CITY OF TORONTO

Functional Design Report

Hillside Bridge (No. 806) on Meadowvale Road
Rouge Park Bridges Transportation Master Plan

February 2025 - 19-1924

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1.0 Introduction

1.1 Project Description

The City of Toronto (City) has retained Dillon Consulting Limited (Dillon) to complete a Transportation Master Plan (TMP) focused on the development of renewal strategies for the following five municipal bridges located on City rights-of-way within the Rouge National Urban Park (RNUP):

- Maxwell Bridge on Twyn Rivers Drive (No. 802)
- Stotts Bridge on Twyn Rivers Drive (No. 803)
- Hillside Bridge on Meadowvale Road (No. 806)
- Sewell's (Suspension) Bridge on Sewell's Road (No. 812)
- Milne (Bailey) Bridge on Old Finch Avenue (No. 813).

These bridges have been designated under *The Ontario Heritage Act, R.S.O. 1990, c. O.18* as amended, with the exception of the Milne Bridge, which was listed by the City in 2006 and has not been designated.

The Rouge Park Bridges TMP will be completed in accordance with the provisions of the Municipal Class Environmental Assessment (EA) process, Approach #2. The purpose of the TMP is to undertake a comprehensive review, develop and evaluate Alternative Solutions for each of the bridges, including the retention, rehabilitation, or replacement of each, and prioritize the implementation of the recommended solution.

This Functional Design Report is focussed on bridge engineering factors, with reference to roadway geometrics and other factors as appropriate. This report provides input to the "Rouge Park Bridges Transportation Master Plan Report", which documents the evaluation of alternative solutions from a comprehensive, multi-factored perspective, and identifies a recommended solution, and is supported by other technical and professional studies and reports.

This report summarizes the existing conditions and provides an assessment of alternative solutions for retaining, rehabilitating, or replacing the **Hillside Bridge on Meadowvale Road (No. 806)** from a bridge engineering perspective. It also provides functional design recommendations for the recommended alternative.

1.2 Project Location

Hillside Bridge is located on Meadowvale Road between Plug Hat Road to the north and Old Finch Avenue to the south, crossing over the Little Rouge River.

The Little Rouge River flows southward, parallel to the west side of Meadowvale Road, along the north approach to the bridge, and bends sharply eastward near the bridge location. For reporting purposes, the bridge spans in a north-south direction.

The site location is labelled as site “C” in **Figure 1.**

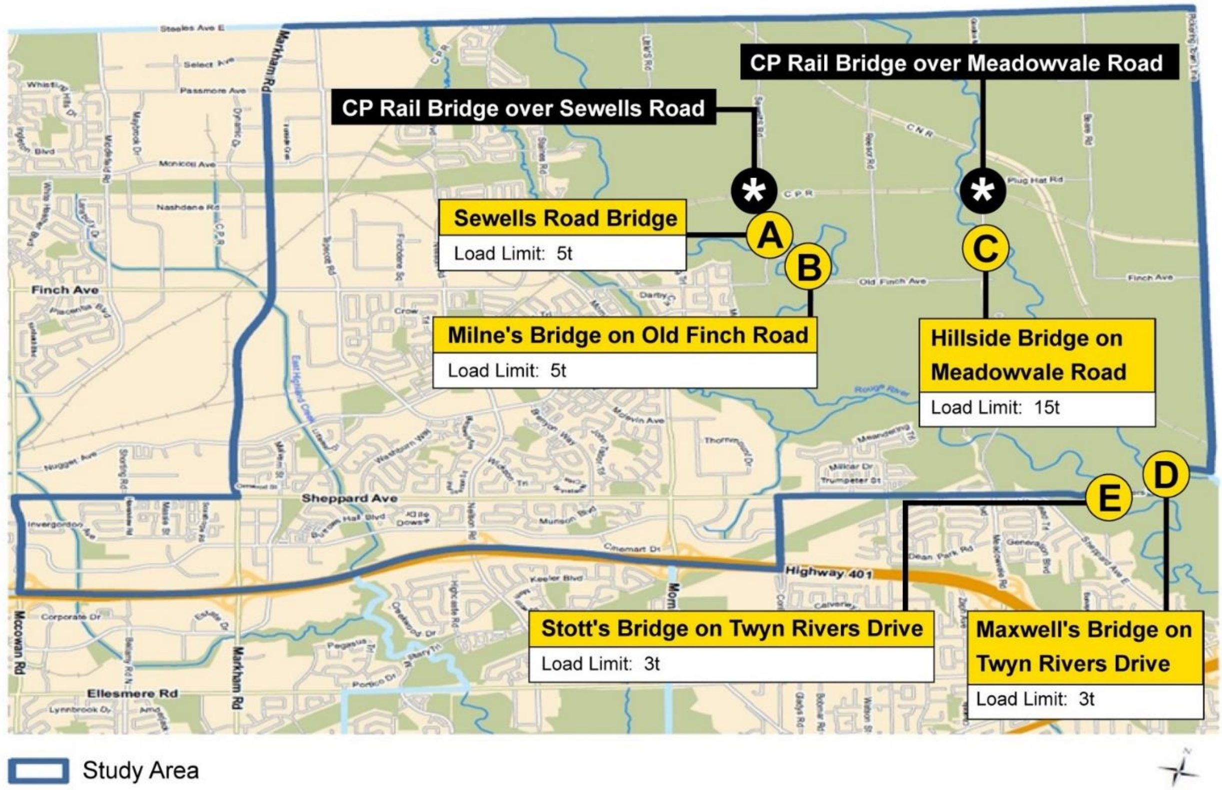


Figure 1: Site location

2.0 Available Information

2.1 Drawings

The following historical drawings were available for reference:

- Drawings 5006-S-1 to 5006-S-3, “Proposed River Works, Little Rouge River, Hillside Bridge”, Scarborough Works Department, 1969.
- Drawings 5006-S-4 to 5006-S-8, “Rehabilitation of Hillside Bridge”, Wyllie & Ufnal Consulting Engineers, 1986.
- Drawings 806-S5006-9 to 806-S5006-12, “Hillside Bridge”, Doug Dixon & Associates, 2020.

2.2 Reports

The following documents are available for reference:

- City of Toronto Bridge Inspection Form, Structure No. 806, Structure Name: Meadowvale Road over Little Rouge River, 2021.
- “Meadowvale Road Bridge, Bridge No. 806, Structural Steel Inspection and Fatigue Analysis Report”, MMM Group, March 2017.
- Corporation of the City of Scarborough By-Law Number 25153 to designate the Hillside Bridge part of original road allowance between Part Lots 4 and 5, Concession iv; now designated as Part 1 on Plan 64R-15214 as being of historical and architectural value, 1997.
- “Rouge Park Bridges TMP: Traffic Analysis Memo”, Dillon Consulting, April 2021.
- Transportation Assessment Memo, Rouge Park Bridges TMP, Dillon Consulting, May 2021.
- “Hydraulic Report - Rouge Park Bridges Transportation Master Plan”, Dillon Consulting, November 2020.
- “Desktop Study Geotechnical and Hydrogeological Assessment. Rouge Park Bridges Transportation Master Plan EA, Toronto, Ontario”, Thurber Engineering Ltd, November 2020.

2.3 Relevant Design Guidelines

References for the assessment of feasible alternative solutions for retention, rehabilitation or replacement of the bridge structures included, but was not limited to the following:

- MTO Structural Planning Guideline
- MTO Structural Manual
- Canadian Highway Bridge Design Code (CHBDC)
- MTO Structural Financial Manual
- MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads
- MTO Roadside Safety Manual
- City of Toronto - Road Engineering Design Guidelines
- Accessibility for Ontarions with Disabilities Act (AODA)

3.0 Existing Site Conditions

3.1 Roadway Features & Geometry

Meadowvale Road has a two-lane rural cross-section with no paved shoulder, bike lanes or sidewalks. The road is posted with "no trucks" signage at entry points. It is classified as a collector road with a posted speed of 50 km/h. The profile features a sag curve (Minimum K=2.3) at the bridge. See **Appendix A** for the General Arrangement drawing of the bridge.

The roadway becomes narrower at the location of the bridge (approximately 4.64 m clear between guide rails), allowing only one lane of traffic on the bridge at a time. Within the structure limits the existing horizontal alignment is straight. The bridge has no skew angle and no crown on the deck.

A CP Rail bridge over Meadowvale Road (at Mileage 193.03, Belleville Subdivision) is located 0.55 km north of the Hillside Bridge. The CP Rail bridge is posted with a 3.5 m vertical clearance and its width limits traffic to an alternating direction traffic, single lane configuration. See **Appendix A** for the CP Rail Bridge General Arrangement drawing.

There is a trail head for RNUP *Cedar Trail* located just northeast of the structure.

3.2 Traffic

A Traffic Analysis Memo was prepared as part of the Rouge Park Bridges TMP, which provided an analysis and overview of the existing and future traffic conditions within the RNUP. The reported 2021 Annual Average Daily Traffic (AADT) at the structure is 7,200 vehicles per day and the forecasted 2041 AADT is 10,100 vehicles per day. The road is posted with "no trucks" signage at entry points.

The bridge width of 4.64 m restricts traffic to a single-lane, alternating direction traffic configuration.

3.3 Roadside Safety

There is guide rail approaching the bridge and anchored into the thrie beam in all four quadrants of the structure. The guide rail is in good condition. A detailed road safety audit was not completed.

Access to the *Cedar Trail* to the north of the bridge does not accommodate parking, which may increase risk of collisions between pedestrians and vehicles in the area.

3.4 Property

The bridge is located on City property, within an approximate 20 m right-of-way. Beyond the 20 m right-of-way limit most of the property is owned by Parks Canada. Additional property owners exist within the boundaries of the park and the extents of these should be determined in preliminary design.

3.5 Utilities

Overhead utility lines run parallel to Meadowvale Road at the structure along the west side.

3.6 Water and Sewer

Water and sewer information was not available at this time.

3.7 Posted Signage

The following posted signage was observed at the bridge:

- The bridge has a load posting sign for a maximum load limit of 15 tonnes, at both approaches.
- A narrow bridge sign indicating one lane is posted at the approaches of the bridge to alternate traffic.
- A sign for cyclists is posted at both ends to ensure they dismount before crossing the bridge to avoid injury from falling on deck.
- At each end of Meadowvale Road a regulatory Heavy Vehicle Prohibition sign and a low clearance sign of 3.5 m is posted.
- Along Meadowvale Road warning signs about curves and pedestrian crossing are posted.

3.8 Survey

Existing topographic survey information was obtained from the City. Hydraulic models for the Little Rouge River at the location of the bridge were provided by the Toronto and Region Conservation Authority.

4.0 Existing Bridge

The Hillside Bridge, constructed in 1917, is a 24.68 m single-span steel pony truss bridge with an open grating deck carrying Meadowvale Road over the Little Rouge River. The bridge width of 4.64 m restricts traffic to a single-lane, alternating direction traffic configuration. The bridge has a load posting of 15 tonnes.

