is accepting Proposals for the following:

RFP# 1/2026
McEachern Bridge Replacement over Boyne River

Proposals will be received until **12:00 p.m.** Central Time on **Wednesday, February 4, 2026**:

Rural Municipality of Dufferin
12 – 2nd Avenue Southwest, Box 26
Carman, R0G 0J0

Envelope to be sealed and clearly marked:

"RFP# 1/2026
MCEACHERN BRIDGE REPLACEMENT
OVER BOYNE RIVER"

General inquiries may be directed to:

Rodney Last, Municipal Foreman
12 – 2nd Avenue Southwest, Box 26
Carman, R0G 0J0
Office: (204) 745-7582
Email: shop@rmofdufferin.com

REQUEST FOR PROPOSALS

1.0 Invitation

The Rural Municipality of Dufferin (Municipality) is seeking a Contractor to replace the McEachern Bridge located in the SW 28-6-4 WPM on Road 22W, ½ mile north of PTH 3 spanning the Boyne River, east of Carman, Manitoba.

The Work includes the demolition of the remaining bridge structure and the construction of a new bridge.

Addenda may be issued during the RFP process. Addenda will become part of the RFP Documents. Include costs for all issued addenda in the proposal price. Verbal answers are only binding when confirmed by written addenda.

2.0 Background

The site was formerly a 4-span timber bridge, approximately 110 ft long, that had deteriorated over time and sustained damage during significant flooding events. Due to the deterioration and flood damage, the bridge was closed to traffic in 2012, and the deconstruction of the bridge began in 2013 with it currently being completely removed except for the remaining timber pile foundations and abutments.

This Request for Proposal and the RFP Documents include the Detailed Design Report completed by Samson Engineering Inc. (Samson), dated November 28, 2025. The Detailed Design Report including the design summary, permits and approvals as provided in the appendices. The design summary includes the: hydraulic study, geotechnical investigation and review, geodetic topographic survey, project specifications and issued for construction drawings. The permits and approvals for the proposed work have already been acquired from all necessary regulators including Department of Fisheries and Oceans, Transport Canada, Province of Manitoba and Manitoba Transportation and Infrastructure.

The Appendices also include the shop drawings, completed by Armtec, dated January 16, 2026 for the bridge structure and guardrails that have already been directly purchased by the Municipality for this project through Canoe Procurement Canada.

3.0 Scope of Work

The Scope of Work generally consists of, but is not limited to:

- Demolition of remaining bridge structure;
- Excavation and cleaning of the stream bed below proposed bridge structure, upstream and downstream;
- Construction of a 26 ft wide, 80 ft long CL-625 rated single span bridge and guardrails;
    - It should be noted that driven steel HP14x73 piles are estimated to refuse at a depth of 160 ft below existing ground surface.
- Construction of raised approach roadway profile;
- Construction of rip-rap erosion protection; and
- Construction of gravel roadway surface.

All items listed above are to be completed by the Contractor for the fixed price as specified in Schedule A. Quantities shown on the drawings are estimated and for reference only. Contractors shall do their own due diligence to confirm quantities for the fixed price proposal. The Municipality will not be responsible for overage in estimated quantities for this fixed price proposal.

4.0 Schedule

The proposed schedule is as follows:

- RFP Closes — February 4, 2026
- Completion of Proposal Evaluation — February 9, 2026
- Award of Proposal — February 10, 2026
- Start Date — February 16, 2026
- Completion of In-Water Works — March 31, 2026
- Anticipated Delivery of Bridge and Guardrails — April 14, 2026
- Substantial Completion — May 31, 2026
- Total Completion — June 30, 2026

If the Proponent is not able to complete the Work within this timeframe or is able to complete the Work within a shorter time frame, the Proponent should specify this in the Proposal.

5.0 RFP Closing

Proposals must be received by 12:00 PM Friday, February 4, 2026 at the following address:

Rural Municipality of Dufferin
Attention: Rodney Last, Municipal Foreman
12 – 2nd Avenue Southwest, Box 26
Carman, R0G 0J0

The time that proposals are received will be conclusively deemed to be the time shown on the clock used by the Municipality for this purpose.

PROPOSAL INSTRUCTIONS & GENERAL TERMS

1.0 Submission of Proposal

Proposals in accordance with the Request for Proposal, Proposal Instructions & General Terms must be received by the Municipality by Closing at the location indicated in the Request for Proposal. Proposals received after Closing will not be considered. The Municipality may extend the time and/or date of Closing by addendum for any reason and, in that case, the extended date and/or time of Closing will become the new Closing Date. The time and date stamp at the Closing location is the official clock for determining the time that proposals are received. The time that proposals are received on Closing will be the official clock for determining the time that a proposal was received.

Proposals must be delivered by hand or mail/courier in a sealed envelope clearly marked with the RFP number, RFP title, Proponent's name and Proponent's address.

Faxed or emailed submissions will not be accepted.

2.0 Form of Proposal

Proponents shall submit three (3) printed and signed copies of the Proposal Submission Form attached as Schedule A.

3.0 Signatures

All Proposals shall contain the full legal name of the individual, company or partnership submitting the proposal, the proponent's address and other contact information and, in the case of a company, partnership or other corporate entity, shall be signed by an authorized signatory of the proponent capable of legally binding the Proponent.

4.0 Conditions

The Undersigned (referred to as the "Proponent" and the "Contractor"), have carefully read the RFP documents and hereby agree to execute and complete the Work contemplated in strict accordance with the said RFP documents as the prices shown in the Schedule of Prices.

It is understood that:

(i) Proponent must be COR certified;
(ii) Proponent must be in good standing with WCB;
(iii) Obtaining regulatory approvals for the Work and all associated costs are the responsibility of the Contractor;
(iv) Quantities shown on the drawings are estimated and for reference only. Contractors shall do their own due diligence to confirm quantities for the fixed price tender. The Municipality will not be responsible for overage in estimated quantities for this fixed price tender;
(v) The Project Manual provided in Appendix A outlines the warranty, insurance requirements, project meetings, submittal procedures, health and safety requirements, regulatory requirements, other General Requirements, as well as the Specifications related to the work; and
(vi) The successful proponent will enter into a CCDC2, 2008 contract between the proponent and the Municipality for the work outlined in the Project Manual in Appendix A.

5.0 Rights and Reservations

The Rural Municipality of Dufferin:

(i) Reserves the right to reject any or all proposals;
(ii) May not accept the lowest price or any proposal and may, at its sole discretion, accept any proposal that is deemed to be most beneficial to the Municipality;
(iii) Reserves the right to waive informalities, irregularities, technicalities and minor non-compliances;
(iv) May cancel this RFP at any time prior to or after Closing;
(v) Reserves the right to accept a proposal in total or in part or to accept some or all options listed;
(vi) Reserves the right, in the event that only one proposal is received, to terminate this RFP process;
(vii) May reject any proposal that is unsigned, improperly signed, conditional, illegible, contains arithmetical errors, erasures or irregularities of any kind;
(viii) Reserves the right to change the Scope of Work and reissue the RFP or negotiate the Scope of Work, or a portion thereof, if the Municipality does not receive a substantially compliant proposal within the Municipality's budget;
(ix) Reserves the right to reject any proposals submitted by a proponent who has previously defaulted on an RFP or otherwise failed to complete a contract with the Municipality;
(x) Reserves the right to consider its legal position and risk associated with entering into a contract with a party that the Municipality is in litigation with or has a history of unsatisfactory performance; and
(xi) In the event of a discrepancy between a unit price and an extension of price, the unit price will govern.

6.0 Evaluation of Proposals

Proposals will be evaluated on the basis of the overall value to the Municipality, at the Municipality's sole discretion, having regard for the mandatory evaluation criteria and weighted evaluation criteria set out below.

Pricing
- Include in the proposal a detailed cost breakdown of each phase of the project;
- Complete Part B **–** Schedule of Prices and Delivery Schedule; and
- Lowest Price / Proponent's Price x Avaliable Points = Proponent's Pricing Points.

Delivery Schedule
- Include in the proposal a detailed timeline of the proposed project milestones and the anticipated timeframe for regulatory approvals and lead times for materials throughout the project; and
- Complete Part B **–** Schedule of Prices and Delivery Schedule.

Experience and Qualifications
- Include in the proposal a written description of the proponent's experience and qualifications including:
  - A description of relevant construction services the proponent has delivered;
  - The roles and responsibilities of the proponent and any of its agents, employees and subcontractors who will be involved in project, together with the identity of those who will be performing those roles and their relevant respective expertise;
  - The proponents knowledge, skills and expertise in construction of bridges;
  - A description of how the proponent will complete the project, which should include a work plan and timeline indicating how the proponent intends to structure its working relationship with the Municipality; and
  - A complete list of sub-contractors and their duties related to the project shown in an organizational chart.

References
- Include resumes of primary staff members who will complete the work, including qualifications and number of years of experience;
- Provide three references (name, address, job title, phone number, email address), describing how the services provided for these references relate to the services you will provide to the Municipality. References from rural municipalities are preferred; and
- Provide three reference bridge projects of similar size, scope, name of owner, location of project and cost of construction.

Local Knowledge
- Indicate experiencing completing projects of similar scope in the vicinity of the Municipality; and
- A review of the proponent's past performance on previous contracts with the Municipality.

PROPOSAL EVALUATION MATRIX		
MANDATORY EVALUATION CRITERIA	**Score**	
Proposal Received on or before Specified Closing Date and Time	P / F	
Three (3) Hard Copies of Proposal Received	P / F	
Proposal Agreement Received	P / F	
Schedule of Prices and Delivery Schedule Received	P / F	
Proof of COR Certification Received	P / F	
Proof of Good Standing with WCB Received	P / F	
Bid Bond Received (10% of Contract Amount)	P / F	
PASS/FAIL	P / F	
WEIGHTED EVALUATION CRITERIA	**Maximum Points**	**Score**
Pricing	**30**	
Delivery Schedule	**10**	
Experience and Qualifications	**25**	
References	**25**	
Local Knowledge	**10**	
TOTAL POINTS AWARDED	**100**	

7.0 Notice of Award

It is anticipated that the Municipality will provide notice of award in writing to the successful proponent on February 10, 2026. The Municipality will also notify remaining Proponents upon successful execution of the Contract to complete the Work.

8.0 Clarifications and Addenda

All inquiries regarding this RFP must be submitted by email no later than four (4) business days prior to Closing to:

Rodney Last, Municipal Foreman
12 – 2nd Avenue Southwest, Box 26
Carman, R0G 0J0
Office: (204) 745-7582
Email: shop@rmofdufferin.com

All responses to inquiries, if deemed necessary by the Municipality, and any revisions to the RFP will be issued by way of addendum only, which addendum will be posted on the same public notice board as this call for Proposals. It is the sole responsibility of the proponent to check, from time to time, the public notice board for addenda and by submitting a RFP in response to this call for Proposals, the proponent acknowledges having received, reviewed and considered all addenda issued in respect thereof. Clarifications, comments, revisions or any other information regarding this RFP obtained by the proponent from any other source is not authorized and should not be relied upon.

9.0 Revisions, Withdrawal and Irrevocability

Amendments to Proposals may be submitted in writing at any time before Closing. No amendments or revisions received after Closing will be considered. Any amendment must be signed by an authorized signatory of the proponent and submitted in accordance with the requirements for the Submission of Proposals, as set out above. All Proposals will remain open for acceptance for thirty (30) days after Closing.

10.0 Costs of Preparation and Limitation of Liability

All costs incurred by the proponent in the preparation and submission of their Proposal will be at their own expense. The Municipality will not be liable to any proponent for any claims, whether for costs, expenses, losses or damages, or for loss of anticipated profits, incurred by the proponent in preparing and submitting their Proposal or participating in this RFP process.

11.0 Solicitation of Municipality Council and Staff

Proponents (and their Agents) are not permitted to contact any member of the Municipality Council or staff with respect to this RFP at any time prior to the award or termination of this RFP, except as expressly provided herein. The Municipality reserves the right to reject any RFP of any proponent that acts in contravention of this no-solicitation requirement.

The Proponent may contact the Municipal Foreman with questions regarding this RFP by email at shop@rmofdufferin.com.

12.0 Conflict of Interest

Proponents shall disclose any potential conflict of interest or existing business relationships they may have with the Municipality, its elected or appointed officials or employees.

13.0 Confidentiality

All Proposals become the property of the Municipality and will not be returned to the proponent, except as expressly provided for herein. All Proposals will be held in confidence by the Municipality unless disclosure is otherwise required by law.

14.0 Proposal Security and Default

Bid Security

Proposals must be accompanied by bid security in the form of:

(i) A bid bond issued by a surety licensed to carry on the business of suretyship in Manitoba in a form reasonably satisfactory to the Municipality; or
(ii) Cash, bank draft or letter of credit in a form acceptable to the Municipality, in an amount equal to a minimum of 10% of the proposal price.

Default of Proponent

If the successful proponent:

(i) Fails or refuses to enter into the Contract for the Works then such failure or refusal will be deemed to be a refusal by the successful proponent to enter into the Contract and the Municipality may, on written notice to the successful proponent, award the Contract to another party.

15.0 Security for Performance of Works

The successful proponent, within five (5) calendar days of receipt of a written notice of award, deliver to the Municipality a Performance Bond and a Labour and Material Payment Bond, each in the amount of 50% of the contract price, covering the performance of the Works, issued by a surety licensed to carry on the business of suretyship in the province of Manitoba, and in a form acceptable to the Municipality.

16.0 Insurance

The Contractor shall provide evidence of general liability insurance with insurable limits of not less than Five Million Dollars ($5,000,000) for each occurrence or incident. The Municipality shall be named as an additional named insured to the Contractor's General Liability Insurance Policy.

17.0 Workers Compensation

The Contractor shall comply with all provisions of the Worker's Compensation Act, with respect to all persons employed by him and shall provide proof of coverage.

18.0 Safety

The successful Proponent shall assume the responsibilities of the Prime Contractor for the Work as provided in Section 7 of The Workplace Safety and Health Act and shall sign a document with the Municipality identifying the successful Proponent as the prime contractor.

19.0 Prices

The proposal price will represent the entire cost **before** GST to the Municipality for the McEachern Bridge Replacement over Boyne River based on the Schedule of Prices.

Notwithstanding the generality of the foregoing, proponents shall include in the proposal price sufficient amounts to cover:

(i) The costs of all regulatory permitting, labour, equipment and material included in or required for the McEachern Bridge Replacement over Boyne River, including all items which, while not specifically listed in the Schedule of Prices, are included in the Work; and

(ii) All overhead costs, including head office and on-site overhead costs, and all amounts for the profit of the Contractor.

The proposal price shall cover all taxes and assessments of any kind payable with respect to the McEachern Bridge Replacement over Boyne River but shall not include GST. GST shall be listed as separate items.

20.0 Contract

The Contract for the McEachern Bridge Replacement over Boyne River, to be entered into between the Municipality and the successful proponent, is referred to in this section as the "**Contract**" and the successful proponent is referred to herein as the "**Contractor**".

The successful Contractor will enter into a CCDC2, 2008 Contract between the Contractor and the Municipality for the work as outlined in the Project Manual in Appendix A.

Schedule A

PROPOSAL SUBMISSION FORM

List of Contents

Proponents are requested to use this form for the submission of proposals.

This form consists of the following:

1. Part A – Proposal Agreement
2. Part B – Schedule of Prices and Delivery Schedule

PART A
PROPOSAL AGREEMENT

The Agreement made on the ___ day of _____ in the year Two Thousand and Twenty-Six by and between the Rural Municipality of Dufferin, Manitoba, hereinafter called the "Municipality" and _____ hereinafter called the "Contractor"
witnesses: that the Municipality and the Contractor agree as follows:

Article A-1

The Contractor shall:

a) Perform the Work as required by the RFP Documents for the McEachern Bridge Replacement over Boyne River;
b) Do and fulfil everything indicated by this Agreement;
c) Commence Work by no later than _____, 2026; and
d) Obtain Total Completion by no later than _____, 2026.

Article A-2

The Total Price (Including GST) for the McEachern Bridge Replacement over Boyne River is _____ Dollars and _____ Cents ($ _____) in Canadian funds, as detailed on Part B – Schedule of Prices and Delivery Schedule.

Article A-3

This proposal shall be open for acceptance, binding and irrevocable for a period of thirty (30) calendar days following the Closing.

Article A-4

Subject to applicable legislation and the provisions of the Contract Documents, the Municipality shall make payments in Canadian funds to the Contractor.

PART A
PROPOSAL AGREEMENT
(CONTINUED)

Article A-5

The successful proponent will enter into a CCDC2, 2008 contract between the proponent and the Rural Municipality of Dufferin for the work outlined in the Project Manual in Appendix A.

Article A-6

Communications in writing between the parties shall be considered to have been received by the addressee on the date of delivery if delivered by hand to the individual member, or officer of the firm or Corporation for whom they are intended or if sent by post of by courier, to been delivered within five (5) working days of the date of mailing, dispatch or of delivery to the courier company when addressed as follows:

Rural Municipality of Dufferin
12 – 2nd Avenue Southwest, Box 26
Carman, R0G 0J0

The Contractor at:

_____

_____

_____

_____

PART A
PROPOSAL AGREEMENT
(CONTINUED)

Article A-7

In witness whereof the parties hereto have executed this Agreement under their respective corporate seals and by the hands of their proper officers' thereunto duly authorized.

Municipality

Rural Municipality of Dufferin

_____
Chief Administrative Officer

Contractor

_____	_____
Name	Corporate Seal
_____	_____
Contractor Agents Name	Witness' Name
_____	_____
Signature	Signature
_____	_____
Title	Title

PART B
SCHEDULE OF PRICES AND DELIVERY SCHEDULE

DESCRIPTION	AMOUNT
McEachern Bridge Replacement over Boyne River (Armtec to supply and delivery bridge and guardrails to site free-on-board)	$
SUB-TOTAL PRICE	**$**
GST	**$**
TOTAL PRICE	**$**

All items listed in the Scope of Work are to be completed by the Contractor for the fixed price provided above. Quantities shown on the drawings are estimated and for reference only. Contractors shall do their own due diligence to confirm quantities for the fixed price proposal. The Rural Municipality of Dufferin will not be responsible for overage in estimated quantities for this fixed price proposal.

Please state below the proposed dates for start, substantial completion and total completion of the Work within the specified dates under Section 4.0 of the RFP (or suggested alternative dates for start of work and completion of work):

Start of Work Date:	
Completion of In-Water Works Date:	
Substantial Completion Date:	
Total Completion Date:	
Proponent Company Name:	
Proponent Mailing Address:	
Proponent Contact Name:	
Proponent Contact Phone Number:	
Proponent Contact Email Address:	

The Proponent has received the following addenda and proposed to perform the Work in accordance to the Request for Proposal and the Addenda outlined below:

Addendum Number	Date

DATED at _____ this ___ day of _____ 2026.

_____ _____

Proponent Contact Name Proponent Signature

APPENDICES

APPENDIX A

DETAILED DESIGN REPORT

SAMSON ENGINEERING INC.
NOVEMBER 28, 2025

DETAILED DESIGN REPORT:
MCEACHERN BRIDGE
SW28-6-4W ROAD 22W, ½ MILE NORTH OF HIGHWAY PTH 3

RURAL MUNICIPALITY OF DUFFERIN
12-2ND Avenue SW, Box 100
CARMAN, MB R0G OJ0

BY: Samson Engineering Inc.(SAMSON)
162-10th Street
Brandon, Manitoba R7A 4E6
Phone: 204.727.0747
Email: info@samsonae.ca

Date: November 28, 2025

SAMSON
ARCHITECTURE | ENGINEERING

TABLE OF CONTENTS

LIST OF APPENDICIES

1 Background

The McEachern Bridge Crossing is located in SW28-6-4W on Road 22W, ½ mile north of Highway PTH 3 spanning the Boyne River.

The site was formerly a 4-span timber bridge, approximately 110’ long, had deteriorated over time and sustained damage during significant flooding events. Due to the deterioration and flood damage, the bridge was closed to traffic in 2012, and the deconstruction of the bridge began in 2013 with it currently being completely removed except for the remaining timber pile foundations.

Figure 1 – Existing Timber Bridge

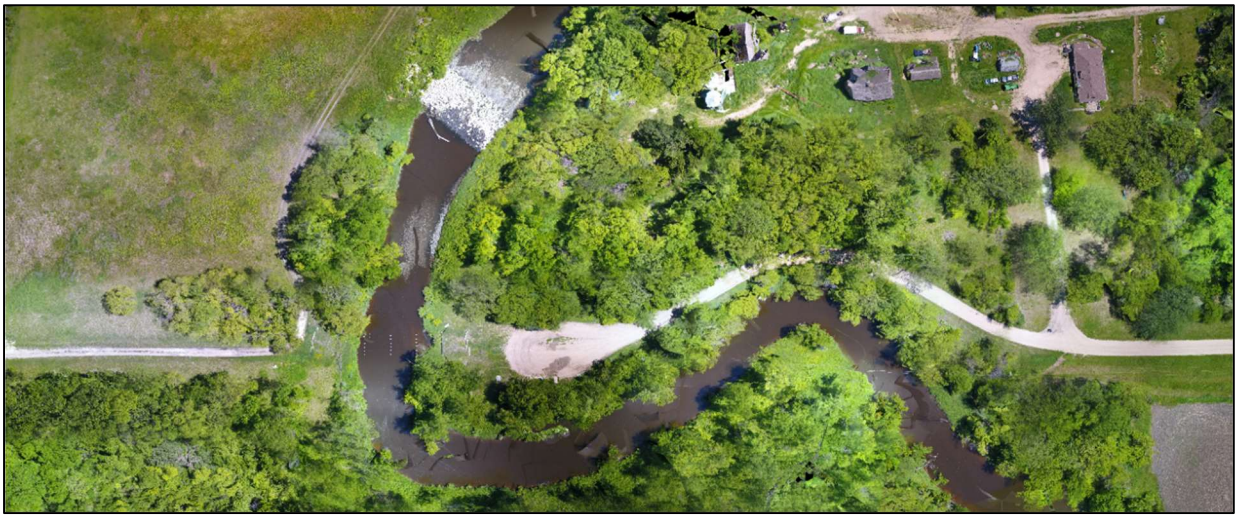


Figure 2 – Existing Timber Bridge

2 Design Summary

This Detailed Design package encompassed the final engineering components of the McEachern Bridge.

2.1 Hydraulic Study

Samson reviewed and coordinated the design of the McEachern Bridge structure according to the requirements and recommendations in the Final Hydraulic Study Report, which was received on October 14th, 2025.

Please refer to **Appendix A – Hydraulic Study Report.**

2.2 Geotechnical Investigation and Review

Samson reviewed and coordinated the design of the McEachern Bridge structure according to the requirements and recommendations in the Final Geotechnical Report, which was received on July 2nd, 2025.

Please refer to **Appendix B – Geotechnical Report.**

2.3 Geodetic Topographic Survey

Barnes and Duncan completed a Geodetic Topographic Survey of the project site, which included the roadway on both sides of the bridge, within the river channel and of the MTI infrastructure that's downstream of the crossing. Samson reviewed and coordinated the design of the McEachern Bridge structure according to the topographical survey.

Please refer to **Appendix C – Geodetic Topographic Survey**.

2.4 Project Specifications

Project Specifications for the site have been prepared.

Please refer to **Appendix D – Project Specifications.**

2.5 Issued for Construction Drawings

Drawings for the site have been prepared and issued for construction.

Please refer to **Appendix E – Issued for Construction Drawings**.

3 Permits and Approvals

Samson is coordinating with the Authorities Having Jurisdictions (AHJ) and is in the process of obtaining the necessary permits and approvals, as outlined in the subsections below.

3.1 Department of Fisheries and Oceans

Samson submitted a Request for Review to Department of Fisheries and Oceans (DFO) and received approval on July 17th, 2025.

Please refer to **Appendix F – DFO Permit**

3.2 Transport Canada

Samson contacted Transport Canada and were informed that the Boyne River is not on their scheduled list of navigable water ways. As such, they do not require review/permitting.

3.3 Province of Manitoba

Samson has contacted Manitoba Sustainable Development and due to Manitoba Transportation and Infrastructure (MTI) downstream infrastructure, Manitoba Sustainable Developments does not require review/approvals.

3.4 Manitoba Transportation and Infrastructure

Samson has contacted MTI and have coordinated the required analysis and documentation required for their review and approval. Additionally, MTI has provided us with relevant topographic images and structural drawings for the downstream infrastructure. Samson received approval on November 19th, 2025.

Please refer to **Appendix G – MTI Permit.**

4 Report Limitations

This report is based on the information collected from sub-contractors, previous documents, research, and site visits. All information collected by Samson was collected in good faith with the assumption that the information is correct or to the best of their knowledge. Samson accepts no responsibility for any inaccurate information in this report as a result of omissions or misinterpretations of information that was provided by previous reports or sub-contractors.

This report has been prepared exclusively for the Project Team. Should this report be used by a third party, any reliance or decisions made based on this report shall be the responsibility of the third party. Samson makes no representation concerning the legal significance of the findings or the information contained within this report.

5 Closure

We trust this report meets your requirements. If you have any questions or comments, please feel free to contact our office.

Yours very truly,
Samson Engineering Inc.

Phil Dorn, P.Eng.
President

Liam Caldwell, EIT

APPENDIX A

HYDRAULIC STUDY REPORT

SAMSON
ARCHITECTURE | ENGINEERING

RM of Dufferin

McEachern Bridge Replacement
Boyne River at Road 22W

Hydrologic and Hydraulics Design Assistance

Report on Single-Span Bridge Alternative - Rev. 1

prepared for

Samson Engineering Inc.

Campbell D. MacInnes
Ph.D., P.Eng.(SM)

October 14, 2025

Campbell D. MacInnes
Ph.D., P.Eng.(SM)

cmacinnes@unies.mb.ca
204-294-9227
14 Sandra Bay
Winnipeg MB R3T 0K1
Canada

October 14, 2025

File #969-95

Eric Thiessen, EIT
Samson Engineering Inc
162 - 10th Street, Brandon MB R7A 4E6

Dear Sir:

Re: RM of Dufferin, McEachern Bridge Replacement, Boyne River at Road 22W
Hydrologic and Hydraulics Design Assistance - Revised Report

Note: This report revises the original report dated June 25, 2025.

As requested, I have reviewed the hydrologic and hydraulic regime relevant to the municipal road crossing of the Boyne River on Road 22W, northeast of Carman, Manitoba. Herein I provide my conclusions and recommendations concerning a proposed replacement structure at the site. The analysis consisted of:

(a) review of the subject crossing site and the Boyne River watershed and channel via remote and aerial photographs of various sources as well as land survey data,

(b) reviews and office studies to estimate the hydrologic and hydraulic behaviour which would be expected to affect the stream and a replacement crossing structure during its design life, and

(c) evaluation of key minimum design dimensions for acceptable hydraulic performance of the proposed design for a replacement bridge at the site.

1.0 Summary: Hydraulic Recommendations for Site

It is concluded from the hydrologic and hydraulic studies described below that:

(a) a proposed 24-metre single-span bridge with built-up approach road profile and elevated superstructure at the bridge would provide acceptable hydraulic performance at the 3%, or 33-year return period, annual exceedance design flowrate. Standard riprap erosion protection on the slopes below the abutment walls to protect lower bank and river bottom soils would be required. Acceptable fish passage design velocities through the finished hydraulic opening would be maintained. Details follow below.

1.1 Summary of Report Revisions

Figure 6 added to Sec. 3.2 Open Channel Hydraulics; one data source added to 5.0.

2.0 Background

The location of the existing municipal McEachern Bridge crossing of the Boyne River in the R.M. of Dufferin, Manitoba, just east and downstream of the Town of Carman, is shown in **Figure 1**. A closer-up view of the terrain near the crossing follows in **Figure 2**.

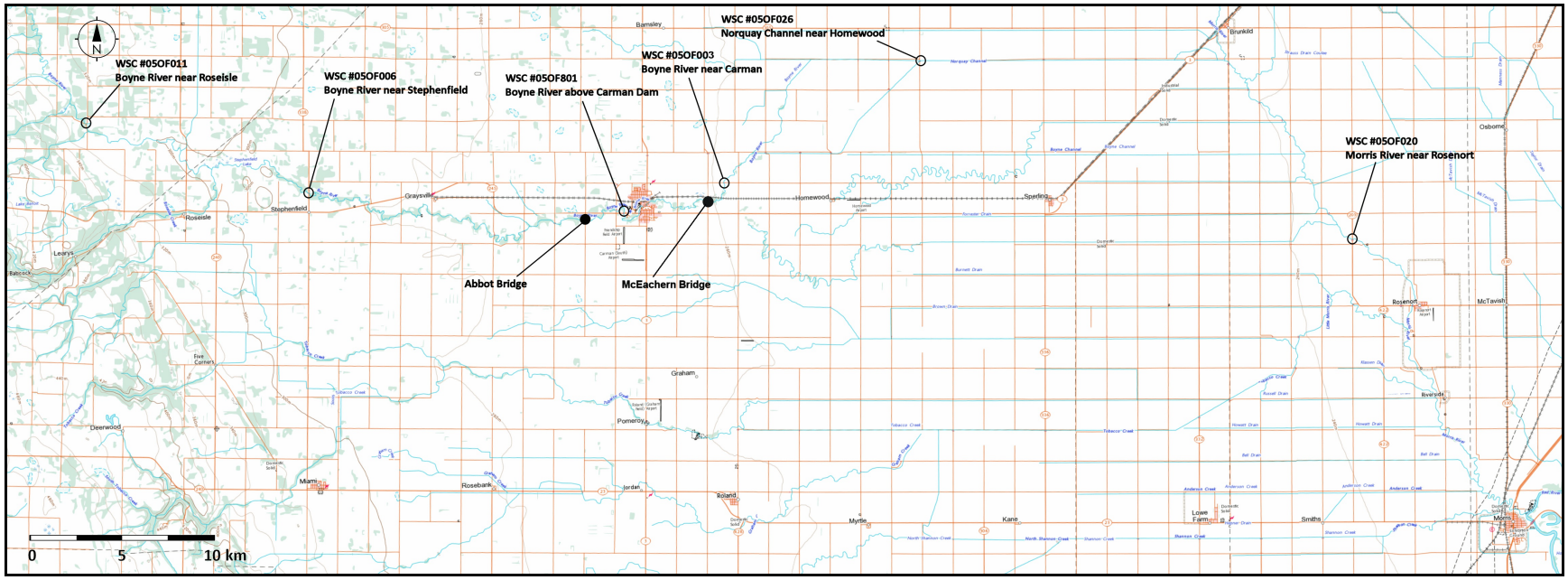


Figure 1. Location plan, Manitoba Rural Municipality of Dufferin's McEachern crossing of Boyne River on Road 22W and the regional Water Survey of Canada (WSC) streamflow stations used in hydrologic design (base map: Natural Resources Canada, 2021).

Figure 2. Site characteristics, McEachern Bridge crossing, July 8, 2021, with Boyne River discharge approximately 0.1 CMS and with hydraulics study reach bracketed in yellow (background image: CNES / Airbus 2024 via Google Earth).

The present Boyne River, in the midst of its low-gradient stroll across the flatness and fine surface deposits characteristic of the former bottom of Lake Agassiz (now the familiar Red River Valley) has been channelized just east of the present Carman, in order to facilitate passage of excess spring and summer runoff, thus protecting both communities and agriculture. Carman originally established itself just upstream of this zone, where the Boyne River continues to weave and reshape its sinuous way back and forth across a several-hundred-metre wide band of previously deposited fluvial sediments, and today unrelentingly threatens the Town with too-frequent spring flooding. Three particularly significant events occurred at Carman in 1970, 1974 and 1979.

The Town and other governments worked on floodplain delineation and management measures for Carman through the 1980s. The latter culminated in 1991 with the completion of a Boyne diversion channel intended to connect to and complement the downstream channelization, bypass most of the community's properties and infrastructure and, through town, generally confine the Boyne's main channel flows to within the stream's banks. At that time, town bankfull capacity was estimated at 70 cubic metres per second [CMS] with the diversion simultaneously moving 110 CMS. The design capacity of the diversion channel was estimated to be 136 CMS.

The Carman diversion has allowed the Town of Carman to avoid significant flooding that would have occurred in 2006, 2009, 2011, 2013, 2017, and 2022, a recent clustering of middle-to larger-sized spring Boyne floods. In 2017, nevertheless, a localized kilometres-long ice jam did cause damaging flooding that extended beyond the river banks within the Town. At Water Survey of Canada (WSC) streamflow monitoring gauge # 05OF003 (Boyne River near Carman) on Road 35N, about 1.3 kilometres (km) northeast of the McEachern Bridge, or 3.1 km downstream along the channel, the 2017 obstruction of flow by ice raised the water level by up to approximately 1.0 metre (m) relative to the equivalent open water condition on the rising limb of the hydrograph, but the local influence of the ice jam on the river's varying water level had fully disappeared as the flow approached and reached its maximum level for the year a few days later.

The McEachern Bridge site and structure, not far upstream of the WSC gauging station, would likely have been a jamming location in 2017 if the existing timber bridge had not already been damaged years before, and removed. The present condition of the crossing site is shown in **Figure 3(a)**. It appears from historical aerial imagery that one or both of the similar 2009 and 2011 spring flood peaks (mid-April) may have been responsible for a partial failure of the structure near the north pier group, and its subsequent closure to traffic. It did seem to have survived the large woody debris jam that accumulated against the bridge during a similar peak spring flood in 2006. However, the two north spans had been completely removed by water or man by mid-2013 (yet another similar-sized spring peak occurred that year). Ice (and debris) conditions therefore will be a necessary consideration for a replacement bridge at the site, but should not be much of a factor in elevating local water levels coincident with the times of design-range peak discharges.

Immediately downstream of the bridge crossing site lies a sheet-pile weir, the McEachern Dam, shown in **Figure 2** and **Figure 3(b)**. With recently upgraded, angular riprap, this structure may be expected to continue to impound close to 3 m of water at low flows and may be assumed to survive future large flow events, easily passing ice and debris with depths of submergence above the weir crest of on the order of 1.5 m through the range of design discharges (e.g., 1% to 3 % annual exceedance probability) for a replacement McEachern Bridge.

(a)

(b)

Figure 3. Boyne River at McEachern Bridge site, May 2, 2024, discharge approximately 1.2 CMS: (a) looking upstream toward existing timber bridge remnants; (b) looking northeast along sheet-piling weir with angular riprap, i.e., the McEachern Dam (photos: Samson Engineering 2024).

The proposed replacement bridge concept for the McEachern crossing is sketched in **Figure 4**, below: a single span, to be shorter overall than the former four-span timber bridge whose intermediate pier rows are visible in the figure. The deck and longitudinal girders will be set higher than those of the former timber bridge, providing a greater open flow area. The roadways approaching from south and north will be realigned and ramped up from the existing as necessary to complement the new deck. Further, with a higher superstructure and without pile rows in the channel, the tendency for the snagging of woody debris should be minor.

Figure 4. Proposed McEachern Bridge concept used for hydraulic studies (base sketch: adapted from Samson Engineering, 2024).

