produce a pavement structure that will deliver the longest service life attainable within a reasonable cost. As important as the products, are the mixing and application of the asphalt. The quality control will have a total of 3 samples taken (per lot). The first sample will be taken by the Engineer and analysed to obtain results that will be measured against the specification requirements. The second sample will be the ‘Contractor’s’ sample (of the same lot) for the Contractor to test and confirm or dispute any results obtained from the Engineer’s sample. The third sample (of the same lot) will be the ‘referee’ sample. If results obtained from first and/or second samples are not agreeable by both

parties (Engineer and Contractor), the ‘referee’ sample shall be analysed by an independent qualified geotechnical party and the results shall be deemed accurate by both parties. At this point, 100% payment of the contract unit price will be used if the results meet or exceed specifications. Final acceptance is by the Engineer from Greer Galloway. However, if the results are less than specifications, it will be the Engineer and Owner’s discretion to have the unit price payment amount reduced or to have the asphalt removed and replaced at the Contractors cost.

**Basis of Payment:** The unit prices bid shall be full compensation to complete the above items. Measurement for payment shall be by the metric tonne.

### **Item No. 12 – Supply and Place Topsoil and Seed (Provisional)**

Under this item the contractor shall supply and install 100mm of topsoil and hand seed disturbed areas and/or as directed by the Contract Administrator seed placed shall be standard roadside mix. Any watering required shall be completed by the contractor until such time that germination has taken place. All work completed shall be as per OPSS 802 and OPSS 804.

**Basis of payment:** Payment at the contract price for the above tender item shall be full compensation for all labour, equipment and material required to complete the work. Measurement for payment shall be by the square meter.

### **Item No. 13 - Dewatering**

Activities under this item include, but are not limited to, the construction of coffer dams or approved equivalent, dewatering/sediment traps, and pumping. Dewatering operations shall conform to OPSS 517 and 518. The Contractor’s dewatering method shall be capable of lowering the groundwater table to a minimum of 1.0 m below the proposed base of the excavation.

This work shall be in accordance with all regulations as set by Regulatory Agencies (e.g. Cataraqui Region Conservation Authority, DFO and MNR). The Contractor will be required to provide a detailed dewatering plan for the review and approval of the Conservation Authority and the Contract Administrator prior to construction. A permit to take water has not been obtained and it is the Contractor’s responsibility to ensure that the dewatering operation does not exceed 50,000 liters of water per day from the environment. If the Contractor’s dewatering plan calls for the removal of more than 50,000 litres of water per day it will be the contractor’s responsibility to ensure that they meet the requirements of **O.Reg 63/16, O.Reg 245/11, O.Reg387/04, EPA and the Ontario Water resources Act. (OWRA)** prior to the commencement of dewatering operations.

**50,000 Litres/Day – 400,000 Litres/Day requires the contractor to register with the Environmental Activity and Sector Registry or (EASR) prior to commencement of any water taking.**

The link to the registry is <https://www.ontario.ca/page/water-taking-user-guide-environmental-activity-and-sector-registry#section4> this registry explains in detail the process required and there is no wait time associated with receiving the approval and necessary documentation to complete the work, note there is a fee associated with this

**registration and the contractor must include the cost associated with this fee in his/her unit cost for this item.**

The design, implementation, maintenance, and removal of the Dewatering System will be the sole responsibility of the Contractor. The Contractor in relation to these system designs shall satisfy themselves of the subsurface conditions prior to submitting a bid. No additional payment will be made for dewatering beyond the contract price for this item.

Also, under this item the Contractors shall acquire the necessary permit for the relocation of aquatic species into their natural environment and perform these duties as well. It is highly recommended that a biologist be retained by the contractor to apply for the permit and as well relocate all trapped aquatic species.

**Basis of Payment:** Payment at the contract price for the above tender item shall be full compensation for all labour, equipment and material required to complete and maintain dewatering for the removal and construction activities required under this contract, including any relocation of equipment as may be required during the work. It shall also be full compensation for aquatic species relocation. Measurement of payment shall be Lump Sum.