A General Arrangement drawing is provided in **Appendix A**, and site photographs are included in **Appendix B**.

4.1 Superstructure

The superstructure is a steel half-through warren pony truss with longitudinal stringers and transverse floor beams and cross bracing. The bridge has a single span of 24.68 m and trusses spaced at 5.14 m, resulting in a clear width of 4.64 m.

The trusses were fabricated from rolled steel channel and angle sections, with cover plates and steel lacing, riveted together. The trusses are connected with five steel floor beams with outriggers along the span and are anchored at the abutment.

The bridge deck is comprised of galvanized open grating on galvanized steel stringers installed during the 1986 rehabilitation.

Attached to the inside of the truss on each side is a galvanized guide rail beam and railing.

4.2 Substructure

The substructure is constructed of conventional concrete abutments founded on spread footings.

Gabion walls have been installed at the abutments to address erosion and scour, and the corner slopes have riprap rock protection.

There is a system of groynes and guide banks along the river, upstream, at the bend in the river.

4.3 Maintenance and Repair History

The Hillside Bridge was rehabilitated in 1986, when the following work was completed:

- Installation of new stringers and wind bracing.
- Concrete deck replacement with new open grating steel deck and thrie beam guide rail.
- Clean and paint structural steel.
- Concrete patch repair of the abutments.
- Repairs to gabion baskets.

In 2020, the bridge was closed for the following repairs:

- Repairs to bottom and top chords and one floor beam.
- Repairs to wind brace at connections.
- Repairs to north bearing seats.

See **Appendix A** for the Rehabilitation General Arrangement drawings from 1986 and 2020.

4.4 Condition of Structure

The condition of the structure was determined from a review of available documentation, visual site walk-through surveys of the structure in November 2019 and October 2020, and interviews with City staff.

The 2021 biennial bridge inspection assigned a Bridge Condition Index (BCI) of 55.0, which relates to a bridge in fair condition. It should be noted that these inspections are intended to identify repairs required in the next two years and do not address functional obsolescence or long-term considerations.

The structural steel inspection and fatigue analysis completed in 2017 indicated that some truss members could develop fatigue cracking but confirmed that there were no fatigue cracks identified in these members at that time. The evaluation confirmed the 15-tonne load posting. The report recommended the structure be monitored for fatigue cracking every five years until rehabilitation or replacement

The lower chord of the truss has areas of severe corrosion and perforation at connections. Monitoring in 2020 determined that immediate localized repairs were required to be undertaken to allow the bridge to remain in service until rehabilitation or replacement.

The abutments were in generally fair to poor condition. Concrete spalls and/or delaminations are undermining the north truss bearings.

In general, the bridge is nearing the end of its service life.

5.0 Heritage Evaluation

In 1997, the City of Scarborough designated Hillside Bridge as being of historical and architectural value or interest under *The Ontario Heritage Act, R.S.O. 1990, Chapter O.18.*

The reasons for designation were given in Schedule B to By-Law Number 25153, as follows:

> "The Hillside Bridge is recommended for designation for historical and engineering reasons. The bridge, built in 1917, is technically described as a Pony Warren Truss Bridge similar in design to the Stotts bridge. The structure does not require cross bracing, thereby eliminating height restrictions. The bridge was designed to carry local traffic across the Little Rouge in a rural environmental setting. It continues to serve this purpose today as this area of Scarborough forms part of the Rouge Valley Park. It is important that this bridge be preserved for future generations."

Heritage conservation is an important consideration in the assessment of bridge alternative solutions, and in the overall evaluation of alternative solutions in the TMP, which are addressed in the "Cultural Heritage Resource Assessment Report" and a "Scoped Heritage Impact Assessment Report" by ASI, to assess the recommended alternative solutions from a heritage perspective.

5.1 Heritage Guideline Options

The "Ontario Heritage Bridge Guidelines" (Ontario Ministry of Transportation, 2008) has been used as a supplementary reference to the primary heritage guide used by the City, "Conservation of Historic Places in Canada" (Parks Canada, 2010). The former guide articulates a series of heritage treatment options to be considered in rank order (from most desirable to least) as follows:

1. Retention of existing bridge with no major modifications;
2. Retention with restoration of missing or deteriorated elements;
3. Retention of bridge with sympathetic modification;
4. Retention of bridge with sympathetically designed new structure nearby;
5. Retention of bridge adapted for alternative use;
6. Retention of bridge as heritage monument for viewing purposes;
7. Relocation of bridge – applicable for smaller, lighter structures; and
8. Bridge removal and replacement with sympathetically designed structure.

Reference will be made to these options in the remainder throughout this report.

6.0 Identification of Alternative Solutions

Need for a Crossing

At the onset of the project, the need for a bridge crossing at the site was evaluated based on traffic needs, detour route availability, and other factors. It was concluded that the crossing could not be closed and decommissioned permanently. Therefore, **all alternative solutions to be considered require a bridge crossing to be in service for the next 20 years**, representing the study period for the TMP.

Three Alternative Solutions for the bridge crossing have been identified:

- Alternative 1: Retain Bridge
- Alternative 2: Rehabilitate Bridge
- Alternative 3: Replace Bridge

Each alternative is described below, for clarity.

6.1 Alternative 1: Retain Bridge

Retention of the existing bridge means keeping the bridge in its existing configuration with minimal changes, if any. It may include maintenance repairs, or improvements to roadway approaches, sign lines, signage or other ancillary features. However, functional improvements that change the cross-section of the bridge, or strengthening that substantially alters the form and appearance of the structure are not considered in this alternative.

This alternative involves continued operation of the bridge with minimal modifications at the start and no planned repairs in the next 20 years. Normal maintenance and inspections are anticipated. No improvement to functional adequacy would be achieved. Roadside safety would typically not be improved.

This alternative would only be feasible if the level of risk, safety and reliability of continued operations is deemed acceptable.

6.2 Alternative 2: Rehabilitate Bridge

Rehabilitation means strengthening and altering the existing bridge to address deficiencies, and the process may allow improvements to its functional adequacy. This may include adding structural components to supplement the existing ones, replacing components of the structure or other similar improvements. However, significant alterations in form and appearance may occur.

Rehabilitation is defined in the Canadian Highway Bridge Design Code (CHBDC) as a modification, alteration, or improvement of the condition of a structure or bridge subsystem that is designed to correct deficiencies in order to achieve a particular design life and live load level.

Functional adequacy may be viewed as encompassing not only design life and live load levels, but also operational risk, maintenance requirements, geometric constraints, and other factors.

A minor rehabilitation may focus solely on correcting deficiencies without any improvement in functional adequacy. However, corrective actions that require more extensive modifications are considered major rehabilitations.

Major rehabilitations provide the opportunity (and often the obligation) to achieve an acceptable level of functional adequacy. For example, the CHBDC indicates that consideration shall be given to closing bridges that would be posted for a load limit below 7 tonnes. For older bridges, it is often not feasible to strengthen bridges to load levels comparable to a new bridge, thus lower load levels would be targeted. Table 15.1 of the CHBDC provides guidance on target load levels for bridges to be rehabilitated for restricted normal traffic. In this case, bridges carrying emergency vehicles, single unit trucks, school buses and maintenance vehicles should be capable of supporting a CL3-ONT design live load, which relates to a posted load limit of 25 tonnes. (For comparison, a bridge that can support unrestricted normal traffic would be comparable at 63 tonnes.)

Rehabilitation typically extends the service life of a bridge for 25 to 35 years, which would correlate to no planned repairs during the 20-year planning horizon for this study. Normal maintenance and inspections are anticipated. Roadside safety (e.g. barriers) could be improved in some cases, but it may not be possible to achieve the level of performance possible with new construction.

The benefits of rehabilitation should be evaluated against associated costs, risks and consequences.

Risks may include increasing loads to the substructure (e.g., abutments) beyond acceptable levels, the potential to uncover problems during construction that are much worse than could be known at the beginning, hazards to worker or public safety during the rehabilitation, and other issues.

Consequences include potential impacts to the heritage value and aesthetic appearance of the bridge, and these should be minimized or avoided where feasible. Rehabilitation may involve adding structural components to supplement the existing ones, replacing components of the structure or other significant modifications. Such significant alterations in form, proportion, massing, or materials may be so extensive that the heritage value cannot be appropriately preserved, in which case rehabilitation would not be recommended.

Widening of this bridge through a major rehabilitation would require such an extensive dismantling and replacement of the original structure and abutments that it is not considered feasible.

6.3 Alternative 3: Replace Bridge

Replacement of the existing bridge means complete removal of the existing bridge, and replacement with a new structure. This allows the greatest improvement in the functional adequacy of the bridge such as load-carrying capacity, width, and service life. For replacement of heritage bridges, it must be demonstrated that the other alternative solutions are not suitable before replacement is considered.

Replacement would remove constraints such as load limits, span limits for hydraulics, bridge width, number of lanes, shoulder widths, roadside safety barriers, bicycle lanes, and pedestrian accommodation. It also provides the opportunity to use new materials and structure forms to improve durability and potential environmental impacts, as a closed deck system will result in a reduction in the amount of contaminated run-off containing de-icing salts entering the river below. Typically, the design life for a new bridge designed according to the CHBDC is 75 years. Minimal maintenance would be required for the first 20 years after construction.

Replacement would involve removal of the existing bridge span and its abutments, affecting the heritage characteristics of the bridge and its surrounding area. However, the existing bridge superstructure could be removed carefully and adapted for alternate use away from its current location, potentially elsewhere in the RNUP or in the City, providing a degree of heritage conservation.

In many cases the original bridge could be adapted for a new use such as a pedestrian crossing, cycle path or scenic viewing, or retained as a heritage monument for viewing purposes only. The bridge could be relocated to a new site for these purposes.

Retention of the existing bridge on the current site is not considered feasible at this site, due to limitations in right-of-way and span limitations to achieve appropriate hydraulic span.

The use of the existing bridge for a single lane of traffic while providing a replacement bridge for the opposing direction would cause undesirable roadside safety characteristics by requiring significant horizontal curves for the roadway and separated bridge lanes and create collision hazards at the median location. This approach also creates future issues when the existing bridge is removed, because the replacement bridge would require significant rework, widening or removal and replacement to remedy geometric concerns.

The Ontario Heritage Bridge Guidelines (MTO, 2008) recommends the heritage impact of a bridge replacement could be mitigated using sympathetic design which means making the new structure physically and visually compatible with the heritage attributes of the original. It would be compatible in terms of the massing, size, scale, and architectural features to protect the cultural heritage value of the bridge and its environment.

A commemorative monument, plaque or sign could be erected at the site to recognize the history of the original bridge.

A heritage bridge often has contextual value attached to its cultural heritage value, requiring the scenic characteristics of the river crossing, the roadway alignment, and natural setting be taken into account for any replacement structure that may be considered.