3.0 Hydrologic and Hydraulic Analysis

3.1 Design Hydrology: Determination of Boyne River Design Discharges for Site

Figure 1 shows the locations of several longer-term Water Survey of Canada (WSC) streamflow gauging stations along the Boyne River flow path. All were taken into some consideration in the development of a suitable design discharge frequency distribution for the McEachern Bridge stream crossing site. The stream flows are considered to be close to natural, but the various measurement stations' records tend to span different durations and historical periods, with the added complication of the entering-into-service of the Carman Diversion in 1991 and its consequence, a bypassing of what had been a good, long-term streamflow gauge located on the main channel near Carman (i.e., WSC #05OF003, see **Figure 1**). The contributing drainage basin for this station is approximately 1130 square kilometres (sq km).

A summary of the design hydrology relevant to the McEachern Bridge site is shown in **Figure 5**. With a long history of tracking the Boyne River flows through Carman, both before and after the entering into service of the Carman Diversion, which significantly has altered the continuous record, WSC #05OF003 is utilized here as a site to represent simply the "flows at Carman". A Manitoba Water Stewardship 2010 estimate of "natural" annual peak annual daily discharges for the Boyne River at Carman is compared in **Figure 5** with a composite estimated series of total annual maximum mean daily discharges for the Boyne River at Carman (assumed to be at the location of the existing WSC # 05OF003) for the near-stationary period 1965 to 2023. The latter series excludes 1997, effectively a year of poor Boyne River hydrometric data. From correlation of Boyne data for other years to those of adjacent streams, however, it may be concluded with quite a bit of remaining uncertainty that the Boyne peak magnitude near Carman in 1997 may fall within the 5% to 10% exceedance range for the years shown in **Figure 5**.

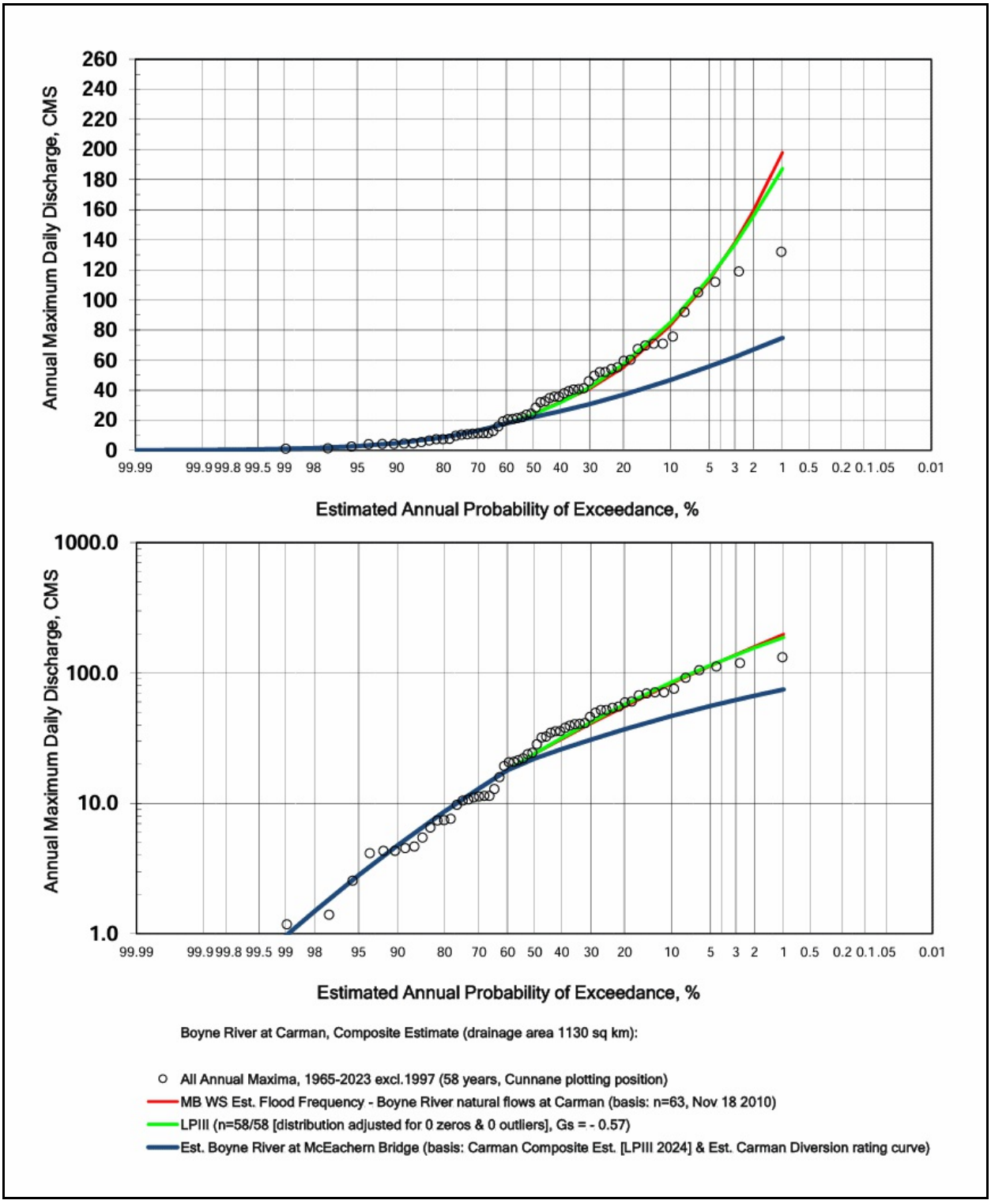


Figure 5. Estimated Boyne River historical flood frequency characteristics, 1965-2023, at Carman (composite series) and the corresponding estimated non-diverted maximum annual daily discharges through Carman via the original channel, including at McEachern Bridge site; alternative visualizations of ranges of discharges and statistical fits: upper panel: linear space; lower panel: logarithmic space.

The Carman composite series was fitted to a Log Pearson Type III ("LPIII") probability distribution (according to the methods of Bulletin #17B, 1982 [see references], which handle zeros and outliers characteristic of a streamflow history according to a standard procedure). A corresponding estimated probability distribution of maximum annual daily mean discharges on the Boyne River main channel "through" Carman (the fuzzy Boyne index location is assumed here to include the McEachern Bridge site) was then developed using an estimated rating curve for the Carman Diversion. Those results are also included in **Figure 5**.

Where WSC #05OF003 data pairs are available from the period 1992 to the present, the average of the ratios of the recorded Boyne in-Carman, main-channel annual instantaneous peak discharges to the annual maximum daily discharges has been 1.046, with not much variation, or a premium of under 5%, indicative of the sluggish flow changes that are characteristic of the flat and ponderously winding river course.

Description of a study of the expected hydraulic performance of the proposed replacement McEachern bridge and the determination of the necessary minimum bridge dimensions follow in the next section. The individual discharges used in the study are listed in **Table 1**.

3.2 Open Channel Hydraulics: Minimum Geometry for Replacement Stream-Crossing Structure

Hydraulic model. A one-dimensional mathematical model representation (HEC-RAS) of the road crossing of the Boyne River at the McEachern Bridge site, was prepared. The model cross sections, locations, and elevations were derived from a basis in land survey data collected in 2024 for Samson Engineering along with other topographical and site information. Additional model parameters have been estimated from inspection of aerial and ground photographs and other information. Manning's "n" values adopted for the meandering channel and banks, along with treed or open floodplain areas, are conservatively set at 0.04 and 0.06, respectively. The estimated normal slope (downstream side) adopted for beginning subcritical flow analysis is 0.0004, based on slopes of general along-channel floodplain ground elevations as well as typical channel bottom and water surface elevations observed at the McEachern site and at the site of WSC #05OF003 downstream.

The proposed hydraulic opening, as sketched in **Figure 6**, is made up of one span of 24.4 m (80 feet nominal), with the typical pre-cast concrete abutment wall and steel piles system creating an opening 23.8 m in width. This is evaluated for expected hydraulic performance under the design discharge and other conditions. The estimated 3 % annual exceedance daily discharge (main design discharge for the road crossing) is 62 CMS, which turns out to be similar to the estimated site's peak daily discharge during the 1974 flooding event, assuming a recurrence with the Carman Diversion in place. The maximum daily mean flowrate during the recent 2022 flooding event has been estimated as 55 CMS, slightly smaller.

Results of the HEC-RAS based hydraulics analysis are shown in **Table 1**, with the plan used in, and the water surface profiles resulting from, the analysis following in **Figure 6**.

Design deck and superstructure elevation. Recommended dimensions according to Manitoba Transportation and Infrastructure (MTI) hydraulic design guidelines for Provincial Roads include, at the 3% design flowrate, a minimum bridge freeboard of 0.3 m, maximum head loss of 0.2 m, and a maximum mean flow-through velocity of 1.5 metres per second (m/s). MTI's through-velocity and head loss constraints at the 3% design event would be satisfied with this geometry.

Table 1.

RM of Dufferin, Boyne River, McEachern Bridge
Summary Results:
Estimated Flood Frequency and Evaluation of Replacement Structure

Annual Exceedance Event, % (approx. return period)	Design Discharges: Est. Max. Daily Discharge, CMS[1]		Estimated Hydraulic Conditions for One-Span Bridge assuming no obstruction by woody debris [2]			
			24.4 m one span / 23.8 m opening: Channel bottom elevation: 253.4 m Minimum underside of girder: 258.33 m [2]			
Road 22 at Boyne River (McEachern Bridge)	Est. Boyne River Carman Composite Total, (LPIII, 1965-2023)	Est. Boyne River Main Channel in Carman	water surface elevation, upstream of weir, at McEachern crossing (m, GSC datum)	free-board, (m)	head loss at bridge (m)	velocity through bridge opening (m/s)
1% (100 years)	187	75	258.29	0.04	0.01	0.78
2% (50 years)	155	67	258.11	0.22	0.00	0.73
3% (33 years)	137	62	258.03	0.30 [3]	0.00 [3]	0.69 [3]
1974-04-22	129	61	258.02	0.31	0.00	0.68
5% (20 years)	114	56	257.95	0.38	0.00	0.63
2022-05-02	109	55	257.94	0.39	0.00	0.63
2017-04-03	90	49	257.85	0.48	0.00	0.57
10% (10 years)	85	47	257.82	0.51	0.00	0.55
$3dQ_{10}$ (Fish Passage)	62	39	257.69	0.64	0.00	0.48 [4]
20% (5 years)	57	37	257.66	0.67	0.00	0.46
30% (3 years)	42	31	257.56	0.77	0.00	0.39
50% (2 years) (Navigation)	24	22	257.38	0.95 [5]	0.00	0.29 [5]

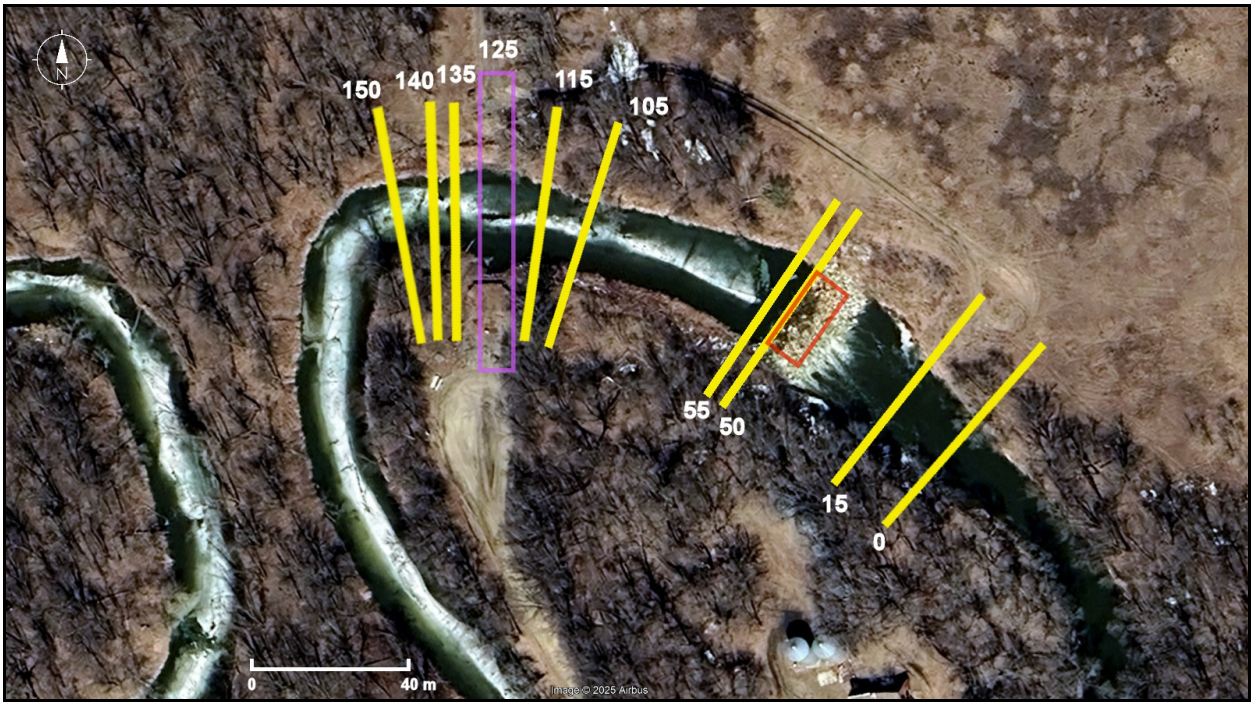
[1] Other hydraulic assumptions: Normal slope, downstream: 0.0004; Manning's n: 0.04 for channel, banks; 0.60 for light brush- and tree-covered floodplain.

[2] Minimum underside of girder setting 0.3 m above 3% est. water surface assumes zero debris- or ice-related backwater elevation with McEachern Dam submerged by 1.5 m.

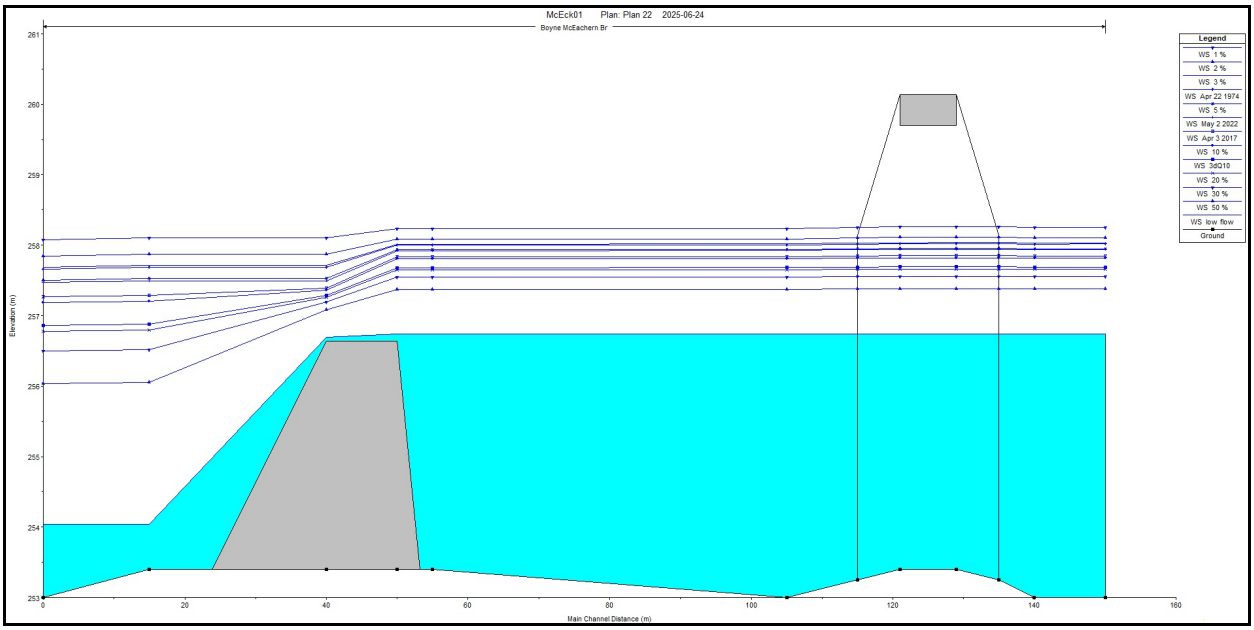
[3] Bridge meets MTI guidelines at 3% Q.

[4] $3dQ_{10}$: non-seasonal value; usually occurs at spring break-up within spring spawning window (Mar 1 - May 15).

[5] Low headroom due to elevation of water surface by downstream weir.



(a)



(b)

Figure 6. One-dimensional hydraulic model (HEC-RAS) plan and profiles for proposed replacement McEachern Bridge site, corresponding to results summarized in **Table 1**: (a) model cross sections, weir, and bridge locations, the white numerical identifiers referring to model's centreline station numbers in metres from downstream boundary at 0 m, with sheet piling at 50 m (approximated as 10 m broad-crested form) and road centreline at 125 m (background image: April 11, 2025, Airbus 2025 via Google Earth, with Boyne River discharge approximately 3 CMS); (b) resulting water surface profiles from sub-critical analysis (HEC-RAS 6.6) through range of modelled discharges listed in **Table 1**.

The proposed minimum elevation for the underside of girder is 258.33 m (GSC datum), or 0.3 m above the design water surface elevation just downstream of the bridge at the 3% design discharge. Ice and woody debris backup would be considered to be minor risk factors at this site, so a bridge superstructure set higher than the above could be considered, taking into account RM of Dufferin and local residents' familiarity with past spring flow behaviour at the site. The proposed bridge dimensions would exceed the MTI hydraulic design guidelines.

Ice jam risk reduced. Risk of ice jamming and pressures against the bridge superstructure should be expected to be significantly reduced with the proposed deck and superstructure elevation and single open span in comparison to the former four-span timber bridge and its three rows of timber piers. The relative amount of river ice available for downstream movement in the spring runoff period is significant in the Town of Carman because of the higher water levels retained in summer and winter by the numerous in-channel structures. Spring flows tend to remain within the original river channel's banks through Carman more often while the diversion takes the larger portion of higher flows. The natural channel is large in comparison to the flows it is now required to handle, but when moderate spring flood flows are confined within the channel rather than being able to spread out into the floodplain, the risk of backup by ice at tight spots increases somewhat.

Woody debris capture risk. Movement of woody debris should be expected during almost every year's spring runoff along the Boyne River at the McEachern crossing and it is possible that some could become beached off-channel at the bridge abutments. Ongoing monitoring is recommended, with debris clearing and removal as necessary.

Erosion protection. Streamflow velocities are quite low at the McEachern Bridge crossing site and remain relaxed at higher discharges within the design range with the water higher up the banks. Coarse riprap nevertheless should be applied to the existing bank slopes adjacent to and beneath the structure to guard against soil loss during debris build-up events and to maintain the finished bottom cross section indefinitely. Gradation of the rock should start down from 300 mm nominal diameter, with angular or quarried material advised in order to maximize interlocking and minimize rolling.

3.3 Fish Passage

It is expected that smaller-bodied fish may spend time in the Boyne River in the Carman area and require freedom of upstream and downstream seasonal movements, related to their populations and life cycle. However, the upstream diversion dam with its culverts, the old concrete Carman drop-structure dam adjacent to the local golf course, several other minor obstruction works in the channel, and the McEachern Dam described in this report, all serve to interrupt the continuity of free passage along the Carman reaches of the main channel. Due to these structures, the channel does retain a significant depth of water all year and develops a significant ice cover despite a typical lack of flow for much of the year. The elevated flow depths minimize the local stream velocities (e.g., **Table 1**). From a fish passage perspective, a replacement McEachern Bridge structure will not significantly impact the existing streamflow velocities throughout the wide range of discharges that may occur.

For simplicity, and without consideration of the seasonality of required fish-spawning movements, the Department of Fisheries and Oceans' $3dQ_{10}$ fish passage test condition is adopted as 39 CMS, for which the annual 3dQ invariably occurs for this stream within a few days of the annual maximum flow rate. For the larger low-return frequency years (e.g., the $3dQ_{10}$% range) along the Boyne River, this is always the spring melt event, partly with ice present and likely to be prior to significant spawning movements. In other words, this is a quite

conservative test condition for this site on the Boyne River. The estimated through-structure average streamflow velocity at the 39 CMS total flow test condition is about 0.48 m/s. At 39 CMS, the river remains below the top of its banks and off the floodplain.

As the above test condition is considered to be conservatively severe, actual velocity outcomes for a later spring spawning period when warmer waters more in the range to promote spawning movements would be much lower than 0.48 m/s at the bridge opening. It is therefore concluded that the proposed bridge would provide no impediment to general fish passage.

3.4 Navigation by Watercraft

The Boyne River main channel in the vicinity of Carman, attractive for its structure-supported water depths, may be used by small unpowered craft occasionally for recreation, but travel would be constrained by the presence of the structures, woody debris and other obstacles. Use of motorized craft in the stream would be unlikely in this area. In practical terms, the stream is non-navigable. At the 50% maximum annual daily discharge test condition, velocities beneath the proposed bridge would be considered to be low (estimated average approximately 0.3 m/s) with overhead clearance of less than one metre, neither of which would realistically negatively affect any watercraft that might be contemplated for usage in the River (overhead clearance at the many Boyne River bridges in the Town of Carman is uniformly minimal) . Water depths near the bridge would be somewhat less than four metres at the 50% discharge test condition and be maintained by the McEachern Dam at about three metres under the lowest (near-zero) flow conditions.

4.0 Conclusions

The analysis indicates that a proposed one-span, 24.4 m bridge with hydraulic opening of 23.8 m would meet standard flood-flow design hydraulic criteria for head loss and through velocity, and would be expected to maintain suitable velocities for fish passage.

5.0 Data Sources

The following information was utilized in the estimation of the hydrologic and hydraulic design conditions applicable to the McEachern Bridge crossing of the Boyne River on Road 22W in the RM of Dufferin:

(a) Samson Engineering, LIDAR- and ground-based survey data of topography and bathymetry including stream cross sections, ground elevations and roadway profile, 2024.

(b) Manitoba Water Stewardship, presentation: Boyne River and Carman Diversion, May 2007.

(c) Natural Resources Canada, National Topographic System (NTS) topographic maps (The Atlas of Canada - Toporama).

(d) Web-based aerial imagery, e.g., Google Inc., 2024, 2025.

(e) Environment Canada, Water Survey of Canada, Real-time and historical hydrometric data:
   (i) #05OF003, Boyne River near Carman

(ii) #05OF006, Boyne River near Stephenfield
(iii) #05OF011, Boyne River near Roseisle
(iv) #05OF020, Morris River near Rosenort
(v) #05OF026, Norquay Channel near Homewood
(vi) #05OF801, Boyne River above Carman Dam

(f) Ellis, J.H., and W.H. Shafer, Reconnaissance Soil Survey, South-Central Manitoba, Manitoba Soil Survey, Manitoba Department of Agriculture, Soils Report No. 3, 1940.

(g) Michalyna, W., G. Podolsky, and E. St. Jacques, Soils of the Rural Municipalities of Grey, Dufferin, Roland, Thompson, and Part of Stanley, Canada - Manitoba Soil Survey, Manitoba Department of Agriculture, Soils Report No. D60, 1988.

(h) Manitoba Water Stewardship estimated flood frequency, Manitoba Zone 5 Regional Formulae.

(i) U.S. Army Corps of Engineers simulator, HEC-RAS 6.6, September 2024.

(j) Chow, Ven Te, Open-Channel Hydraulics, McGraw-Hill, New York, 1959.

(k) Watt, W. Edgar, ed., Hydrology of Floods in Canada: A Guide to Planning and Design, National Research Council of Canada, Ottawa, 1989.

(l) U.S. Department of the Interior, Geological Survey, Guidelines for Determining Flood Flow Frequency, Bulletin #17B, of the Hydrology Subcommittee, 1982.

(m) Washington State Department of Transportation Research Office in Cooperation with US DOT, Federal Highway Administration, Modeling Hydrology for Design of Fish Passage, Research Report, Project T1804, Task 2, June 2002.

(n) Manitoba Infrastructure and Transportation, Water Control and Structures, Structures Design Manual, Version 1.0, February 18, 2011.

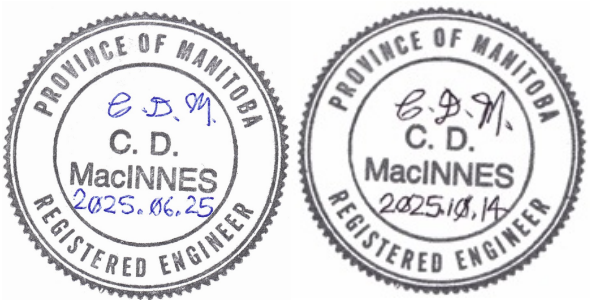
(o) Canada Department of Agriculture, P.F.R.A. Plan No. 64768(A) W-XL-1495, Boyne River Project, McEachern Dam, Topographical Plan, Damsite Area, October 1967.

Please contact the undersigned for further discussion or clarification.

Yours truly,

C. D. MacInnes

Campbell D. MacInnes, Ph.D., P.Eng.(SM)



APPENDIX B

GEOTECHNICAL REPORT

SAMSON
ARCHITECTURE | ENGINEERING

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Samson Engineering Inc.

McEachern Bridge
Road 22W Over Boyne River

Geotechnical Investigation
and Analysis

Prepared for:

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Project Number:

25-GEO-SAMSON-CARMAN

Date:

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Revision History

Revision Number	Author	Issue Date	Description
0	KH	March 19, 2025	Final Report
1	KH	July 2, 2025	Updated Final Report

Authorization Signatures

Prepared by:

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Geotechnical/Civil Engineer

TABLE OF CONTENTS

1.0 PROJECT UNDERSTANDING

TTES Consulting Ltd. (TTES) was retained by Samson Engineering Inc. (Samson) to complete a geotechnical investigation and provide geotechnical recommendations for the replacement of McEachern Bridge on Road 22W, over the Boyne River, east of Carman, Manitoba. McEachern Bridge is located at UTM Zone 14U, Northing 5,484,580 m and Easting 575,520 m. A test hole location plan is shown below in Figure 1.

Figure 1
Test Hole Locations

Preliminary design information for the proposed bridge replacement was provided by Samson and is provided in Appendix A. The preliminary bridge design was a three span steel and concrete bridge with the abutments and piers supported by steel H-piles. The final bridge design was modified to a 24.4 m long single span steel and concrete bridge with the abutments supported by steel H-piles.

2.0 SCOPE OF SERVICES

The geotechnical engineering and assessment services for this project included the following:

- A geotechnical site investigation to document soil and groundwater conditions;
- Laboratory testing on select soil samples;
- Groundwater monitoring;
- Foundation and geotechnical design parameters and recommendations in accordance with Limit State Design (LSD);
- Slope stability analysis; and
- A geotechnical assessment report of the findings, including test hole logs.

3.0 FIELD AND LABORATORY INVESTIGATIONS

Underground public utility clearances were obtained through Click Before You Dig Manitoba by TTES prior to the start of the drilling investigation.

A total of two test holes were drilled from March 5 to 7, 2025 with drilling services and supervision provided by TTES. Drilling was completed using a Marl 80 track mounted drill rig equipped with 125 mm diameter solid stem augers. Test holes were drilled to power auger refusal on either side of the proposed bridge and are summarize below in Table 1.

Table 1
Test Hole Locations and Power Auger Refusal

Test Hole Number	Northing (m)	Easting (m)	Ground Surface Elevation (m)	Power Auger Refusal Depth (m)	Power Auger Refusal Elevation (m)
TH25-01 (South of Bridge)	5,484,544.99	575,529.47	259.97	43.7	216.3
TH25-02 (North of Bridge)	5,484,605.75	575,528.89	260.19	44.7	215.5

Subsurface conditions observed during drilling were visually classified and documented by TTES geotechnical personnel according to the modified Unified Classification System for soils. Other pertinent information such as sloughing and seepage conditions observed during drilling were also recorded. Field torvane tests were completed, and disturbed grab samples were collected at selected depths from the test holes. Samples retrieved during the field investigation were transported to and tested at TTES's laboratory in MacGregor, Manitoba.

The test hole logs provided information on the description and depth of the soil units encountered, sample types and locations, results of in-situ and laboratory testing, and other drilling observations such as sloughing and seepage.

Detailed test holes logs have been prepared for each test hole and are attached in Appendix B.

3.1 SUBSURFACE CONDITIONS

The following sections provide information regarding the subsurface conditions encountered at the test hole locations, including a summary of in-situ testing, laboratory testing and observations during drilling.

3.1.1 CLAY FILL

A 1 m thick layer of clay fill which was encountered at ground surface in both test holes. The clay fill was dark brown, frozen at the time of drilling, of high plasticity and contained some topsoil.

Moisture content of the clay fill ranged from 24 to 25%, as measured from two samples.

3.1.2 LEAN CLAY (CL)

Alluvial lean clay was encountered beneath the clay fill and extended to the top of the fat clay at a depth of 6.6 m below ground surface. The lean clay was light brown in colour, dry, soft to firm in consistency, of low plasticity and contained with to and fine to coarse grained sand and with to and silt. With depth the lean clay became grey in color, wet and firm in consistency.

Particle size analysis of two lean clay samples measured 0% gravel, 0.0 to 0.1% coarse grained sand, 0.3 to 0.6% medium grained sand, 32 to 43% fine grained sand, 32 to 42% silt and 25 to 26% clay.

Two Atterberg limits completed on lean clay samples showed a liquid limit range of 30 to 31, a plastic limit range of 12 to 14, and a plasticity index range of 12 to 14.

Moisture content of the lean clay ranged from 16 to 34%, as measured from ten samples.

3.1.3 FAT CLAY (CH)

Lacustrine fat clay was encountered beneath the lean clay at a depth of 6.6 m below ground surface and extended to the top of the silt till at a depth of 33.4 to 37.6 m below existing ground surface. The fat clay was grey in colour, damp, firm in consistency, or high plasticity and contained trace fine to coarse grained sand, with silt. With depth the fat clay became stiff in consistency.

Particle size analysis of one fat clay samples measured 0% gravel, 0% coarse grained sand, 0.2% medium grained sand, 4.7% fine grained sand, 30% silt and 65% clay.

One Atterberg limits completed on a fat clay sample showed a liquid limit of 62, a plastic limit of 21, and a plasticity index of 41.

Moisture content of the fat clay typically ranged from 42 to 57%, as measured from 17 samples.

3.1.4 SILT TILL

Silt till was encountered below the fat clay at a depth of 33.4 to 37.6 m below existing ground surface. The silt till was generally dark grey in color, damp, loose to compact, of no to low plasticity and contained some to and fine to coarse grained sand, trace fine to coarse grained gravel, with clay. With depth the silt till became compact, then dense, prior to power auger refusal on suspected cobbles and boulders. Cobbles and boulders were suspected when drilling below 37.6 to 39.0 m.

Particle size analysis of one silt till sample measured 5% gravel, 3% coarse grained sand, 11% medium grained sand, 21% fine grained sand, 37% silt and 23% clay

One Atterberg limits completed on a silt till sample showed a liquid limit of 27, a plastic limit of 14, and a plasticity index of 13.

Moisture content of the silt till typically ranged from 18 to 25%, as measured from five samples.

3.1.5 POWER AUGER REFUSAL

Power auger refusal occurred in the silt till at a depth of 43.7 to 44.7 m below existing ground surface.

3.2 GROUNDWATER CONDITIONS

Seepage and sloughing conditions were observed during drilling below a depth of approximately 3.5 m when drilling approached the river water level. The groundwater observations made during drilling are short-term and should not be considered reflective of groundwater levels at the site which would require monitoring over an extended period to determine. It is important to recognize that groundwater conditions may vary seasonally, annually, or as a result of construction activities.

A standpipe piezometer was installed on the south side of the bridge at a depth of 7.7 m below ground surface. At the time of this report the piezometers have been read twice by TTES with results provided on Table 2. The standpipe piezometer can be used for long-term groundwater monitoring at the site.

Table 2
Groundwater Monitoring Data

Test Hole:	TH25-01
Piezometer Type:	Standpipe Piezometer
Top of Pipe Elevation (m):	260.80
Stick Up Above Existing Grade (m):	0.91
Ground Surface Elevation (m):	259.89
Tip Depth Below Existing Grade (m):	7.67
Tip Elevation (m):	252.20
Date	**Piezometric Elevation (m)**
March 7, 2025	256.53
March 14, 2025	256.22

3.3 LABORATORY TEST RESULTS

Laboratory tests were completed on representative soil samples to determine the index properties for correlation to relevant engineering parameters. Laboratory testing was completed at the TTES soils laboratory in MacGregor, Manitoba, which is certify by the Canadian Council of Independent Laboratories (CCiL). Testing included 36 moisture contents, four Atterberg limits and four particle size analyses.

Laboratory testing results are provided in Appendix C.

4.0 GEOTECHNICAL RECOMMENDATIONS

The following foundation recommendations provided in this report are valid for the project details discussed in Section 1.0 of this report. The recommendations offer varying options intended to aid in the development of project concepts and specifications.

The following recommendations are based on the subsurface conditions encountered in the test holes drilled at the project site. Note that geological conditions are innately variable. At the time of preparation of this report, information on the subsurface stratigraphy was available only at discrete test hole locations. To develop design recommendations from this information, it is necessary to make some assumptions concerning conditions other than those present at the test hole locations.

The recommendations are provided with the understanding that the relevant aspects of the final design (drawings and specifications) will be reviewed as necessary to ensure compliance with the geotechnical aspects of the relevant code, this report, and the final plans and specifications.

4.1 GENERAL

All foundation design recommendations presented in this report are based on the assumption that an adequate level of field review will be provided during construction and that all construction will be carried out by a qualified contractor experienced in foundation and earthworks construction. An adequate level of field review is considered to be:

- Full-time monitoring and design review during construction for deep foundations.
- Full-time monitoring and compaction testing for earthworks.

All field reviews should be carried out by suitably qualified persons, independent of the contractor.

One purpose of providing an adequate level of field review is to check that recommendations, based on data obtained at discrete test hole locations, are relevant to other areas of the site.

4.2 LIMIT STATE DESIGN

The foundation considerations described in this report follow Limit States Design (LSD) guidelines. Limit States Design requires consideration of two (2) main loading states: Ultimate Limit State (ULS) and Serviceability Limit State (SLS). The ULS are primarily concerned with collapse mechanisms of the structure and safety, and the SLS present conditions or mechanisms that restrict or constrain the intended use, function, or occupancy of the structure under expected service or working loads. For foundation design, LSD prescribes Geotechnical Resistance Factors (Φ) that are based upon the method used to evaluate pile capacity to obtain the factored ULS pile capacity values.

The design parameters listed below were estimated based on the encountered stratigraphy and correlations to engineering properties from the results of the laboratory index testing. The unfactored ULS values represent the nominal (ultimate) geotechnical resistance, Rn. The appropriate geotechnical resistance factors (Φ) should be applied to determine the factored geotechnical resistance as presented in the following equation:

$$\Phi R_n \geq \Sigma \alpha_i S_{n_i}$$

Where:

Φ – geotechnical resistance factor
R_n – nominal (ultimate) geotechnical resistance
$\Sigma \alpha_i S_{n_i}$ – summation of the factored overall load effects for a given load combination.

4.3 DEEP FOUNDATIONS

The piers and abutments for the bridge should be supported using deep foundations installed at a minimum depth of 42 m below ground surface. Due high pile loading and significant depth to power auger refusal, driven steel H-piles are the only foundation type being considered to support the bridge at this time.

