Functional Specifications for Glen Access Road Improvement Niagara Operations

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Prepared by:

Nicole Whitmore Shiqiang Ye Date: Aug 22, 2018

Nicole Whitmore and Shiqiang Ye, P.Eng.
Plant Engineering Services

Reviewed by:

Date: Aug 23, 2018

Allan Zheng, P. Eng.
Production Supervisor, Technical
Plant Engineering Services

Reviewed by:

Date: AUGUST 23/2018

Ryan Ball, P. Eng.
Plant Technical Support Manager

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TABLE OF CONTENTS

1. INTRODUCTION 3
2. SCOPE OF WORK 3
3. LAWS, STANDARDS AND CODES 6
4. MINIMUM QUALIFICATION 7
5. DOCUMENTATION 7

LIST OF APPENDICES

APPENDIX A – Documents Included for Reference 8
APPENDIX B – Labelled Site Maps Identifying Chainages and Culverts……..9

1. INTRODUCTION

The Glen Access Road is located along the west bank of the Niagara River gorge and descends from the Niagara Parkway to the Sir Adam Beck 2 (SAB2) Powerhouse. The road was built in the 1950's during construction of SAB2 and provides the only vehicular access to both SAB1 & SAB2 powerhouses.

The access road ranges in width from 22 ft (6.71 m) to 55 ft (16.8 m). It is approximately 6,562 ft (2 km) in length, and it carries two-way traffic. With the exception of the north and south sections, the access road is unpaved.

In 2012, OPG contracted Golder Associates to conduct drilling investigation, survey of the road, gravel road upgrade recommendations, and provide recommendations for road pavement design. The Report (#NF28-REP-13110-0001) - Glen Access Road / North SAB1 Tailrace Road – Investigations and Recommendations for Road Upgrade was issued December 2013 (see Appendix A).

In 2012, a new rock fall fence was installed along the road to mitigate the potential for High Risk incidents due to falling rocks.

Objective:

The Glen Access Road provides the only access for vehicular traffic to SAB1 and SAB2 Powerhouses. This access road must be reliable and easily maintained to satisfy the operation needs, unit overhauls, and other project works.

2. SCOPE OF WORK

Provide Detailed Engineering Design and Technical Specifications/Drawings for Glen Access Road Improvement Project, as follows:

(1) General Requirements:

- Provide a work plan as part of the proposal.
- Provide QA/QC Plan after the Contract is awarded.
- Participate in 6 milestone meetings (kick-off, field work planning, on-site safety, field work wrap-up, 30% complete, 100% complete, about 2 hours each).

- Coordinate weekly project review meetings (about 1 hr each), issue minutes and maintain an action tracking list.
- Issue monthly project update report including the project progress, schedule update, cost update, work forecasts, risks and issues.
- Provide a presentation and meeting at OPG Niagara Office at the completion of the Design Basis Report and at 90% of Design Completion.
- Participate Value engineering, Constructibility, Operatibility and Maintenatibility and Safety Review by Design (COMS Review) with OPG. Assume 7 hours.
- Issue drawings, calculations and technical specifications for OPG to review at 30%, 90% and 100% stage. The OPG review turnaround is 10 business days.
- Submit a site specific safety and environment plan, as part of work plan prior to field inspections.

(2) Review OPG provided information: topographic survey data, soil testing data, drawings, rock fence drawings, inspection reports, Geotechnical report (by Golder Associates, Dated December 2013) etc, which are included in APPENDIX A.

(3) Recommend and conduct any additional investigations as required.

(4) Conduct condition inspections including the following:

- Inspect the condition of surface drains, grading and address any issues in the design.

(5) Design the new road:

- Granular road from Niagara Parkway to Chainage 44+00, dust control measures shall be included as part of the design.
- Asphalt pavement from Chainage 44+00 to SAB2 Gate
  - The design life for new pavement should be min. 30 years.
  - Traffic volume is low but the units and transformer shipments are heavy and there will be concrete repair work in the next few years.

(6) Design two new culverts including:

- Location: Determine the best location for new culvert around chainage 20+00 and chainage 60+00.
- Material: Corrugated Steel Culvert, hot dip galvanized. Min. 30 years of design service life. The design shall consider the extensive use of salt on the road.
- Min diameter: able to pass 25 years of storm flow, and add 150 mm. This is to make future culvert replacement easier.
- Design new screening at inlet.
- Design new end treatment to eliminate the soil and slope erosion and provide safe access for future maintenance. Provide fall arrest anchor as required.
- There shall be maximum one joint. The coupling and the fitting shall be designed.