7.0 Evaluation of Alternative Solutions

As part of the broader Transportation Master Plan, alternative solutions are being evaluated against the following six factors:

- Bridge Condition and Function
- Transportation
- Heritage and Archaeology
- Natural Environment & Hydraulics
- Public Uses in Rouge National Urban Park
- Implementation

This report focuses on the 'Bridge Condition and Function' for each alternative, and the review has been supported by other technical and professional studies. The evaluation of alternative solutions is described in the following sections.

7.1 Alternative 1: Retain Bridge

The existing bridge has known deficiencies in geometry, such as single lane width, alternating direction traffic, poor sight lines and no accommodation for cyclists. These are significant to the multi-factored evaluation of alternative solutions at the TMP level and are relevant to the 'Bridge Condition and Function" evaluation as well.

Typically bridges should not have alternating direction traffic by yielding to oncoming traffic, and there are side clearance requirements to separate travelled lanes from the structure itself. The bridge does not have suitable barriers to protect the bridge from damage arising from a collision These deficiencies exist in the current configuration and would remain under this alternative.

Hydraulic clearance horizontally would not be improved at the bridge for the 20-year horizon. The existing soffit elevation meets current hydraulic vertical clearance requirements for conveyance. There is evidence of stream bank erosion along the watercourse and stabilization measures including gabion walls, rip rap, and groynes are present at the site. The south abutment is currently constraining the watercourse and does not provide any allowance for future meandering.

The durability and reliability of the existing bridge is an area of concern. The bridge had to be closed for emergency repairs in 2020 to correct severe localized corrosion, loss of section, and perforations in plates. The observed corrosion and loss of section is expected to continue, requiring several future repairs to allow the bridge to remain open during the 20-year study horizon. This requires closure of road and detouring off site. This uncertainty and unreliability of the bridge cannot be corrected without a significant rehabilitation or replacement.

The bridge has been observed to have rust jacking between members which is difficult to remedy without disassembly in a major rehabilitation context.

The existing galvanized steel open grate decking and stringers were installed during the 1986 rehabilitation and the decking may be nearing the end of its expected service life. The fatigue analysis report completed in 2017 indicated that there was potential for some truss members to develop fatigue cracking under full CL3-625-ONT loading. A regular monitoring and maintenance program would be required for the remainder of the service life to address ongoing deterioration at critical locations and inspect the structure for fatigue cracking.

The abutment bearing seats require repairs to ensure stability of the structure, involving jacking and temporary shoring of the bridge, concrete removals, concrete forming and patching and dowelling. Encapsulation of the north abutment bearing seats to prevent additional undermining of the primary truss bearings is recommended.

The steel used in the original design has experienced a long service life to date and may be experiencing fatigue stress. Metal fatigue depends on the level of stress and the number of cycles of loading a member experiences. As the range of stresses and number of cycles increases, the metal can experience strain hardening that can lead a sudden brittle failure of a member or connection. To retain the structure with limited modification would require more frequent inspection and monitoring be undertaken, as a minimum. If the bridge is retained, it would be prudent to undertake additional analysis and non-destructive testing to understand the potential vulnerabilities that may be present.

The bridge has significant structural deficiencies that prevent usage by emergency vehicles due to load limits (in this case, 15 tonnes). The deficiencies affect several structural members and would require extensive modifications to correct. It is not considered feasible to remedy the structural deficiencies with simple measures like addition of strengthening plates, without extensive rehabilitation.

Truck traffic would continue to be required to use an alternate route, which limits nearby residents' access to fire and other emergency services as well as access for service vehicles, and deliveries such as home heating oil.

Maintaining the single lane, alternating direction traffic configuration would continue to pose a collision risk to all users. Cyclists would continue to share the road with vehicular traffic and would need to dismount to safely cross the open grate decking.

Retention of the existing bridge is not recommended due to concerns about frequent repairs, reliability, structural condition, geometric deficiencies, and associated safety hazards.

7.2 Alternative 2: Rehabilitate Bridge

Rehabilitation requires consideration of the extent of modifications, the consequences for the result, and whether these works provide sufficient improvement in the functional adequacy of the bridge.

The size of several structural members is inadequate to support the rehabilitation loads, and these members would have to be increased in size with the addition of cover plates or bolted-on attachments to increase the member cross-section.

To strengthen the chords may require complete replacement of the member, the member connections, or both. In addition, the connections in the truss would have to be increased in strength to suit the enlarged members and this would require disassembly, replacement of existing connection plates with larger ones and redesign of the joints.

The floor beam connection to the vertical members (including diagonals) is a critical aspect of pony truss design. The stiffness of the connection provides the required lateral support to the top chord in for the pony truss, to avoid buckling. The rehabilitation would increase the loads in the top chord and may require a stiffer and stronger connection between the strengthened floor beams and vertical. It may not be possible to strengthen these connections without extensive shoring and potentially complete dismantling and reassembling of the bridge.

Any areas of dismantling and reassembly will require the rivets to be removed, causing a loss of that heritage feature. This can be partially mitigated with button-headed bolts or the use of new hot rivets, but the latter is extremely rare, difficult to achieve and carries added risk due to contractor unfamiliarity with the means and methods of carrying this out with the quality and reliability that is required for bridge construction. Riveting in bridge construction is a specialization that is rarely used, and especially rare in a field setting, typically requiring training from experts outside Canada.

The ability to upgrade the traffic barrier on the bridge is limited by the lack of supporting steel framing. The current steel guide rail that is mounted on the trusses offers negligible protection to the structure from a vehicle collision. A direct collision could damage the truss to an irreparable state and may cause collapse and injury or loss of life. This condition has existed for the entire service life of the bridge, so it represents a case of ongoing risk acceptance in the rehabilitation.

The steel used in the original design has experienced a long service life to date and may be experiencing fatigue stress. Metal fatigue is a property that depends on the level of stress and the number of cycles of loading a member experiences. As the range of stresses and number of cycles increases, the metal can experience strain hardening that can lead a sudden brittle failure of a member or connection. The existing structure would require a thorough inspection, analysis, and review for fatigue stresses. Any members that are nearing or exceeding their fatigue life would have to be replaced.

The rehabilitation of the bridge would also require evaluation of the foundations for added loading due to the rehabilitation. In general (as described in an MTO Bridge Office Bulletin), foundations cannot be assumed to support more than 10% additional load without an extensive foundation investigation and analysis. There is limited information about the foundation for this bridge, making any prediction of its suitability for larger than 10% additional load difficult to determine at this stage. However, it is anticipated that the strengthening of the bridge will add a significant amount of dead load and could exceed the 10% load increase. If the foundation investigation was unable to achieve an appropriate load resistance, then the abutments would have to be strengthened or replaced, adding cost, environmental impacts and a need for temporary support or removal of the superstructure during construction.

The north abutment bearing pedestals supporting the primary truss members (not the stringers) should be reconstructed, as they are currently severely disintegrated and undermining the bearings. The abutments themselves do not have any known distinctive features that would make them important from a historical point of view in terms of materials, form, or construction methods.

Rehabilitation would not allow lengthening of the span which may be required to accommodate bank erosion and meander effects.

The rehabilitation would be of high complexity. The severe corrosion on the below deck elements is expected to be concealing perforations and areas of severe section loss that would be difficult to quantify during design. Impacts to aesthetics and loss of heritage value would result from the rehabilitation design and additional impacts should be anticipated as a result of repair work identified during construction of the rehabilitation. Above-average contingency allowances would be required to cover the risk of additional work.

Overall, the massing and proportions of the bridge would be significantly altered, and most riveted connections would be lost. Many members would either be strengthened by adding large steel plates and shapes, or replaced entirely with larger modern steel members that would alter the appearance and authenticity of any heritage conservation efforts in the design. Consideration should be given to strategies that preserve the heritage value of the truss bridge by relocating it for an adaptive use that requires less alteration than required under a rehabilitation.

If a successful rehabilitation were undertaken, there would remain several aspects of the bridge that could not be corrected and remain deficient. These include the narrow width of the bridge, allowing one lane only at a time with signage to drivers to yield to oncoming traffic, the lack of appropriate traffic barriers, the lack of cyclist or pedestrian accommodation, the continued use of the open steel grating deck which is expensive to maintain and leads to accelerated deterioration of deck truss components below, among other items.

It should be noted that the rehabilitated bridge would still require a posting load limit sign and the road still may require a ‘no trucks’ signage, depending on the load limit achieved in the rehabilitation.

Maintaining the single lane, alternating direction traffic configuration would continue to pose a collision risk to users, including cyclists who share the road with vehicular traffic. Open grate decking can be hazardous to cyclists, so signage directing them to dismount to safely cross the structure would remain in place.

Rehabilitation of the bridge is not recommended due to the limited improvement that is possible from a structural strength perspective, no improvement to the width and span, and the loss of heritage and aesthetic character that would arise from the extensive modifications.

7.3 Alternative 3: Replace Bridge

Bridge replacement provides the most improvements to the safety and overall function of the crossing. The replacement structure would be designed in accordance with current standards and would provide access for truck traffic, including emergency vehicles and large service trucks.

A new two-lane configuration would reduce collision risk and improve access for commuter cyclists. A concrete deck and asphalt wearing surface could be provided to improve the rideability for users and help protect the primary structural members from corrosion, reducing maintenance requirements. Minimal maintenance would be expected for the first 20 years. Modern structural configurations and materials could be used, resulting in a more durable structure with lower ongoing maintenance requirements.

Provision of a longer span replacement bridge structure would improve the hydraulic opening and provide increased conveyance. The span could be increased to include an allowance for spanning the meander belt or erosion limits of the river. The roadway profile could also be improved along the approaches to improve sight lines and meet City geometric design criteria.

Replacement of the bridge would represent Option 8 in the rank order of heritage options (removal and replacement due to functional obsolescence). The Guidelines recommend “sympathetic design”, which means making new work physically and visually compatible with heritage attributes for the replacement, using similar materials and design elements where possible. This perspective would suggest the construction of a modern bridge of a similar type to the original (i.e. a modern pony truss bridge). Conventional two lane pony truss bridges are fairly common and are typically used for spans of up to 30 m. However, two lane pony truss bridges have been constructed in spans up to 81 m but longer spans typically feature lightweight deck systems and narrower lane widths and represent less conventional and more costly design approaches.

Consideration could be given to rehabilitating (and potential narrowing) of the existing bridge after removal for re-use as a pedestrian or cycling bridge at another site. It would require a suitable relocation site be determined. This approach would provide conservation through adaptive reuse and may reduce the need for the replacement vehicular structure to consider sympathetic design for the bridge replacement. The identification of a suitable relocation site and function has not been established, so this approach is referred for future consideration.

A commemorative monument could be erected at the site to recognize the history of the original structure.

7.4 Recommended Alternative

Bridge replacement is the recommended alternative for this site (Alternative 3). Retaining the original structure (Alternative 1) is not feasible based on its current condition. The existing design is functionally obsolete, and rehabilitation (Alternative 2) cannot address all of the safety concerns and functional deficiencies of the single lane crossing and would require major modifications, essentially removing the bridge's heritage value.