Geotechnical design and construction recommendations for these deep foundations are provided in the subsequent sections. TTES can provide recommendations for additional pile types and sections, upon request.

4.3.1 DRIVEN STEEN H-PILES

Driven steel H-piles can be used to support the bridge and are considered to be well suited to reaching driving refusal given the ability to splice piles. Based on the geotechnical investigation completed within the site area, driven steel H-piles are anticipated to reach driving refusal at approximately Elev. 213 m or 47 m below existing ground surface.

SLS and unfactored ULS values for HP310x79 and HP360x108 H-piles are provided for end bearing piles driven to practical refusal, as listed below. A geotechnical resistance factor (Φ) of 0.4 should be applied to the ULS values shown in Table 3 below to determine the factored geotechnical resistance in compression.

Table 3
Driven Steel H-Pile Capacities

Location	Pile Section	Minimum Pile Tip Elev. (m)	Minimum Embedment into Dense Till (m)	SLS (kN)	Unfactored ULS (kN)
Abutment	HP310x79	217	1	380	1,200
Abutment	HP360x108	217	1	490	1,550
Pier	HP310x79	217	1	360	1,150
Pier	HP360x108	217	1	480	1,500

Capacities for alternate pile sections can be provided upon request.

It can be assumed that a plug will form during driving of steel H-piles. Under this assumption, the pile tip area used to calculate the tip bearing capacity can be taken as the flange width, “b”, multiplied by the web depth, “d” (i.e., b x d), while the contact perimeter used to calculate the shaft capacity should be taken as the sum of the flange width and web depth, multiplied by two (i.e., 2 x [b+d]).

The total settlement of a pile is a combination of pile movement to mobilize resistance within the soil as well as elastic shortening of the steel pile. The anticipated settlement of driven steel H-piles is estimated to be approximately 10 mm plus the elastic compression of the pile, provided piles are driven to practical refusal into the silt till. The elastic compression of the pile due to structural loads should be evaluated by the structural engineer based on the elastic properties of the pile and the pile cross-section.

Additional design and construction recommendations for driven steel H-piles are provided below:

- The piles must be designed to withstand design loads, handling stresses, and driving forces during installation.
- The weight of the embedded portion of the pile may be neglected.
- The piles will be subject to uplift forces due to frost jacking and tensile forces due to lateral loading. The piles should be designed to resist these uplift forces. Average adfreeze bond stress is 100 kPa for steel.
- Pile spacing should be a minimum of 2.5 times the flange width measured centre-to-centre. Should this spacing not be achievable, consideration should be given to pile group effects.
- Strict control of pile location and orientation should be exercised to obtain accurate pile installation.
- Vibrations generated from driven pile installation have the potential to damage nearby infrastructure. If sensitive infrastructure is located within the vicinity of the pile installations a vibration monitoring program should be implemented.
- The proposed hammer, piling rig, and methodology should be approved in advance of construction and the refusal criterion should be confirmed for the actual hammer and design load. This can be achieved by performing a wave equation analysis using GRLWEAP.
- Diesel hammers with a maximum energy rating of approximately 65 kN-m (45 kip-ft) will be required to install the above pile sections and achieve stated capacities. The maximum energy requirement of a hydraulic hammer will be less. The hammer and pile section combination should be reviewed by TTES prior to mobilizing to the site.
- A steel follower should not be used for driving of steel piles.
- Driving stresses should not exceed 90% of the nominal yield stress of the steel (Fy). As a minimum, steel piles should meet the requirements of CAN/CSA G40.20/G40.21, Grade 350 W.
- Pile Driving Analyzer PDA tests or static load tests shall be completed on a minimum of 5% of the installed piles to verify that design capacities have been achieved at the design termination depth.
- A PDA testing program is recommended as it will confirm the effectiveness of the hammer during driving to achieve the design values, and also allow for the use of an increased geotechnical resistance factor of 0.5.
- Piles that refuse shallower than the minimum 42 m should be reviewed by TTES on a case-by-case basis.
- Pre-boring approximately 3.0 to 4.0 m below grade at all drive pile locations is recommended to allow for standing of piles, to reduce ground vibration and potential ground heave in large pile groups.

- The piles should be free from protrusions, which could create voids in the soil around the pile during driving.
- All piles must be driven to completion once they have been initiated.
- Pile lengths will vary based on site variability and the piles established production drive criteria to achieve the required capacity.
- Any piles that are damaged, excessively out of plumb, or refuse prematurely may need to be replaced, pending a review of their load carrying capacity and expected settlement by a qualified geotechnical engineer.
- Cobbles and boulders are known to be present within the silt till. Careful attention will be required during driving, especially as the pile tip approaches refusal, to avoid damaging the pile.
- After each pile is driven to its required depth, an elevation should be taken at the pile top or at a suitable mark on the side of the pile. The elevation should be checked periodically to measure potential heave caused by driving of the adjacent piles or any uplift forces. Piles that have heaved 5 mm or more must be re-driven to their previous final elevation and final set. At a minimum, all piles driven within five pile diameters should be monitored for heave.
- Corrosive rating of the soils and design life should be considered when selecting and appropriate thickness of below-grade steel members.
- Steel driving shoes should be used to improve drivability of the piles and to reduce likelihood of damage to the pile tips when driving into the till.

At the time of writing this report, finalized structural design drawings were not available for TTES review of the proposed foundations. Should driven steel H-pile foundations be the preferred foundation type for any structures, TTES should be given the opportunity to review the structural design drawings and revise the design recommendations presented within this report accordingly.

4.3.2 SUBGRADE REACTION FOR LATERALLY LOADED PILES

The resistance of vertical piles against horizontal loads involves the interaction between the soil and the structure, which can be represented as a series of horizontal springs with uniform stiffness. To analyze lateral pile performance, the soil's modulus of horizontal subgrade reaction (ks) is utilized.

This modulus should be estimated based on the site's soil characteristics. It is generally expected that most lateral resistance will be provided by the upper 5 to 10 meters of soil, depending on where the horizontal load is applied and the relative stiffness of the pile compared to the soil. It is crucial to note that the depth affected by frost should not be included in the lateral capacity calculations, and soil below 10 m should also be disregarded in this analysis. Additionally, any voids around the piles should be filled with cement grout or lean-mix concrete to ensure proper contact with the surrounding soil; otherwise, regions with voids must be excluded from the lateral capacity assessment.

For a more thorough evaluation of the lateral pile response, a detailed analysis should be conducted during the detailed design phase. This analysis should incorporate the actual properties of the soil and pile, the expected loads, allowable lateral deflection criteria, and a more complex elastic-plastic model to accurately represent the soil’s response under loading.

TABLE 4
MODULUS OF SUBGRADE REACTION

Material Type	Approximate Depth Below Grade (m)	Estimated Modulus of Horizontal Subgrade Reaction, k_s (kPa/m)
Clay Fill	0 – 1.0	–
Lean Clay (CL)	1.0 – 2.5	–
Lean Clay (CL)	2.5 – 6.6	5,500z/d
Fat Clay (CH)	6.6 – 10.0	34,000/d

Notes:
- z = depth (m)
- d = pile diameter (m)

The modulus of horizontal subgrade reaction assumes a linear response to lateral loading and therefore is only appropriate under the following conditions:

- Maximum pile deflection is less than 1% of the pile diameter;
- Static, non-cyclical loading; and
- Pile material does not reach yield conditions.

If any of the conditions above are not met, a more rigorous analysis using LPILE should be competed which considers non-linear behaviour of the pile and soil.

5.0 GEOTECHNICAL RECOMMENDATIONS

5.1 SEISMIC SITE CLASSIFICATION

In the absence of in situ measurements of shear wave velocity at the site, the site classification for seismic response was determined using Table 4.1.8.4.-B of the 2020 National Building Code of Canada.

Based on the energy-corrected average standard penetration resistance within the top 30 m at the site and the undrained shear strength from laboratory testing results, the site classification for seismic site response is considered to be Class E.

5.2 FROST PENETRATION

The depth of frost penetration will vary depending on air temperature, ground cover, the type of fill material used during development and other factors. The estimated maximum depth of frost penetration is 2.5 m assuming bare ground and no insulation cover. Heaving of surficial soils upon freezing should be given consideration must be considered in the foundation design. Good site drainage must also be maintained after development.

Well-graded granular materials should be utilized as structural backfill material as they are less susceptible to the effects of frost heave than fine grained silt and clay materials.

Soil in contact with foundation elements can freeze to the foundations and develop adfreeze bonding, which can result in uplift forces. The 2023 Canadian Foundation Engineering Manual recommends the following adfreeze bond stresses for soil and foundation materials:

- 65 kPa for fine grained soils frozen to wood or concrete;
- 100 kPa for fine grained soils frozen to steel; and
- 150 kPa for saturated gravel frozen to steel.

The annual freezing index for Carman, Manitoba, is approximately 1,602 °C-days, and the seasonal frost penetration depth estimated at this site based on this return period and the soils encountered is approximately 2.5 m. The estimated frost penetration depth assumes that there is no snow cover or vegetation on surface. The presence of snow and vegetation may reduce the seasonal frost penetration depths.

The qualitative frost susceptibility of soil is typically assessed using guidelines developed by Casagrande on the basis of the percentage by weight of the soil finer than 0.02 mm and the plasticity index. This classification system has been adapted by the U.S. Army Corps of Engineers and CFEM, and consists of classifying soils as F1 though F4 in order of increasing frost susceptibility.

The near surficial soils encountered at the site consist of clays that would be classified as F3 to F4, and therefore should be considered as highly frost susceptible.

5.3 LATERAL EARTH PRESSURES

The parameters required for calculation of lateral earth pressures are the site are summarized in Table 5.

The lateral earth pressure may be calculated on the basis of the following relationship, which produces a triangular pressure distribution assuming horizontal ground behind the wall. If the ground surface slopes away from the wall, the design pressure should be reevaluated.

$$P = K (\gamma_b D + q)$$

Where:

P	=	Lateral earth pressure at depth D (kPa).
K	=	Coefficent of lateral earth pressure from Table 5.
γ_b	=	Unit Weight of soil (kN/m^3).
q	=	Subsurface surcharge pressure (kPa).

Table 5
Lateral Earth Pressure Parameters

Soil Type	γ_b (kN/m3)	Angle of Internal Friction ϕ (degrees)	Active Earth Pressure Coefficient Ka	Passive Earth Pressure Coefficient Kp	At-rest Earth Pressure Coefficient Ko
Compacted Sand	20.0	30	0.33	3.00	0.50
Compacted Granular Fill	21.0	38	0.24	4.20	0.38
Clay Fill	17.5	20	0.49	2.04	0.66
Lean Clay (CL)	17.5	23	0.44	2.28	0.61
Fat Clay (CH)	17.5	20	0.49	2.04	0.66
Silt Till	19.0	30	0.33	3.00	0.50

Notes:

1. Gradation tests should be conducted for compacted fill materials to confirm design parameters.

The equation above is based on the assumption that the backfill behind the retaining wall is properly drained. Proper drainage can be provided by using a layer of free draining gravel (50 mm down, well-graded granular material with less than 5% fines) behind the wall to prevent the development of hydrostatic pressure behind the wall. The free draining gravel should be hydraulically connected to free draining gravel placed below the structure so that water can be discharged by gravity. Consideration may be given to placing a weeping tile at the toe of the wall that will be hydraulically connected to the gravel behind the wall. The weeping tile should drain towards a sump pump or natural drainage discharge point.

Providing a proper drainage system for below-grade walls will reduce the lateral frost forces on the walls in the winter (when the water level is at its lowest elevation) provided the backfill behind the wall is properly drained. The thickness of the free draining gravel should not be less than 500 mm. The free draining gravel placed behind the wall should be wrapped in a non-woven filter fabric to reduce the potential for migration of fines from the existing soils into the free draining gravel. The free draining gravel placed around the weeping tile should also be wrapped in a non-woven geotextile to control migration of fines.

Lateral hydrostatic pressure should be added to lateral earth pressure if the backfill behind the retaining wall is not properly drained. Buoyancy forces should also be considered if the base of the wall is below the groundwater table.

A layer of compacted clay, approximately 500 mm thick, should be placed at the surface to reduce surface infiltration. The clay layer should be compacted to a minimum of 95% of the SPMDD.

Active earth pressure (Ka) may be used for flexible walls that can move laterally at the top a distance of 0.002 times the height of the wall. For rigid concrete walls, the at-rest earth pressure (Ko) should be used. Where traffic or other live loads may travel or operate near the wall, the horizontal pressure due to the live load should be added to the lateral earth pressure. The passive earth pressure (Kp) will be mobilized when the top of the wall has moved into the backfill a distance of 0.02 times the height of the wall.

Only hand-operated compaction should be employed within 600 mm of the walls. Caution should be used during compaction of backfill to reduce lateral loads caused by the compaction. To avoid differential lateral pressures against walls during construction the backfill should be brought up evenly around the walls.

5.4 TEMPORARY EXCAVATIONS

All excavations should be carried out in accordance with Manitoba Workplace Safety and Health Act and Regulation.

The temporary side slopes should not be steeper than 2 horizontal to 1 vertical (2H:1V) up to a maximum height of 5.0 m. The temporary side slopes of excavations greater than 1.5 m up to 5 m should not be steeper than 3H:1V. If seepage, sloughing, and/or flowing soils are encountered, slopes need to be made flatter under the direction of a geotechnical engineer. Slope stability of the excavation, staging, and excavation plan should be designed by a geotechnical engineer.

Should excavations encounter groundwater infiltration, the Contractor should control this infiltration through the use of pumps and transmit this water outside of the excavation footprint.

Temporary slopes must be excavated in stages and must not be left open and unattended during construction downtime. If excessive groundwater seepage is encountered or excavations are required to be left open for extended periods of time, flatter sideslopes or shoring may be required to provide a safe working environment.

Temporary surcharge loads, such as excavated material and construction materials and equipment, should be placed such that the toe of the surcharge is at a minimum distance equal to the depth of the excavation. Vehicles delivering materials should be kept back from the edge of the excavation by at least one-half of the depth of excavation. All excavations should be protected from surface runoff and checked regularly for signs of sloughing, especially after periods of precipitation. Small earth falls from the side slopes are a potential source of danger to workers and must be guarded against. Vehicles delivering materials should be kept back from excavated faces by at least 1.0 m.

Excavations left open for extended periods may collect groundwater seepage. It is anticipated that pumping from sumps or trench and sump systems will be sufficient to dewater typical excavations. Any surface water or groundwater infiltration into an excavation should be diverted

away from the base to avoid softening. Ponded water should not be permitted to remain near excavation slopes as it may result in soil softening and shallow slumps.

Prior to allowing workers to enter, and particularly after periods of rain, construction excavations should be carefully observed for evidence of instability such as cracks, bulging, or soil loss from seepage areas. Small earth falls from the side slopes are a potential source of danger to workers and must be guarded against. Evidence of excavation instability or seepage should be corrected prior to allowing worker access. Loose soil blocks, cobbles, and the like should be scaled from the excavation slopes prior to worker entry.

5.5 CONSTRUCTION DEWATERING

Although observations of seepage and groundwater during the test hole drilling were typically observed below a depth of 3.5 m below ground surface, presence of groundwater seepage should be anticipated at shallower depths during construction. A system of ditches leading to sumps equipped with pumps should be available to dewater excavations in the event that groundwater seepage is encountered.

Note that construction dewatering may impact construction and the long-term performance of the abutments and, therefore, should be reviewed by a qualified geotechnical engineer prior to the construction.

5.6 TYPE OF CEMENT FOR CONCRETE MIX

It is recommended that all concrete be made with high sulphate-resistant cement (HS or HSb), and pile caps should have a minimum specified 28-day compressive strength of 35 MPa and S-1 class of exposure, corresponding to very severe sulphate attack. A maximum water to cement ratio of 0.40 should be specified in accordance with Table 2, CSA A23.1 for concrete with very severe sulphate exposure (S-1). Concrete which may be exposed to freezing and thawing should be adequately air entrained to improve freeze-thaw durability in accordance with Table 5, CSA A23.1.

5.7 SOIL CORROSIVITY

It should be assumed for the design of concrete and steel materials that the soils have an extreme corrosive rating.

It is recommended that a heavier steel section be considered to account for the potential effects of corrosivity over the design life of the structure. A mean corrosion rate of 0.02 mm/year/side should be considered when selecting the thickness of below-grade steel members to account for soil corrosivity, assuming that the piles will be installed through compacted fill and/or undisturbed soils.

5.8 EMBANKMENT SETTLEMENT

The final bridge design has approximately 2.5 m of additional fill above existing ground to raise the approach embankment to the deck elevation due to the hydraulic requirements. The placement of fill above existing ground surface will result in consolidation settlement of the underlying soils. The long-term consolidation settlement can have negative impacts on the approach embankments. Typically, consolidation settlement in Manitoba ranges from 5 to 10% of the total fill height placed above existing ground surface.

The negative impacts of consolidation settlement can be minimized by pre-loading with excess fill, installing wick drains, and/or using lightweight fill. A detailed settlement analysis can be completed upon request if 10% consolidation settlement is unacceptable.

6.0 SLOPE STABILITY ANALYSIS

Slope stability analyses were completed for the existing riverbank geometry, then the final bridge design and riverbank geometry under two groundwater and river level conditions. The soil strength parameters were determined using a back analysis of the existing riverbank geometry under the extreme groundwater conditions. The final bridge design and riverbank geometry were then input into the model to determine the estimated increase in the global factor of safety following construction due to the modifications to the riverbank including the addition of geogrid reinforcement within the abutment and lining the riverbank with riprap.

The slope stability analysis was completed using limit equilibrium techniques based on the Morgenstern-Price Method of Slices with half sine wave inter-slice force function in GeoStudio software.

6.1 RIVERBANK GEOMETRY

Three riverbank geometries were analyzed as part of the slope stability analysis using information provided by Samson. The following geometries were analyzed:

- Existing riverbank
- Final bridge design and riverbank through bridge centreline
- Final riverbank 6 m south of the bridge centreline

The riverbank geometries are described below and are presented in Appendix D.

6.1.1 EXISTING RIVERBANK

The details regarding the existing riverbank geometry are provided below in Table 6.

TABLE 6
EXISTING RIVERBANK GEOMETRY

Item	Approximate Measurement
Minimum Channel Elevation	252.8 m
Channel Width	18.0 m
North Slope	2.0H:1V
South Slope	2.0H:1V
North Abutment Elevation	260.2 m
South Abutment Elevation	258.4 m

6.1.2 PROPOSED BRIDGE AND RIVERBANK

The final bridge design and riverbank geometries include the new bridge structure, abutment and riprap lined channel. The proposed abutments include well-graded granular backfill and Miragrid 10XT geogrid behind pre-cast concrete panel abutment walls. The details regarding the final bridge design and riverbank geometries are provided below in Table 7.

TABLE 7
FINAL BRIDGE DESIGN AND RIVERBANK GEOMETRY

Item	Approximate Measurement
Minimum Channel Elevation	252.8 m
Natural Channel Width	7.0 m
North and South Riprap Lined Slopes	2.5H:1V
North Abutment Bottom of Exposed Backwall Elevation	256.9 m
South Abutment Bottom of Exposed Backwall Elevation	256.9 m
Top of Road Elevation	260.5 m
Geogrid Reinforcement Length from Backwall	7.0 m

6.1.3 ABUTMENT GEOSYNTHETICS

Geosynthetics should be installed within the well-graded granular backfill between the backwall and wingwalls. Combigrid 30/30 (or similar) should be installed below the granular backfill above the subgrade from the backwall for a minimum distance of 7 m away from the backwall. To reduce the horizontal loading on the backwalls and wingwalls Miragrid 10XT geogrid should be installed as outlined in Table 8 below.

TABLE 8
ABUTMENT GEOSYNTHETICS

Geosynthetic Material	Height Above Subgrade (m)	Spacing Above Lower Layer (m)	Elevation (m)	Location
Combigrid 30/30 and Miragrid 10XT	0	-	255.45	Top of Subgrade
Miragrid 10XT	0.6	0.6	256.05	
Miragrid 10XT	1.2	0.6	256.65	
Miragrid 10XT	1.8	0.6	257.25	
Miragrid 10XT	2.4	0.6	257.85	
Miragrid 10XT	3.0	0.6	258.45	
Miragrid 10XT	3.6	0.6	259.05	
Miragrid 10XT and Non-Woven 8 oz Geotextile	4.2	0.6	259.65	Top of Granular Backfill
None	5.0	0.8	260.45	Top of Road

6.2 SOIL STRATIGRAPHY

The soil stratigraphy used in the model was based on the two test holes that were drilled to power auger refusal on either sides of the Boyne River and laboratory testing that was completed on collected representative samples.

6.3 BACK ANALYSIS

A back analysis was completed to determine the soil parameters using the existing riverbank geometry under the extreme groundwater level and river level condition. The soil strength parameters were selected so that the existing riverbank stability has a factor of safety at 1.0. The selected soil strength parameters were within anticipated ranges based on the soil classification and resulted in a factor of safety of 1.0. These soil strength parameters are provided below in Table 9.

TABLE 9
SOIL STRENGTH PARAMETERS

Material Type	Unit Weight (kN/m^3)	Cohesion (kPa)	Friction Angle (degrees)
Lean Clay (CL)	17.5	3	27
Fat Clay (CH)	17.5	5	22

6.4 ENGINGEERED MATERIALS

The final bridge design and riverbank geometry includes the placement of granular backfill, riprap and concrete abutment walls. The engineered materials strength parameters are provided below in Table 10.

TABLE 10
ENGINEER MATERIALS STRENGTH PARAMETERS

Material Type	Unit Weight (kN/m^3)	Cohesion (kPa)	Friction Angle (degrees)
Granular Backfill	21	0	32
Riprap	20	0	35
Concrete Abutment Wall	0	-	-

The concrete abutment wall has been designed structurally by Samson to withstand the induced stresses from the applied loading and has been modelled as a high strength material supported by the abutment and wingwall piles.

6.5 GROUNDWATER AND RIVER LEVELS

Two groundwater and river level conditions were used in the slope stability analysis. The extreme condition was selected as rapid drawdown from the water level experienced during 2022 spring flood event with a return period of 20 years at Elev. 257.95 m, to the normal water level at Elev 256.20 m with a return period of two years. The only recorded event with a water level higher than the 2022 spring flood event was in 1974, prior to the construction of the Boyne diversion channel in 1991. The normal condition conservatively uses the downstream weir elevation as the river level at the site at Elev. 256.20 m, with a groundwater level 0.5 m above the river level at Elev. 256.70 m. Monitored groundwater level one week after drilling on March 14, 2025 was at Elev. 256.22 m.

TABLE 11
GROUNDWATER AND RIVER LEVELS

Condition	Groundwater Elevation (m)	Boyne River Elevation (m)
Normal	256.20	256.20
Extreme	257.95	256.20

6.6 SLOPE STABILITY RESULTS

The results of the slope stability analyses are provided below in Table 12 and in Appendix D. The analysis concluded that the existing riverbank geometry under extreme conditions has an estimated factor of safety of approximately 1.0, while the final bridge design and riverbank geometry will result in a significant increase to riverbank stability. The final bridge design and riverbank geometry will provide a factor of safety of approximately 1.3 under normal, long-term conditions and 1.2 under extreme, rapid drawdown conditions.

Raising the approach embankments was required to meet the required Manitoba Transportation and Infrastructure hydraulic design guidelines for Provincial Roads with a 3% design flowrate, minimum bridge freeboard of 0.3 m, maximum head loss of 0.2 m, and a maximum mean flow-through velocity of 1.5 m/s. Raising the approach embankments has a negative impact on slope stability, decreasing the factor of safety.

TABLE 12
SLOPE STABILITY RESULTS

Geometry	Slope	Condition	Analysis Number	Factor of Safety
Existing	North	Normal	1	1.14
Existing	South	Normal	2	1.13
Existing	North	Extreme	3	1.03
Existing	South	Extreme	4	1.07
Proposed – 6 m South of Centerline	North	Normal	5	1.56
Proposed – 6 m South of Centerline	South	Normal	6	1.54
Proposed – 6 m South of Centerline	North	Extreme	7	1.41
Proposed – 6 m South of Centerline	South	Extreme	8	1.41
Proposed – Through Centerline	North	Normal	9	1.33
Proposed – Through Centerline	South	Normal	10	1.66
Proposed – Through Centerline	North	Extreme	11	1.33
Proposed – Through Centerline	South	Extreme	12	1.66

7.0 REVIEW OF DESIGN AND CONSTRUCTION

TTES should be given the opportunity to review details of the design and specifications related to geotechnical aspects for the project prior to construction.

Full-time monitoring, inspection and testing should be undertaken during construction by qualified personnel, independent of the contractor.

8.0 STATEMENT OF LIMITATIONS AND CONDITIONS

8.1 LIMITATIONS

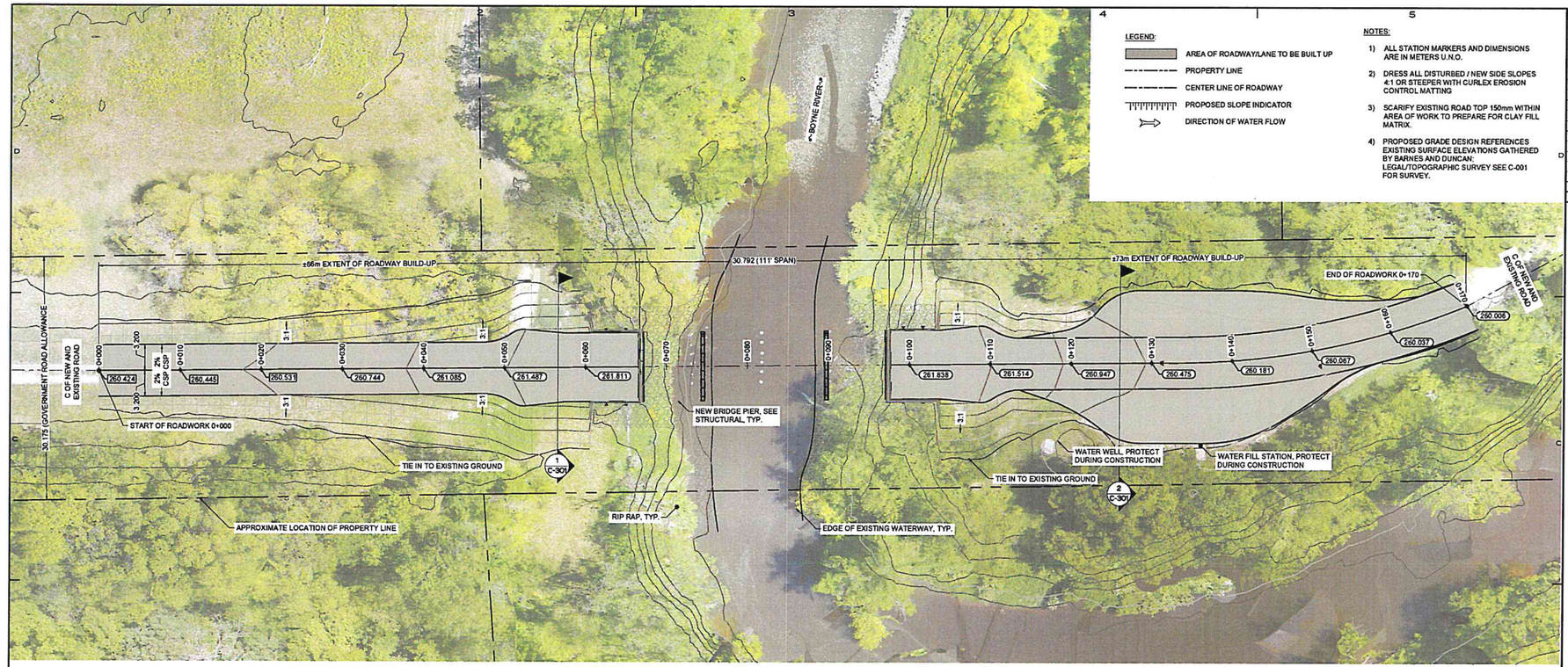
The information provided in this report is in accordance with current geotechnical principles and practices. The findings of this report were based on information acquired during the field investigation and laboratory testing, combined with an interpolation of soils and groundwater conditions found at and within the depth of the test holes drilled by TTES at the site at the time of drilling. Soil conditions are natural deposits that can be highly variable across a site. TTES should be notified to review and modify the findings of this report if subsurface conditions are found to be different than the conditions presented in this report. The information, data, recommendation, and conclusions in this report should be read as a whole, and sections or parts should not be read out of context.

8.2 THIRD PARTY USE OF REPORT

This report has been prepared for Samson Engineering Inc. to whom this report has been addressed and any use a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. TTES Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

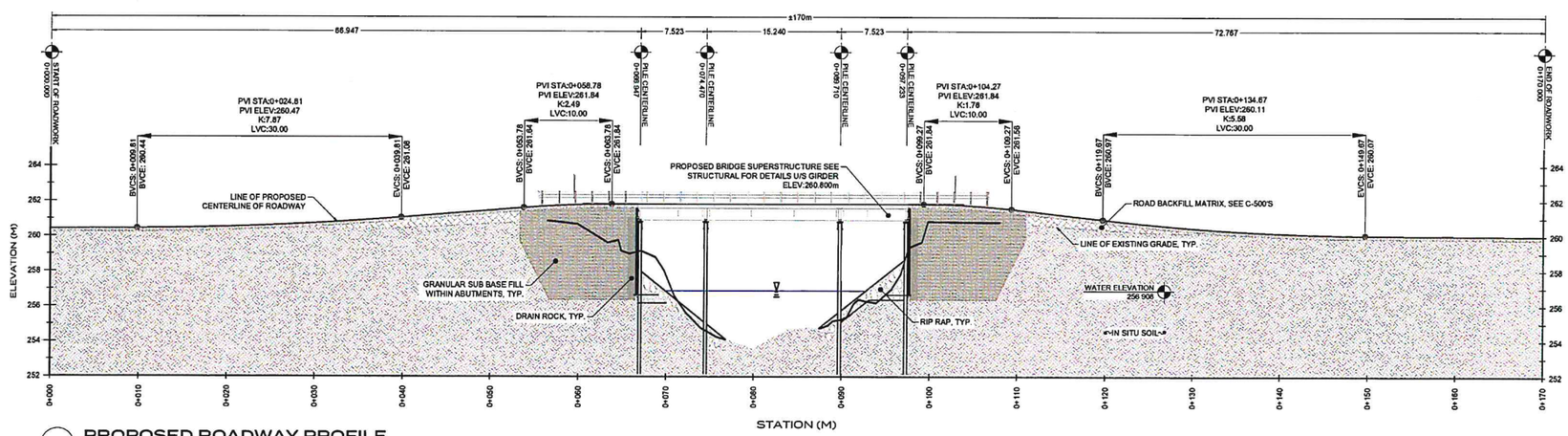
APPENDIX A

PRELIMINARY BRIDGE DESIGN



1 PROPOSED ROADWAY ALIGNMENT

SCALE: 1:250



2 PROPOSED ROADWAY PROFILE

VERT EXAGGERATION:2
HORZ SCALE:1:250

NO	ISSUED	DATE
1	ISSUED FOR PERMIT	2024-12-02
NO	ISSUED	DATE

APEGM
Certificate of Authorization
Samson Engineering Inc.
No. 3050 Expiry: April 30, 2025

ISSUED FOR PERMIT

PROVINCE OF MANITOBA
P.M. DORN
Member
21651
REGISTERED PROFESSIONAL ENGINEER

NORTH ARROW

NOTE:
THE GENERAL CONTRACTOR MUST VERIFY ALL DIMENSIONS, DATUMS AND LEVELS NOTED ON THESE DRAWINGS WITH SITE CONDITIONS. ANY DISCREPANCIES OR OMISSIONS ON THESE DRAWINGS MUST BE REPORTED TO THE ARCHITECT/ENGINEER PRIOR TO COMMENCING ANY RELATED WORK.
DO NOT SCALE DRAWINGS.

SAMSON
ARCHITECTURE | ENGINEERING
102 - 10TH STREET
BRANDON, MB R7A 4G6
PH: (204) 727-0747

PROJECT LOCATION: CARMAN MB

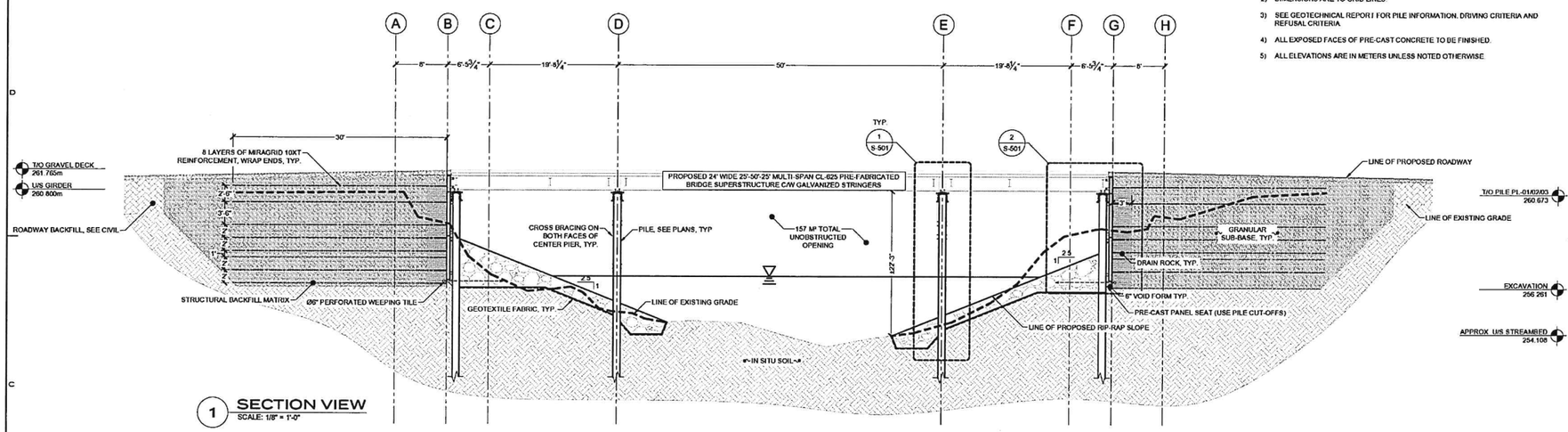
PROJECT NAME: RM OF DUFFERIN McEACHERN BRIDGE REPLACEMENT STRUCTURE

DRAWING TITLE: PROPOSED ALIGNMENT

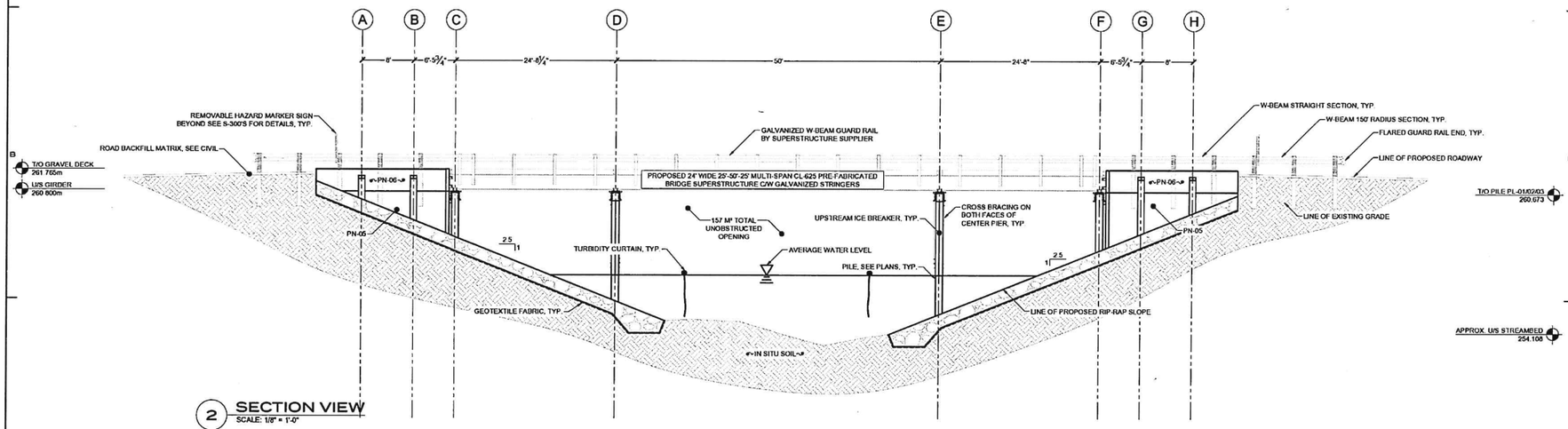
PROJECT NUMBER	DATE
SEI2022-116	DECEMBER 2, 2024
DRAWING NUMBER	SHEET SIZE (24" X 36") / SCALE
C-101	AS NOTED
DRAWN BY: SJ	CHECKED BY: PD

NOTES:

1) GRID LINES ARE COINCIDENT WITH CENTER OF PILES.
2) DIMENSIONS ARE TO GRID LINES.
3) SEE GEOTECHNICAL REPORT FOR PILE INFORMATION, DRIVING CRITERIA AND REFUSAL CRITERIA.
4) ALL EXPOSED FACES OF PRE-CAST CONCRETE TO BE FINISHED.
5) ALL ELEVATIONS ARE IN METERS UNLESS NOTED OTHERWISE.