- The minimum embedment shall consider the future maximum load requirements for the intent use.

(7) Design new end treatment for Culvert 3, chainage 36+00, to address slope erosion and provide safe access for future maintenance. Provide fall arrest anchor as required.

(8) Design replacent of guide rail sections and broken conduits, as indicated on the Larocque Group survey, see Appendix.

(9) The Proponent shall prepare a Design Basis Memorandum describing the design basis method and provide commentary on the selection of appropriate design parameters to meet the performance specification for a Municipal Two Lane Road with normal truck traffic.

- Traffic volumes on Glen Access Road are estimated at less than the minimum for a municipal road and thus the Proponent shall provide commentary on the flexible pavement design selection. However, the road will be used by heavy equipment for station operation and maintenance uses (unit overhauls, transformers, concrete repair work etc.)
- A design methodology such as flexible pavement design for new construction (MTO Pavement Design and Rehabilitation Manual 2013) or other recognized method may be used and any modifications based on empirical knowledge should be identified and discussed.
- The Proponent should strive to incorporate as much of the existing road and road base into the new road cross section as possible to reduce the quantity of existing materials that need to be removed from site.
- The Proponent shall select the most appropriate drainage method to reduce the water content of the existing and new subgrade and road base to provide the base stability to allow for pavement longevity.
- Sub-surface drainage along both edges of all roads where rehabilitation is done shall be included.
- Surface drainage from the road and adjacent land must be addressed. The design shall include surface treatment method for the cliff soil erosion.
- Review the slope and gradient of the ditch and provide rock checks as required to reduce erosion potential to the ditch.
- The Proponent shall select the most appropriate cross section slope and road profile to achieve the design objectives while following recognized geometric design practices.
- The rock fence has a deflection zone. of2.32 m for 500 KJ system and 3.15 m for 1000 KJ system. Consider the deflection zone when determining the painted roadway lines on ashphalt section, while maintaining two-way road standards.
- Exisiting chainage markers locations shall be verified and posts repositioned if needed. Additional chainage locations every 100 ft are to be identified and marked in field. Chainage marker stickers to be applied on guard rail at specified locations.

- The rock ditch and all drainage paths should be cleared of debris, including culvert inlets and the grated ditch at the SAB2 gate.
- Prepare scope of work and itemized quantity take-offs as part of the design specifications/drawings.
- The Proponent shall prepare all the necessary documents and drawings required to tender out a Lump Sum contract for the above Work Scope.

(10) Engineering support during project execution:

- It is anticipated that knowledgeable quality control personnel from the Proponent will regularly be on-site to make decisions on the suitability of the existing materials for re-use in the new road (and other quality control issues) so that the road can be constructed as designed. It is recognized that weaker sub-grade conditions or unsuitable base may be exposed and would require a remove and replace decision to quickly be made based on these field conditions.
- Prepare Record Drawings for all of the work performed and a Project Completion Report. The construction and record drawings shall be prepared in accordance the requirements of PEO Guideline “Use of Professional Engineer’s Seal”.

(11) The Proponent shall conduct a survey, using a qualified biologist, to identify any endangered species in the vincinity of work areas and determine an action plan if they are to interfere with construction. Of special concern is the Butternut tree. Any endangered species are to be flagged in the field and coordinates recorded.

3. LAWS, STANDARDS AND CODES

All work shall conform to:

- The laws and regulations of Canada, the Province of Ontario, local municipalities
- Professional Engineer Ontario
- Ontario Ministry of Transportation
- Ontario Ministry of Labor Occupational Health & Safety Act
- Ontario Electrical Safety Code
- Ontario Building Code
- Ontario Ministry of Natural Resources Endangered Species Act, 2007
- OPG Drafting Consultant Package
- City of Niagara Falls Engineering Standards

The Proponent shall clearly state in its proposal any exceptions or deviations it intends to take to these standards.

Should any law, standard or code be revised, the Proponent and OPG will make each other aware of the revision to discuss adoption of the revision.

Should conflict occur between the applicable laws, standards or codes and this Standard Technical Specification, the most stringent requirements shall govern.