This Functional Design Report is focused on bridge engineering, with reference to roadway geometrics and other factors as appropriate. The evaluation of alternative solutions, from this perspective, is summarized in **Table 1**. A more comprehensive multi-factor evaluation of alternative solutions is included in the TMP report.

Table 1: Summary of Evaluation of Alternative Solutions

Criteria	Alternative 1: Retain	Alternative 2: Rehabilitate	Alternative 3: Replace
Bridge Condition and Function	Capacity, durability, reliability, risk, and high repair frequency.	Service life extended, but bridge would remain one lane with load posting.	New bridge would meet current bridge and geometric standards.
Heritage	Cultural heritage value would be maintained for study period.	Rehabilitation would deter from the heritage conservation.	Sympathetic design and adaptive reuse may mitigate impacts.
Implementation	Significant ongoing repairs and monitoring for study period.	Cannot strengthen to current standards or widen to two lanes.	Normal bridge and roadway design and construction

For the purposes of this report, a modern panel bridge has been recommended as the replacement structure type with a focus on sympathetic design, given the uncertainty of other heritage mitigations.

7.5 Heritage Conservation Options Review

Heritage conservation options are based on the 'Conservation of Historic Places in Canada;' (Parks Canada, 2010) which provides principles for infrastructure conservation and references the Ontario Heritage Bridge Guidelines (MTO, 2008) for the specific case of bridges. This provides a rank-order approach to heritage bridge conservation options, ranging from least to most heritage impact. The rank-order approach requires each option to be evaluated and found to be non-viable before the subsequent option is considered. The rank-order options that were considered are listed in **Table 2**.

Table 2: Heritage Options Review

Conservation Option	Evaluation Summary
1. Retain existing bridge with no major modifications	Not viable due to the poor condition of the bridge.
2. Retain & restore missing or deteriorated elements	Not viable because localized repairs will not achieve the required structural capacity and durability.
3. Retain bridge with sympathetic modification	Not viable because sympathetic modification would require strengthening of all members and connections to an impractical size and scale, obscuring the original bridge from sight and destroying any residual heritage appearance or value.
4. Retain with sympathetically designed new structure nearby	Not viable to retain the bridge on its current alignment because it cannot be rehabilitated for the required loads, and changing the roadway alignment to bypass the bridge would create road safety concerns. This option would also not be feasible within the roadway right-of-way allowance.
5. Retain & adapt for alternative use	Not viable to retain the bridge in-place for alternative use because a vehicular crossing is required at this location.
6. Retain as heritage monument for viewing purposes	Not viable to retain the bridge in-place as a monument because a vehicular crossing is required at this location.
7. Relocate – applicable for smaller, lighter structures	Relocation of the steel pony truss is a viable option, requiring strengthening for an alternative use (e.g. pedestrian crossing on a trail). This option may be considered if a suitable site can be determined, and it should be recognized the rehabilitation will be extensive for any use and may involve modifying the bridge to make it narrower and reduce the load demands. This option could be applied in conjunction with a replacement bridge (option 8) to address the need for a vehicular crossing.
8. Remove & replace – consider sympathetic details	For sympathetic details, the replacement bridge could be constructed using a modern type of pony truss bridge. The span lengths would be modified to suit the site. Removal of the existing bridge may also include relocation for alternative use as outlined under option 7.
Recommendation:	**Remove and replace bridge (option #8, perhaps with option #7).**

Heritage conservation is an important consideration in the assessment of bridge alternative solutions, and in the overall evaluation of alternative solutions in the TMP, which will be addressed in the “Cultural Heritage Resource Assessment Report” and a “Heritage Impact Assessment Report” by ASI, to assess the recommended alternative solutions from a heritage perspective.

8.0 Functional Design (Recommended Alternative)

The layout of the recommended alternative has been advanced to an approximate 10% level of design development. Future preliminary and detailed engineering studies will be required to refine the design.

8.1 Functional Design of Replacement Structure

Based on the existing profile and stream alignment, it is anticipated that a single span of approximately 36 m. Hydraulic conveyance and fluvial geomorphology investigations during preliminary or detailed design may indicate changing the span length. Other factors, such as roadway profile and management of abutment height may also modify the layout from the concept provided here. The vertical profile may be raised to meet hydraulic conveyance and geometric design requirements.

The new structure is expected to remain on the existing (straight) alignment and include two traffic lanes with shoulders. The roadway width on the bridge is anticipated to be 11.6 m wide from face-to-face of curbs, with a bridge layout as described below:

- Two 3.3 m wide traffic lanes;
- Two 2.5 m wide raised concrete shoulders separated from the main lanes by a mountable concrete curb;
- Two bicycle-height four tube combination TL-4 (SS110-34) traffic railings mounted on concrete curbs; and
- Pony truss members located outside of the bridge railings.

A sympathetically designed pony truss bridge is recommended given the uncertainty of the other heritage mitigations. A detailed analysis will need to be completed as part of the preliminary design to assess feasibility of proposed deck width based on proposed construction materials to be supported by a “sympathetic” modern pony truss bridge structure.

The test level requirements of the barrier system are based on the approach roadway/structure geometry, traffic volumes and barrier side clearance. A TL-4 four tube combination traffic/bicycle railing is recommended to both satisfy the test level requirements and provide protection to above deck truss components with respect to potential vehicle impact loads as the railing is offset from the structure itself. An alternate parapet wall or parapet wall/railing system could also be considered to provide better protection from de-icing chemicals to truss components within the splash zone. However, this type of system would add additional weight, be less aesthetically pleasing and will be less sympathetic to the existing structure from a heritage perspective.

No sidewalk facility is included. In the future, if pedestrian accommodation is needed within the City right-of-way, a separate pedestrian bridge could be added adjacent to the crossing.

During preliminary design the relative advantages of increased structure width versus optimization of the structure load carrying components will need to be assessed, particularly with respect to the unbraced top chord and the U-Frames providing the necessary stiffness to prevent buckling of the top chord. Future design considerations could include but are not limited to restricting deck width between curbs to 10 m (restricting to two design lanes rather than three design lanes, as defined by the CHBDC), use of lightweight deck materials, arching of the top chord and/or use of stiffer steel components with closed sections that are less prone to buckling.

A functional design general arrangement drawing of the proposed bridge is provided in **Appendix C**, and a cost estimate is provided in **Appendix D.**

8.2 CP Rail Bridge over Meadowvale

The CP Rail crossing over Meadowvale Road will continue to present a vertical clearance constraint on truck access, including fire trucks. As an interim solution, until the CP structure is replaced (under a separate study), it is proposed that the roadway be lowered over an approximate length of 30 to 40 meters at each approach using retaining walls to increase the clearance. This would require further investigation. The use of foundation insulation is anticipated, to provide frost protection. Based on the existing clearance of 3.5 m, a lowering of the road by 0.6 m to 0.7 m may be sufficient to allow fire trucks and most other vehicles to pass under the CP Rail bridge.

9.0 Other Considerations

9.1 Hydraulics and Hydrology

A Hydraulic Report was provided under separate cover. The key hydraulic design criteria for Hillside Bridge are summarized as follows:

High water level based on 1:50 year design flow is estimated to be 125.82 m. Existing freeboard and clearance are estimated to be 5.83 m and 5.03 m, respectively. These are both well above the minimum freeboard and clearance requirement of 1.0 m.

9.2 Navigability

The Little Rouge River is not included on the List of Scheduled Waters under the *Canadian Navigable Waters Act*.

9.3 Access to Site

The site is readily accessible from Meadowvale Road. Based on discussions with the City, full closure of the road during bridge construction is feasible. Therefore, no on-site detour bridge was assumed for this site. Further development of closure details or alternate staged construction recommendations should be investigated as part of the (future) preliminary design.

9.4 Environmental Considerations

This Transportation Master Plan is being completed in accordance with the Municipal Class Environmental Assessment process, using Approach #2, where the level of investigation, consultation and documentation shall fulfil the requirements for Schedule B projects, as a minimum. This includes completion of Phase 1 (problem/opportunity definition) and Phase 2 (evaluation and selection of a recommended solution) of the Class EA process.

Identification of environmental factors (e.g., natural habitat, archaeology, cultural heritage, hydrology and hydraulic conveyance, fluvial geomorphology, geotechnical and foundation conditions, traffic, etc.) will need to be completed as part of the Preliminary Design for the recommended alternative following completion of the Rouge Park Bridges TMP.

9.5 Hazardous Materials

Based on the age of the structure, the presence of lead paint is possible and should be assumed to be present, or testing undertaken to determine its presence.

9.6 Future Study Requirements

Additional studies that should be undertaken as part of preliminary design of the recommended alternative include, but are not limited to:

- Geotechnical Investigation - to determine subsurface conditions at proposed bridge foundations.
- Natural Habitat Studies – to determine potential environmental impacts of replacement alternatives and alternate alignments (including SAR, tree inventory, etc).
- Archealogical Study
- Cultural Heritage Study
- Hydrology, Hydraulic Conveyance and Fluvial Geomorphology Study – including a detailed hydraulic model to confirm hydraulic requirements and determine bank erosion limits.
- Traffic Study – to better determine proposed construction staging impacts.
- Survey – to confirm roadway geometry and provide detailed basemapping.

10.0 Closure

The foregoing summarizes the structural existing conditions at **Hillside Bridge on Meadowvale Road (No. 806)**. Alternative Solutions for retaining, rehabilitating, and replacing the structure are presented and assessed and a recommended solution is recommended for this bridge project site, one of five bridge project sites considered under the Rouge Park Bridges Transportation Master Plan.