1 SECTION VIEW
SCALE: 1/8" = 1'-0"



2 SECTION VIEW
SCALE: 1/8" = 1'-0"

NO	ISSUED	DATE
1	ISSUED FOR PERMIT	2024-12-02
NO	ISSUED	DATE

APEGM
Certificate of Authorization
Samson Engineering Inc.
No. 3050 Expiry: April 30, 2025

ISSUED FOR PERMIT

PROVINCE OF MANITOBA
P. M. DORN
Member
21651
ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS

NORTH ARROW

NOTE:
THE GENERAL CONTRACTOR MUST VERIFY ALL DIMENSIONS, DATUMS AND LEVELS NOTED ON THESE DRAWINGS WITH SITE CONDITIONS. ANY DISCREPANCIES, ERRORS OR OMISSIONS MUST BE REPORTED TO THE ARCHITECT OR ENGINEER PRIOR TO COMMENCING ANY RELATED WORK.
DO NOT SCALE DRAWINGS.

SAMSON
ARCHITECTURE | ENGINEERING
163 – 10TH STREET
BRANDON, MB R7A 4G8
PH: (204) 727-0717

PROJECT LOCATION: CARMAN MB

PROJECT NAME: MUNICIPALITY OF DUFFERIN McEACHERN BRIDGE REPLACEMENT

DRAWING TITLE: SECTIONS

PROJECT NUMBER	DATE
SE12024-048	DECEMBER 2, 2024
DRAWING NUMBER	SHEET SIZE (24"X 36") / SCALE: AS SHOWN
S-301	DRAWN BY: BJ / CHECKED BY: PD

APPENDIX B

TEST HOLE LOGS

TEST HOLE ID: TH25-01

Client:	Samson Engineering Inc.	**Job Number:**	25MB-GEO-SAMSON-CARMAN	**Top of Pipe Elev.:**	260.80 m
Project:	McEachern Bridge Road 22W over Boyne River	**Date Drilled:**	2025-03-05	**Ground Elev.:**	259.97 m
Site:	TH25-01	**Northing:**	5,484,544.99 m	**Water Elev.:**	256.22 m
Location:	South of Bridge	**Easting:**	575,529.47 m		
Drilling Method:	125 mm Solid Stem Auger				

Elevation (m)	Depth (m)	Depth (ft)	Graphics	Description and Classification	Piezo. Log	Depth (m)	Sample Type	Sample No.	Recovery %	STANDARD PENETRATION TESTING (Uncorrected - N) (blows/0.15 m) 20 40 60 80	Cu (kPa) Pocket Pen * Torvane ◆ PL MC LL (%) 20 40 60 80
260.0	0	0		**CLAY FILL - Dark brown, frozen, high plasticity.**							
259.0	1	3		**LEAN CLAY (CL) - Light brown, dry, soft, low plasticity, with to and fine to coarse grained sand, with to and silt.**				S01			
		5						S02			
258.0	2	7		**- Firm below 2.0 m.**				S03			
257.0	3	10		**- Particle Size Analysis at 3.1 m: 0.0% Gravel, 0.1% Coarse Grained Sand, 0.3% Medium Grained Sand, 31.8% Fine Grained Sand, 41.9% Silt, 26.0% Clay.** **- Atterberg Limits at 3.1 m: 30% Liquid Limit, 18% Plastic Limit, 12% Plasticity Index.**				S04			
256.0	4	13		**- Grey and wet below 4.3 m.**				S05			
		15						S06			
255.0	5	16									
254.0	6	20		**- Particle Size Analysis at 6.1 m: 0.0% Gravel, 0.0% Coarse Grained Sand, 0.6% Medium Grained Sand, 42.5% Fine Grained Sand, 31.6% Silt, 25.3% Clay.** **- Atterberg Limits at 6.1 m: 31% Liquid Limit, 17% Plastic Limit, 14% Plasticity Index.**				S07			
253.0	7	23		**FAT CLAY (CL) - Grey, damp, firm, high plasticity, trace fine to coarse grained sand, with silt.**							
252.0	8	26									
251.0	9	29						S08			
250.0	10	33									
249.0	11	36									
		38						S09			
248.0	12	39									
247.0	13	43									
246.0	14	46									

Contractor: TTES Consulting Ltd.

Inspector: Justin Ham

Approved: Kyle Hamilton

Date: 2025-03-18

TEST HOLE ID: TH25-01

Client:	Samson Engineering Inc.	**Job Number:**	25MB-GEO-SAMSON-CARMAN	**Top of Pipe Elev.:**	260.80 m
Project:	McEachern Bridge Road 22W over Boyne River	**Date Drilled:**	2025-03-05	**Ground Elev.:**	259.97 m
Site:	TH25-01	**Northing:**	5,484,544.99 m	**Water Elev.:**	256.22 m
Location:	South of Bridge	**Easting:**	575,529.47 m		
Drilling Method:	125 mm Solid Stem Auger				

Elevation (m)	Depth (m)	Depth (ft)	Graphics	Description and Classification	Piezo. Log	Depth (m)	Sample Type	Sample No.	Recovery %	STANDARD PENETRATION TESTING (Uncorrected - N) (blows/0.15 m) 20 40 60 80	Cu (kPa) Pocket Pen * Torvane ◆ PL MC LL (%) 20 40 60 80
246.0	14	46									
		47									
		48									
245.0	15	49									
		50									
		51						S10			
244.0	16	52									
		53									
		54									
243.0	17	55									
		56									
		57									
		58									
242.0	18	59									
		60						S11			
		61									
		62									
241.0	19	63									
		64		- Stiff below 19.2 m.							
		65									
240.0	20	66									
		67									
		68									
239.0	21	69									
		70		- Trace gypsum inclusions below 21.4 m.							
		71						S12			
238.0	22	72									
		73									
		74									
237.0	23	75									
		76									
		77									
		78									
236.0	24	79									
		80									
		81						S13			
235.0	25	82									
		83									
		84									
		85									
234.0	26	86									
		87									
		88									
233.0	27	89									
		90									
		91						S14			
232.0	28	92									

Contractor: TTES Consulting Ltd.

Inspector: Justin Ham

Approved: Kyle Hamilton

Date: 2025-03-18

TEST HOLE ID: TH25-01

Client:	Samson Engineering Inc.	**Job Number:**	25MB-GEO-SAMSON-CARMAN	**Top of Pipe Elev.:**	260.80 m
Project:	McEachern Bridge Road 22W over Boyne River	**Date Drilled:**	2025-03-05	**Ground Elev.:**	259.97 m
Site:	TH25-01	**Northing:**	5,484,544.99 m	**Water Elev.:**	256.22 m
Location:	South of Bridge	**Easting:**	575,529.47 m		
Drilling Method:	125 mm Solid Stem Auger				

Elevation (m)	Depth (m)	Depth (ft)	Graphics	Description and Classification	Piezo. Log	Depth (m)	Sample Type	Sample No.	Recovery %	STANDARD PENETRATION TESTING (Uncorrected - N) (blows/0.15 m) 20 40 60 80	Cu (kPa) Pocket Pen * Torvane ◆ PL MC LL (%) 20 40 60 80
232.0	28	92									
		93									
		94									
231.0	29	95									
		96									
		97									
		98									
230.0	30	99									
		100									
		101						S15			
229.0	31	102									
		103									
		104									
228.0	32	105									
		106									
		107									
227.0	33	108									
		109									
		110						S16			
		111									
226.0	34	112									
		113									
		114									
225.0	35	115									
		116									
		117									
224.0	36	118									
		119									
		120									
223.0	37	121									
		122									
		123									
		124		SILT TILL (CL) - Dark grey, damp, loose, no to low plasticity, with clay, some to and fine to coarse grained sand, trace fine to coarse grained gravel.							
222.0	38	125									
		126									
		127						S17			
221.0	39	128									
		129		- Suspected cobbles below 39.0 m.							
		130									
		131									
220.0	40	132									
		133									
		134									
219.0	41	135									
		136									
		137									
218.0	42	138									

Contractor: TTES Consulting Ltd.

Inspector: Justin Ham

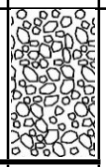
Approved: Kyle Hamilton

Date: 2025-03-18

TEST HOLE ID: TH25-01

Client:	Samson Engineering Inc.	**Job Number:**	25MB-GEO-SAMSON-CARMAN	**Top of Pipe Elev.:**	260.80 m
Project:	McEachern Bridge Road 22W over Boyne River	**Date Drilled:**	2025-03-05	**Ground Elev.:**	259.97 m
Site:	TH25-01	**Northing:**	5,484,544.99 m	**Water Elev.:**	256.22 m
Location:	South of Bridge	**Easting:**	575,529.47 m		
Drilling Method:	125 mm Solid Stem Auger				

Elevation (m)	Depth (m)	Depth (ft)	Graphics	Description and Classification	Piezo. Log	Depth (m)	Sample Type	Sample No.	Recovery %	STANDARD PENETRATION TESTING (Uncorrected - N) (blows/0.15 m) 20 40 60 80	Cu (kPa) Pocket Pen * Torvane ◆ PL MC LL (%) 20 40 60 80
218.0	42	138									
		139									
		140									
217.0	43	141									
		142									
		143									
		144		**Notes:**							
216.0	44	145		1. End of test hole at 43.7 m at power auger refusal on suspected cobbles and boulders.							
		146		2. Test hole backfilled with auger cuttings to grade.							
		147		3. Standpipe piezometer installed adjacent to test hole at Northing: 5,484,544.99, Easting: 575529.47, Elevation: 259.97 m. 50 mm slotted screen was installed 6.15 m to 7.68 m below ground surface, with 0.91 m stick up above gound surface. The annulus was backfilled with sand from 8.3 m to 5.8 m, bentonite chips from 5.8 m to 4.6 m, auger cuttings from 4.6 m to 1.5 m, and bentonite chips from 1.5 m to ground surface.							
215.0	45	148									
		149									
		150		4. Water level measured in the standpipe piezometer on March 14, 2025 shown.							
214.0	46	151									
		152									
		153									
213.0	47	154									
		155									
		156									
		157									
212.0	48	158									
		159									
		160									
211.0	49	161									
		162									
		163									
210.0	50	164									
		165									
		166									
209.0	51	167									
		168									
		169									
		170									
208.0	52	171									
		172									
		173									
207.0	53	174									
		175									
		176									
206.0	54	177									
		178									
		179									
205.0	55	180									
		181									
		182									
		183									
204.0	56	184									



S18

Contractor: TTES Consulting Ltd.

Inspector: Justin Ham

Approved: Kyle Hamilton

Date: 2025-03-18

Client:	Samson Engineering Inc.	**Job Number:**	25MB-GEO-SAMSON-CARMAN	**Top of Pipe Elev.:**	N.A. m
Project:	McEachern Bridge Road 22W over Boyne River	**Date Drilled:**	2025-03-06	**Ground Elev.:**	260.19 m
Site:	TH25-02	**Northing:**	5,484,605.75 m	**Water Elev.:**	N.A. m
Location:	North of Bridge	**Easting:**	575,528.89 m		
Drilling Method:	125 mm Solid Stem Auger				

Elevation (m)	Depth (m)	Depth (ft)	Graphics	Description and Classification	Piezo. Log	Depth (m)	Sample Type	Sample No.	Recovery %	STANDARD PENETRATION TESTING (Uncorrected - N) (blows/0.15 m) 20 40 60 80	Cu (kPa) Pocket Pen * Torvane ◆ PL MC LL (%) 20 40 60 80
260.2	0	0		**CLAY FILL (CL)** - Light brown, frozen, low plasticity, some topsoil.							
259.2	1	3		**LEAN CLAY (CL)** - Light brown, dry, soft, low plasticity, with to and fine to coarse grained sand, with to and silt.				S01			
258.2	2	7									
257.2	3	10		- Wet below 3.1 m.				S02			
		11						S03			
256.2	4	13									
255.2	5	17						S04			
		18		- Grey below 5.5 m.				S05			
254.2	6	20									
253.2	7	22		**FAT CLAY (CL)** - Grey, damp, firm, high plasticity, trace fine to coarse grained sand, with silt.							
252.2	8	26						S06			
251.2	9	29									
250.2	10	33									
249.2	11	36						S07			
248.2	12	39									
247.2	13	43						S08			
246.2	14	46									

TEST HOLE ID: TH25-02

Client:	Samson Engineering Inc.	**Job Number:**	25MB-GEO-SAMSON-CARMAN	**Top of Pipe Elev.:**	N.A. m
Project:	McEachern Bridge Road 22W over Boyne River	**Date Drilled:**	2025-03-06	**Ground Elev.:**	260.19 m
Site:	TH25-02	**Northing:**	5,484,605.75 m	**Water Elev.:**	N.A. m
Location:	North of Bridge	**Easting:**	575,528.89 m		
Drilling Method:	125 mm Solid Stem Auger				

Elevation (m)	Depth (m)	Depth (ft)	Graphics	Description and Classification	Piezo. Log	Depth (m)	Sample Type	Sample No.	Recovery %	STANDARD PENETRATION TESTING (Uncorrected - N) (blows/0.15 m) 20 40 60 80	Cu (kPa) Pocket Pen * Torvane ◆ PL MC LL (%) 20 40 60 80
246.2	14	46									
		47									
		48									
245.2	15	49									
		50									
		51									
		52									
244.2	16	53									
		54									
		55									
243.2	17	56						S09			
		57									
		58									
242.2	18	59									
		60									
		61									
241.2	19	62									
		63									
		64									
		65									
240.2	20	66									
		67						S10			
		68									
239.2	21	69									
		70		- Trace gypsum inclusions below 21.4 m.							
		71									
238.2	22	72									
		73									
		74									
237.2	23	75									
		76									
		77		- Particle Size Analysis at 23.5 m: 0.0% Gravel, 0.0% Coarse Grained Sand, 0.2%				S11			
		78		Medium Grained Sand, 4.7% Fine Grained Sand, 30.4% Silt, 64.8% Clay.							
236.2	24	79		- Atterberg Limits at 23.5 m: 62% Liquid Limit, 21% Plastic Limit, 41% Plasticity Index.							
		80									
		81									
235.2	25	82									
		83									
		84									
234.2	26	85									
		86		- Stiff below 26.3 m.				S12			
		87									
		88									
233.2	27	89									
		90									
		91									
232.2	28	92									

Contractor: TTES Consulting Ltd.

Inspector: Justin Ham

Approved: Kyle Hamilton

Date: 2025-03-18

TEST HOLE ID: TH25-02

Client:	Samson Engineering Inc.	**Job Number:**	25MB-GEO-SAMSON-CARMAN	**Top of Pipe Elev.:**	N.A. m
Project:	McEachern Bridge Road 22W over Boyne River	**Date Drilled:**	2025-03-06	**Ground Elev.:**	260.19 m
Site:	TH25-02	**Northing:**	5,484,605.75 m	**Water Elev.:**	N.A. m
Location:	North of Bridge	**Easting:**	575,528.89 m		
Drilling Method:	125 mm Solid Stem Auger				

Elevation (m)	Depth (m)	Depth (ft)	Graphics	Description and Classification	Piezo. Log	Depth (m)	Sample Type	Sample No.	Recovery %	STANDARD PENETRATION TESTING (Uncorrected - N) (blows/0.15 m) 20 40 60 80	Cu (kPa) Pocket Pen * Torvane ◆ PL MC LL (%) 20 40 60 80
232.2	28	92									
		93									
		94									
231.2	29	95									
		96									
		97									
		98									
230.2	30	99									
		100									
		101									
229.2	31	102									
		103									
		104		- Soft, transitioning from fat clay to silt till below 31.7 m.				S14			
228.2	32	105									
		106									
		107									
227.2	33	108									
		109									
		110		SILT TILL (CL) - Dark grey, damp, loose, no to low plasticity, with clay, some to and fine to coarse grained sand, trace fine to coarse grained gravel.							
		111									
226.2	34	112									
		113									
		114						S15			
225.2	35	115									
		116									
		117									
224.2	36	118									
		119									
		120									
223.2	37	121									
		122									
		123						S16			
		124		- Compact, suspected cobbles below 37.6 m.							
222.2	38	125									
		126									
		127									
221.2	39	128									
		129									
		130									
220.2	40	131									
		132									
		133									
		134		- Particle Size Analysis at 40.9 m: 5.0% Gravel, 2.7% Coarse Grained Sand, 11.1% Medium Grained Sand, 21.4% Fine Grained Sand, 37.2% Silt, 22.6% Clay. - Atterberg Limits at 40.9 m: 27% Liquid Limit, 14% Plastic Limit, 13% Plasticity Index.						
219.2	41	135						S17			
		136									
		137									
218.2	42	138									

Contractor: TTES Consulting Ltd.

Inspector: Justin Ham

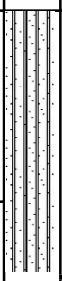
Approved: Kyle Hamilton

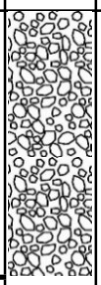
Date: 2025-03-18

TEST HOLE ID: TH25-02

Client:	Samson Engineering Inc.	**Job Number:**	25MB-GEO-SAMSON-CARMAN	**Top of Pipe Elev.:**	N.A. m
Project:	McEachern Bridge Road 22W over Boyne River	**Date Drilled:**	2025-03-06	**Ground Elev.:**	260.19 m
Site:	TH25-02	**Northing:**	5,484,605.75 m	**Water Elev.:**	N.A. m
Location:	North of Bridge	**Easting:**	575,528.89 m		
Drilling Method:	125 mm Solid Stem Auger				

Elevation (m)	Depth (m)	Depth (ft)	Graphics	Description and Classification	Piezo. Log	Depth (m)	Sample Type	Sample No.	Recovery %	STANDARD PENETRATION TESTING (Uncorrected - N) (blows/0.15 m) 20 40 60 80	Cu (kPa) Pocket Pen * Torvane ◆ PL MC LL (%) 20 40 60 80
218.2	42	138									
		139									
		140									
217.2	43	141									
		142									
		143									
		144									
216.2	44	145									
		146									
		147									
215.2	45	148									
		149									
		150									
214.2	46	151									
		152									
		153									
213.2	47	154									
		155									
		156									
		157									
212.2	48	158									
		159									
		160									
211.2	49	161									
		162									
		163									
210.2	50	164									
		165									
		166									
209.2	51	167									
		168									
		169									
		170									
208.2	52	171									
		172									
		173									
207.2	53	174									
		175									
		176									
		177									
206.2	54	178									
		179									
		180									
205.2	55	181									
		182									
		183									
204.2	56	184									





S18

Notes:
1. End of test hole at 44.7 m at power auger refusal on suspected cobbles and boulders.
2. Test hole backfilled with auger cuttings to grade.

APPENDIX C

LABORATORY TESTING

TTES
CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com
1701 Moreland Avenue
Brandon, Manitoba R7C 1A6
Phone 204-685-3123
Fax 204-685-2401

AASHTO T88 (ASTM D422) - PARTICLE-SIZE ANALYSIS OF SOILS

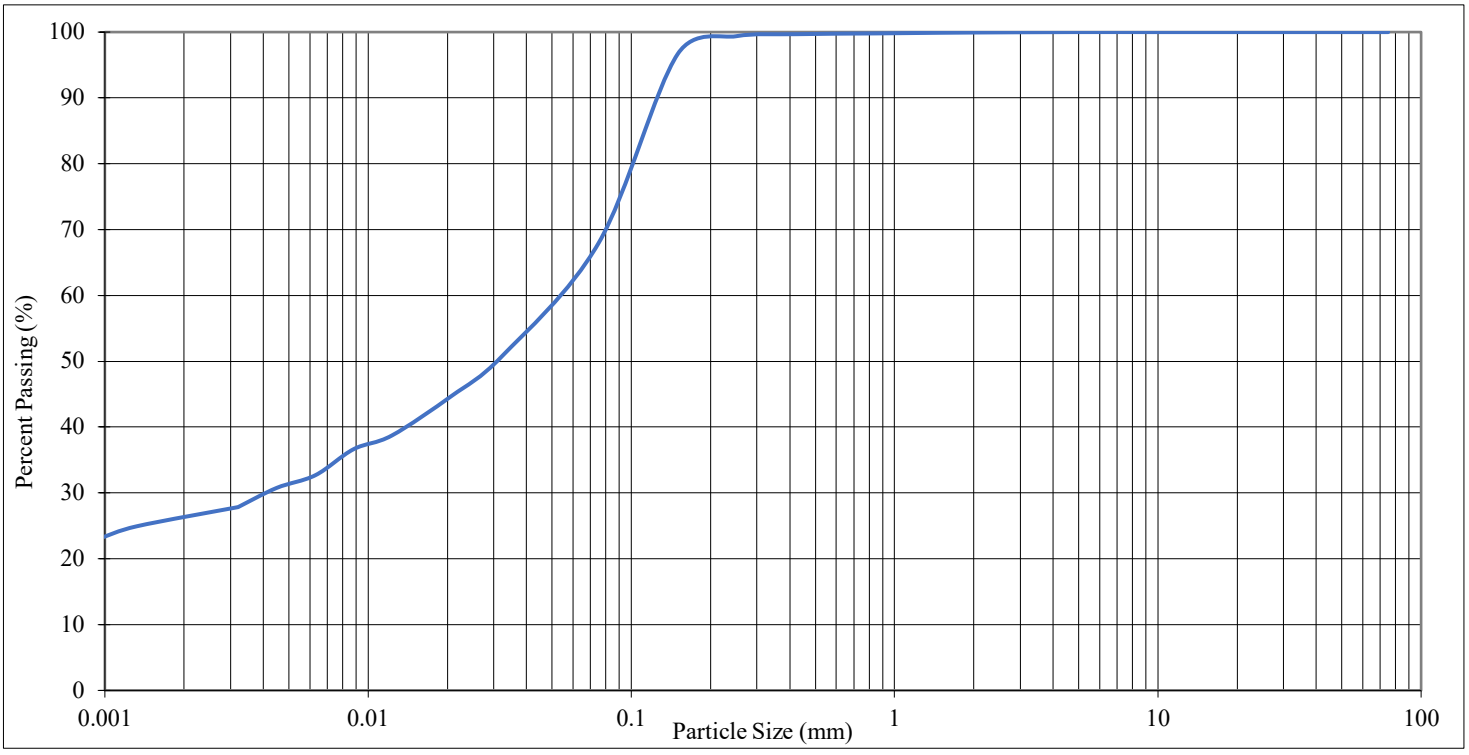
CLIENT: RM of Dufferin
SAMPLED BY: JH
SAMPLE LOCATION: South Test Hole
BOREHOLE No: S4

PROJECT: McEachern Bridge
DATE SAMPLED: 03-05/07-25
DESCRIPTION: Sandy Lean Clay
TESTED BY: RP
DATE TESTED: 03-18-25

SIEVE SIZE (mm)	PERCENT PASSING	SPEC.
75	100.0	
50	100.0	
37.5	100.0	
25	100.0	
19	100.0	
12.5	100.0	
9.5	100.0	
4.75	100.0	
2	99.9	

SIEVE SIZE (mm)	PERCENT PASSING	SPEC.
1.18	99.9	
0.85	99.8	
0.425	99.7	
0.25	99.4	
0.15	96.7	
0.075	67.9	
0.005	31.3	
0.002	26.0	
0.001	23.3	

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.002 mm	Clay, % <0.002 mm	Colloids, % <0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
0.0	0.1	0.3	31.8	41.9	26.0	23.3
	Total Sand: 32.1%					



COMMENTS:

Report Date: 2025-03-18

Reviewed By: Jeff Tait, C.E.T.

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AASHTO T88 (ASTM D422) - PARTICLE-SIZE ANALYSIS OF SOILS

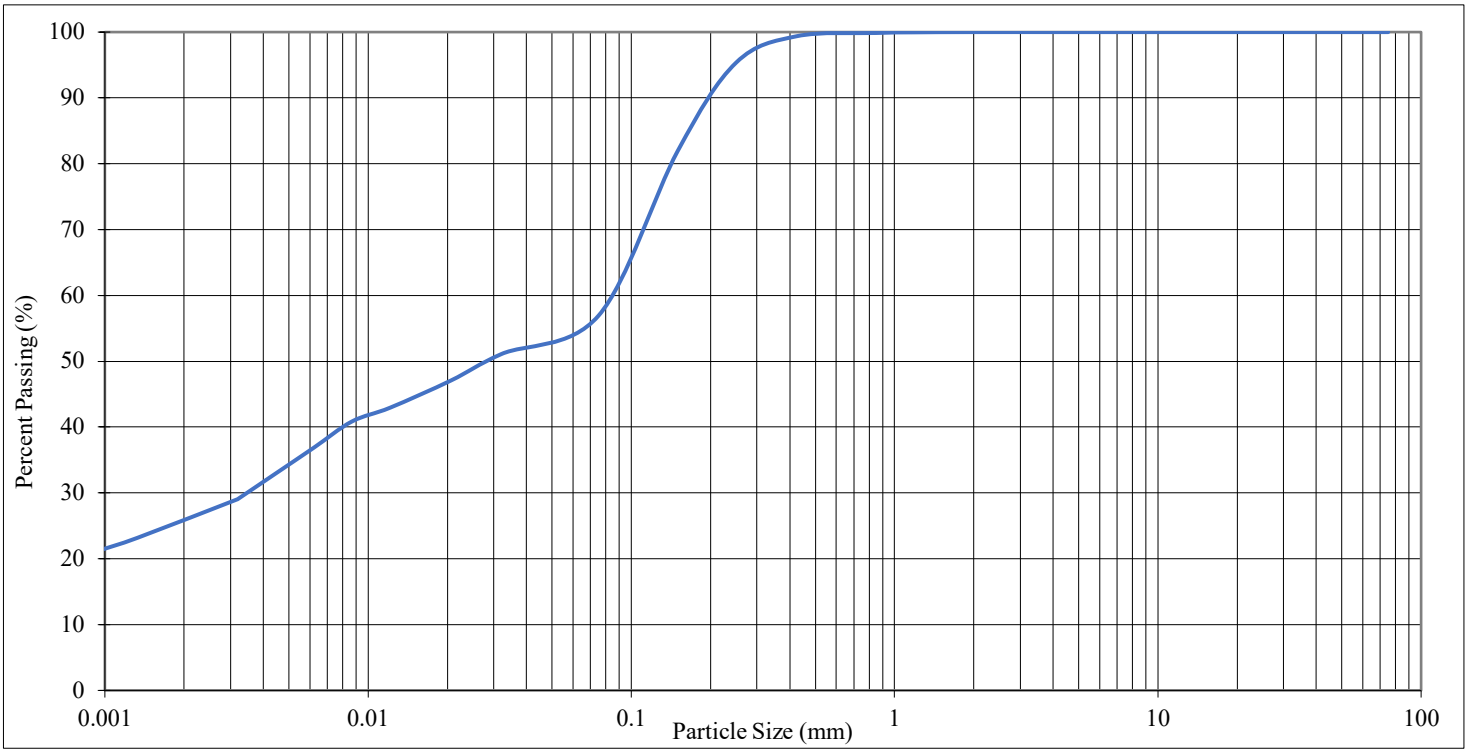
CLIENT: RM of Dufferin
SAMPLED BY: JH
SAMPLE LOCATION: South Test Hole
BOREHOLE No: S7

PROJECT: McEachern Bridge
DATE SAMPLED: 03-05/07-25
DESCRIPTION: Sandy Lean Clay
TESTED BY: RP
DATE TESTED: 03-18-25

SIEVE SIZE (mm)	PERCENT PASSING	SPEC.
75	100.0	
50	100.0	
37.5	100.0	
25	100.0	
19	100.0	
12.5	100.0	
9.5	100.0	
4.75	100.0	
2	100.0	

SIEVE SIZE (mm)	PERCENT PASSING	SPEC.
1.18	100.0	
0.85	99.9	
0.425	99.4	
0.25	95.4	
0.15	81.9	
0.075	56.9	
0.005	34.2	
0.002	25.3	
0.001	21.5	

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.002 mm	Clay, % <0.002 mm	Colloids, % <0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
0.0	0.0	0.6	42.5	31.6	25.3	21.5
	Total Sand: 43.1%					



COMMENTS:

Report Date: 2025-03-18

Reviewed By: Jeff Tait, C.E.T.

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AASHTO T88 (ASTM D422) - PARTICLE-SIZE ANALYSIS OF SOILS

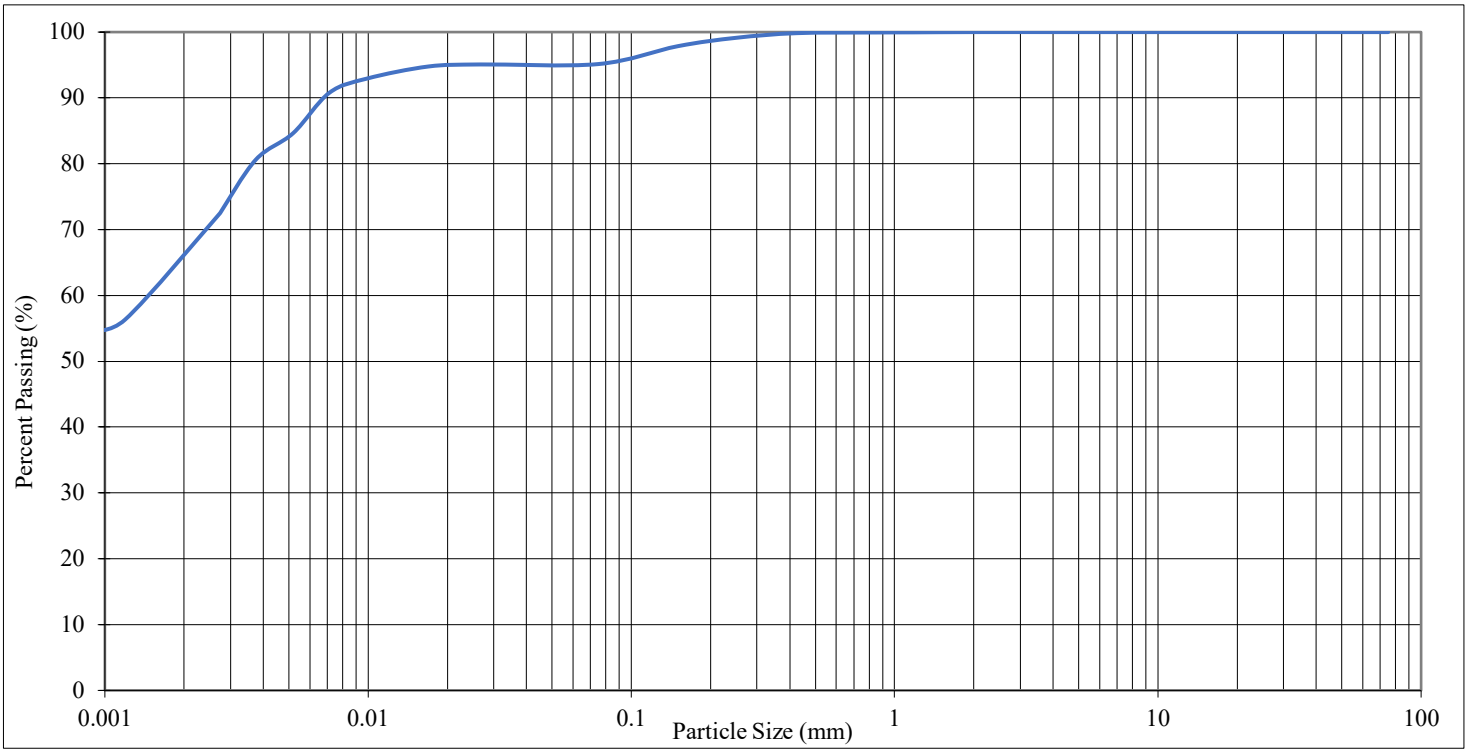
CLIENT: RM of Dufferin
SAMPLED BY: JH
SAMPLE LOCATION: North Test Hole
BOREHOLE No: N11

PROJECT: McEachern Bridge
DATE SAMPLED: 03-05/07-25
DESCRIPTION: Fat Clay
TESTED BY: RP
DATE TESTED: 03-18-25

SIEVE SIZE (mm)	PERCENT PASSING	SPEC.
75	100.0	
50	100.0	
37.5	100.0	
25	100.0	
19	100.0	
12.5	100.0	
9.5	100.0	
4.75	100.0	
2	100.0	

SIEVE SIZE (mm)	PERCENT PASSING	SPEC.
1.18	100.0	
0.85	99.9	
0.425	99.8	
0.25	99.1	
0.15	97.9	
0.075	95.1	
0.005	84.1	
0.002	64.8	
0.001	55.2	

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.002 mm	Clay, % <0.002 mm	Colloids, % <0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
0.0	0.0	0.2	4.7	30.4	64.8	55.2
	Total Sand: 4.9%					



COMMENTS:

Report Date: 2025-03-18

Reviewed By: Jeff Tait, C.E.T.