#### **Item No. 14 - Environmental Protection**

Under this item the contractor shall supply, install and facilitate the necessary environmental protection requirements to ensure compliance with all Regulatory Agencies i.e. Ministry of the Environment, Department of Fisheries and the Ministry of Natural Resources.

The Contractor shall supply, install, and maintain erosion and sedimentation control measures according to OPSS 805 including, but not limited to, turbidity curtain and light duty silt fence shown on the plans. Regardless of site-specific measures detailed on the plans, the Contractor shall ultimately be responsible for selecting and implementing additional erosion and sediment control measures to suit their chosen work methods to sufficiently ensure no sediment runoff from the site. The Contract Administrator and Regulatory Agencies reserve the right to direct the contractor to install enhancements/additions to the measures in place at no additional cost to the project when they are found to be insufficient.

All erosion and sediment control measures shall be installed prior to the disturbance of the areas they are meant to protect and shall be monitored and maintained by the contractor until the disturbed areas have had stabilizing ground cover reinstated. All erosion and sediment control measures shall be inspected prior to and after each rainfall event to ensure they are functioning properly to the satisfaction of the Contract Administrator.

Any disturbed areas not scheduled for further construction for forty-five (45) days will be provided with a suitable temporary ground cover. Disturbed areas that have been graded to their final constructed state shall be covered with topsoil and seed within 7 days of completion. Erosion and sedimentation control measures shall be removed after, in the opinion of the Contract Administrator, adequate development of the permanent stabilizing ground cover has occurred.

All roads used to access the site shall be kept clean to the satisfaction of the Contract Administrator/the Director of Public Works.

**Basis of Payment:** Payment at the contract price for the above tender item shall be full compensation for all labour, equipment and material required to complete the work. Measurement of Payment shall be by Lump Sum.

### **Item No. 15 - Construction of Concrete Garbage Receptacle Pad**

#### **Scope:**

This item shall cover the construction of a concrete pad for the existing garbage receptacle. It shall also include the removal and reinstallation of the existing garbage receptacle.

#### **Materials:**

Concrete shall have a compressive strength of 30 MPa and shall be as per OPSS 1350.

Reinforcement shall be as per OPSS 1440.

Granular base material shall be as per OPSS 1010.

#### **Construction:**

This item shall include the supply, placement and compaction of granular base material as specified on the Contract Drawings and as per OPSS 314 and OPSS 501.

Concrete shall be supplied, placed and cured as per OPSS 904.

Reinforcement shall be supplied and placed as per OPSS 905.

The Contractor shall provide a minimum of 3 Business Days notice to the Contract Administrator prior to placing concrete.

#### **Quality Assurance:**

Testing of plastic concrete and sampling for compressive strength testing shall be completed at the discretion of the Contract Administrator. Testing shall be organized and paid for by the Owner.

#### **Measurement for Payment:**

Measurement for payment shall be by lump sum.

**Basis of Payment:**

Payment by lump sum shall be full compensation for all labour, equipment and material required to complete the work.

**Item No. 16 - Traffic Control**

All work under this item shall be in accordance with the Contract Drawings and relevant General Special Provisions and OPSS 706.

Payment at the contract price for this tender item shall be full compensation for all labour, equipment, and materials required to supply and maintain all temporary signing, traffic control devices, flagmen and vehicle/pedestrian protection as per the Ontario Traffic Manual Book 7 for all lane closures, the full road closure of Dark Bay Road at the work zone, detour routes, construction access, and the accommodation for residential/commercial entrances where affected by the work zone, and the provision of a traffic control plan.

A detailed traffic control plan is to be submitted to the Contract Administrator for approval. The plan shall include the planned positions/arrangements/configurations of traffic control devices/signs, flaggers, or other materials for all lane closures, the full road closure of Dark Bay Road at the work zone, detour routes, construction access, and the accommodation for residential/commercial entrances where affected by the work zone. The plan shall include a standalone excerpt that can be distributed and posted for public information detailing the duration of construction, construction phasing, impacts to vehicle traffic access, impacts to pedestrians traffic access, impacts to emergency vehicle access, product deliveries, garbage / recycling pickup, timeframes, and other relevant impacts/changes. The plan shall be detailed and site specific (generic references to OTM Book 7 or other resources will not suffice). The traffic control plan shall be submitted to the Contract Administrator for review and approval at least 2 weeks in advance of the scheduled closure of Dark Bay Road at the work zone.