DILLON CONSULTING LIMITED

Reviewed by:

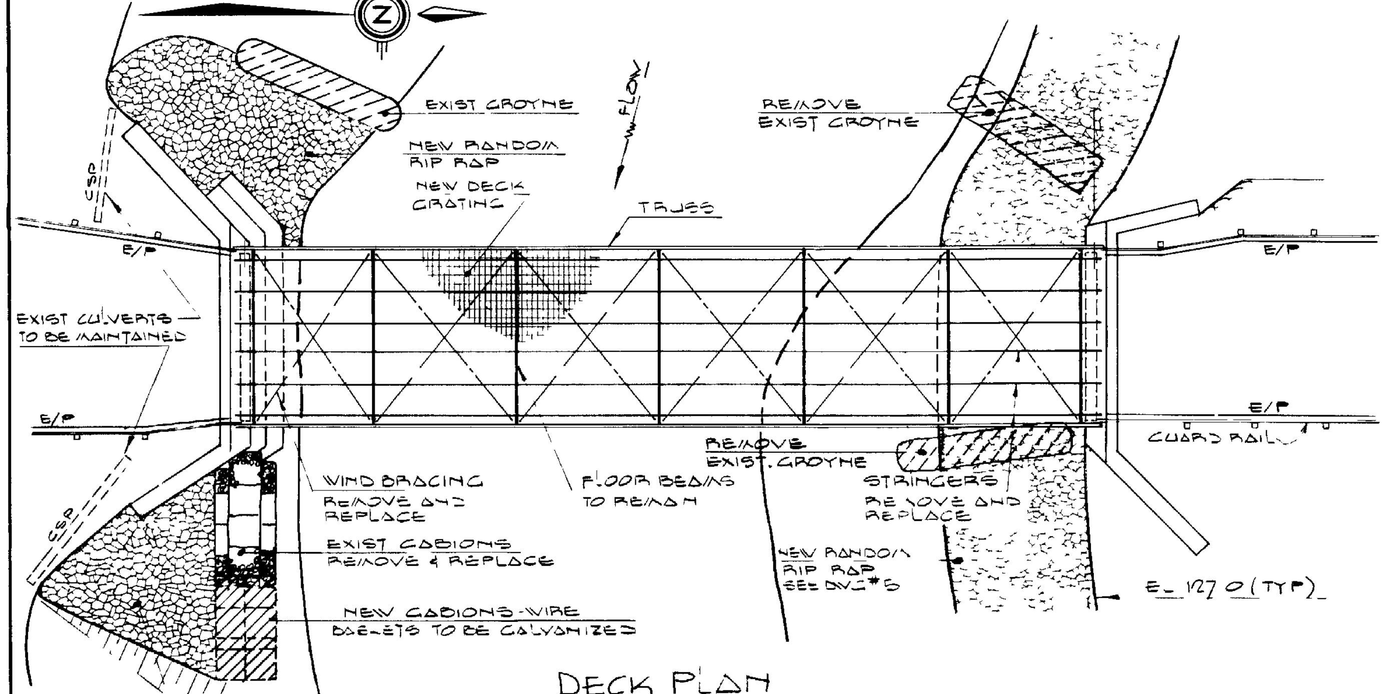
Janette McCann, M. Eng, P.Eng.
Associate, Structural Engineer

Reviewed by:

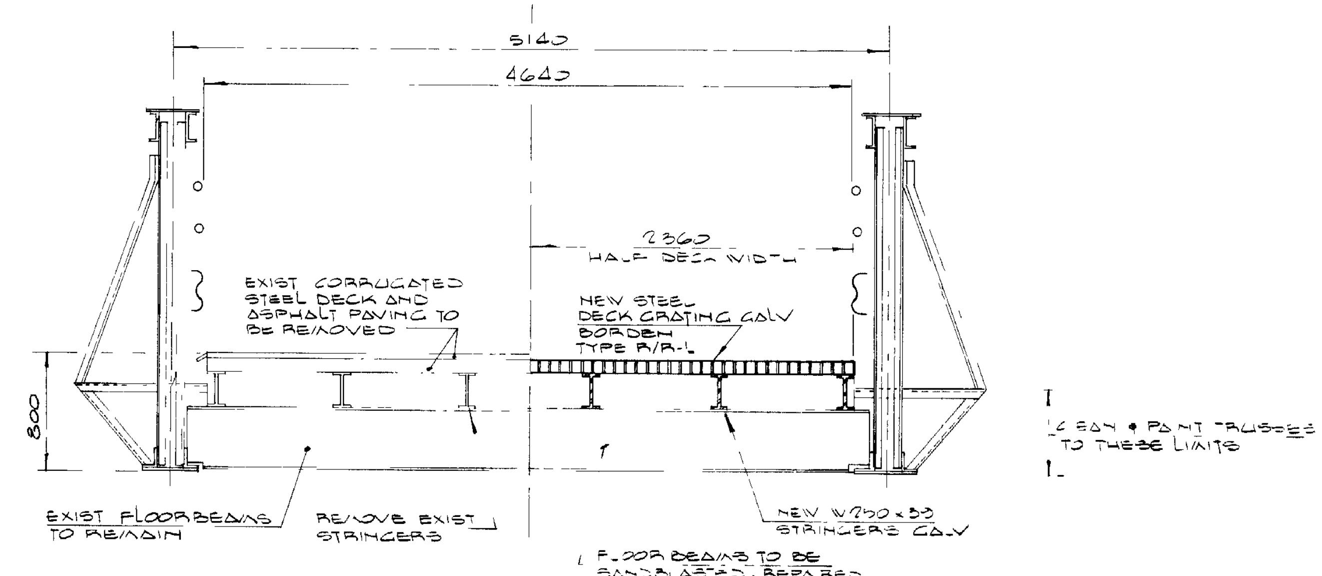
Chris Haines, P.Eng.
Project Manager, Structural Engineer

Appendix A

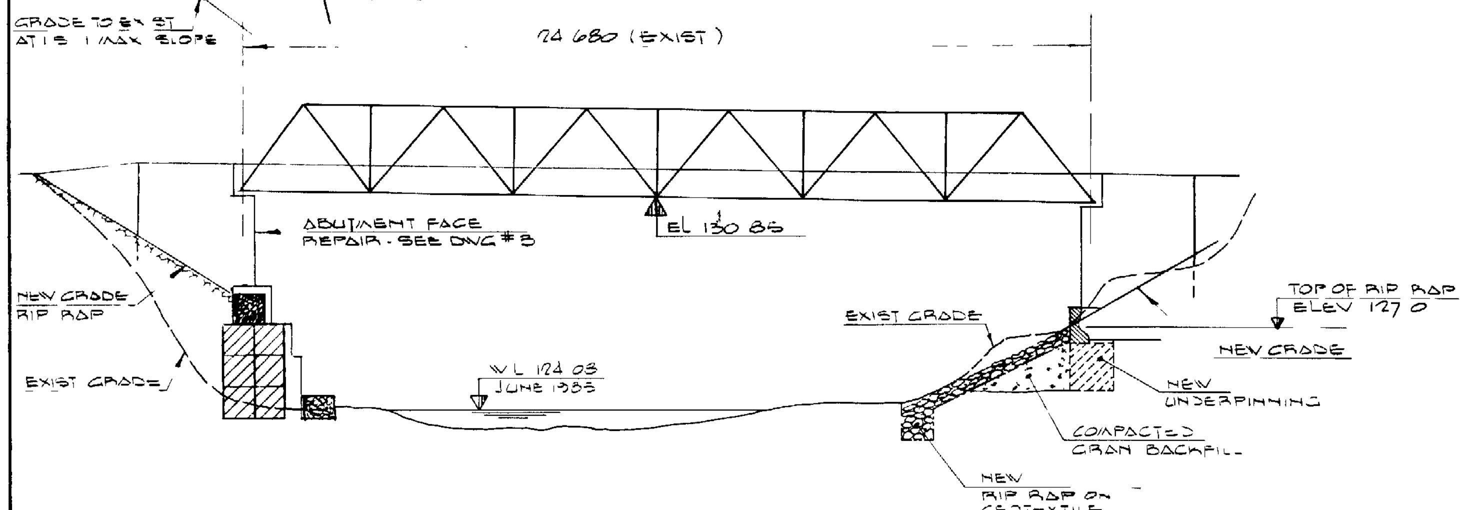
Drawings of Existing Bridges



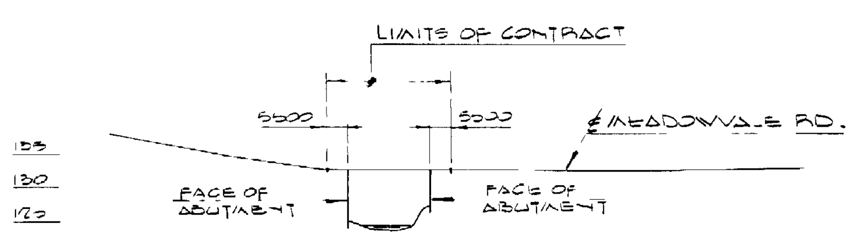
DECK PLAN
1:100



TYPICAL SECTION
1:25



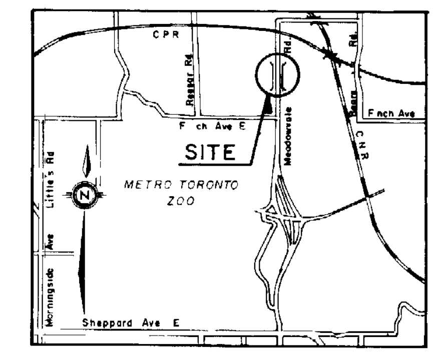
ELEVATION
1:100



℄ ROAD PROFILE
1:200 HOR
1:50 VER

SCOPE OF WORK

1. CLOSE BRIDGE TO ALL TRAFFIC
2. REMOVE EXISTING CORRUGATED STEEL DECK AND ASPHALT PAVING
3. REMOVE EXISTING STRINGERS AND WINDBRACING
4. REMOVE BALLAST WALLS AND BEARING SEATS AT BOTH ABUTMENTS AND RE-BUILD
5. INSPECT FLOOR BEAMS AND LOWER SECTION OF TRUSSES, REPAIR IF REQUIRED, SANDBLAST AND APPLY NEW COATING
6. REMOVE TWO GROYNES IN FRONT OF NORTH ABUTMENT
7. UNDERPIN NORTH ABUTMENT FOOTING AND SOUTH ABUTMENT WEST WING WALL FOOTING
8. REPAIR CONCRETE IN SOUTH ABUTMENT BY RE-FACING
9. REMOVE AND RE-BUILD GABIONS
10. CONSTRUCT NEW RIP-RAP SLOPE PAVING ON GEOTEXTILE IN FRONT OF NORTH ABUTMENT AND ON BOTH SIDES OF SOUTH ABUTMENT
11. FABRICATE, DELIVER AND ERECT NEW STRINGERS, WIND BRACING AND GRATING
12. ADJUST PAVEMENT GRADE TO SUIT



KEY PLAN

GENERAL NOTES:

1. CLASS OF CONCRETE
   ALL NEW CONC SHALL BE 30MPa
2. REINFORCING STEEL
   GRADE 400
   BAR MARK WITH SUFFIX C DENOTES COATED BAR
3. CLEAR COVER TO REINF STEEL

FOOTINGS	100 mm ± 25
FRONT FACE OF ABUTMENT	80 mm ± 20
REMAINDER	70 mm ± 20

4. CONSTRUCTION NOTES
   THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS OF THE EXISTING WORK AND ALL DETAILS ON SITE AND REPORT ANY DISCREPANCY TO THE ENGINEER BEFORE PROCEEDING WITH THE REPAIR WORK.