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AASHTO T88 (ASTM D422) - PARTICLE-SIZE ANALYSIS OF SOILS

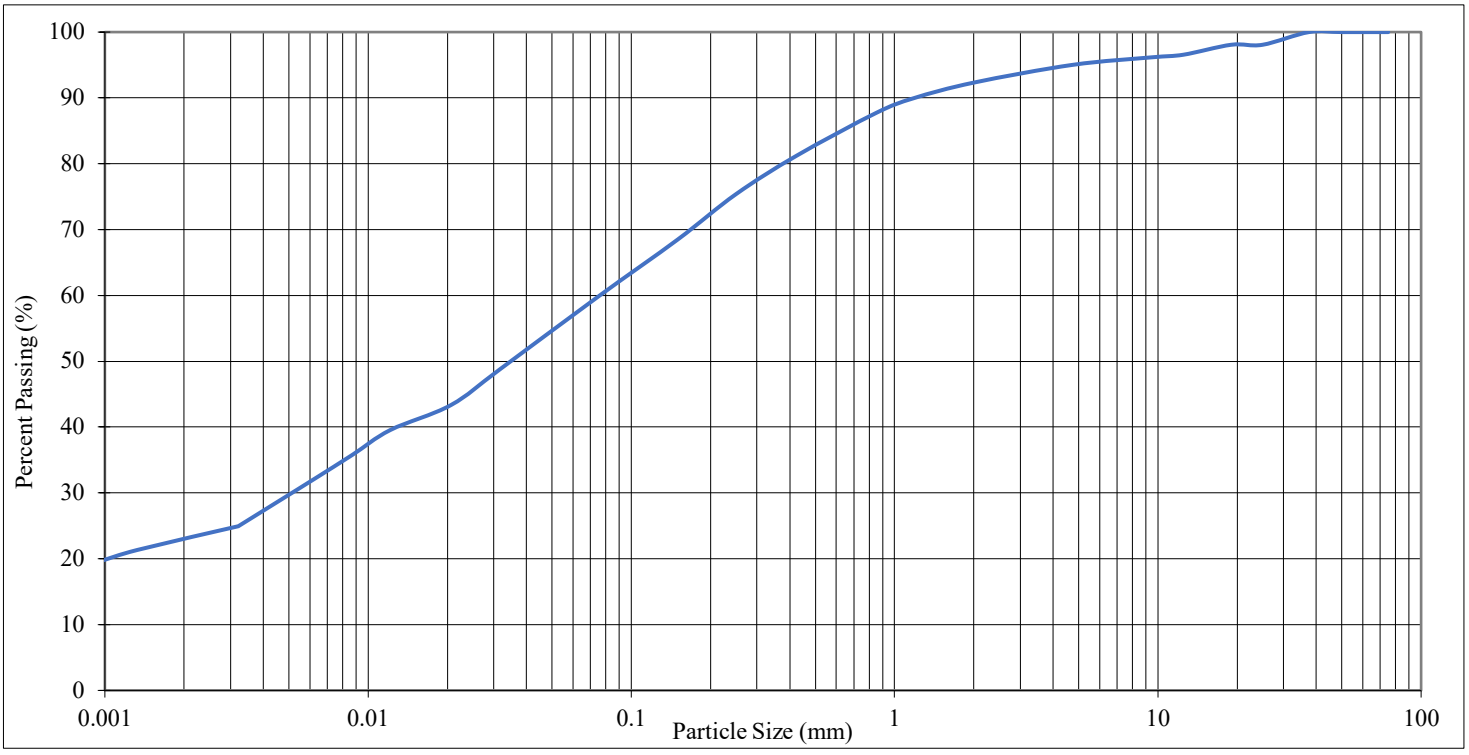
CLIENT: RM of Dufferin
SAMPLED BY: JH
SAMPLE LOCATION: North Testhole
BOREHOLE No: N17

PROJECT: McEachern Bridge
DATE SAMPLED: 03-05/07-25
DESCRIPTION: Sandy Lean Clay
TESTED BY: RP
DATE TESTED: 03-18-25

SIEVE SIZE (mm)	PERCENT PASSING	SPEC.
75	100.0	
50	100.0	
37.5	100.0	
25	98.1	
19	98.1	
12.5	96.6	
9.5	96.2	
4.75	95.0	
2	92.3	

SIEVE SIZE (mm)	PERCENT PASSING	SPEC.
1.18	89.9	
0.85	87.7	
0.425	81.2	
0.25	75.4	
0.15	68.5	
0.075	59.9	
0.005	29.6	
0.002	22.6	
0.001	19.8	

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.002 mm	Clay, % <0.002 mm	Colloids, % <0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
5.0	2.7	11.1	21.4	37.2	22.6	19.8
	Total Sand: 35.2%					



COMMENTS:

Report Date: 2025-03-18

Reviewed By: Jeff Tait, C.E.T.

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ATTERBERG LIMITS REPORT

Client: RM of Dufferin	Project: McEachern Bridge	Specimen Preparation: Dry Preparation	
Location: South Test Hole - Sample 4	Material: Lean Clay	Grooving Tool: Metal	Testing Equipment Plastic Limit: Hand Rolled
Date Sampled: 03-05/07-2	Date Tested: 03-13-25	Sampled By: JH	Tested By: ME	Testing Equipment Liquid Limit: Manual

LIQUID LIMIT

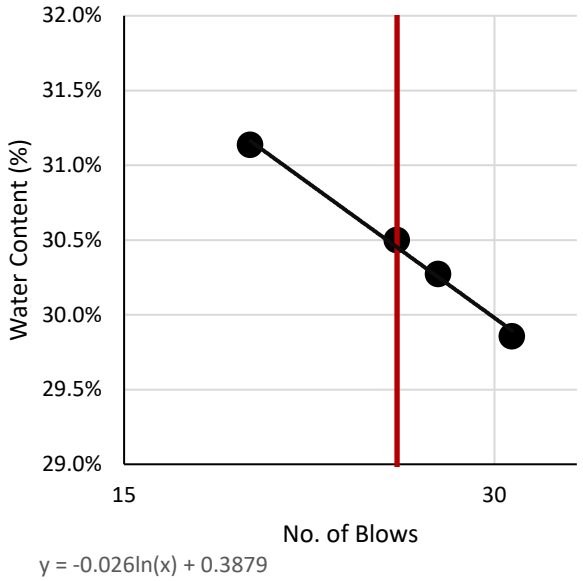
Trial	1	2	3	4
No. of Blows	19	25	27	31
Tare (g)	13.8	13.7	13.8	13.7
Wet+Tare (g)	31.7	32.3	30.1	32.3
Dry+Tare (g)	27.5	27.9	26.3	28.0
Dry Soil (g)	13.7	14.2	12.5	14.4
Water (g)	4.3	4.3	3.8	4.3
Water Content (%)	31.1%	30.5%	30.3%	29.9%

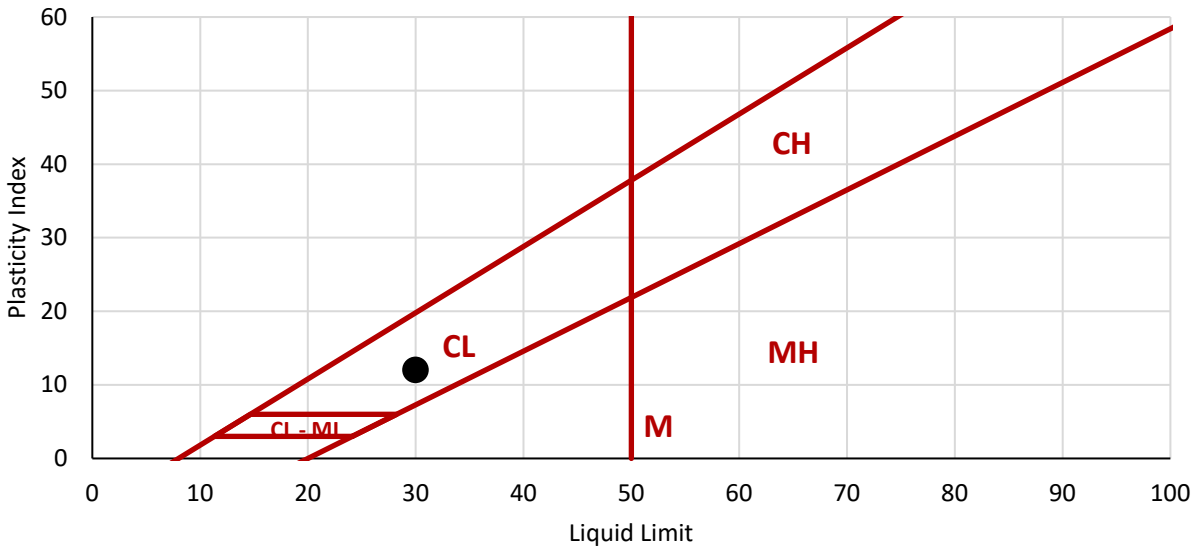
PLASTIC LIMIT

Trial	1	2	3
Tare (g)	13.7	13.7	13.5
Wet+Tare (g)	20.8	20.8	20.0
Dry+Tare (g)	19.7	19.7	19.0
Dry Soil (g)	5.9	6.0	5.6
Water (g)	1.1	1.1	1.0
Water Content (%)	18.4%	17.7%	17.5%

RESULTS

LL	30
PL	18
PI	12
Insitu MC (%)	21.0





Comments:

1) ASTM D4318, Method A - Multi-Point was used to determine the liquid limit of the sample material.

2) Location of Test hole was surveyed as Northing 5484544.993 , Easting 575529.471

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ATTERBERG LIMITS REPORT

Client: RM of Dufferin	Project: McEachern Bridge	Specimen Preparation: Dry Preparation	
Location: South Test Hole - Sample 7	Material: Lean Clay	Grooving Tool: Metal	Testing Equipment Plastic Limit: Hand Rolled
Date Sampled: 03-05/07-2	Date Tested: 03-13-25	Sampled By: JH	Tested By: ME	Testing Equipment Liquid Limit: Manual

LIQUID LIMIT

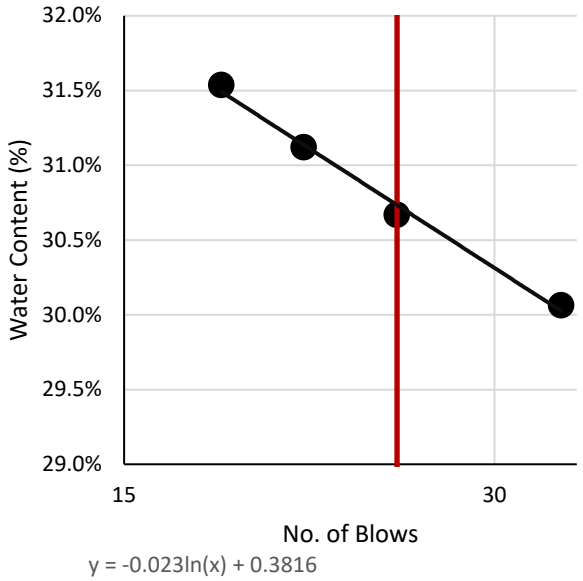
Trial	1	2	3	4
No. of Blows	18	21	25	34
Tare (g)	11.3	11.4	11.4	11.3
Wet+Tare (g)	32.3	34.5	34.3	32.0
Dry+Tare (g)	27.3	29.0	28.9	27.2
Dry Soil (g)	16.0	17.6	17.5	15.9
Water (g)	5.0	5.5	5.4	4.8
Water Content (%)	31.5%	31.1%	30.7%	30.1%

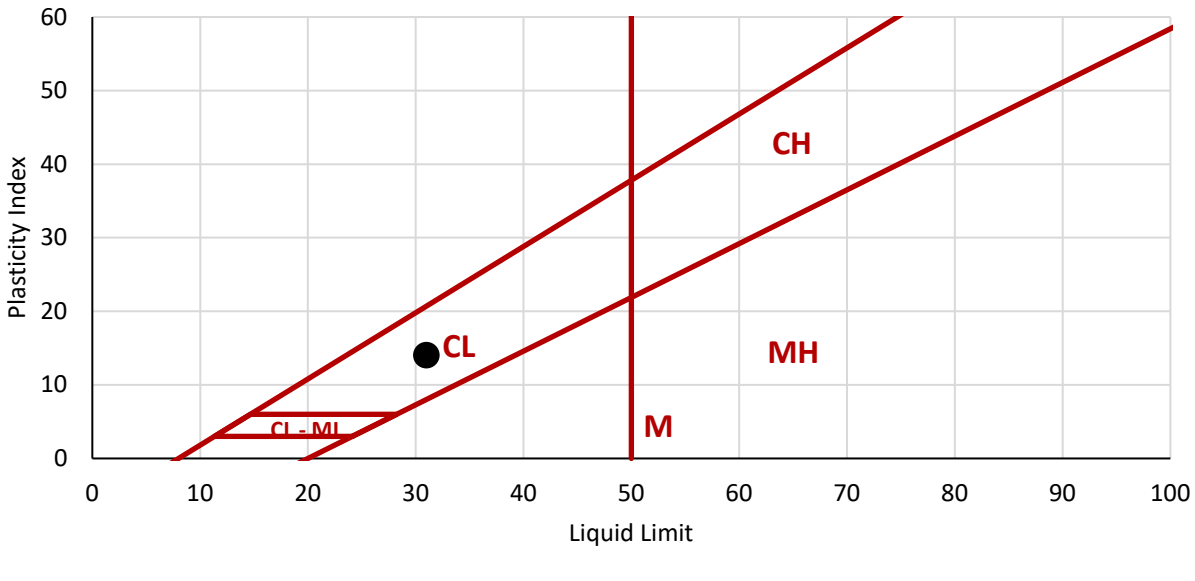
PLASTIC LIMIT

Trial	1	2	3
Tare (g)	13.7	13.8	13.9
Wet+Tare (g)	20.9	20.3	20.7
Dry+Tare (g)	19.8	19.4	19.7
Dry Soil (g)	6.1	5.5	5.9
Water (g)	1.1	0.9	1.0
Water Content (%)	17.2%	17.2%	16.7%

RESULTS

LL	31
PL	17
PI	14
Insitu MC (%)	33.7





Comments:

1) ASTM D4318, Method A - Multi-Point was used to determine the liquid limit of the sample material.

2) Location of Test hole was surveyed as Northing 5484544.993 , Easting 575529.471

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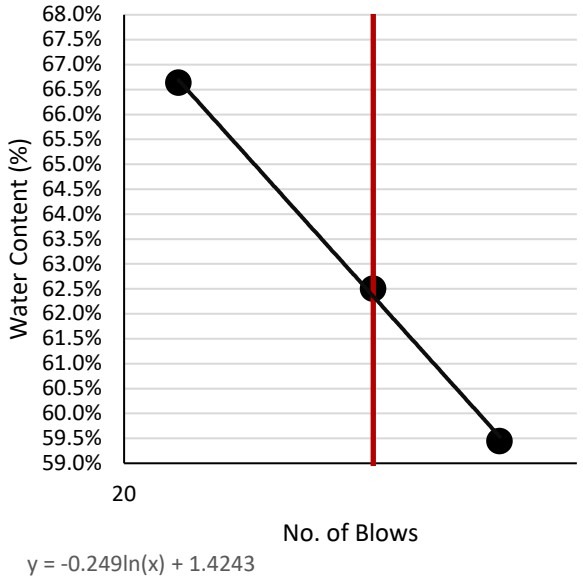
ATTERBERG LIMITS REPORT

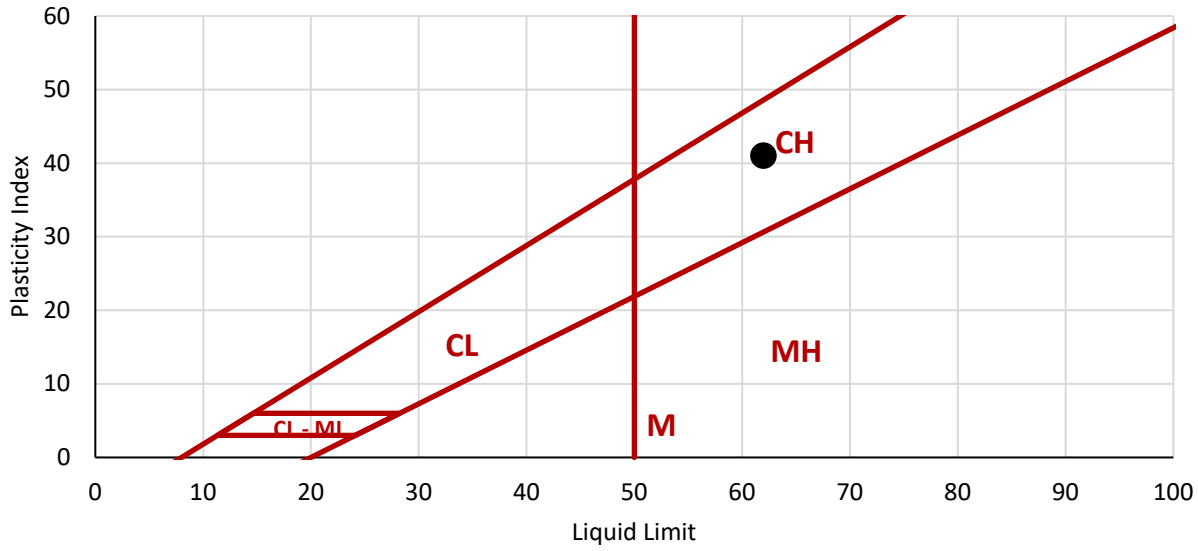
Client: RM of Dufferin	Project: McEachern Bridge		Specimen Preparation: Dry Preparation	
Location: North Test Hole - Sample N11		Material: Fat Clay	Grooving Tool: Metal	Testing Equipment Plastic Limit: Hand Rolled
Date Sampled: 03-05/07-2	Date Tested: 03-13-25	Sampled By: JH	Tested By: ME	Testing Equipment Liquid Limit: Manual

LIQUID LIMIT				
Trial	**1**	**2**	**3**	**4**
No. of Blows	21	25	28	
Tare (g)	13.7	13.6	13.5	
Wet+Tare (g)	29.0	31.3	30.6	
Dry+Tare (g)	22.9	24.5	24.3	
Dry Soil (g)	9.1	10.9	10.8	
Water (g)	6.1	6.8	6.4	
Water Content (%)	66.6%	62.5%	59.4%	

PLASTIC LIMIT			
Trial	**1**	**2**	**3**
Tare (g)	11.3	11.2	
Wet+Tare (g)	17.6	18.4	
Dry+Tare (g)	16.5	17.1	
Dry Soil (g)	5.2	5.9	
Water (g)	1.1	1.3	
Water Content (%)	20.2%	22.1%	

RESULTS	
LL	62
PL	21
PI	41
Insitu MC (%)	
50.9	





Comments:

1) ASTM D4318, Method A - Multi-Point was used to determine the liquid limit of the sample material.

2) Location of Test hole was surveyed as Northing 5484605.745 , Easting 575528.893

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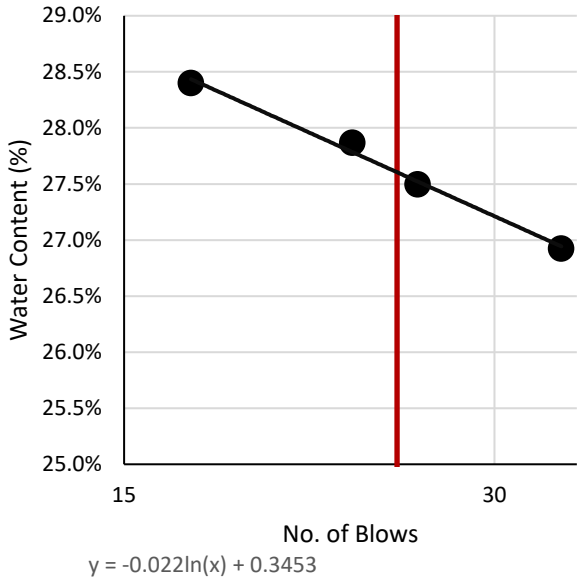
ATTERBERG LIMITS REPORT

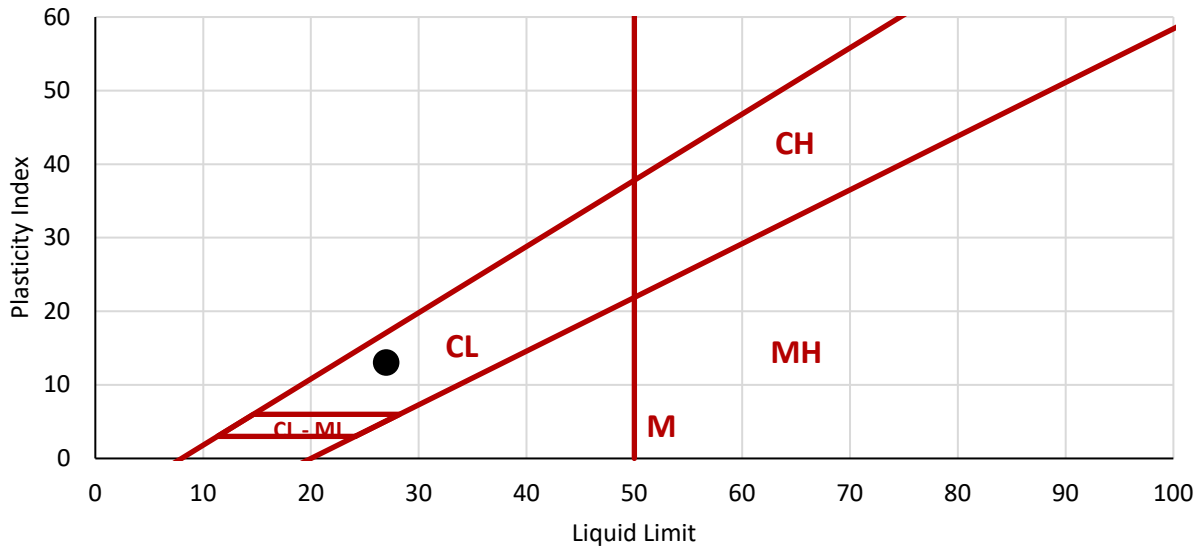
Client: RM of Dufferin	Project: McEachern Bridge	Specimen Preparation: Dry Preparation	
Location: North Test Hole - Sample N17	Material: Lean Clay	Grooving Tool: Metal	Testing Equipment Plastic Limit: Hand Rolled
Date Sampled: 03-05/07-2	Date Tested: 03-13-25	Sampled By: JH	Tested By: ME	Testing Equipment Liquid Limit: Manual

LIQUID LIMIT				
Trial	**1**	**2**	**3**	**4**
No. of Blows	17	23	26	34
Tare (g)	13.7	13.8	13.7	13.7
Wet+Tare (g)	30.6	33.7	31.0	31.2
Dry+Tare (g)	26.9	29.4	27.3	27.5
Dry Soil (g)	13.2	15.6	13.5	13.8
Water (g)	3.7	4.4	3.7	3.7
Water Content (%)	28.4%	27.9%	27.5%	26.9%

PLASTIC LIMIT			
Trial	**1**	**2**	**3**
Tare (g)	13.9	13.8	13.7
Wet+Tare (g)	20.8	20.4	20.3
Dry+Tare (g)	20.0	19.6	19.5
Dry Soil (g)	6.1	5.8	5.8
Water (g)	0.8	0.8	0.8
Water Content (%)	13.6%	13.6%	13.7%

RESULTS	
LL	27
PL	14
PI	13
Insitu MC (%)	
19.2	





Comments:

1) ASTM D4318, Method A - Multi-Point was used to determine the liquid limit of the sample material.

2) Location of Test hole was surveyed as Northing 5484605.745 , Easting 575528.893

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DRY BACK REPORT

Material: VARIOUS	Project: McEachern Bridge on Road 22W over Royne River	
Hole Location: South Side of Bridge	Client: RM of Dufferin	
Date: 03-13-25	Time of Sample: 03/06 & 03/07	
Tested By: JH	Sampled By: JH	Test Number: 1

SAMPLE I.D.	TARE WEIGHT	WET WEIGHT + TARE	DRY WEIGHT + TARE	MOISTURE %
1	219.2	1375.9	1149.9	24.3
2	269.7	1886.2	1660.0	16.3
3	546.1	2346.5	2057.5	19.1
4	538.6	2371.6	2055.3	20.9
5	543.9	3229.5	2655.5	27.2
6	540.4	3033.4	2473.1	29.0
7	547.2	2499.1	2007.0	33.7
8	540.2	2909.7	2108.5	51.1
9	546.9	2027.8	1548.0	47.9
10	545.4	1963.0	1491.7	49.8
11	544.1	2494.4	1845.1	49.9
12	219.3	834.2	628.0	50.5
13	540.0	3001.3	2199.7	48.3
14	548.3	2772.0	2024.1	50.7
15	773.8	1845.5	1510.0	45.6
16	776.1	2805.2	2203.9	42.1
17	540.0	3278.2	2870.7	17.5
18	769.2	2748.3	2400.4	21.3

Comments:

1) Entire provided samples were dried back at a temperature of 60 ^{0}C over a two day period.

2) Samples N11 & N17 have been prepped for fine grain size analysis & Atterberg Limits Testing

3) Location of Test hole was surveyed as Northing 5484544.993 , Easting 575529.471 , Elevation 259.965

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DRY BACK REPORT

Material: VARIOUS	Project: McEachern Bridge on Road 22W over Royne River	
Hole Location: North Side of Bridge	Client: RM of Dufferin	
Date: 03-13-25	Time of Sample: 03/05 & 03/06	
Tested By: JH	Sampled By: JH	Test Number: 2

SAMPLE I.D.	TARE WEIGHT	WET WEIGHT + TARE	DRY WEIGHT + TARE	MOISTURE %
N1	269.8	1326.6	1117.4	24.7
N2	270.9	2183.3	1762.2	28.2
N3	268.8	2149.2	1702.2	31.2
N4	270.0	1877.5	1509.2	29.7
N5	555.3	2733.0	2222.7	30.6
N6	270.0	2077.3	1506.6	46.2
N7	270.9	1480.0	1049.2	55.4
N8	213.1	1362.0	943.7	57.3
N9	272.7	1200.3	883.6	51.8
N10	546.2	1826.0	1393.2	51.1
N11	275.1	1981.3	1405.5	50.9
N12	542.0	2884.5	2103.4	50.0
N13	547.0	3249.6	2317.7	52.6
N14	542.8	2457.1	2116.9	21.6
N15	543.7	2766.8	2323.7	24.9
N16	546.7	2960.3	2576.0	18.9
N17	542.9	3282.8	2841.1	19.2
N18	547.4	2466.0	1890.4	42.9

Comments:

1) Entire provided samples were dried back at a temperature of 60 ^{0}C over a two day period.

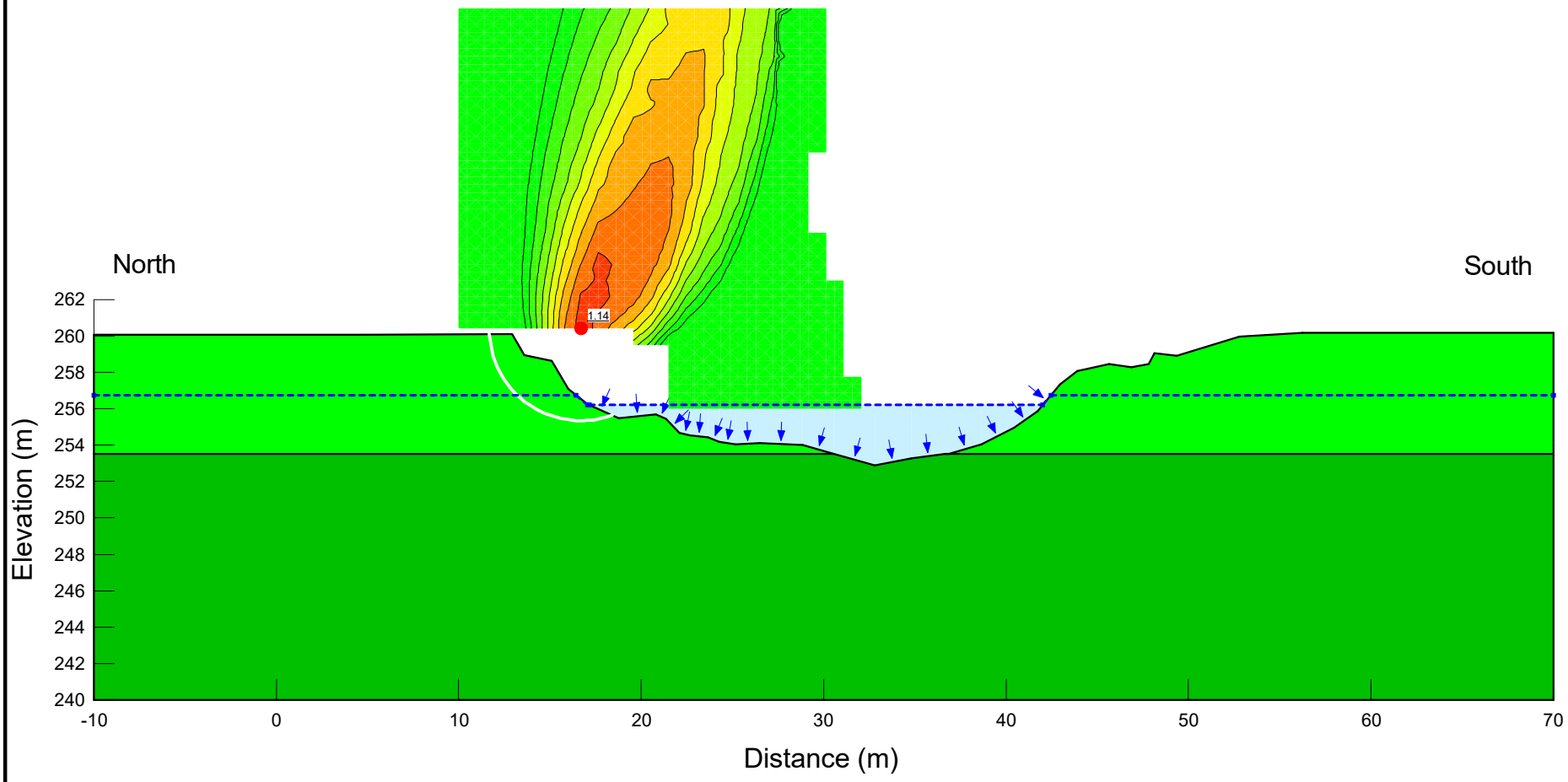
2) Samples N11 & N17 have been prepped for fine grain size analysis & Atterberg Limits Testing

3) Location of Test hole was surveyed as Northing 5484605.745 , Easting 575528.893 , Elevation 260.188

APPENDIX D

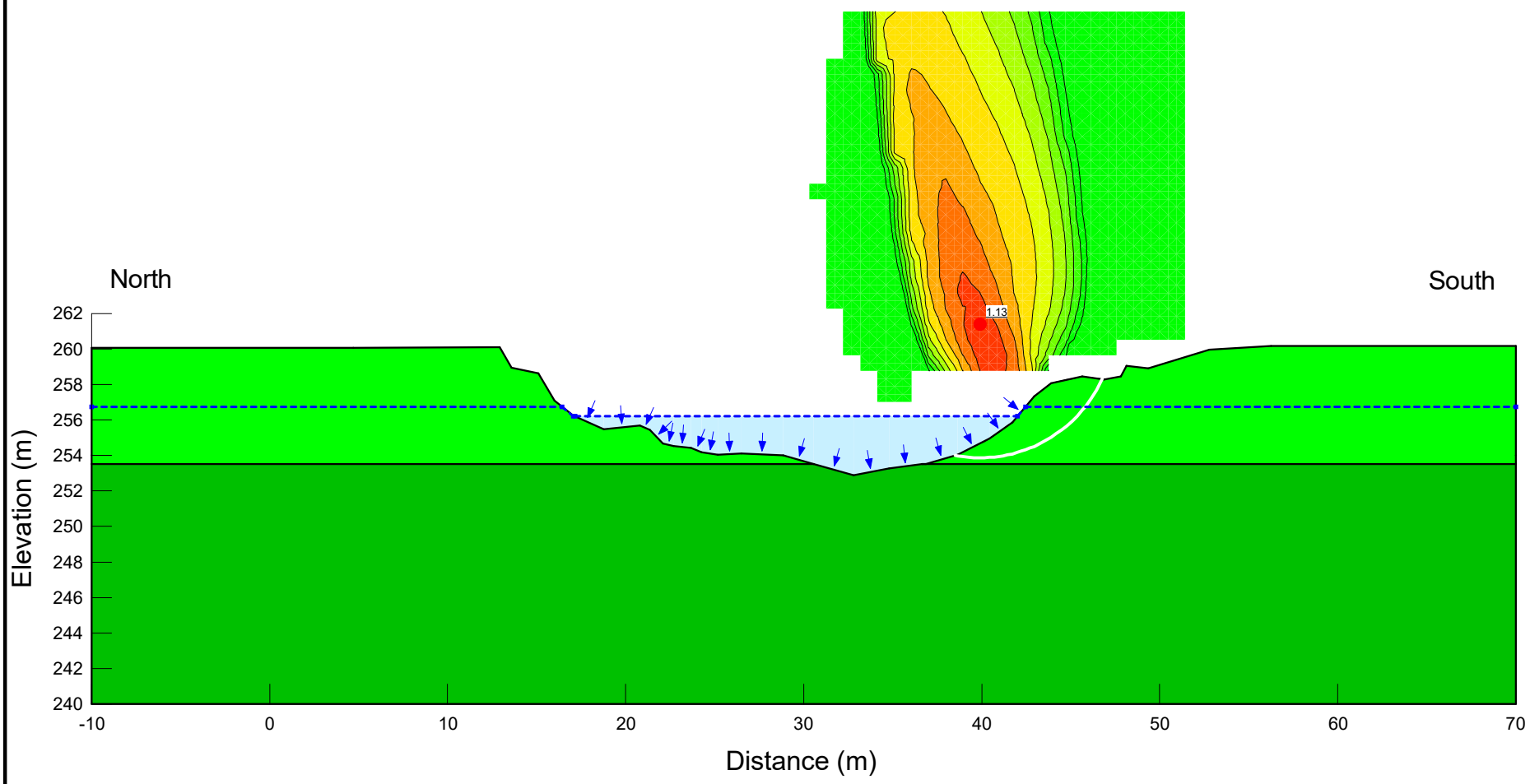
STABILITY ANALYSIS

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Fat Clay (CH)	Mohr-Coulomb	17.5	5	22
	Lean Clay (CL)	Mohr-Coulomb	17.5	3	27