**Basis of Payment:** Measurement for payment is by Lump Sum. This Lump Sum shall be inclusive of all labour, material and equipment required to complete the work.

**Item No. 19 – Slope Flattening**

Under the item, the contractor shall include all traffic control, labour and equipment to complete hauling, placement and shaping of excess materials generated from excavation for the purpose of slope flattening.

Areas for slope flattening will be within the municipal road right of way, at areas located within 10 km of the project location. Specific areas will be provided to the Contractor by the Contract Administrator prior to the work taking place.

Payment for this item shall be by lump sum, and shall be deemed full compensation for all labour, equipment, and material to do the work.

Dark Bay Road Culvert  
Geotech Report



2023/7/13 15:46:11 EDT

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## **APPENDICES**

**Borehole Data**  
**Site Photos**

**terraspec engineering inc.**  
**geotechnical engineers ■ materials testing**

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**Peterborough, Ontario**  
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July 29, 2023

The Greer Galloway Group Inc.  
640 Cataraqui Woods Drive, Unit 2A  
Kingston, Ontario  
K7P 2Y5

**Re: Dark Bay Road Culvert Replacement**  
**Project Number 23-5-5361**

**Investigation Data**

Four exploratory boreholes were placed adjacent to the culvert. The borehole log and laboratory test data has been appended to this report.

**Dark Bay Road Culvert**

The steel multiplate culvert is located on Dark Bay Road, just north of the Muskoka Road 169 intersection. The culvert will typically be replaced with a new culvert of similar construction. The original culvert diameter was 4.93m. The culvert shape has deformed over time due to corrosion of the culvert and occasional heavy truck traffic.

The soil physiography for the site is shallow till and rock ridges.

The bedrock in this area is biotite/quartz/gneiss.

The lane widths were 3.25m, with adjacent 1.5-2m wide sand shoulders.

The pavement consisted of surface treatment and asphalt patching which were in poor condition. The granular depths encountered in the road were too thin, with a typical 50mm of sandy crushed gravel. The west side pavement lanes had some large gravel or cobbles in the sand near to the pavement surface. It is anticipated that the road will be reconstructed as necessary with new granular materials and surface treatment as per District standards.

The typical subsoil layers encountered were as follows:

Asphalt patch or surface treatment  
Thin layer of crushed gravel and sand base  
Fine sand trace gravel  
Fine sand with gravel  
Fine sand some gravel/cobble  
Silty sand some cobble  
Silty sand  
Granitic bedrock



The sandy subsoils were generally in a compact state, although saturated below the water elevation. Bedrock was inferred based on auger refusal.

The water level was typically at 2.6m below road surface.

### **Excavation and Dewatering**

A significant continuous dewatering operation is expected to be required.

The subsoils above the water table were classified as OHSA Type 3 soils. It is anticipated that all soils at and below the groundwater elevation will require treatment as Type 4 collapsing soils. It is anticipated that a sheet piling system will be required to assist with groundwater removal and to hold back the subsoils. The toe of the sheet piling may be driven into the underlying soil below the culvert elevation, however, it should be noted in the contract that obstruction of the sheet piling may occur due to existing boulders or the uneven bedrock surface.

An Environmental Activity and Sector Registry (EASR) registration will be a suitable option for this project, depending on the daily volume of water that will require removal. An EASR allows for taking of groundwater and stormwater for construction dewatering purposes that total less than 400,000 L/day. Contractors bidding on this work should be advised to consult a hydrogeologist or other dewatering expert to assess the water quantities to be removed, and the viability of using an EASR registration for the dewatering operations on site.

The construction contract should stipulate that the integrity of all soil bearing surfaces must be preserved at all times. Therefore, all excavations on site must be protected from high moisture levels due to rainfall or accumulating groundwater, using appropriate dewatering techniques for the encountered site conditions. Stipulate in the contract that the contractor will be wholly responsible for the dewatering operation and will submit a detailed plan for the dewatering operation, to be reviewed by the Contract Administrator.