LIST OF DRAWINGS:

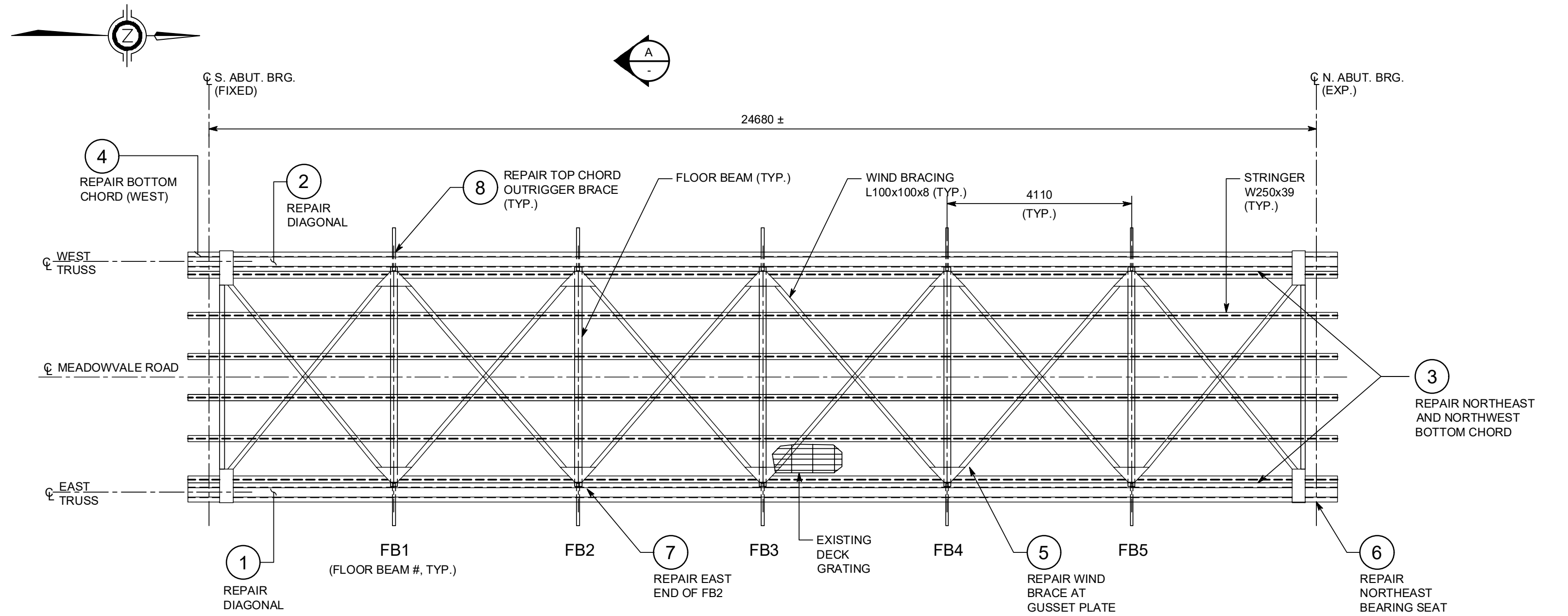
1. GENERAL ARRANGEMENT
2. STRUCTURAL STEEL
3. SOUTH ABUTMENT
4. NORTH ABUTMENT
5. RIP RAP PLAN

08499 V01

5006-S-4

APPROVED	
CONSULTANT	
DATE	
REGISTERED PROFESSIONAL ENGINEER B FARAGO PROVINCE OF ONTARIO	
CITY OF SCARBOROUGH WORKS DEPARTMENT	
Wyllie & Ufnal consulting engineers	
No / BY / REVISIONS / DATE	
DESIGN	
DRAWN	G S
CHECKED	
APPROVED	B F
DATE	AUG 1986
SCALE	AS NOTED
REHABILITATION OF HILLSIDE BRIDGE	
GENERAL ARRANGEMENT	
PROJECT No	8527
DRAWING No	1
SHEET OF	

FILE No 2856A



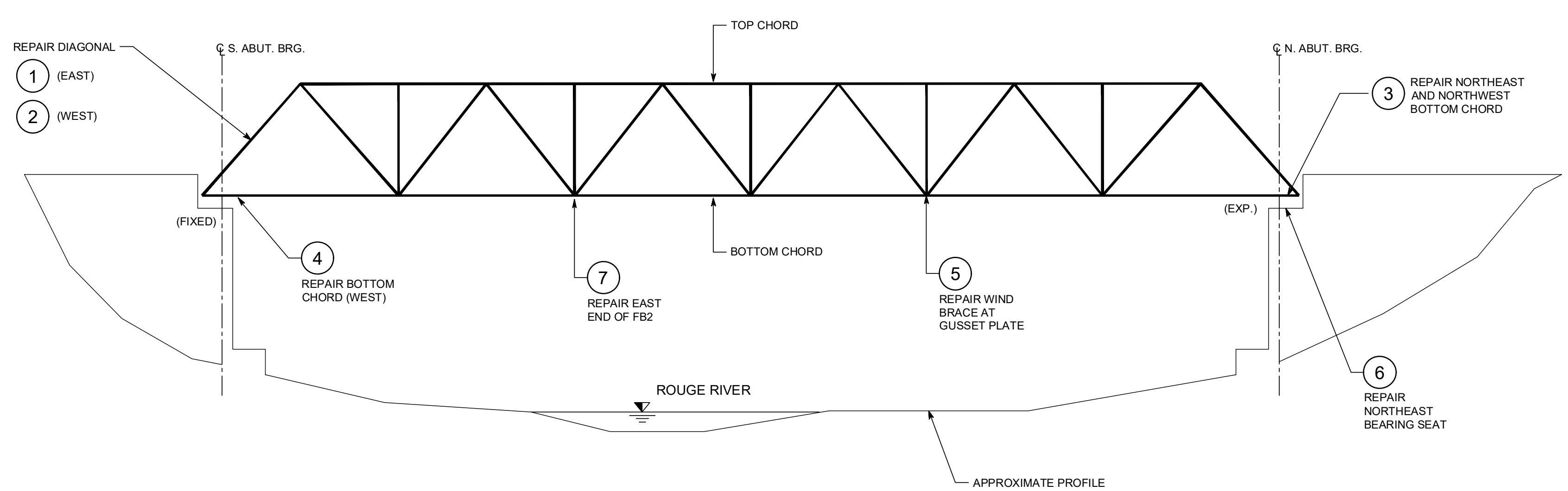
PLAN
1 : 75

NOTES:

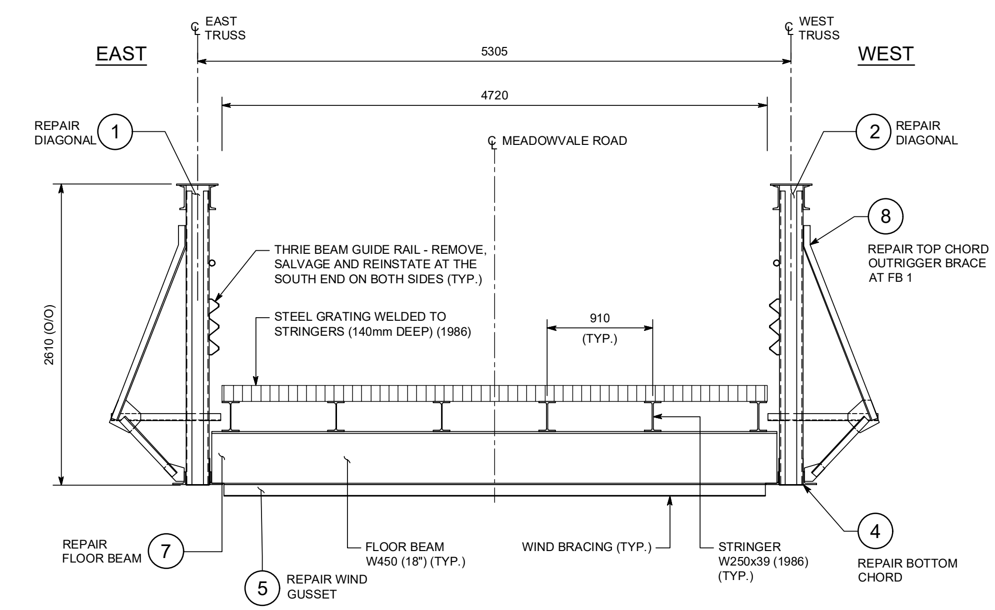
1. STRUCTURAL STEEL SHALL CONFORM TO CAN/CSA G40.20/G40.21-04 GRADE 300W OR 350W.
2. STRUCTURAL STEEL SHALL BE FABRICATED AND ERECTED IN ACCORDANCE WITH OPSS906.
3. BOLTS SHALL BE M22 SIZE, GALVANIZED AND CONFORM TO ASTM STANDARD A325M TYPE 1. BOLTS THREADS SHALL BE EXCLUDED FROM SHEAR PLANES.
4. RIVETS SHALL BE REMOVED USING MECHANICAL MEANS IN A MANNER SUCH THAT EXISTING STEEL TO REMAIN IS NOT DAMAGED.
5. CONCRETE REPAIR MATERIAL SHALL BE AN APPROVED PROPRIETARY MIX SUCH AS SIKA. PROVIDE PROTECTION FROM FROST WHILE CURING.
6. WHERE NECESSARY, EXISTING RIVET HOLES SHALL BE REAMED TO ALLOW FOR INSTALLATION OF NEW BOLTS IN EXISTING STEEL.
7. WELDING SHALL BE IN ACCORDANCE WITH CSA STANDARD W59. FIELD WELDING SHALL BE CARRIED OUT BY WELDERS CERTIFIED TO DIVISION 1 OR 2, CSA W47.1.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL FIELD MEASUREMENTS AND VERIFICATION OF MEMBER/COMPONENT SIZES FOR ORDERING MATERIALS REQUIRED TO DO THE WORK.
9. UNLESS OTHERWISE NOTED, THE MINIMUM FILLET WELD SHALL BE AS FOLLOWS:

MATERIAL THICKNESS THICKER PART JOINED (mm)	MINIMUM SIZE OF FILLET WELD (mm)
UP TO 12 INCLUSIVE	5
OVER 12 TO 20	6
OVER 20 TO 40	8

10. ENSURE STABILITY OF ALL COMPONENTS DURING HANDLING, TRANSPORTATION, ERECTION AND CONSTRUCTION. MAINTAIN STABILITY SAFEGUARDS DURING REHABILITATION.
11. THESE DRAWINGS WERE PREPARED BY DOUG DIXON & ASSOCIATES INC FOR TORBRIDGE CONSTRUCTION AS PART OF A DESIGN/BUILD CONTRACT.



ELEVATION
1 : 75



SECTION A
1 : 30

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, DETAILS, AND ELEVATIONS OF THE EXISTING STRUCTURE THAT ARE RELEVANT TO THE WORK IN ADVANCE OF FABRICATION OF ANY COMPONENT TO ENSURE THE PROPER LAYOUT AND FIT-UP OF ALL COMPONENTS AND TO ENSURE THE CONTRACTOR'S CHOSEN CONSTRUCTION MEANS AND METHODS ARE APPROPRIATE. PROPER FIT-UP OF ALL COMPONENTS AND SELECTION OF MEANS AND METHODS ARE SOLELY THE CONTRACTOR'S RESPONSIBILITY.