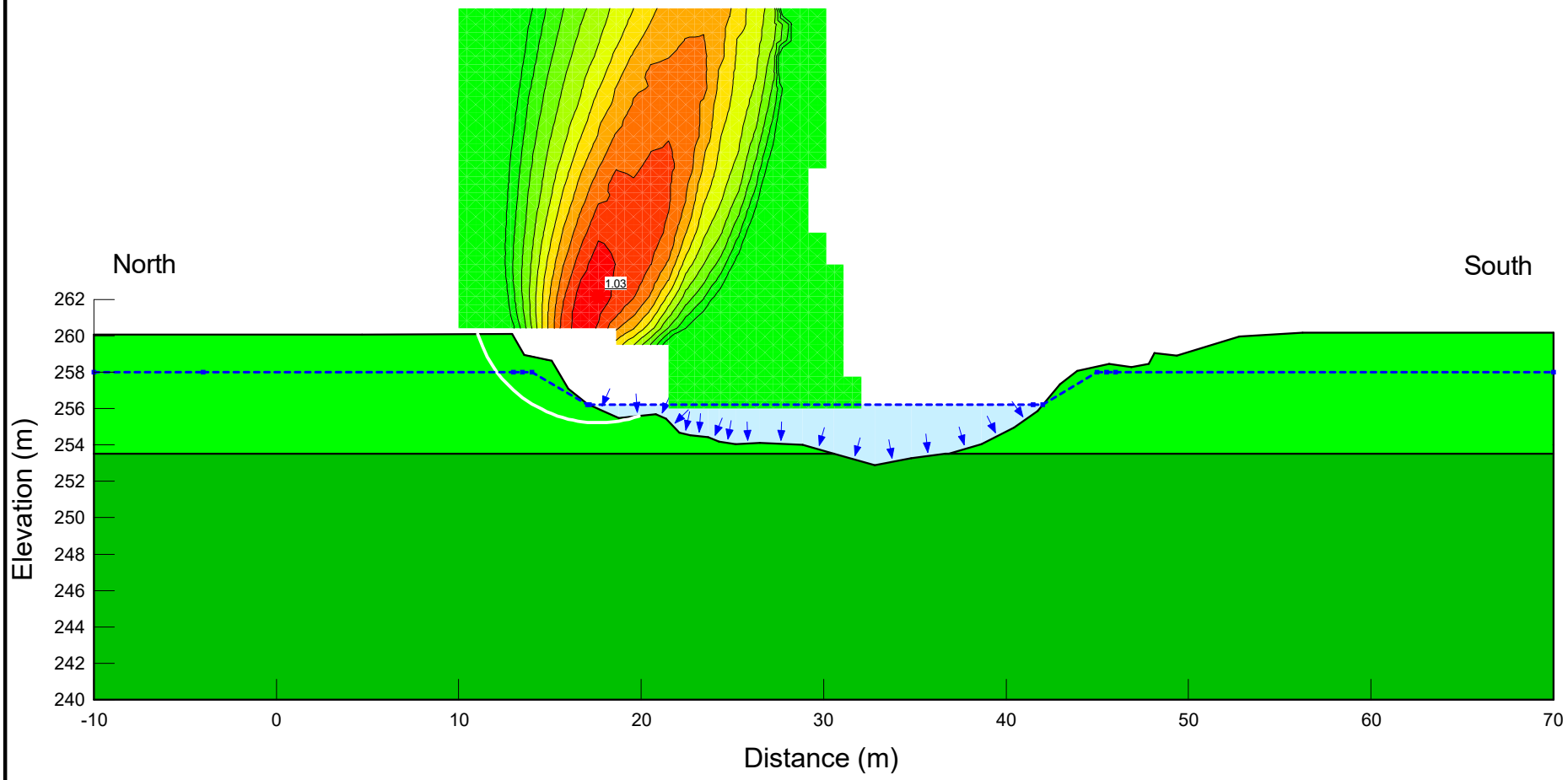
Geometry: Existing	Client: Samson Engineering Inc.
Analysis: 1) North Slope - Normal Condtion	Project: McEachern Bridge - Road 22W over Boyne River
Scale: 1:350	Date: 2025-06-29

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Fat Clay (CH)	Mohr-Coulomb	17.5	5	22
	Lean Clay (CL)	Mohr-Coulomb	17.5	3	27



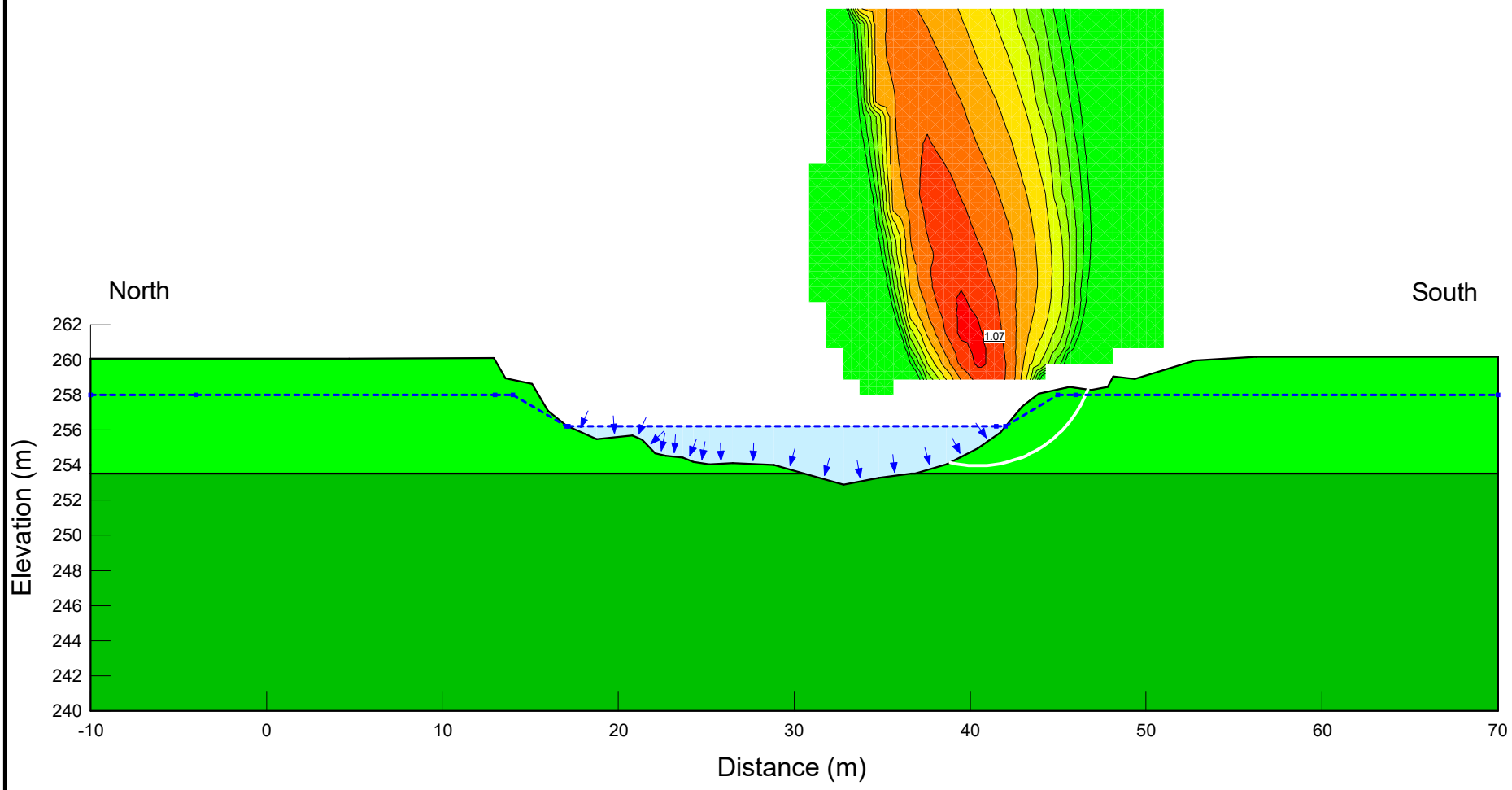
TTES	Geometry: Existing	Client: Samson Engineering Inc.
	Analysis: 2) South Slope - Normal Condition	Project: McEachern Bridge - Road 22W over Boyne River
	Scale: 1:350	Date: 2025-06-29

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Fat Clay (CH)	Mohr-Coulomb	17.5	5	22
	Lean Clay (CL)	Mohr-Coulomb	17.5	3	27



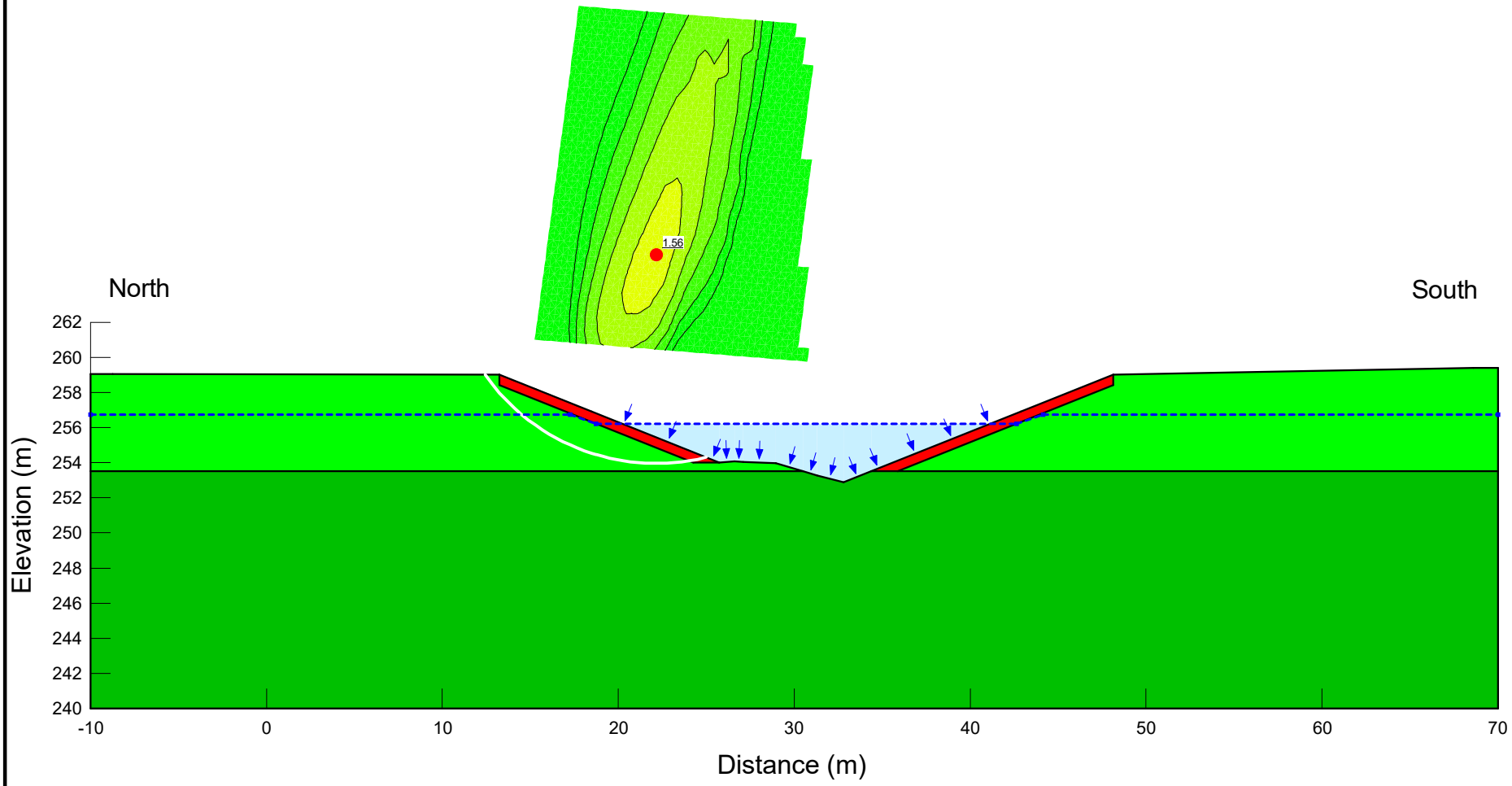
TTES	Geometry: Existing	Client: Samson Engineering Inc.
	Analysis: 3) North Slope - Extreme Condition	Project: McEachern Bridge - Road 22W over Boyne River
	Scale: 1:350	Date: 2025-06-29

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Fat Clay (CH)	Mohr-Coulomb	17.5	5	22
	Lean Clay (CL)	Mohr-Coulomb	17.5	3	27



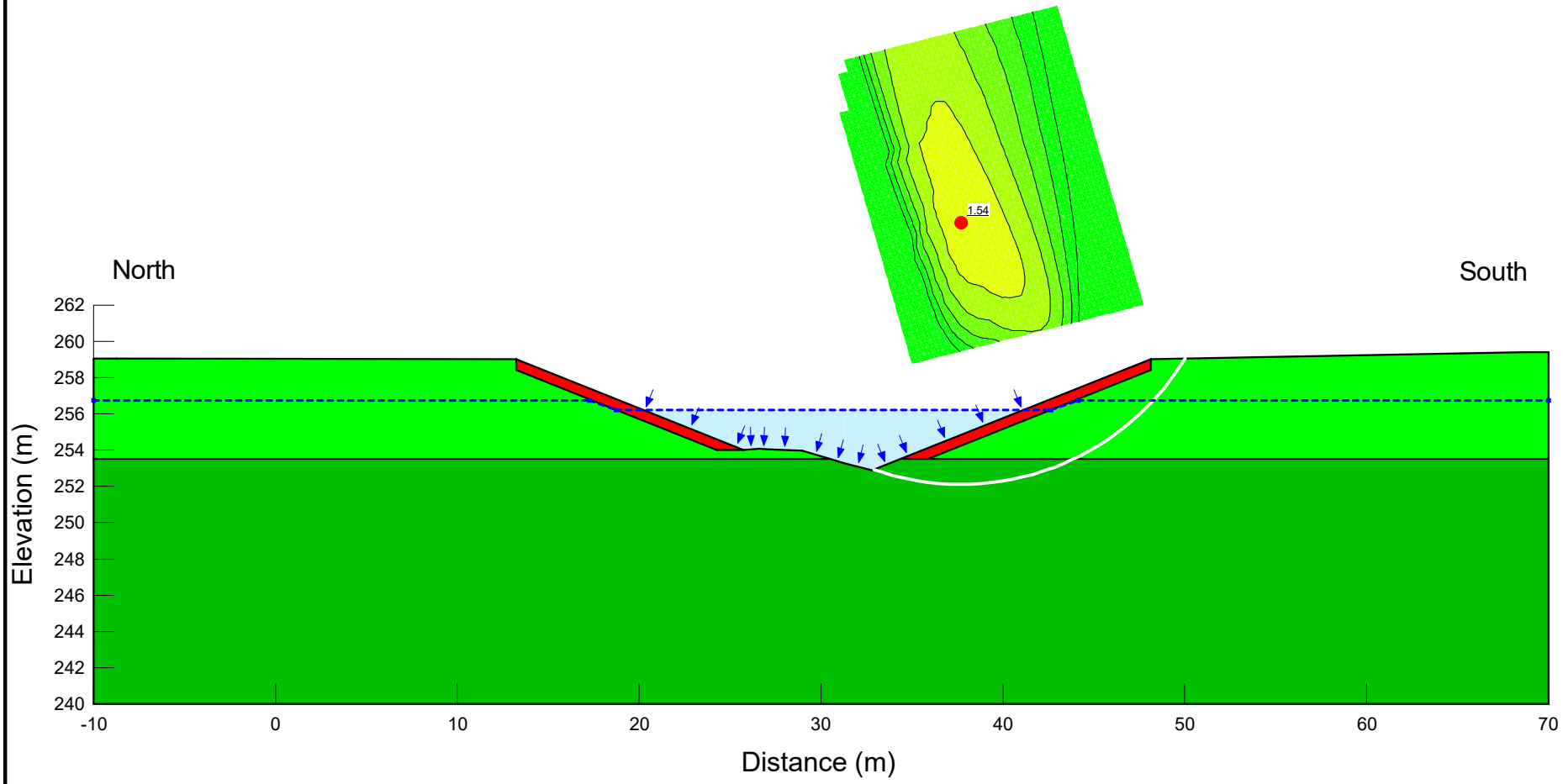
TTES	Geometry: Existing	Client: Samson Engineering Inc.
	Analysis: 4) South Slope - Extreme Condition	Project: McEachern Bridge - Road 22W over Boyne River
	Scale: 1:350	Date: 2025-06-29

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Fat Clay (CH)	Mohr-Coulomb	17.5	5	22
	Lean Clay (CL)	Mohr-Coulomb	17.5	3	27
	Riprap	Mohr-Coulomb	20	0	35



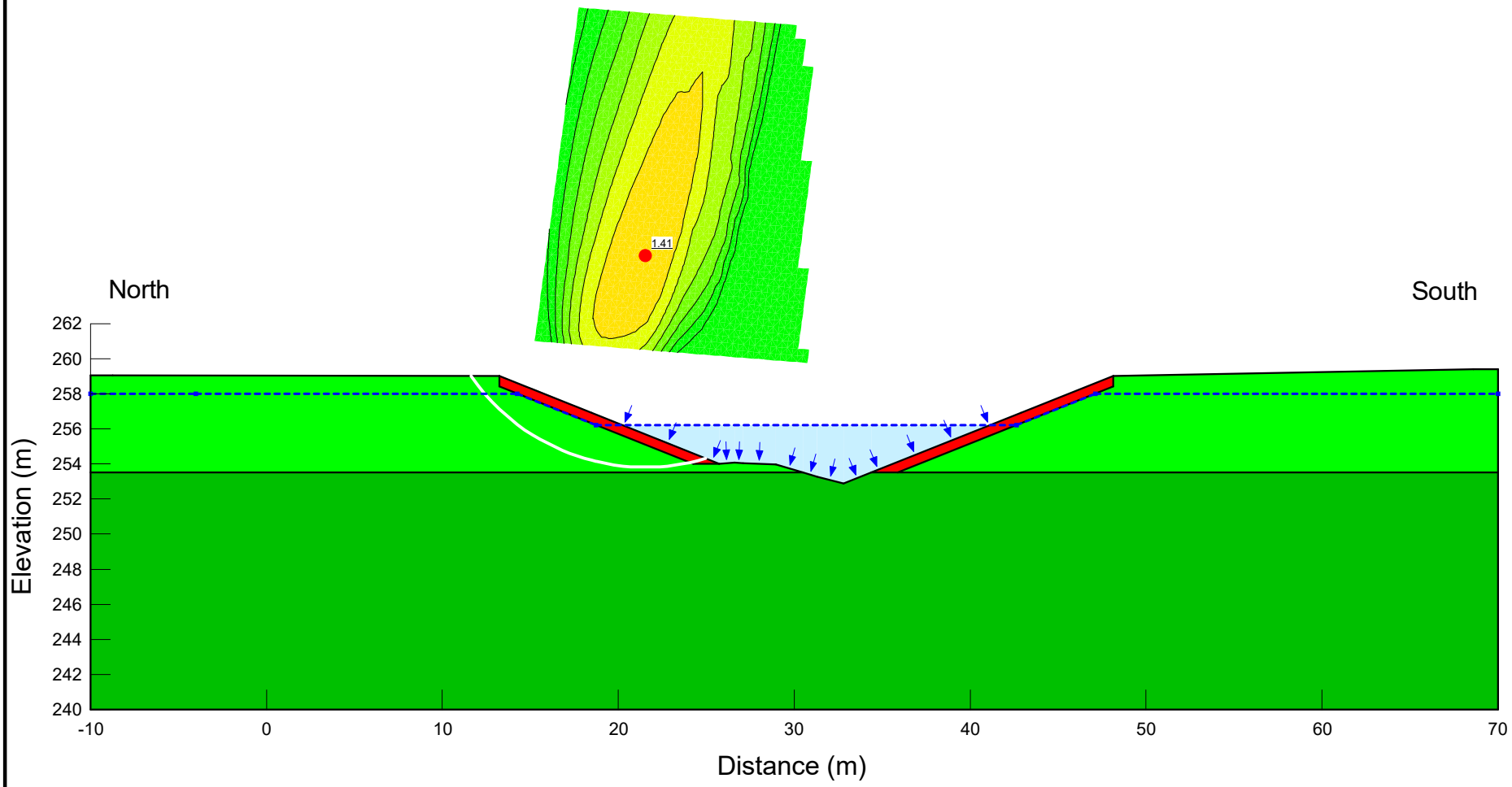
TTES	Geometry: Proposed 6 m South of Bridge CL	Client: Samson Engineering Inc.
	Analysis: 5) North Slope - Normal Condition	Project: McEachern Bridge - Road 22W over Boyne River
	Scale: 1:350	Date: 2025-06-29

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Fat Clay (CH)	Mohr-Coulomb	17.5	5	22
	Lean Clay (CL)	Mohr-Coulomb	17.5	3	27
	Riprap	Mohr-Coulomb	20	0	35



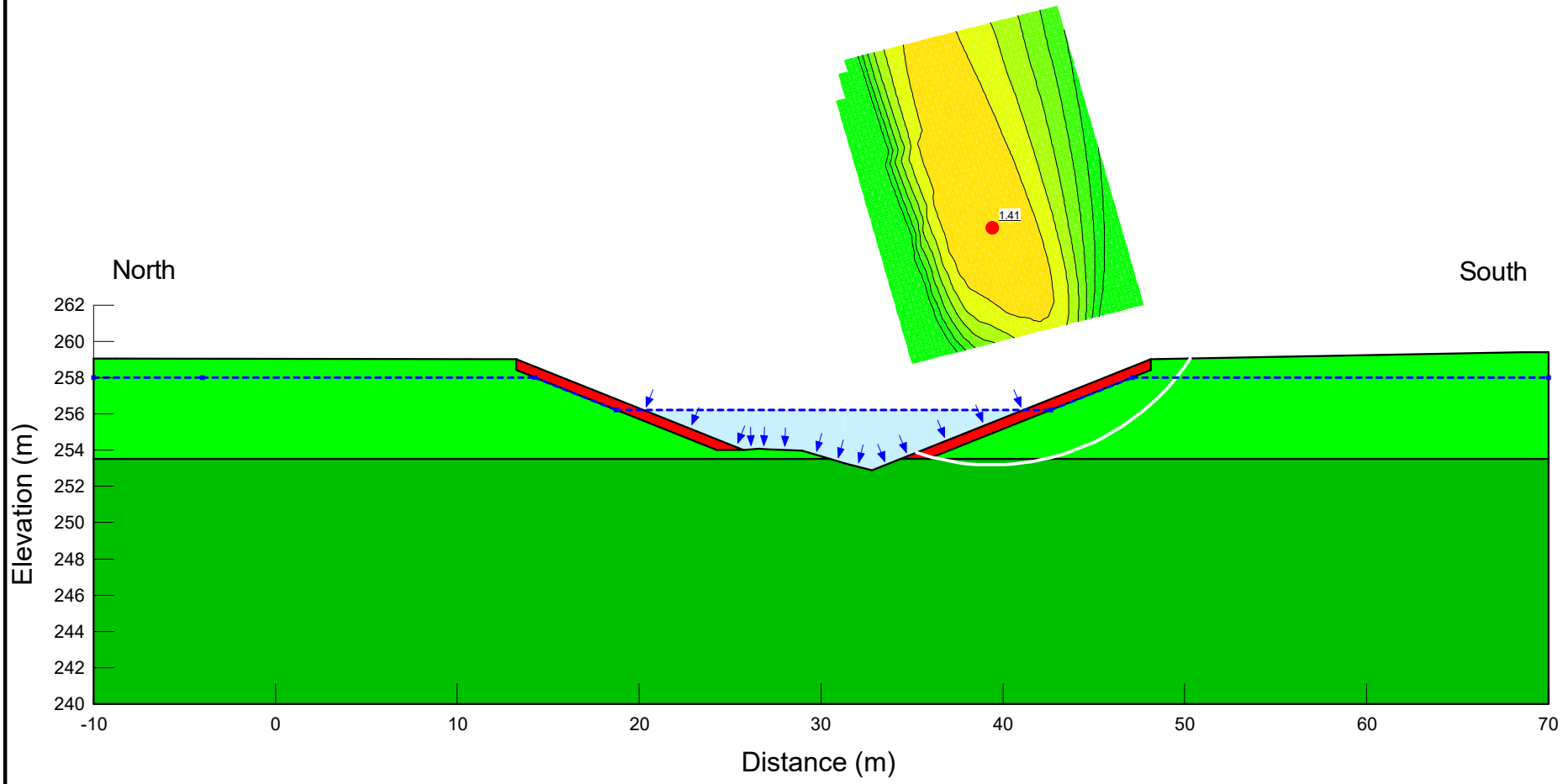
TTES	Geometry: Proposed 6 m South of Bridge CL	Client: Samson Engineering Inc.
	Analysis: 6) South Slope - Normal Condition	Project: McEachern Bridge - Road 22W over Boyne River
	Scale: 1:350	Date: 2025-06-29

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Fat Clay (CH)	Mohr-Coulomb	17.5	5	22
	Lean Clay (CL)	Mohr-Coulomb	17.5	3	27
	Riprap	Mohr-Coulomb	20	0	35



TTES	Geometry: Proposed 6 m South of Bridge CL	Client: Samson Engineering Inc.
	Analysis: 7) North Slope - Extreme Condition	Project: McEachern Bridge - Road 22W over Boyne River
	Scale: 1:350	Date: 2025-06-29

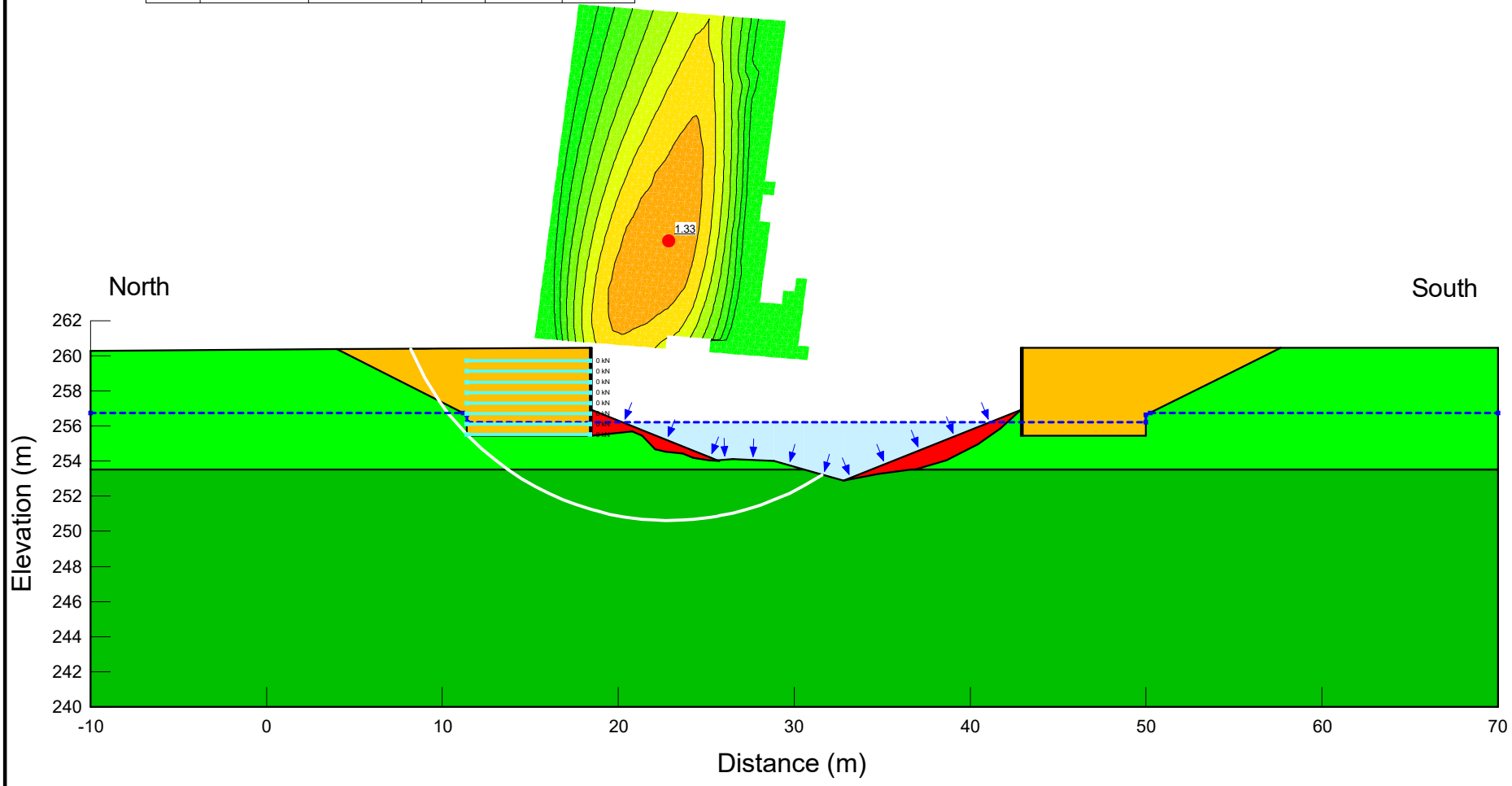
Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Fat Clay (CH)	Mohr-Coulomb	17.5	5	22
	Lean Clay (CL)	Mohr-Coulomb	17.5	3	27
	Riprap	Mohr-Coulomb	20	0	35



TTES	Geometry: Proposed 6 m South of Bridge CL	Client: Samson Engineering Inc.
	Analysis: 8) South Slope - Extreme Condition	Project: McEachern Bridge - Road 22W over Boyne River
	Scale: 1:350	Date: 2025-06-29

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Backwall	High Strength	1e-05		
	Fat Clay (CH)	Mohr-Coulomb	17.5	5	22
	Granular Fill	Mohr-Coulomb	21	0	32
	Lean Clay (CL)	Mohr-Coulomb	17.5	3	27
	Riprap	Mohr-Coulomb	20	0	35

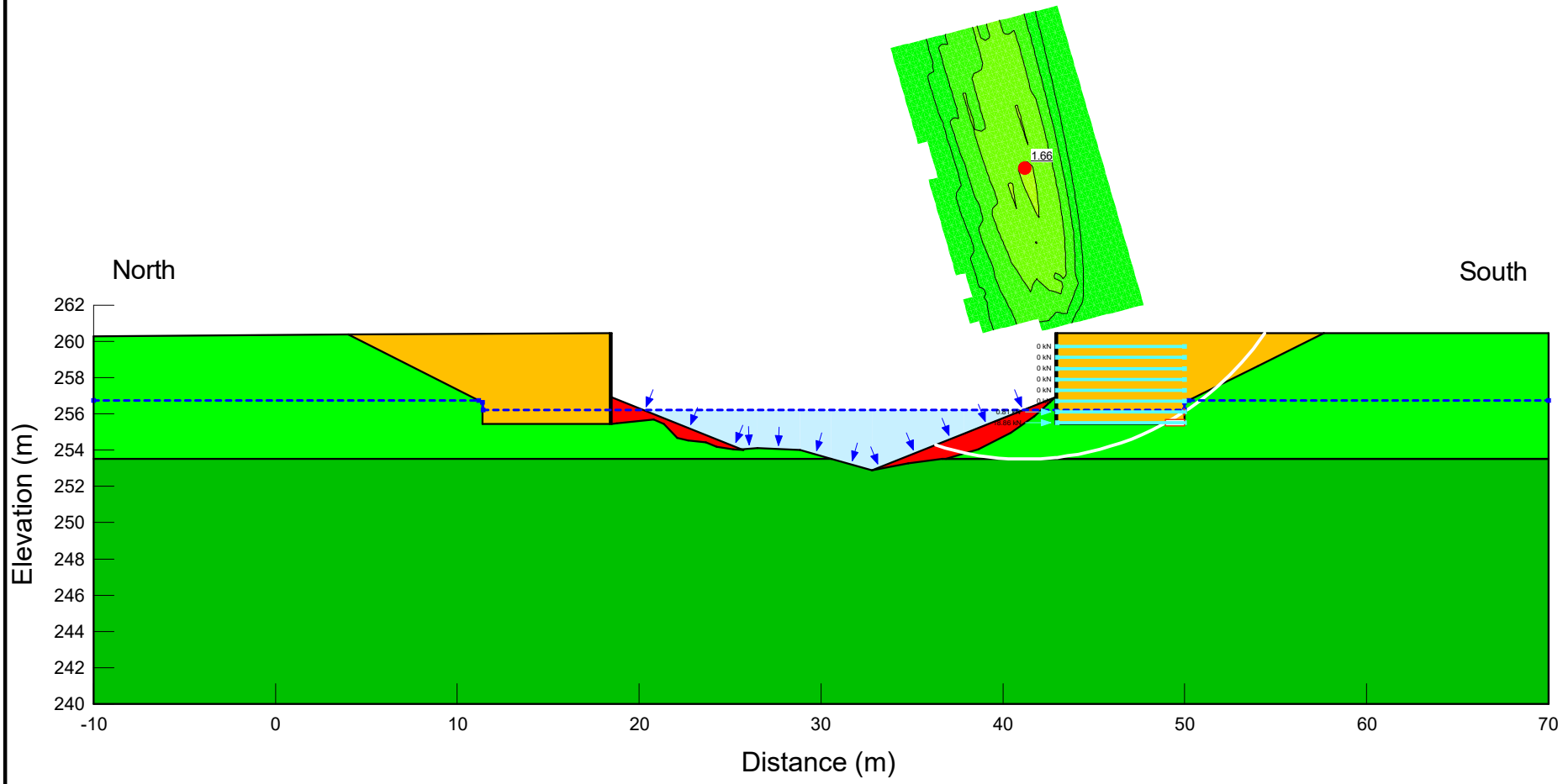
Color	Name	Type	Interface Adhesion (kPa)	Interface Shear Angle (°)	Tensile Capacity (kN)
	Miragrid 10XT	Geosynthetic	0	25	148.8



Geometry: Proposed through Bridge Centerline	Client: Samson Engineering Inc.
Analysis: 9) North Slope - Normal Condition	Project: McEachern Bridge - Road 22W over Boyne River
Scale: 1:350	Date: 2025-06-29

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Backwall	High Strength	1e-05		
	Fat Clay (CH)	Mohr-Coulomb	17.5	5	22
	Granular Fill	Mohr-Coulomb	21	0	32
	Lean Clay (CL)	Mohr-Coulomb	17.5	3	27
	Riprap	Mohr-Coulomb	20	0	35