### **Pipe Installation**

Allow for placement of Geogrid on the culvert subgrade, with up to a 450mm layer of 3" minus rock fill over the grid, for the culvert base. Use MacGrid EG-30 geogrid. This treatment will be applied to the entire culvert placement area. Use a geotextile cloth layer over the rockfill (such as Maccaferri MX225) and backfill with Granular B Type 1 or other suitable subgrade fill. For both the east and west culvert outlets, place clean 4" minus Rock Fill in the creek outlet to rebuild the culvert outlet base.

Use OPSD 800 series standard drawings for new culverts, typically OPSD 802.010, or OPSD 802.031 for rigid pipe, with a Class B bedding. The bedding and lower cover materials will need to be comprised of crushed gravel for placement in wet subgrade conditions. It is anticipated that the following could be utilized: Clear Stone, OPSS 1010 Granular B Type 2 with a maximum particle size of 50mm, or 3inch minus crushed rock fill.

When the culvert is removed, leave the existing culvert base material intact, while allowing room to apply the culvert base treatment. (The base treatment will become the culvert bedding.)

Place geogrid as per the manufacturer's instructions. Allow for geogrid overlap when calculating the total geogrid area. The subgrade soil should be inspected to ensure that the culvert base material is placed onto a competent subsoil. An engineering firm should be consulted to confirm the competency of the subgrade soil.

The soil bearing capacity of the culvert base is as follows:

Dark Bay Road

Factored ULS bearing capacity: 270 kPa

SLS allowable bearing capacity: 180 kPa

Granular B Type 1 material may be used as the culvert back fill material. Other materials such as 3inch minus rock fill or Granular B Type 2 will also be viable as back fill material, and can be listed as alternates. OPSS 1010 SSM may also be used as general subgrade backfill over the culvert, however, construct granular frost tapers when the culvert lies within the frost penetration depth, as per OPSD 803.030 and OPSD 803.031. The frost penetration treatment depth for the culvert site is 1.8m below finished grade.

It should be noted that there are seasonal changes to the groundwater level, therefore, culvert structures should be designed to control for hydrostatic uplift.

### **Re-use of Soils**

The sandy subsoils encountered over the existing culverts were typically of good quality. Provided that these soils are free of organic material, they may be re-used as subgrade fill. Soils that are saturated or contain organics will not be useful on site, but may be dried for re-use as surface landscaping. This may be feasible if the construction occurs during the summer months. It may not be practical during the construction period to dry and re-use these soils, hence, these soils may require disposal off site.

### **Pavement Design**

Reconstruction of the roadway:

Apply general grading as per OPSD 200.01.

Compact the subgrade soil by proof rolling prior to placing the new Granular B and A.

Use the following materials:

surface treatment

150mm Granular A base

300mm Granular B Type 1 subbase

(Place Type 2 non-woven geotextile cloth as needed over Granular B2 or rock fill subgrade)

Cover the B2 or rock fill surface with a Type 2 non-woven geotextile cloth (such as Maccaferri MX225), to prevent the upper roadway materials such as Granular B1 from sinking into the underlying Granular B2 or rock fill.

Apply surface treatment to the road as per District of Muskoka Lakes standards, or typically use Class 2 aggregate for the base lift, and use Class 6 aggregate for the top lift. For asphalt cement, as a minimum use HF-150S. Polymer-modified cements are desirable and may also be used, such as HF-150SP or HFMS-2P.

#### Ditch Improvement

The roadway north of the culvert has a bedrock outcrop adjacent to the culvert. Improve the road ditching on the northeast side, from the culvert proceeding north, the length is 20m. There is a bedrock outcrop on surface here, hence, the ditch improvement will require bedrock excavation.

#### **Compaction Requirements**

Compaction requirements for all subgrade fill and granular materials should conform with OPSS 501, Subsection 501.08.02 - Method A, utilizing a compaction standard of 100% of Standard Proctor Maximum Dry Density.

#### **Statement of Limitations**

This report is intended for the guidance of the project design team. From a construction standpoint, contractors are required to make their own assessment of the soil, rock, and groundwater conditions and how these will affect their proposed construction techniques and schedules.