MEASUREMENTS SHOWN ON THESE PLANS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED

DOUG DIXON & ASSOCIATES INC
CONSULTANTS

CAD FILE: \\DDASHARE\Projects\Projects\20-095 Morningside Bridge over Rouge River\DDA CAD files\20-095_GA.dwg
MODIFIED: 2020-11-23 5:41:34 PM BY: ypatel
PLOTTED: 2020-11-23 5:41:49 PM BY: ypatel

No.	DATE	REVISIONS	INITIAL	SIGNED
	11-23-2020	ISSUED FOR CONSTRUCTION	D.D.	

DIGITAL INFORMATION

TORONTO Engineering & Construction Services

LICENSED PROFESSIONAL ENGINEER R.SHANMUGALINGAM 100154578 NOV 23/20 PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER D. G. DIXON NOV 23/20 PROVINCE OF ONTARIO

MICHAEL D'ANDREA, P.ENG
CHIEF ENGINEER AND EXECUTIVE DIRECTOR
Engineering & Construction Services

FRANK CLARIZIO, P.ENG.
Director, Design & Construction
Transportation Infrastructure

JODIE ATKINS, P.ENG
Senior Manager, Bridges, Structures & Expressways, Design & Construction
Transportation Infrastructure

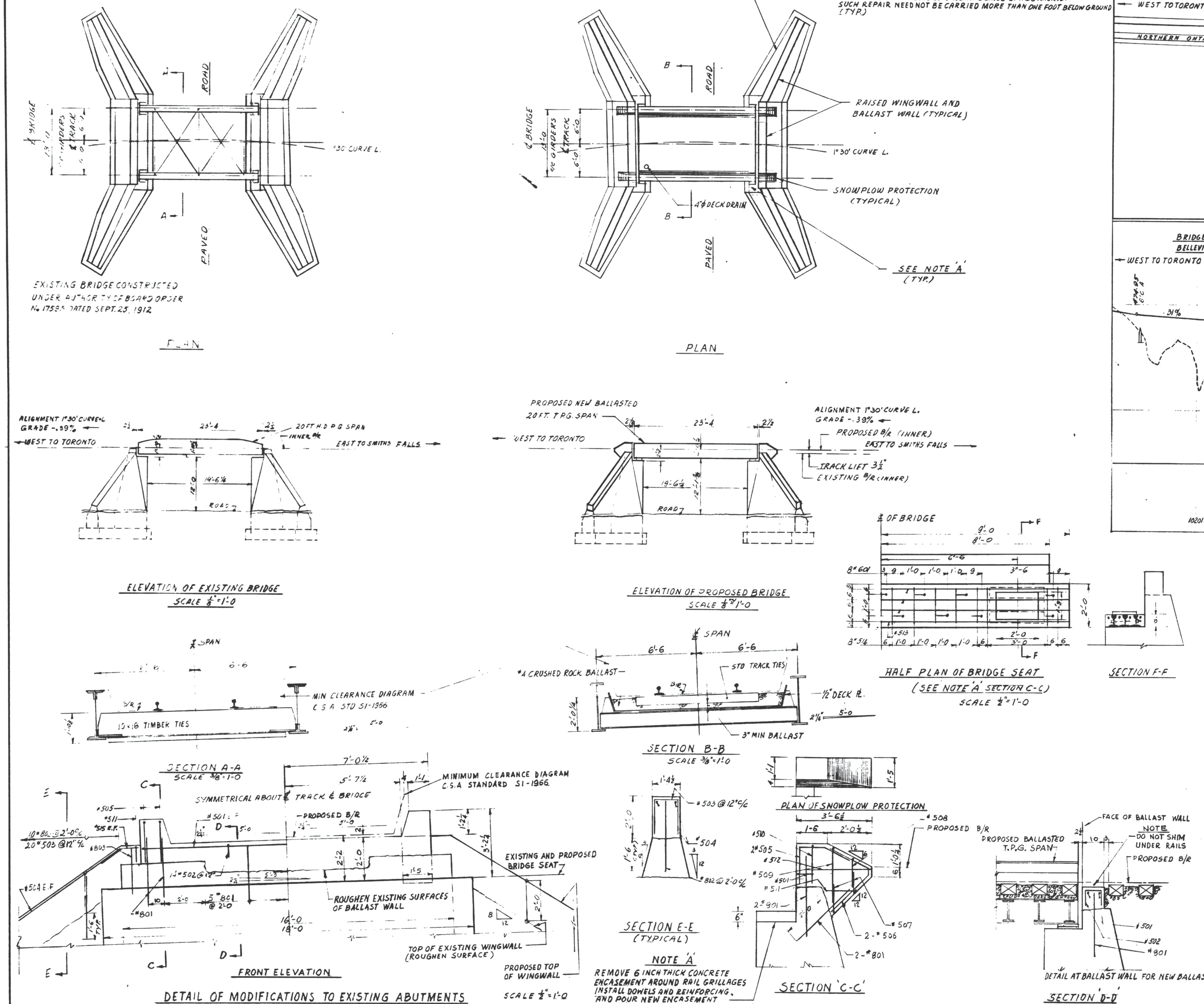
HILLSIDE BRIDGE

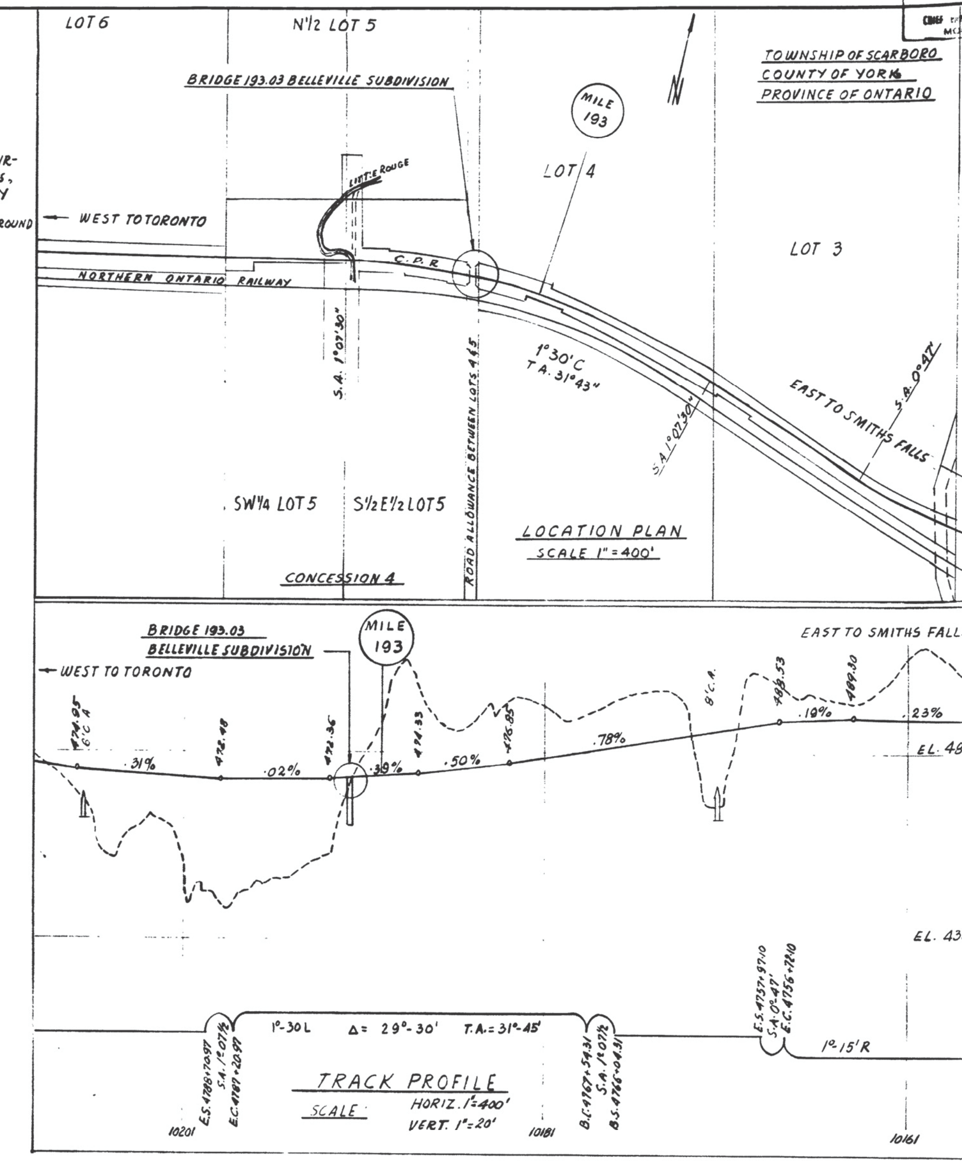
OVER LITTLE ROUGE RIVER
STRUCTURAL STEEL REPAIR
GENERAL ARRANGEMENT

DESIGN	R. SHAN	DRAWN	A. ZHANG	CHECKED	D. DIXON	CONTRACT No. ----
SCALE	AS NOTED			DRAWING NUMBER	806-S5006-9	SHEET S1
DATE	November 23, 2020					

NOTE "B"

REMOVE ALL LOOSE AND DETERIORATED CONCRETE FROM THE FRONT SURFACES OF ABUTMENTS AND WINGWALLS TO A MINIMUM DEPTH OF 4 INCHES, INSTALL DOWELS AND WIRE MESH REINFORCEMENT, AND APPLY GUNITE SO AS TO RESTORE ORIGINAL LINES OF ABUTMENTS. SUCH REPAIR NEED NOT BE CARRIED MORE THAN ONE FOOT BELOW GROUND (TYP.)





GENERAL NOTES

DESIGN LOADING FOR STEEL SPAN: COOPER'S E75 WITH DIESEL IMPACT.

CONCRETE: TO BE IN ACCORDANCE WITH C.P. LTD. BRIDGE SPECIFICATION No 221, ISSUE No 2 DATED NOV. 22, 1972. ALL CONCRETE TO BE NORMAL PORTLAND CEMENT CONCRETE WITH A COMPRESSIVE STRENGTH OF 4000 P.S.I. IN 28 DAYS. MAXIMUM SIZE OF AGGREGATE TO BE ¾" CHAMFER ON EXPOSED EDGES TO BE 1"

REINFORCING STEEL: TO BE IN ACCORDANCE WITH C.S.A. STANDARD G30-1, INTERMEDIATE OR HARD GRADE, OR C.S.A. STANDARD G30.2, USING DEFORMED BARS. RAIL STEEL OR HARD GRADE BILLET STEEL SHALL NOT BE USED IN BENT BARS.
MINIMUM CLEAR CONCRETE COVER TO REINFORCING STEEL TO BE 2".

ANCHOR BOLTS: HOLES FOR ANCHOR BOLTS TO BE DRILLED AFTER SPAN IS LOCATED ON BRIDGE SEATS, AND ANCHOR BOLTS TO BE GROUTED IN PLACE, UNLESS OTHERWISE APPROVED BY THE CHIEF ENGINEER.