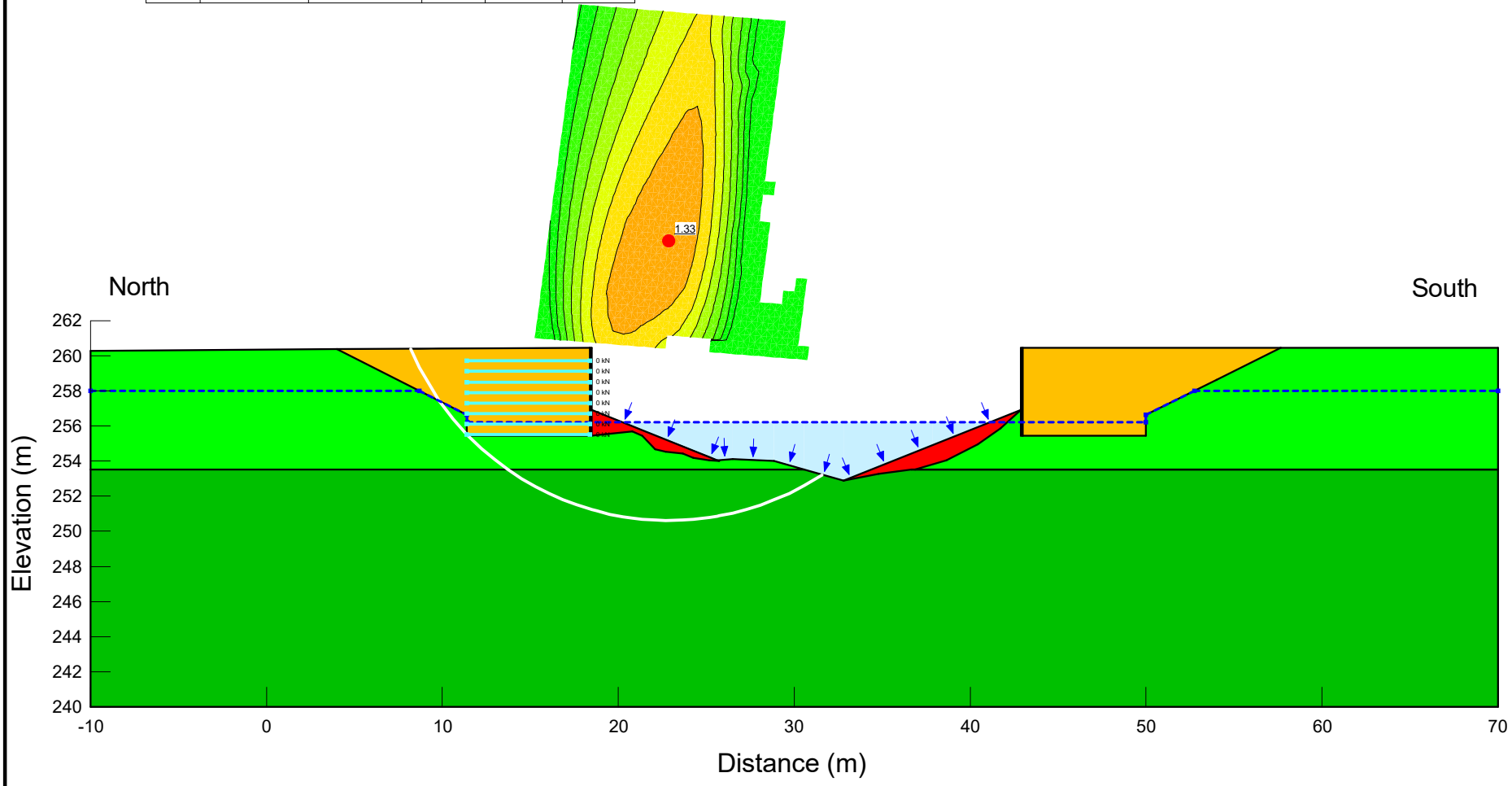
Color	Name	Type	Interface Adhesion (kPa)	Interface Shear Angle (°)	Tensile Capacity (kN)
	Miragrid 10XT	Geosynthetic	0	25	148.8



TTES	Geometry: Proposed through Bridge Centerline	Client: Samson Engineering Inc.
	Analysis: 10) South Slope - Normal Condition	Project: McEachern Bridge - Road 22W over Boyne River
	Scale: 1:350	Date: 2025-06-29

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Backwall	High Strength	1e-05		
	Fat Clay (CH)	Mohr-Coulomb	17.5	5	22
	Granular Fill	Mohr-Coulomb	21	0	32
	Lean Clay (CL)	Mohr-Coulomb	17.5	3	27
	Riprap	Mohr-Coulomb	20	0	35

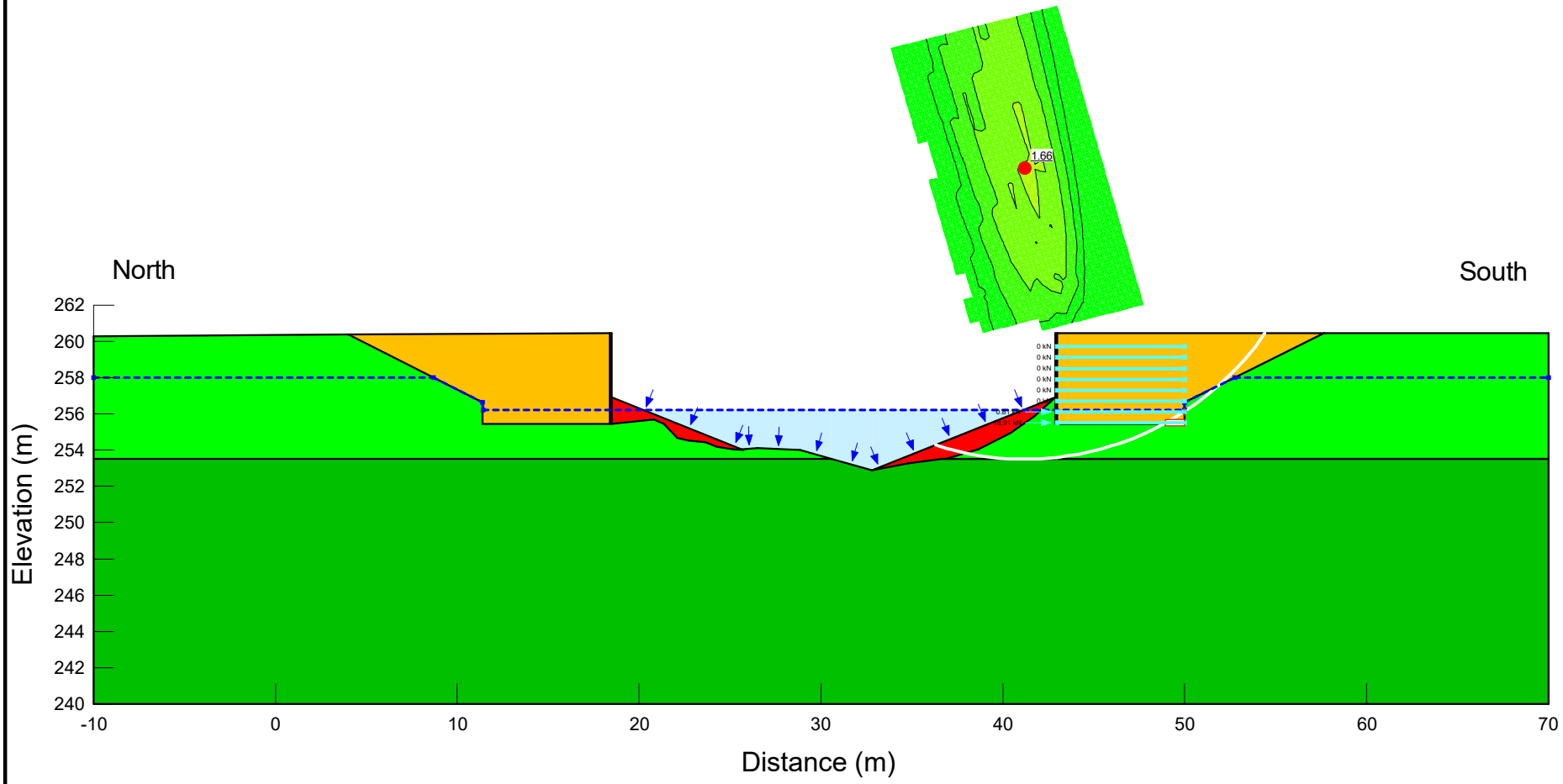
Color	Name	Type	Interface Adhesion (kPa)	Interface Shear Angle (°)	Tensile Capacity (kN)
	Miragrid 10XT	Geosynthetic	0	25	148.8



Geometry: Proposed through Bridge Centerline	Client: Samson Engineering Inc.
Analysis: 11) North Slope - Extreme Condition	Project: McEachern Bridge - Road 22W over Boyne River
Scale: 1:350	Date: 2025-06-29

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Backwall	High Strength	1e-05		
	Fat Clay (CH)	Mohr-Coulomb	17.5	5	22
	Granular Fill	Mohr-Coulomb	21	0	32
	Lean Clay (CL)	Mohr-Coulomb	17.5	3	27
	Riprap	Mohr-Coulomb	20	0	35

Color	Name	Type	Interface Adhesion (kPa)	Interface Shear Angle (°)	Tensile Capacity (kN)
	Miragrid 10XT	Geosynthetic	0	25	148.8



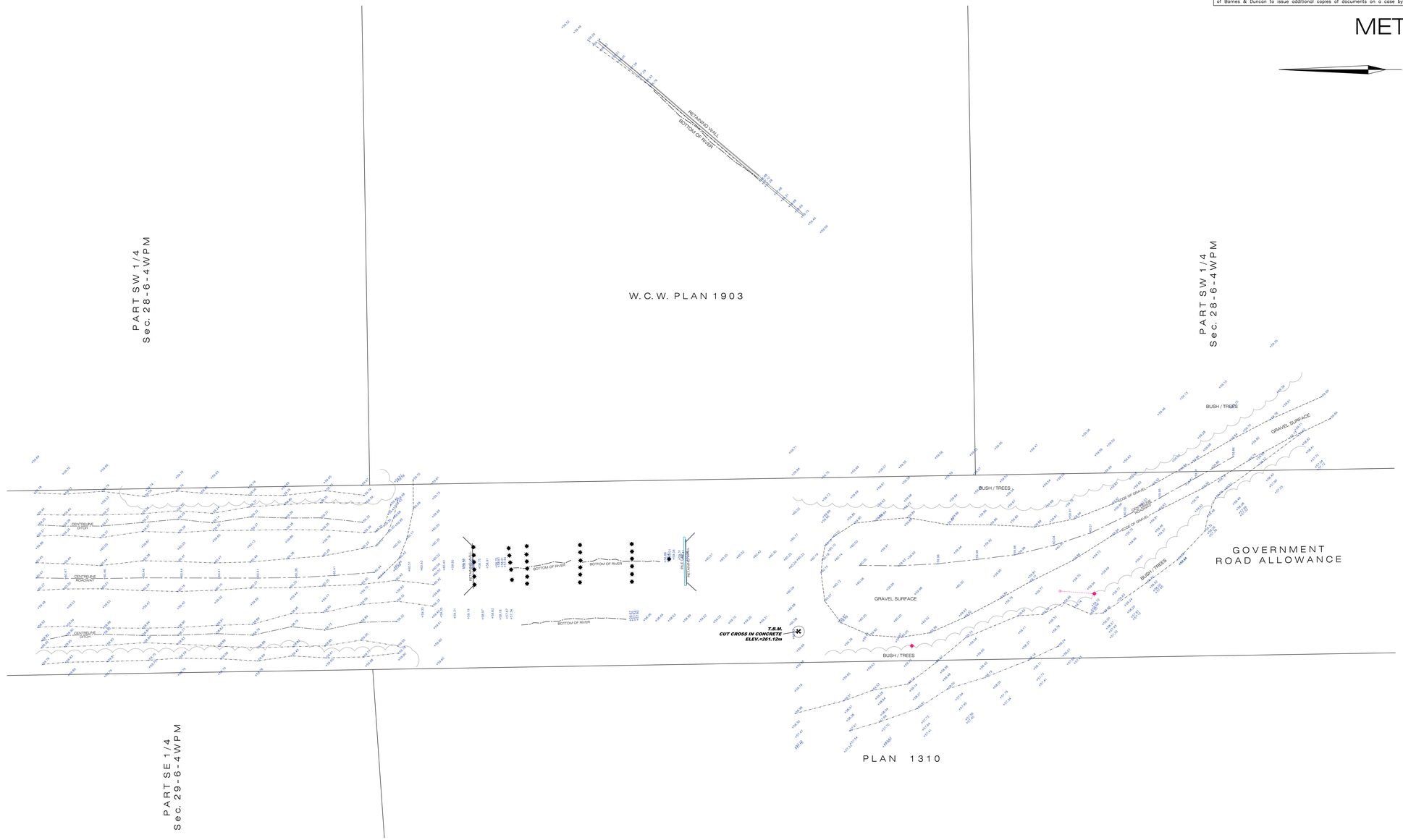
TTES	Geometry: Proposed through Bridge Centerline	Client: Samson Engineering Inc.
	Analysis: 12) South Slope - Extreme Condition	Project: McEachern Bridge - Road 22W over Boyne River
	Scale: 1:350	Date: 2025-06-29

APPENDIX C

GEODETIC TOPOGRAPHIC SURVEY

SAMSON
ARCHITECTURE | ENGINEERING

METRIC



BARNES 1906 &DUNCAN
SURVEYING, ENGINEERING & PLANNING
6 DONALD STREET
WINNIPEG, MANITOBA
R3L 0K6

CLIENT:
SAMSON ARCHITECTURE ENGINEERING

MUNICIPALITY OF DUFFERIN
MANITOBA

PLAN OF TOPOGRAPHIC SURVEY

OF PART OF

SW 1/4 Sec. 28 & SE 1/4 Sec. 29
Twp. 6, Rge. 5 W.P.M.
AND GOVERNMENT ROAD ALLOWANCE

MUNICIPALITY OF DUFFERIN
MANITOBA

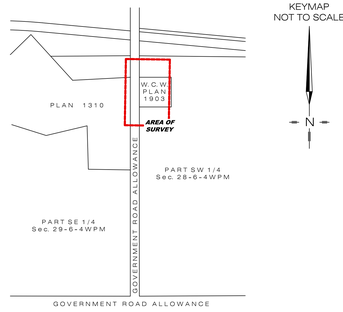
SCALE 1 : 250

2.5 0 2.5 5 7.5 10 12.5 15 17.5 20 22.5 25

LEGEND

Utility Pole
Utility Pole Anchor
Pile – Bridge
Bank – Top
Bank – Bottom

KEYMAP
NOT TO SCALE



NOTES

All dimensions are in metres and may be converted to feet by multiplying by 3.28084 .

For Geodetic Elevations add 200.0 to all elevations shown.
Elevations are referred to CGVD28 and are indicated thus
Elevations derived using NRCan's Precise Point Positioning Service.

Locations of utility structures as shown are based on the best information available, but no guarantee is given that all existing utilities are shown or that the given locations are exact. Confirmation of existence and exact location of all services must be obtained from the individual utilities before proceeding with construction.

This survey was made between the 25th day of November, 2024, and the 5th day of December, 2024.

SHOULD INFORMATION ON THE DIGITAL FILE DIFFER FROM THE INFORMATION SHOWN ON THE ORIGINAL HARD COPY, AS PROVIDED BY OUR FIRM, THE LATTER WILL GOVERN.

FILE: 2024/1579
DWG: 24-1579 topo
FB: 1668-40/41
DRAFTER: STU

JESSE P. S. CARELS, C.L.S.
DATED THIS 8th DAY OF JULY, 2025

APPENDIX D

PROJECT SPECIFICATIONS

SAMSON
ARCHITECTURE | ENGINEERING

SAMSON
ARCHITECTURE | ENGINEERING

PROJECT MANUAL

FOR

RM of Dufferin - McEachern Crossing Structure Replacement

SW28-6-4W, ROAD 22W, ½ MILE NORTH OF HIGHWAY PTH 3, NEAR CARMAN, MANITOBA

OWNER:
RM of Dufferin
12-2ND Avenue SW, Box 100
Carman, MB, R0G 0J0

STRUCTURAL/CIVIL ENGINEER:
SAMSON ENGINEERING INC. (SAMSON)
162-10TH STREET
BRANDON, MANITOBA
R7A 4E6

SAMSON PROJECT NUMBER: SEI2024-049

DATE: November 28, 2025

Seal  ISSUED FOR CONSTRUCTION	PHIL DORN NOVEMBER 28, 2025 (INSERT NAME) Date Specification Divisions covered by this seal: CIVIL / STRUCTURAL
Seal	(INSERT NAME) Date Specification Divisions covered by this seal:
Seal	(INSERT NAME) Date Specification Divisions covered by this seal:
Seal	(INSERT NAME) Date Specification Divisions covered by this seal:

END OF SECTION

CIVIL	SHEET	TITLE
	C-001	LEGAL AND TOPOGRAPHICAL SURVEY
	C-101	PROPOSED SITE PLAN
	C-301	SECTIONS

STRUCTURAL	SHEET	TITLE
	S-001	TH25-01 BORE HOLE LOGS
	S-002	TH25-02 BORE HOLE LOGS
	S-101	SUBSTRUCTURE PLAN
	S-102	SUPERSTRUCTURE PLAN
	S-301	SECTIONS
	S-501	DETAILS
	S-502	DETAILS
	S-503	DETAILS

1 GENERAL

1.01 AVAILABLE DOCUMENTS

.1 Included herein is the *"RM of Dufferin McEachern Bridge Replacement Boyne River at Road 22W, Hydrologic and Hydraulics Design Assistance Report on Single-Span Bridge Alternative – Rev. 1"*.

.2 Included herein is the *"McEachern Bridge Road 22W Over Boyne River, Geotechnical Investigation and Analysis"*.

.3 Included herein is the *"Department of Fisheries and Oceans Approval"*.

.4 Included herein is the *"Manitoba Transportation and Infrastructure Approval"*.

.5 Included herein is the *"PLAN OF TOPOGRAPHIC SURVEY OF PART OF SW ¼ Sec. 28 & SE ¼ Sec. 29 Twp. 6, Rge. 5 W.P.M. AND GOVERNMENT ROAD ALLOWANCE"*.

.6 The Consultant does not assume any responsibility for the above-mentioned items.

2 PRODUCTS AND EXECUTION

2.01 NOT USED

.1 Not Used.

1 GENERAL

1.01 FORM OF AGREEMENT

.1 The 2020 edition, Canadian Construction Documents Committee document for Stipulated Price Contract CCDC 2, as modified herein forms the basis of the Contract.

.2 Certain parts of CCDC 2 Contract are modified, revised, amended, supplemented as follows hereunder and shall be read in conjunction with CCDC 2.

1.02 SUPPLEMENTARY CONDITIONS

.1 GC 11.1 INSURANCE

.1 Paragraph 11.1.1.1 delete only the words “6 years” and replace with the words “2 years”.

.2 Paragraph 11.1.6 delete in its entirety.

.3 Paragraph 11.1.7 delete in its entirety.

.4 Paragraph 11.1.8 delete in its entirety.

.2 GC 13.1 INDEMNIFICATION

.1 Paragraph 13.1.1.2 delete only the portion that reads “6 years” and replace with “1 year”.

.3 GC 13.2 WAIVER OF CLAIMS

.1 Paragraph 13.2.4 delete only the portion at reads “six years” and replace with “one year”.

END OF SECTION

FORM OF AGREEMENT

.1 Certain parts of CCDC 41 Insurance Requirements are modified, revised, amended, supplemented as follows hereunder and shall be read in conjunction with CCDC 41.

SUPPLEMENTARY CONDITIONS

1. Paragraph 1 delete only the portion that reads “$10,000,000” and replace with “$5,000,000”

2. Paragraph 2 delete only the portion that reads “$10,000,000” and replace with “$2,000,000”

3. Paragraph 3 delete only the portion that reads “$10,000,000” and replace with “$2,000,000”

4. Paragraph 4 delete in its entirety.

5. Paragraph 8 delete in its entirety.

END OF SECTION

1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

.1 The Rural Municipality of Dufferin (Municipality) Bridge Replacement project includes demolishing the existing bridge and constructing a new bridge in SW 28-6-4W on Road 22W, ½ mile north of Highway PTH 3.
The work generally consists of the following:

Demolish and remove the existing timber abutments and pile foundations. Clear and grub work area as required for road work and site improvements.

Construct new abutments consisting of driven steel H-Piles, steel pile cap and pre-cast concrete back walls and wing walls. Design, pre-fabricate, pre-assemble, and install 26' wide single span 80' long, CL 625 load rated bridge steel superstructure assemblies complete with corrugated steel decking and granular wearing surface. Complete associated riprap protection around abutments, and roadway earthworks.

.2 Any item of work not specifically called for in the Specifications or shown on the drawings, but clearly required to meet the intent of the design shall be provided as if specifically called for in the Contract Documents.

1.02 WORK BY OTHERS

.1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Consultant.

.2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or results upon work of another Contractor, report promptly to Consultant, in writing, any defects which may interfere with proper execution of Work.

2 PRODUCTS and EXECUTION

2.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.02 USE OF SITE AND FACILITIES

.1 The Contractor will coordinate with the Owner following award, the location and size of laydown areas.
.2 The Contractor shall have written approval from all landowners prior to conducting work on private property. Copy of approval shall be provided to the Consultant.
.3 Contractor's use of the worksite shall be limited to the areas within the right of way, unless as noted in Section 01 52 00 – Construction Facilities.
.4 During the duration of use, the Contractor is responsible for security and compliance with Health and Safety Regulations.
.5 The Contractor shall be responsible for access to and from the worksite by means of temporary roads and or agreements with landowners and the authorities having jurisdictions.
.6 The Contractor shall leave all laydown areas to the pre-construction condition or as agreed to by the applicable landowners agreement.

1.03 EXISTING SERVICES

.1 Notify, Owner and utility companies of intended interruption of services and obtain required permission.
.2 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.04 SPECIAL REQUIREMENTS

.1 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
.2 Submit schedule - Bar (GANTT) Chart in accordance with Section 01 32 16.19 Construction Progress Schedule – Bar (GANTT) Chart.

2 PRODUCTS (not used)

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work at the call of Owner and Consultant.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each meeting 5 days in advance of meeting date to Owner and Consultant.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

.6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.

.7 Reproduce and distribute copies of minutes within 3 days after meetings and transmit to meeting participants.

.8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.02 PRECONSTRUCTION MEETING

.1 Within 7 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Owner, Consultant, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include:

.1 Appointment of official representative of participants in the Work.

.2 Schedule of Work

.3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.

.5 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

.6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.7 Owner provided products.

.8 As Built drawings in accordance with Section 01 33 00 - Submittal Procedures.

.9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

.10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.

.11 Monthly progress claims, administrative procedures, photographs, hold backs.

.12 Appointment of inspection and testing agencies or firms.

.13 Insurances, transcript of policies.

1.03 PROGRESS MEETINGS

.1 During course of Work schedule progress meetings monthly.

.2 Contractor, major Subcontractors involved in Work, Consultant and Owner are to be in attendance.

.3 Notify parties' minimum 5 days prior to meetings.

.4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 5 days after meeting.

.5 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.
.2 Review of Work progress since previous meeting.
.3 Field observations, problems, conflicts.
.4 Problems which impede construction schedule.
.5 Review of off-site fabrication delivery schedules.
.6 Corrective measures and procedures to regain projected schedule.
.7 Revision to construction schedule.
.8 Progress schedule, during succeeding work period.
.9 Review submittal schedules: expedite as required.
.10 Maintenance of quality standards.
.11 Review proposed changes for effect on construction schedule and on completion date.
.12 Other business.

2 PRODUCTS

2.01 NOT USED

.1 Not Used

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 01 14 00 Work Restrictions.

1.02 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally, Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five-day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project Planning, Monitoring and Control System: overall system operated by Consultant to enable monitoring of project work in relation to established milestones.

1.03 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit to Consultant, Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

1.05 MASTER PLAN

.1 Consultant/owner will review and return comments, revise schedule within 5 working days.

.2 Accepted revised schedule will become Master Plan and be used as baseline for project updates.

1.06 PROJECT SCHEDULE

.1 Ensure detailed Project Schedule includes at minimum, milestones and activity types as follows:
- .1 Traffic Plan Submission
- .2 Shop Drawings
- .3 Bridge Superstructure Fabrication Lead Time
- .4 Consultants Superstructure inspection(s)
- .5 Demolition
- .6 Piling schedule
- .7 Substructure pile cap installation
- .8 Riprap and embankment works
- .9 Superstructure installation
- .10 Roadway and remaining earthworks
- .11 Re-opening of roadways
- .12 One year warranty inspection walk-through

1.07 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on monthly basis reflecting activity changes and completions, as well as activities in progress. Send to Consultant.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.08 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

.2 Weather related delays with their remedial measures will be discussed and negotiated.

2 PRODUCTS

2.01 NOT USED

.1 Not used.

3 EXECUTION

3.01 NOT USED

.1 Not used.

END OF SECTION

1 GENERAL

1.01 ADMINISTRATIVE

.1 Submit to Consultant submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
.2 Do not proceed with Work affected by submittal until review is complete.
.3 Present shop drawings, product data, samples and mock-ups in SI Metric or Imperial units, as per drawings.
.4 Where items or information is not produced in SI Metric units converted values are acceptable.
.5 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
.6 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
.7 Verify field measurements and affected adjacent Work is coordinated.
.8 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
.10 Keep one reviewed copy of each submission on site.

1.02 SHOP DRAWINGS AND PRODUCT DATA

.1 Accompany submissions with transmittal letter, in duplicate, containing:
  .1 Date.
  .2 Project title and number.
  .3 Contractor's name and address.
  .4 Identification and quantity of each shop drawing, product data and sample.
  .5 Other pertinent data.

.2 Submissions include:
  .1 Date and revision dates.
  .2 Project title and number.
  .3 Name and address of:
    .1 Subcontractor.
    .2 Supplier.
    .3 Manufacturer.
  .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  .5 Details of appropriate portions of Work as applicable:
    .1 Fabrication.
    .2 Layout, showing dimensions, including identified field dimensions, and

clearances.
.3 Setting or erection details.
.4 Capacities.
.5 Performance characteristics.
.6 Standards.
.7 Operating weight.
.8 Relationship to adjacent work.
.9 Engineer's seal where applicable.

.3 After Consultant's review, distribute copies.

.4 Submit 1 digital copy of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.

.5 Submit 1 digital copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.

.6 Submit 1 digital copy of test reports for requirements requested in specification Sections and as requested by Consultant.
.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accordance with specified requirements.
.2 Testing must have been within 3 years of date of contract award for project.

.7 Submit 1 digital copy of certificates for requirements requested in specification Sections and as requested by Consultant.
.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
.2 Certificates must be dated after award of project contract complete with project name.

.8 Submit 1 digital copy of pre-engineered bridge superstructures final bridge fabrication drawings for each bridge per specification Sections and as requested by Consultant.
.1 Final bridge fabrication inspection report for bridge signed by qualified professional engineer registered or licensed in Manitoba Canada.

.9 Submit 1 digital copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Consultant.
.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.10 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.11 Submit schedule – Critical Path Method Bar (Gantt) Chart in accordance with Section 01 32 16.19 Constrcution Progress Schedule – Bar (Gantt) Chart.

.12 Contractor to submit Emergency Response Plan (ERP) in accordance with COR standards, include:
.1 Requirements by permits/approvals.

.13 Submit construction site plan in accordance with Section 01 52 00 Construction Facilities.

.14 Submit 1 digital copy of traffic sign shop drawings in accordance with Section 10 14 53 Traffic Signage.

.15 Delete information not applicable to project.

.16 Supplement standard information to provide details applicable to project.

.17 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.03 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Consultant's business address.

.3 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.

.6 Make changes in samples which Consultant may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.04 MOCK-UPS

.1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

1.05 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic copy of colour digital photography in jpg format, standard resolution as directed by Consultant.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints: 4 locations.

.1 Viewpoints and their location as determined by Consultant.

.4 Frequency of photographic documentation: as directed by Consultant.

.1 Upon completion of: demolition, excavation, pile installation, pile cap installation, bearing pads, backwall installation, wing wall installation, bridge superstructure installation, and earthworks before concealment of Work, and as directed by Consultant.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
.2 Province of Manitoba
  .1 The Workers Compensation Act RSM 1987

1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
.3 Submit copies of incident and accident reports.
.4 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Consultant.
.5 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.03 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project.

1.04 MEETINGS

.1 Schedule and administer Health and Safety meeting with Consultant prior to commencement of Work.

1.05 REGULATORY REQUIREMENTS

.1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

1.06 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

1.07 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

1.08 COMPLIANCE REQUIREMENTS

.1 Comply with The Workers Compensation Act, Workplace Safety Regulation, Manitoba

Regulations.

.2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.09 UNFORESEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Manitoba and advise Consultant verbally and in writing.

1.10 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Consultant.

1.11 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Consultant.

.2 Provide Consultant with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Consultant may stop Work if non-compliance of health and safety regulations is not corrected.

1.12 WORK STOPPAGE

.1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

2 PRODUCTS (not used)

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 SUMMARY

.1 This Section covers the required environmental procedures to be implemented at the Work Site to mitigate the potential impact on water in or around construction projects, including bridge operations and maintenance, and impact on aquatic and riparian habitats and water quality. Follow these procedures before and during execution of the Work.

1.02 RELATED REQUIREMENTS

.1 Section 00 31 00 Available Project Information

.2 Section 01 41 00 Regulatory Requirements

1.03 ABBREVIATIONS AND ACRONYMS

.1 EPP: Environmental Protection Plan

.2 HSP: Health and Safety Plan

1.04 DEFINITIONS

.1 Contact Water: Water that has been in contact with construction-disturbed soils on the Project.

.2 Erosion: Deterioration, displacement, or transportation of land surface by wind or water, intensified by land clearing practices related to construction work.

.3 Sediment: Particulate matter transported and deposited as a layer of solid particles within a waterbody.

.4 Shroud: A protective casing or cover.

.5 Waterbody: Includes the water and shore of lakes, rivers, waterways, wetlands and associated bays, arms, and inlets, whether or not water is continuously present.

1.05 REFERENCE STANDARDS

.1 Government of Canada:
- .1 Canada National Parks Act (S.C. 2000, c. 32)
- .2 Canada Water Act (R.S.C., 1985, c. C-11)
- .3 Canada Labour Code, Part 2, Canada Occupational Health and Safety Regulations
- .4 Canadian Centre for Occupational Health and Safety (CCOHS): OSH Answers Fact Sheets, Working on or near water
- .5 Canadian Environmental Protection Act
- .6 Fisheries Act (R.S.C., 1985, c. F-14)
- .7 Migratory Birds Convention Act (S.C. 1994, c. 22)
- .8 Species at Risk Act (S.C. 2002, c. 29)

.2 Transport Canada (TC):

.1 Transportation of Dangerous Goods Act, 1992 (S.C. 1992, c. 34)

1.06 ADMINISTRATIVE REQUIREMENTS

.1 Comply with the following during performance of Work:
- .1 Government of Canada:
  - .1 Manitoba Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat
  - .2 Migratory Birds Convention Act and Regulations C.22
  - .3 Species at Risk Act C.29
- .2 Department of Fisheries and Oceans Permit/Approval
- .3 Transport Canada Permit/Approval.
- .4 Manitoba Transportation and Infrastructure Permit/Approval.

.2 Coordination:
- .1 Coordinate requirements of this Section with site-specific Health and Safety Plan (HSP), in accordance with Section 01 35 29.06 - Health and Safety Requirements.
  - .1 Include written Emergency Response Plan (ERP) appropriate to potential emergencies that could happen during working on or above a waterbody in accordance with authorities having jurisdiction (AHJ).
  - .2 List any relevant hazardous or contaminated materials or substances as required by the AHJ, which need to be included in the HSP.

.3 Pre-Installation Meetings: Hold a site meeting in accordance with Section 01 31 19 - Project Meetings, before beginning work at the Work Site, with Contractor, affected Subcontractors, and Consultant to:
- .1 Verify project requirements.
- .2 Examine existing site conditions and adjacent areas.
- .3 Identify potential impact on existing aquatic and riparian habitats and water quality.

.4 Scheduling:
- .1 Whenever possible schedule vegetation removal and the management or removal of hazardous trees or tree limbs within the Regional Timing Window of least risk for breeding birds and before the instream window.
- .2 If required, schedule instream works and vegetation removal, during the Regional Timing Windows of each region to avoid disruption of fish and wildlife habitat.
- .3 Extra precautionary measures are required where fish or species at risk are present at the Work Site.

1.07 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Site Quality Control Submittals: When requested, submit digital photos of repaired bank stabilization areas for review.

2 PRODUCTS

3 EXECUTION

3.01 VERIFICATION OF SITE CONDITIONS

.1 Identify sensitive areas within and adjacent to the Work Site, in accordance with the site-specific Environmental Protection Plan.

3.02 PREPARATION

.1 Provide all required temporary protection measures in accordance with HSP and EPP before beginning work at the Work Site.

3.03 TEMPORARY PROTECTION OF IN-PLACE CONDITIONS

.1 Temporary Tree and Plant Protection:
- .1 If removal of select plants is unavoidable, limit removal to a minimum and limit removal to the right-of-way of the bridge.
- .2 Vegetate disturbed areas due to construction activities by planting and seeding in accordance with Section 31 00 99 Earthworks for Minor Works.
- .3 Maintain sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

3.04 INSTALLATION

.1 Place appropriately-sized clean rocks in eroded areas.
- .1 Do not obtain rocks from below the High-Water Mark (HWM) of any waterbody.
- .2 Avoid the use of acid-generating rock.
- .3 Avoid the use of rock that fractures and breaks down quickly when exposed to the elements.
- .4 Place rock at a similar slope to maintain a uniform stream bank and natural stream alignment.
- .5 Ensure placed rocks do not interfere with fish passage or constrict the channel width.

3.05 POLLUTION PREVENTION

.1 Ensure construction activities have no negative impact on water quality or water quantity in accordance with Canada Water Act:
- .1 Use measures such as shrouding to trap and prevent blasting abrasives, protective coatings, rust and grease from entering the waterbody.
- .2 When removing paint or protective coatings, prevent paints, paint flakes, primers, blasting abrasives, rust, solvents, degreasers, or other waste material from entering the waterbody.
- .3 Prevent concrete and other bridge materials from entering a waterbody. Use barges or shrouding to trap concrete, when Work involves structural repairs and reinforcement.
- .4 Do not allow water containing suspended materials into waterbody.

.2 Construction Equipment Emissions Control:
- .1 Control emissions from construction equipment and vehicles in accordance with local

authorities' emission requirements.

.2 Use new or well-maintained construction equipment.

.3 Arrange for construction equipment to arrive at the Work Site in a clean condition. Maintain construction equipment continuously free of fluid leaks.

.3 Dust Control:

.1 Prevent dust, debris, and other extraneous materials from contaminating air beyond the Work Site.

.2 Prevent dust, debris, and garbage from blowing away by covering or wet down dry materials or other method acceptable to Consultant.

.4 Spill Control:

.1 Develop site-specific spill response plan (SRP) that will contain and clean up any leaks or spills of hazardous materials before beginning work at the Work Site.

.2 Keep (SRP) on hand at all times during the completion of the project, so that any leaks or spills that occur can be promptly contained and cleaned up.

.3 Maintain construction equipment and vehicles in good working condition. Prevent leaks and spills of hazardous materials.

.4 When a spill occurs contact local Environmental Emergency immediately.

.1 Manitoba: Department of Conservation and Climate at 855-944-4888.

.5 Wash, refuel, and service machinery. Store fuel and other materials for the machinery away from waterbody to prevent deleterious substances from entering.

.6 Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.

.7 Store, mix, and transfer paints and solvents on land and not on the bridge to prevent these materials from entering waterbodies in the event of a spill.

3.06 STREAM BANK STABILIZATION

.1 Operate machinery on land (from outside the water) in a manner that minimizes disturbance to the banks and bed of waterbody.

.2 Restore banks to original condition if a disturbance occurs due to work of the Contract.

.3 Stabilize and replace damaged armoring to its original condition or better at eroded areas due to construction activities around bridge structure, such as abutments and wing walls.