The recommendations in this report are based on information obtained from exploratory test holes. Soils, bedrock, and groundwater conditions may differ from those encountered at the time of investigation and conditions may become apparent during construction that could not be detected or anticipated at the time of the investigation. If this occurs, we recommend that Terraspec be contacted for further consultation and analysis.

We recommend that Terraspec be retained to ensure that all subgrade preparation requirements are met, and to confirm that the soil and rock conditions encountered during construction are acceptable as per the geotechnical design.

Elevations listed in the document are approximate.

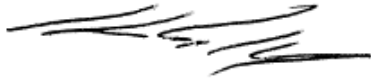
This report is applicable only to this project in accordance with details quoted in the text.

The company retains ownership of the geotechnical design and this report.

The company's responsibility is limited to interpreting information from test hole data and the company's liability is limited to the invoiced value of this report.

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**TERRASPEC ENGINEERING INC.  
GEOTECHNICAL ENGINEERS**



Shane Galloway, B.A.  
Manager



N.A. MacKinnon, P.Eng.  
Senior Engineer

**Borehole Data**  
**Dark Bay Road Culvert**  
**July 25, 2023**

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**Notes**

1. Soil types, strata, and groundwater conditions have been established only at test hole locations.
2. Soils are described according to the ASTM Soils Classification System and OPSD 100.06.
3. Dimensions are in millimetres up to 1 metre, then in metres thereafter.
4. Offsets are from existing road centre line.

**Abbreviations**

|      |   |                     |    |   |                                    |
|------|---|---------------------|----|---|------------------------------------|
| asph | - | asphalt             | &  | - | and                                |
| blds | - | boulders            | w  | - | with                               |
| blk  | - | black               | so | - | some                               |
| br   | - | brown               | tr | - | trace                              |
| BR   | - | bedrock             |    |   |                                    |
| cl   | - | clay(ey)            | S  | - | soil sample                        |
| cob  | - | cobbles             | N  | - | estimated SPT blow counts per 0.3m |
| conc | - | concrete            |    |   |                                    |
| cr   | - | crushed             |    |   |                                    |
| f    | - | fine                |    |   |                                    |
| gr   | - | gravel(ly)          |    |   |                                    |
| gry  | - | grey                |    |   |                                    |
| med  | - | medium              |    |   |                                    |
| NFP  | - | no further progress |    |   |                                    |
| org  | - | organics            |    |   |                                    |
| RF   | - | rock fill           |    |   |                                    |
| sa   | - | sand(y)             |    |   |                                    |
| si   | - | silt(y)             |    |   |                                    |
| tps  | - | topsoil             |    |   |                                    |

**1 NW, 1.4m W**

0 - 40    asph patch  
40 - 100    br cr gr & sa -dry, compact    S1 at 0.06m  
100 - 2.90    br f sa w gr -dry, compact  
-so cob near pavement surface  
2.90 - 3.66    br f sa tr gr -saturated, compact  
3.66 - 4.42    br si sa so cob -saturated, compact  
4.42            NFP, BR inferred  
-water at 2.5m  
-soil caved in at 2.3m, Type 4 soil

**2 NE, 1.6m E**

0 - 44 asph patch  
44 - 100 br cr gr & sa -dry, compact  
100 - 2.59 br f sa w gr -dry, compact S2 at 2.1m  
-so cob at 2.4m  
2.59 NFP, Bld or possible BR  
-water at 2.59m

**3 SE, 1.5m E**

0 - 50 asph patch  
50 - 100 br cr gr & sa -dry, compact  
100 - 2.59 br f sa w gr -moist, compact  
2.59 - 4.27 br f sa tr gr -saturated, compact  
-at 3m N=10  
-so cob at 3.9m  
4.27 - 6.10 dark br f sa tr gr -saturated, compact S3 at 4m  
6.10 - 6.71 dark br f sa w gr so cob -saturated, compact to dense  
6.71 - 6.86 gry si sa - saturated, compact  
6.86 NFP, BR inferred  
-water at 2.59m  
-soil caved in at 2.59m, Type 4 soil