4. MINIMUM QUALIFICATION

The engineer who carries out the work and stamps the technical documents should:

- Be a professional engineer registered in the Province of Ontario, and
- Should have minimum 10 years design experience of road design and construction.
- Should be familiar with Ontario Ministry of Transportation standards, specifications and guidelines.
- Should provide a list of past projects for OPG to check references.

5. DOCUMENTATION

(1) All final documentation shall be in electronic form and shall become the property of OPG. Drawings shall be in AutoCAD format and as a PDF.

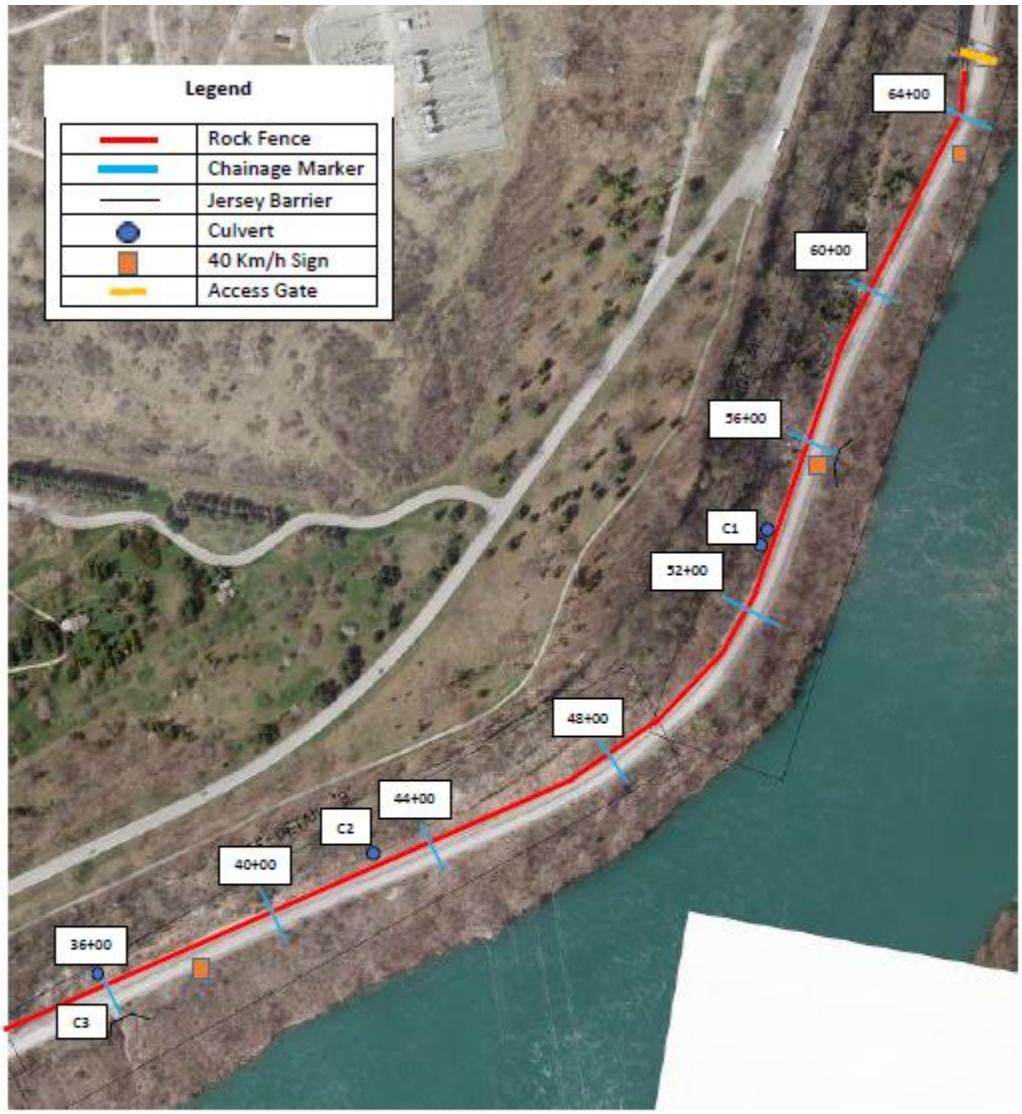
(2) If any OPG drawings and data are required, the Proponent shall contact the project engineer.