REFERENCE DRAWINGS:
- B-1-1061 MASONRY PLAN DATED JULY 22, 1912
- 49805 EXISTING STEEL SPAN
- 57027 TITLE RECORD PLAN DATED AUG. 24, 1918
- 291-9 TRACK PROFILE DATED JULY 1946
- 925 FORM DATED SEPT. 1964
- INSPECTION SKETCH No 1304 DATED OCT. 11, 1973.

LIST OF PLANS:
- B-1-3164-1 GENERAL ARRANGEMENT (THIS PLAN)
- B-1-3099-1 BALLASTED 20 FT. T.P.G. SPAN
- RS-1-3164-1 REINFORCING BAR SCHEDULE

ESTIMATED QUANTITIES:
- CONCRETE 23 CU. YDS
- REINFORCING STEEL 1895 LBS (EXCLUDING DOWELS & WIRE MESH AS PER NOTE 'B')
- STRUCTURAL STEEL 21,500 LBS.

NO	DATE	REVISION	BY
	SEPT. 4. 1974	DIVISION REVISED	M.C.
	AUG. 8. 1974	SIGNED & ISSUED.	
	MAY. 8. 1974	PRELIMINARY	

Canadian Pacific Limited
OFFICE OF THE CHIEF ENGINEER, WINDSOR STATION, MONTREAL, QUE

EASTERN REGION - TORONTO DIV.
BRIDGE 193.03 BELLEVILLE SUBDIV.

GENERAL ARRANGEMENT
(REPLACEMENT OF STEEL SPAN)

J Berger — ENGINEER IN CHARGE
[signature] — ENGINEER OF BRIDGES AND STRUCTURES
C. [signature] — CHIEF ENGINEER

OFFICE FILE NO 6-326-193.0 | PLAN NO. B-1-3164-1 | SCALE AS NOTED | DR. M.C. CH. U.T.

2505

Appendix B

Site Photographs

DILLON
CONSULTING

Meadowvale Road Looking South

Meadowvale Road Looking North

Hillside Bridge, Looking North

West Side of Bridge

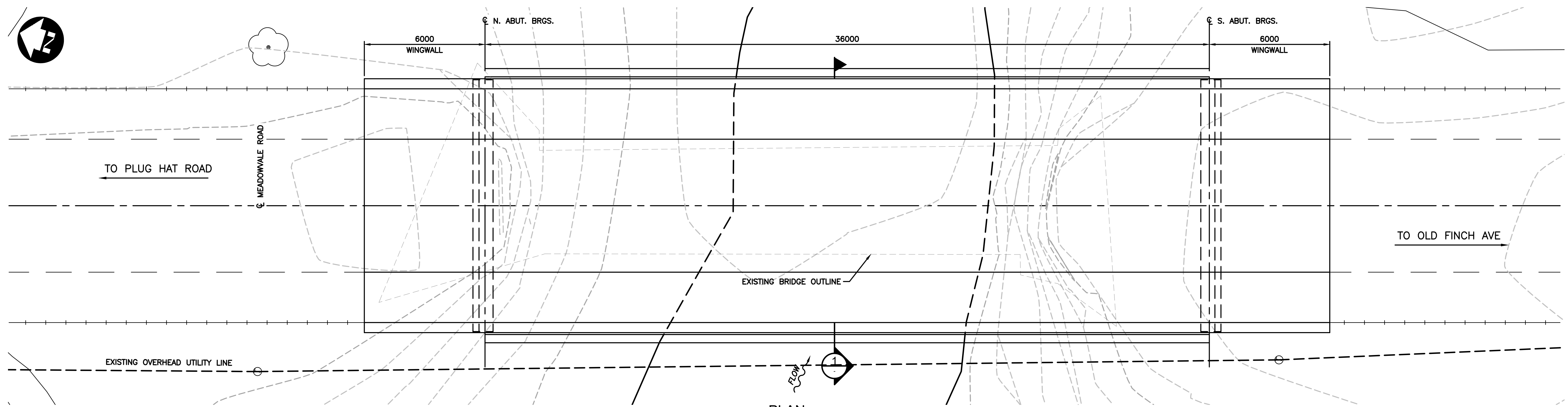
Bridge Deck, Guide Rail and Railing

CP Rail Bridge over Meadowvale Road

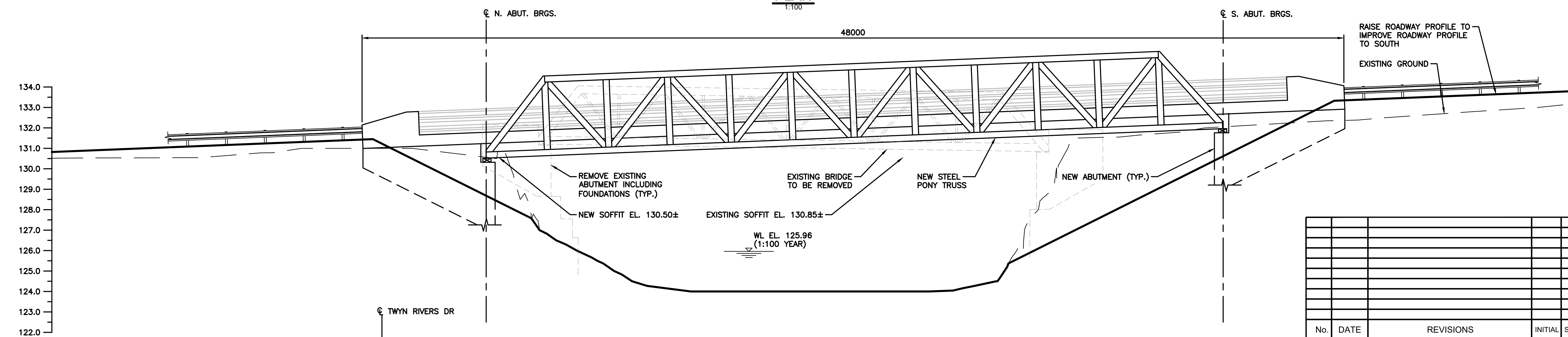
Appendix C

General Arrangement Drawing for the Recommended Alternative

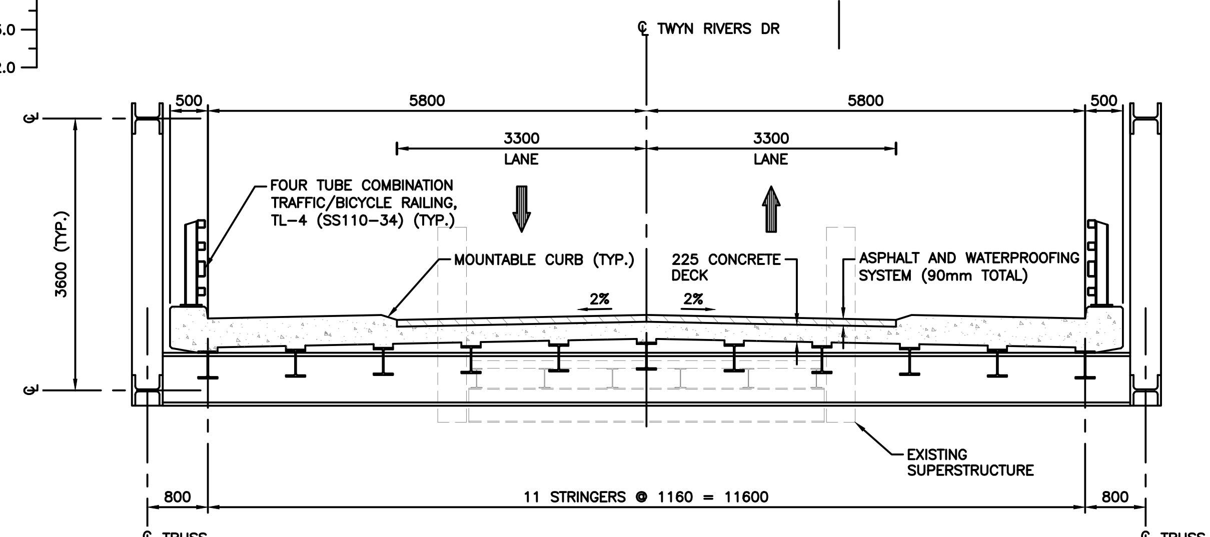
DILLON CONSULTING



PLAN
1:100



WEST ELEVATION
1:100



1 SECTION
1:50

PRELIMINARY

No.	DATE	REVISIONS	INITIAL	SIGNED

DILLON CONSULTING
235 Yorkland Blvd., Suite 800, Toronto, ON M2J 4Y8
Phone: (416) 229-4646 Fax (416) 229-4692

APPROVED ____________

SIGNATURE ____________
NAME (PRINT) ____________
DATE ____________

ROUGE PARK BRIDGES TRANSPORATION MASTER PLAN

HILLSIDE BRIDGE (No. 806) ON MEADOWVALE ROAD OVER LITTLE ROUGE RIVER

DESIGN	---	DRAWN	SJM	CHECKED	---	JOB No. 19-1924
SCALE:	AS NOTED				DWG:	
DATE:	DECEMBER 2023				SHEET	OF

Appendix D

Cost Estimate

Rouge Park Bridges Transportation Master Plan Hillside Bridge (Site ID 806) Recommended Alternative (Replace Bridge)					
No.	Item Description	Unit	Quantity	Unit Price	Total
1	Removal of existing span (disassemble, catalog, deliver)	lump sum	1	$ 200,000	$ 200,000
2	Removal of existing aburments	lump sum	2	$ 25,000	$ 50,000
3	Abutments (incl. joints & approach slabs)	lump sum	2	$ 250,000	$ 500,000
4	Steel pony truss (fabrication, coating, delivery, erection)	m2	450	$ 8,000	$ 3,600,000
5	Concrete deck and curbs (incl. reinforcing)	m3	150	$ 2,000	$ 300,000
6	Asphalt and waterproofing	m2	324	$ 150	$ 50,000
7	Traffic railing (bicycle height)	m	100	$ 1,000	$ 100,000
8	Approach road improvements (grade raise, paving, railings)	lump sum	1	$ 350,000	$ 350,000
9	Bank stabilization at abutments (riprap, topsoil, sod, etc.)	lump sum	1	$ 150,000	$ 150,000
10	Commemorative monument	lump sum	1	$ 15,000	$ 15,000
11	(Provisional) Lowering road at CP Rail bridge (Meadowvale Road)	lump sum	1	$ 150,000	$ 150,000
12	Contingency allowance (25%)				$ 1,370,000
				Construction:	$ 6,840,000
				Environmental & Preliminary Design (5%):	$ 340,000
				Detailed Design (10%):	$ 680,000
				Contract Administration (10%):	$ 680,000
				TOTAL:	$ 8,540,000

Notes:

1. Costs in 2023 dollars. Taxes and permits additional.