**4 SW, 1.1m W**

0 - 50 asph patch  
50 - 110 br cr gr & sa -dry, compact  
110 - 2.74 br f sa w gr -moist, compact  
-so cob near pavement surface  
2.74 - 3.96 br f sa so gr/cob -saturated, compact  
3.96 - 7.01 dark br f sa so gr/cob -saturated, compact  
-at 4.5m N=12  
7.01 - 7.16 gry si sa - saturated, compact  
7.16 NFP, BR inferred  
-water at 2.59m  
-soil caved in at 2.59m, Type 4 soil

**Laboratory Test Data**

| <b>Soil Sample</b> | <b>S1</b>        | <b>S2</b> | <b>S3</b> |                               |
|--------------------|------------------|-----------|-----------|-------------------------------|
| <b>Sieve</b>       | <b>% Passing</b> |           |           |                               |
| 26.5mm             | 100              | 100       | 100       | grain size                    |
| 19.0mm             | 92.9             | 93.8      | 100       |                               |
| 13.2mm             | 73.8             | 83.7      | 97.5      |                               |
| 9.50mm             | 70.7             | 81.5      | 97.5      |                               |
| 4.75mm             | 64.3             | 79.0      | 96.7      |                               |
| 2.36mm             | 59.7             | 77.2      | 95.2      |                               |
| 1.18mm             | 53.9             | 72.4      | 91.0      |                               |
| 600um              | 44.6             | 60.4      | 74.5      |                               |
| 300um              | 29.0             | 35.9      | 38.7      |                               |
| 150um              | 10.1             | 9.6       | 15.0      |                               |
| 75um               | 3.9              | 3.4       | 5.9       |                               |
| ASTM               | SP               | SP        | SP-SM     | soil classification           |
| frost rating       | Low              | Low       | Low       | susceptibility to frost heave |
| W                  | 3.2              | 5.1       | 22.7      | field moisture content        |

# TEST HOLE LOG DATA

PROJECT No.: 23-5-5361  
 CLIENT: Muskoka Lakes  
 PROJECT: Dark Bay Road Culvert  
 DATE: July 25, 2023

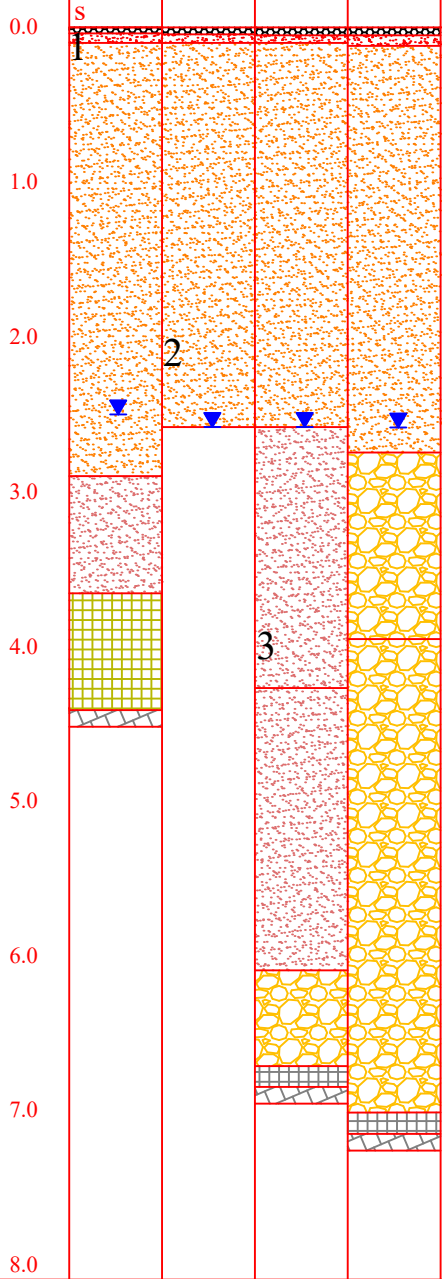
## SOIL DATA

METHOD: 130mm Solid Stem Auger  
 s = sample

▼ encountered water elevation

DEPTH  
(m)

1    2    3    4



## LEGEND


-  asphalt patch
-  crushed gravel & sand
-  fine sand with gravel
-  fine sand trace gravel
-  fine sand some gravel/cobble
-  silty sand some cobble
-  silty sand
-  bedrock





Photo looking North



Photo looking South