(3) Six copies of the final technical specification and drawing package will be required, as well as the electronic files.

APPENDIX A - Documents Included for Reference

- The Larocque Group - Survey Drawing
- Golder Report 2013
- Rock Fence Drawings
- OPG Drafting Consultant Package (under Govdoc Drafting)

Appendix B – Labelled Site Maps Idenitifying Chainages and Culverts

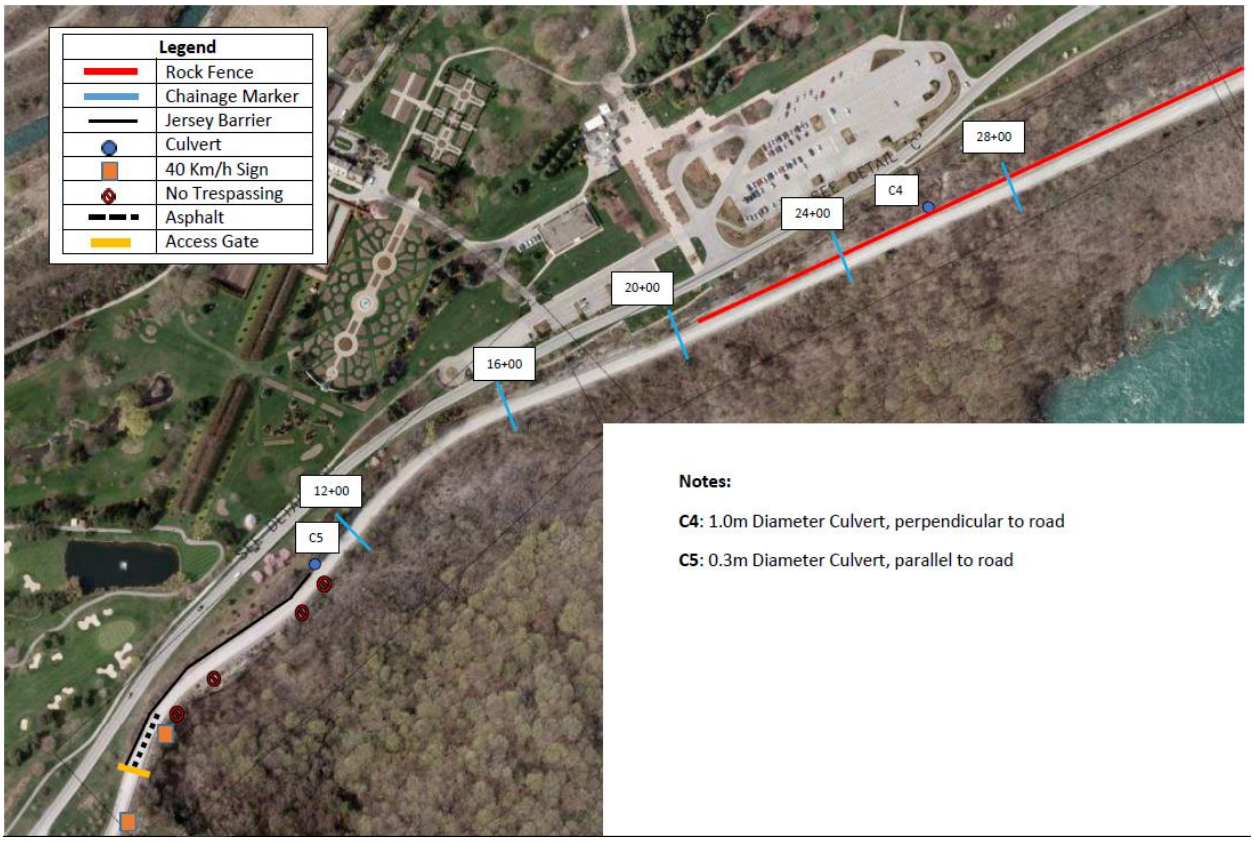


Notes:

C1: 1.0m diameter metal culvert, parallel with road

C2: 1.0m diameter metal culvert, perpendicular to road

C3: 1.0m diameter metal culvert, perpendicular to road



Notes:

C4: 1.0m Diameter Culvert, perpendicular to road

C5: 0.3m Diameter Culvert, parallel to road