3.07 CLEANING

.1 Perform cleaning in accordance with Section 01 74 00 - Cleaning, and as follows:

.1 Progress Cleaning:

.1 Do not clean construction equipment in the watercourse or where the wash-water can enter the waterbody.

.2 Final Cleaning:

.1 Begin cleaning and reclamation activities as soon as possible.

.2 Clean and remove debris and sediment from drainage devices. Dispose of the debris and collected sediment and prevent them from entering the waterbody.

.3 When construction is complete, remove seals and filter cloth from drains and catch basins. Dispose of seals and filter cloth to an approved landfill site.

.4 Re-contour, stabilize, and revegetate areas disturbed due to the work of the Contract.

.5 Give the highest priority for revegetation and erosion control to slopes leading directly into a waterbody. When possible, vegetation should be established within one growing season after construction has completed.

3.08 WASTE MANAGEMENT

.1 Perform in accordance with Section 01 74 19 - Waste Management and Disposal, and as follows:

.1 Do not allow sediments, debris, concrete, concrete fines, cement, mortar, other Portland cement or lime-containing construction materials, wash-water, or contact water to deposit directly or indirectly into or around a waterbody.

.2 Prevent foreign materials including garbage, sand, debris, cleaning solvents and paint from falling or washing into a waterbody.

.1 Use hand tools or machinery for emergency debris removal. Emergencies include situations where carrying out the Project immediately is in the interest of preventing damage to property or the environment, or is in the interest of public health or safety.

END OF SECTION

1 GENERAL

1.01 SUMMARY

.1 This Section references to laws, by laws, ordinances, rules, regulations, codes, orders of Authority Having Jurisdiction, and other legally enforceable requirements applicable to Work and that are; or become, in force during performance of Work.

1.02 REFERENCES TO REGULATORY REQUIREMENTS

.1 Perform Work in accordance with CAN/CSA S6.
.2 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Code; these requirements will govern over the minimum requirements listed in Building Code
    .1 Meet or exceed requirements of:
        .1 Contract documents.
        .2 Specified standards, codes and referenced documents.

1.03 HAZARDOUS MATERIAL DISCOVERY

.1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Consultant.
.2 Polychlorinated Biphenyl (PCB): stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Consultant.
.3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Consultant.

1.04 QUALITY ASSURANCE

.1 Regulatory Requirements: Except as otherwise specified, Contractor shall apply for, obtain, and pay fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:
    .1 Regulatory requirements and fees in force on date of Bid submission, and
    .2 A change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission

2 PRODUCTS

2.01 EASEMENTS AND NOTICES

.1 Owner will obtain permanent easements and rights of servitude that may be required for performance of Work.
.2 Contractor shall give notices required by regulatory requirements.

2.02 PERMITS

.1 Permit:

.1 Owner has approved final design.

.2 Copy of approval and requirements is included in Section 00 31 00 - Available Project Information.

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 INSPECTION

.1 Allow Consultant access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant instructions, or law of Place of Work.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Consultant will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Owner will pay cost of examination and replacement.

1.02 INDEPENDENT INSPECTION AGENCIES

.1 Engage Independent Inspection/Testing Agencies for purpose of inspecting and/or testing portions of Work.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant at no cost to Owner. Pay costs for retesting and re-inspection.

1.03 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.04 PROCEDURES

.1 Notify appropriate agency and Consultant in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.05 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract

Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Consultant.

1.06 REPORTS

.1 Submit 1 digital copy of each inspection and test reports to Consultant.

.2 Provide copies to subcontractor of work being inspected or tested manufacturer or fabricator of material being inspected or tested.

1.07 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Consultant and may be authorized as recoverable.

1.08 MOCK-UPS

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.

.2 Construct in locations acceptable to Consultant as specified in specific Section.

.3 Prepare mock-ups for Consultant’s review with reasonable promptness and in orderly sequence, to not cause delays in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 If requested, Consultant will assist in preparing schedule fixing dates for preparation.

.6 Remove mock-up at conclusion of Work or when acceptable to Consultant.

.7 Mock-ups may remain as part of Work.

.8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.09 MILL TESTS

.1 Submit mill test certificates as required of specification Sections.

2 PRODUCTS (not used)

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.02 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.
.2 Remove from site all such work after use.

1.03 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.
  .1 Pumping, draining and dewatering surface water and groundwater to facilitate construction is the responsibility of the Contractor.
  .2 Provide adequate grading, sloping and ditching to maintain site free from standing water and to minimize saturation of soils and stockpiles.
  .3 Protect from siltation, erosion and contamination in accordance with Section 01 35 43.10 – Environmental Procedures - Bridges.

1.04 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
.2 Construction heaters used in confined space must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
.3 Provide temporary heat and ventilation in enclosed areas as required to:
  .1 Facilitate progress of Work.
  .2 Protect Work and products against dampness and cold.
  .3 Provide adequate ventilation to meet health regulations for safe working environment.
.4 Ventilating:
  .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
  .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
  .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
  .4 Ventilate storage spaces containing hazardous or volatile materials.
  .5 Ventilate temporary sanitary facilities.
.5 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
  .1 Conform with applicable codes and standards.
  .2 Enforce safe practices.
  .3 Prevent abuse of services.
  .4 Prevent damage to finishes.
  .5 Vent direct-fired combustion units to outside.
.6 Be responsible for damage to Work due to failure in providing adequate heat and protection

during construction.

1.05 TEMPORARY POWER AND LIGHT

.1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools.
.2 Provide and maintain temporary lighting throughout project in accordance with provincial regulations.

1.06 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
.2 Burning rubbish and construction waste materials is not permitted on site.

2 PRODUCTS (not used)

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

.1 CSA Group (CSA)
- .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-0121-M1978(R2003), Douglas Fir Plywood.
- .3 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.
- .4 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

.2 Public Works Government Services Canada (PSPC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as of: May 14, 2004.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.03 INSTALLATION AND REMOVAL

.1 Prepare site plan, for each bridge site, indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
.2 Identify areas which have to be graveled to prevent tracking of mud.
.3 Indicate use of supplemental or other staging area.
.4 Provide construction facilities in order to execute work expeditiously.
.5 Remove from site all such work after use.

1.04 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA-S269.2.
.2 Provide and maintain scaffolding, ramps, ladders, swing staging platforms, and temporary stairs.

1.05 HOISTING

.1 Provide, operate and maintain hoists cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
.2 Hoists cranes to be operated by qualified operator.

1.06 SITE STORAGE/LOADING

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
.2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.07 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work.
.2 Provide and maintain adequate access to project site.

.3 Clean runways and taxi areas where used by Contractor's equipment.

1.08 OFFICES

.1 Subcontractors to provide their own offices as necessary. Coordinate location of these offices with Consultant.

1.09 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.10 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances, at each bridge site.
.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.11 CONSTRUCTION SIGNAGE

.1 Provide and erect project sign, within three weeks of signing Contract, in a location designated by Consultant.
.2 Indicate on sign, name of Owner, Consultant and Contractor and Subcontractor, of design style approved by Owner.
.3 No other signs or advertisements, other than warning signs, are permitted on site.
.4 Maintain approved signs and notices in good condition for duration of project and dispose of off-site on completion of project or earlier if directed by Consultant.

1.12 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Protect travelling public from damage to person and property.
.2 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
.3 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
.4 Construct access and haul roads as necessary.
.5 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
.6 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
.7 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Consultant.
.8 Provide snow removal during period of Work.
.9 Remove, upon completion of work, haul roads designated by Owner.

1.13 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site.
.2 Clean dirt or mud tracked onto paved or surfaced roadways.
.3 Store materials resulting from demolition activities that are salvageable.
.4 Stack stored new or salvaged material not in construction facilities.

2 PRODUCTS (not used)

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)
  .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
  .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
.2 CSA Group (CSA)
  .1 CSA-O121-M1978(R2003), Douglas Fir Plywood.
.3 Public Works Government Services Canada (PSPC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as Of: May 14, 2004.

1.02 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.
.2 Remove from site all such work after use.

1.03 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations.
.2 Provide as required by governing authorities.

1.04 WEATHER ENCLOSURES

.1 Design enclosures to withstand wind pressure and snow loading.

1.05 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.06 PUBLIC TRAFFIC FLOW

.1 The contractor shall develop a Traffic Management Plan (TMP) for each site at each stage of construction.
.2 TMP shall include the following items.
  .1 Description of each stage.
  .2 Site plan showing traffic control device’s location, spacing and size.
  .3 Site plan showing detour sign location, spacing and size.
  .4 Image and color of signage as well as dimensions.
  .5 Laydown and construction traffic zones.
.3 The contractor shall supply, maintain, and remove all traffic control sign posts, signs, poly posts, barricades and any other traffic control devices required.

1.07 FIRE ROUTES

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.08 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.
.2 Be responsible for damage incurred.

1.09 PROTECTION OF FINISHES

.1 Provide protection for finished and partially finished finishes and equipment during performance of Work.
.2 Be responsible for damage incurred due to lack of or improper protection.

1.10 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS (not used)

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

.1 Within text of each specifications section, reference may be made to reference standards.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether products or systems are in conformance with applicable standards, Consultant reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be born by Owner in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.02 QUALITY

.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.4 Should disputes arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Contract Documents.

.5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.03 Availability

.1 Immediately after signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of work.

.2 In event of failure to notify Consultant at commencement of work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.04 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.5 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.6 Remove and replace damaged products at own expense and to satisfaction of Consultant.

.7 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.05 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

.2 Transportation cost of materials supplied by Owner will be paid for by Contractor.
.1 Contractor to unload, handle and store such products.

1.06 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Consultant to require removal and re-installation at no increase in Contract Price or Contract Time.

1.07 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Consultant reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Consultant, whose decision is final.

1.08 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.09 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.10 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected Specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.11 PROTECTION OF WORK IN PROGRESS

.1 Do not cut, drill or sleeve load bearing structural member, unless specifically indicated with written approval of Consultant.

1.12 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

2 PRODUCTS (not used)

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

.1 Owner's identification of existing survey control points and property limits.

1.02 QUALIFICATIONS OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to Consultant.

1.03 SURVEY REFERENCE POINTS

.1 Existing base horizontal and vertical control points are designated on drawings.
.2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
.3 Make no changes or relocations without prior written notice to Consultant.
.4 Report to Consultant when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
.5 Require surveyor to replace control points in accordance with original survey control.
    .1 Contractor to pay all cost associated with replacing survey control points.

1.04 SURVEY REQUIREMENTS

.1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations with horizontal and vertical data in Project Record Documents.
.2 Establish lines and levels, locate and lay out, by instrumentation.
.3 Stake for grading, fill and top soil placement and landscaping features.
.4 Stake slopes and berms.
.5 Establish foundation pile locations and cut-off elevations.

1.05 EXISTING SERVICES

.1 Before commencing work, establish location and extent of service lines in area of Work and notify Consultant of findings.
.2 Remove abandoned service lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Consultant.

1.06 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.
.2 On completion of piles and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.
.3 Record locations of maintained, re-routed and abandoned service lines.

1.07 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit name and address of Surveyor to Consultant.

.2 On request of Consultant, submit documentation to verify accuracy of field engineering work.

.3 Topographical survey date in dwg and .csv point file format.

.1 Distances in meters.

.2 Elevations in meters and referenced to CGVD2013 Datum.

.3 Coordinates referenced to UTM, Zone 14, NAD83 Datum.

.4 Promptly notify consultant in writing if subsurface conditions at place of work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

.5 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

2 PRODUCTS (not used)

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit written request in advance of cutting or alteration which affects:
  .1 Structural integrity of elements of project.
  .2 Integrity of weather-exposed or moisture-resistant elements.
  .3 Efficiency, maintenance, or safety of operational elements.
  .4 Visual qualities of sight-exposed elements.
  .5 Work of Owner or separate contractor.
.3 Include in request:
  .1 Identification of project.
  .2 Location and description of affected Work.
  .3 Statement on necessity for cutting or alteration.
  .4 Description of proposed Work, and products to be used.
  .5 Alternatives to cutting and patching.
  .6 Effect on Work of Owner or separate contractor.
  .7 Written permission of affected separate contractor.
  .8 Date and time work will be executed.

1.02 MATERIALS

.1 Required for original installation.
.2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

1.03 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
.2 After uncovering, inspect conditions affecting performance of Work.
.3 Beginning of cutting or patching means acceptance of existing conditions.
.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
.5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.04 EXECUTION

.1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
.2 Fit several parts together, to integrate with other Work.
.3 Uncover Work to install ill-timed Work.
.4 Remove and replace defective and non-conforming Work.
.5 Remove samples of installed Work for testing.
.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
.7 Restore work with new products in accordance with requirements of Contract Documents.
.8 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection.

Refinish assemblies by refinishing entire unit.

1.05 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS (not used)

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Owner. Do not burn waste materials on site, unless approved by Owner.
.3 Clear snow and ice from access to site, bank/pile snow in designated areas only.
.4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
.5 Provide on-site containers for collection of waste materials and debris.
.6 Provide and use marked separate bins for recycling. Refer to Section 01 74 19 - Waste Management and Disposal.
.7 Dispose of waste materials and debris off site.
.8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
.9 Provide adequate ventilation during use of volatile or noxious substances.
.10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

1.02 FINAL CLEANING

.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
.2 Remove waste products and debris other than that caused by others, and leave Work clean.
.3 Prior to final review remove surplus products, tools, construction machinery and equipment.
.4 Remove waste products and debris other than that caused by Owner or other Contractors.
.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Owner. Do not burn waste materials on site, unless approved by Owner.
.6 Make arrangements with and obtain permits from Authorities Having Jurisdiction for disposal of waste and debris.
.7 Remove dirt and other disfiguration from exterior surfaces.

1.03 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS (not used)

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 01 51 00 - Temporary Utilities
.2 Section 01 52 00 - Construction Facilities
.3 Section 02 41 00.08 – Demolition – Minor Works

1.02 DEFINITIONS

.1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
.2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, re modeling, repair and demolition operations.
.3 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.
.4 Non hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.
.5 Non toxic: Not poisonous to humans either immediately or after a long period of exposure.
.6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
.7 Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
.8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form; recycling does not include burning, incinerating, or thermally destroying waste.
.9 Return: To give back reusable items or unused products to vendors for credit.
.10 Reuse: To reuse a construction waste material in some manner on the project site.
.11 Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
.12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.
.13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
.14 Toxic: Poisonous to humans either immediately or after a long period of exposure.
.15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
.16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:
    .1 Solvents in paints and other coatings;
    .2 Wood preservatives; strippers and household cleaners;
    .3 Adhesives in particleboard, fiberboard, and some plywood; and foam insulation.
    .4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.
.17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the project.

1.04 DELIVERY, STORAGE AND HANDLING

.1 Storage Requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the project waste and the available recycling and reuse programs in the project area.

.2 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:

.1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.

.2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.

.3 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

2 PRODUCTS (not used)

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:
- .1 Contractor's Inspection: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
  - .1 Notify Consultant in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
  - .2 Request Consultant inspection.
- .2 Consultant's Review:
  - .1 Consultant and Contractor to review Work and identify defects and deficiencies.
  - .2 Contractor to correct Work as directed.
- .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
  - .1 Work: completed and inspected for compliance with Contract Documents.
  - .2 Defects: corrected and deficiencies completed.
- .4 Final Inspection:
  - .1 When completion tasks are done, request final inspection of Work by Consultant, Owner and Contractor.
  - .2 When Work incomplete according to Owner and Consultant, complete outstanding items and request re-inspection.

1.02 FINAL CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.
- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS (not used)

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
.2 Two weeks prior to Substantial Performance of the Work, submit to the Consultant, two final copies of operating and maintenance manuals in English.
.3 Provide evidence, if requested, for type, source and quality of products supplied.

1.02 FORMAT

.1 Organize data as instructional manual.
.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
.3 When multiple binders are used correlate data into related consistent groupings.
  .1 Identify contents of each binder on spine.
.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
.7 Text: manufacturer's printed data, or typewritten data.
.8 Drawings: provide with reinforced punched binder tab.
  .1 Bind in with text; fold larger drawings to size of text pages.
.9 Provide 1:1 scaled CAD files in dxf or dwg format digitally.
.10 Provide digital copy of project record documents in .pdf format on USB flash drive.

1.03 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;
  .1 Date of submission; names.
  .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
  .3 Schedule of products and systems, indexed to content of volume.
.2 For each product or system:
  .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies.
.3 Product Data: mark each sheet to identify specific products, and data applicable to installation; delete inapplicable information.
.4 Drawings: supplement product data to illustrate relations of component parts and systems, to show control and flow diagrams.
.5 Typewritten Text: as required to supplement product data.
  .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.04 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, at site for Consultant one record copy of:
  .1 Contract Drawings.

.2 Specifications.
.3 Addenda.
.4 Change Orders and other modifications to Contract.
.5 Reviewed shop drawings, product data, and samples.
.6 Field test records.
.7 Inspection certificates.
.8 Manufacturer's certificates.

.2 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.3 Maintain record documents in clean, dry and legible condition.
.1 Do not use record documents for construction purposes.

.4 Keep record documents and samples available for inspection by Consultant.

.5 As-built geodetic survey of all installed items included but not limited to:
.1 Pile locations,
.2 Corners of structure,
.3 Centerline of roadway,
.4 Edge of traveled way,
.5 Invert of ditching,
.6 Secondary approaches

1.05 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Consultant.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.
.1 Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
.1 Measured depths of elements of foundation in relation to geodetic datum.
.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
.3 Field changes of dimension and detail.
.4 Changes made by change orders.
.5 Details not on original Contract Drawings.
.6 Referenced Standards to related shop drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:
.1 Manufacturer, trade name, and catalogue number of each product actually installed.
.2 Changes made by Addenda and change orders.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

.7 Provide digital photos, if requested, for site records.

1.06 DELIVERY, STORAGE AND HANDLING

.1 Store in original and undamaged condition with manufacturer's seal and labels intact.

.2 Store components subject to damage from weather in weatherproof enclosures.
.3 Store paints and freezable materials in a heated and ventilated room.
.4 Remove and replace damaged products at own expense and for review by Consultant.

1.07 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties.
.2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Consultant approval.
.3 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.
.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
.5 Submit, warranty information made available during construction phase, to Consultant for approval prior to each monthly pay estimate.
.6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
    .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
    .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
    .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
    .4 Verify that documents are in proper form, contain full information, and are notarized.
    .5 Co-execute submittals when required.
    .6 Retain warranties and bonds until time specified for submittal.
.7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
.8 Conduct joint 12-month warranty inspection, measured from time of acceptance, by Consultant.
.9 Include information contained in warranty management plan as follows:
    .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
    .2 Provide list for each warranted equipment, item, feature of construction or system indicating:
        .1 Name of item.
        .2 Location where installed.
        .3 Name and phone numbers of manufacturers or suppliers.
        .4 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
        .5 Cross-reference to warranty certificates as applicable.
        .6 Starting point and duration of warranty period.
        .7 Summary of maintenance procedures required to continue warranty in force.
        .8 Cross-Reference to specific pertinent Operation and Maintenance manuals.
        .9 Organization, names and phone numbers of persons to call for warranty service.
        .10 Typical response time and repair time expected for various warranted material.
    .3 Contractor's plans for attendance at 12-month post-construction warranty inspections.
.10 Respond in timely manner to oral or written notification of required construction warranty repair

work.

.11 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Consultant to proceed with action against Contractor.

2 PRODUCTS (not used)

3 EXECUTION (not used)

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 31 00 99 – Earthworks for Minor Works

1.02 REFERENCE STANDARDS

.1 CSA Group (CSA)
- .1 CSA S350, Code of Practice for Safety in Demolition of Structures.

.2 Department of Justice Canada (Jus)
- .1 Canadian Environmental Assessment Act (CEAA), 2012
- .2 Canadian Environmental Protection Act (CEPA), 2012
- .3 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
- .4 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations
- .5 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34
- .6 Motor Vehicle Safety Act (MVSA), 1995
- .7 Hazardous Materials Information Review Act, 1985

.3 National Fire Protection Association (NFPA)
- .1 NFPA 241 - 96, Standard for Safeguarding Construction, Alteration, and Demolition Operations

.4 National Research Council Canada (NRC)
- .1 National Building Code of Canada 2015 (NBC).
- .2 National Fire Code of Canada 2015 (NFC).

.5 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S660-08, Standard for Nonmetallic Underground Piping for Flammable and Combustible Liquids
- .2 ULC/ORD-C58.15-1992, Overfill Protection Devices for Flammable Liquid Storage Tanks
- .3 ULC/ORD-C58.19-1992, Spill Containment Devices for Underground Flammable Liquid Storage Tanks

.6 U.S. Environmental Protection Agency (EPA)/Office of Water
- .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.03 DEFINITIONS

.1 Demolition: rapid destruction of building following removal of hazardous materials.

.2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly.

1.04 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate with Consultant for the material ownership including but not limited to:
- .1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Consultant's property, demolished materials shall become

Contractor's property and shall be removed from Project site.

.2 Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Consultant that may be encountered during demolition remain Owner's property.

1.05 ACTION AND INFORMATIONAL SUBMITTALS

.1 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Submit written demolition plan including at minimum:

.1 Location of material disposal

.2 Utility located/clearance

.3 Erosion and sediment control plan

.4 Schedule of work

.2 Submit in accordance with Section 01 33 00 - Submittal Procedures and 01 74 19 - Waste Management and Disposal.

.2 Informational Submittals: Provide the following submittals when requested by the Consultant:

.1 Qualification Data: Submit information for companies and personnel indicating their capabilities and experience to perform work of this Section including; but not limited to, lists of completed projects with project names and addresses, names and addresses of Consultants and Representative, for work of similar complexity and extent.

1.06 QUALITY ASSURANCE

.1 Regulatory Requirements: Ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial/Territorial and Municipal regulations.

.2 Comply with hauling and disposal regulations of Authority Having Jurisdiction.

.3 Standards: Comply with ANSI A10.6 and NFPA 241.

1.07 SITE CONDITIONS

.1 Take precautions to protect environment.

.2 Environmental protection:

.1 Ensure Work is done in accordance with regulatory requirements.

1.08 EXISTING CONDITIONS

.1 Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

.2 Hazardous materials will be as defined in the Hazardous Materials Act.

2 PRODUCTS

2.01 EQUIPMENT

.1 Equipment and heavy machinery:
  .1 Submit prior to demolition for review by consultant, list and details of equipment for use in demolition.
.2 On-road vehicles to: Comply to CEPA-SOR/2003-2, On-Road Vehicle and Engine Emission Regulations and CEPA-SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations.
.3 Off-road vehicles to: comply to EPA CFR 86.098-10 and EPA CFR 86.098-11.
.4 Machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

3 EXECUTION

3.01 EXAMINATION

.1 Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
.2 Review Project Record Documents of existing construction provided by Representative.
.3 Representative does not guarantee that existing conditions are the same as those indicated in Project Record Documents.
.4 Inventory and record the condition of items being removed and salvaged.
.5 When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element.
.6 Promptly submit a written report to Consultant.
.7 Verify that hazardous materials have been remediated before proceeding with demolition operations.

3.02 PREPARATION

.1 Temporary Erosion and Sedimentation Control:
  .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to: requirements of Consultant
  .2 Protection of In-Place Conditions:
    .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features Provide bracing and shoring required.
    .2 Keep noise and dust to minimum.
    .3 Do Work in accordance with Section 01 35 29.06 - Health and Safety Requirements.
  .3 Demolition/Removal:
    .1 Demolish parts of structure as indicated on drawings.
  .4 Remove materials and equipment and store in location designated by Consultant as indicated in Section 01 74 19 – WASTE MANAGEMENT AND DISPOSAL.

3.03 SITE RESTORATION & REPAIRS

.1 Below Grade Areas: Completely fill below grade areas and voids resulting from structure demolition operations with satisfactory soil materials according to backfill requirements in Section 31 00 00.01 – EARTHWORKS - SHORT FORM.
.2 Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes.
.3 Provide a smooth transition between adjacent existing grades and new grades.
.4 General: Promptly repair damage to adjacent construction caused by demolition operations.
.5 Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
.6 Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

3.04 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  .1 Leave Work area clean at end of each day.
.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
.3 Refer to demolition drawings and specifications for items to be salvaged for reuse.
.4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

.1 CSA Group
- .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-A23.4, Precast Concrete - Materials and Construction.
- .3 CAN/CSA-G30.18, Carbon steel bars for concrete reinforcement.
- .4 CAN/CSA-S6, Canadian Highway Bridge Design Code.
- .5 CSA-W59 - 13, Welded Steel Construction (Metal Arc Welding) (Metric version).
- .6 CSA-W186-M1990, Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.02 PERFORMANCE REQUIREMENTS

.1 Tolerance of precast elements to CSA-A23.4.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Precast Structural Concrete and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit shop drawings prepared in accordance with CSA-A23.4 and include following items:
  - .1 Design calculations for items designed by manufacturer.
  - .2 Details of reinforcement and their connections.
  - .3 Finishing schedules.
  - .4 Methods of handling and erection.
  - .5 Openings, sleeves, inserts and related reinforcement.

.4 Quality Assurance Submittals:
- .1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
- .2 Mill Test Report: Submit to Consultant certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
- .3 Provide quality management plan to ensure verification of concrete quality to specified performance.
- .4 Submit concrete supplier's certification.

1.04 QUALITY ASSURANCE

.1 Quality Control Plan: submit written report, to Consultant verifying concrete provided meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.05 QUALIFICATIONS

.1 Fabricate precast concrete elements by manufacturing plant certified in appropriate categories according to CSA-A23.4, or facility approved by Consultant.

.2 Welding companies certified to CSA-W47.1.

1.06 DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle and store precast units according to manufacturer's instructions.

.2 Protect unit corners from contacting earth to prevent from staining.

.3 Mark mass of precast panels on members.
.1 Ensure marks are installed on unfinished side of the panels.

1.07 WARRANTY

.1 Warrant precast element not to spall or show visible evidence of corrosion of embedded steel and cracking, except for normal hairline shrinkage cracks, in accordance with General Conditions of Contract, but for minimum 1 year.

2 PRODUCTS

2.01 MATERIALS

.1 Cement to CAN/CSA-A3001, Type HS.

.2 Water: to CSA-A23.1/A23.2

.3 Reinforcing steel: to CAN/CSA-G30.18,

.4 Hardware and miscellaneous materials: to CSA-A23.1/A23.2.

.5 Forms: to CSA-A23.4.

.6 Anchors and supports: to CAN/CSA-G40.21

.7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.

2.02 MIXES

.1 Concrete:
.1 Alternative 1 - Performance Method for specifying concrete: to meet Consultant performance criteria in accordance with CAN/CSA-A23.1/A23.2.
.1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance.
.2 Provide concrete mix to meet following hard state requirements:
.1 Durability and class of exposure: S-1
.2 Minimum compressive strength at 28 day age: 35 MPa.
.3 Cement Type: HS

.4 Air Entrained: 3%-6%

.5 Intended application: exterior, vertical walls in contact with water and earth.

.6 Surface texture: exposed faces to be broom finished.

2.03 FABRICATION

.1 Manufacture units in accordance with CSA-A23.4.

.2 Mark each precast unit to correspond to identification mark on project drawings for location with date cast in location not exposed in finished work.

.3 Cast members in accurate rigid moulds designed to withstand high frequency vibration. Set reinforcing anchors and auxiliary items to indicated on shop drawings. Cast in anchors, blocking and inserts supplied by other Sections as required to accommodate their work. Vibrate concrete during casting for full thickness. Provide necessary holes and sinkages for flashings, anchors, and cramps. Maintain even and uniform appearance.

.4 Anchors, lifting hooks, shear bars, spacers and other inserts or fittings required for a complete and rigid installation. Each to conform to requirements of local codes. Lift hooks adequately sized to safely handle panels according to member dimension and weight. Conceal anchors and inserts where practical.

2.04 FINISHES

.1 Finish units to standard grade to CSA-A23.4.

2.05 SOURCE QUALITY CONTROL

.1 Provide Consultant with certified copies of quality control tests related to this project as specified in CSA-A23.4.

.2 provide Consultant with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.

.3 Precast facility to keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to Consultant for review upon request.

3 EXECUTION

3.01 ERECTION

.1 Precast concrete work in accordance with CSA-A23.4 and CAN/CSA-S6.

.2 Welding in accordance with CSA-W59, for welding to steel structures and CSA-W186, for welding of reinforcement.

.3 Erect precast elements within allowable tolerances as specified.

.4 Set elevations and alignment between units to within allowable tolerances before connecting units.

.5 Secure precast with galvanized fasteners.

.6 Uniformly tighten bolted connections.

3.02 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

.1 CSA International
- .1 CSA G40.20/G40.21 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CAN/CSA G164 Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CAN/CSA S6:19, Canadian Highway Bridge Design Code.
- .4 CSA S16, Design of Steel Structures.
- .5 CSA S269.1, Falsework for Construction Purposes.
- .6 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
- .7 CSA W59, Welded Steel Construction, (Metal Arc Welding).

1.02 DESIGN PARAMETERS

.1 Design in accordance with CAN/CSA S6:19.

.2 Pre-fabricated bridge superstructure to be designed for CL-625 loading.

.3 Bridge superstructure to be designed for minimum 75-year design life.

.4 Limit live load deflections to L/480.

.5 All steel substructure and superstructure components, except those specified otherwise in Section 31 61 13 – Pile Foundations General Requirements, to be galvanized.

.6 Decking to be galvanized corrugated steel deck topped with 150mm gravel running surface.
- .1 Include weep holes to drain corrugations.

.7 On-bridge guide rail system in accordance with CAN/CSA S6:19 by pre-fabricated bridge superstructure supplier.

.8 Laminated Elastomeric Pad designed in accordance with CAN/CSA S6:19.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:
- .1 Submit bridge superstructure drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
  - .1 Include all girders, diaphragm, decking, on-bridge guardrail systems, approach rail systems, elastomeric bearing pads, fasteners and miscellanies metals.
- .2 Submit crane rigging and lifting plan stamped and signed by professional engineer registered or licensed in Manitoba, Canada minimum 14 days prior to lift.
- .3 Submit abutment load and girder load summary showing both factored and un-factored reactions, stamped and signed by professional engineer registered or licensed in Manitoba, Canada.

.1 Include individual girder reactions
.2 Include total abutment load from moving load analysis.

.4 Submit summary of design calculations stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
.5 Submit copy of manufacturing shop certifications and welding certifications.
.6 Indicate shop and erection details including shop splices, cuts, copes, connections, holes, bearing plates, threaded fasteners, rivets and welds. Indicate welds by CSA W59, welding symbols.
.7 Proposed welding procedures to be stamped and approved by Canadian Welding Bureau.
.8 Submit description of methods, temporary bracing and strengthening, sequence of erection and type of equipment proposed for use in erecting structural steel.

.3 Upon completion of the pre-fabricated bridge superstructure in the fabrication facility, bridge superstructure stamping engineer shall inspect the bridge and submit a detailed written inspection report, including:
.1 Name of reviewer
.2 Time and date of inspection
.3 Location of inspection
.4 Status of bridge at time of inspection
.5 Confirmation of conformance to shop drawings, include:
.1 Number and size of all components.
.2 Hole and fastener locations.
.3 Review of all welds.
.6 Galvanizing thicknesses measurements at minimum 5 locations on each component type including: girders, corrugated decking, diaphragm members, guard posts, and miscellaneous angles and connector plates. Use appropriate coating thickness measurement device and report thicknesses in one-thousandth of an inch (mil) or in millimeters
.7 Confirmation that repairs to galvanizing damage during fabrication has been completed in conformance with ASTM A780.
.8 Site photos (minimum 20)

1.04 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle in accordance with manufacturers requirements.
.2 Provide protective blocking for lifting, transportation and storing.
.1 Exercise care during fabrication, transportation and erection so as not to damage girders and beams.
.2 Do not notch edges of members.
.3 Do not cause excessive stresses.
.3 Mark mass on members weighing more than 3 tonnes.
.4 Protect unpainted weathering steel, before erection, with waterproof covering.
.5 Ensure that no portion of steel comes into contact with ground.
.6 Provide Consultant with delivery schedules minimum 14 days prior to shipping.

1.05 QUALITY ASSURANCE

.1 Provide suitable facilities and cooperate with Consultant in carrying out inspections.

.2 Accommodate Consultant review of each bridge superstructure at fabrication facility after completion of fabrication and assembly.

2 PRODUCTS

2.01 MATERIALS

.1 Structural steel: to CSA G40.20/G40.21, grade and types as indicated, minimum 350W.
.2 High strength bolts, nuts and washers: to ASTM A325, type 1.
.3 Anchor bolts, washers and nuts: to CSA G40.20/G40.21, grade 300W galvanized.
.4 Bearings: to CSA G40.20/G40.21, elastomer bearing pads to CAN/CSA S6.
.5 Welding electrodes: to CSA W48 series.
.6 Hot dip galvanizing:
  .1 Structural Steel minimum 915g/m^2 Zinc coating, conforming to ASTM A123
  .2 Corrugated decking minimum 915g/m^2 Zinc coating, conforming to ASTM A123
  .3 Angles and miscellaneous metals conforming to ASTM A123
  .4 Bolts conforming to ASTM A153
  .5 Nuts conforming to ASTM A153
  .6 Anchor Rods conforming to ASTM A153

2.02 SOURCE QUALITY CONTROL

.1 Steel manufactures qualifications: certified in accordance with CSA G40.20/G40.21.
.2 Submit Consultant copies of certified test reports for Charpy V-notch test.
.3 Provide suitable facilities and co-operate with inspection organization and Consultant in carrying out inspection and tests required.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for structural steel installation in accordance with manufacturer's written instructions.
  .1 Inform Consultant of unacceptable conditions immediately upon discovery.
  .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.02 PREPARATION

.1 Clean steel surfaces as directed Consultant when staining or defacing occurs.
.2 Verify location of substructure units, elevations of bearing seats and location of anchor bolts before erection of structural steel; report discrepancies to Consultant.
.3 Work near river banks or embankments in accordance with written instructions from Consultant.
.4 Restrict drifting during assembly to minimum required to bring parts into position without enlarging or distorting holes, and without distorting, kinking or sharply bending metal of any unit.
  .1 Enlarge holes if necessary by reaming only after receipt of written approval from Consultant.
  .2 Ensure reamed holes are 2 mm maximum larger than bolt size used.

.5 Fabricate and install bearings as indicated.
.6 Place anchor bolts at elevations and locations indicated.
.1 Protect holes against entry of water and foreign material.

3.03 INSTALLATION

.1 Falsework in accordance to CSA S269.1.
.2 Fabrication and erection of structural steel in accordance with CAN/CSA S6.
.3 Welding in accordance with CSA W59, except where specified otherwise.
.1 Do welding in shop unless otherwise permitted by Consultant.
.2 Weld only at locations indicated.
.4 High strength bolting: in accordance with CAN/CSA S6. Use 'turn-of-nut' tightening method.
.5 Finish: members true to line, free from twists, bends, open joints, sharp corners and sharp edges.
.6 Allowable tolerance for bolt holes:
.1 Matching holes for bolts to line up so that dowel 2 mm less in diameter than hole passes freely through assembled members at right angles to such members.
.2 Finish holes not more than 2 mm in diameter larger than diameter of rivet or bolt unless otherwise specified by Consultant.
.3 Centre-to-centre distance between any two holes of group to vary by not more than 1mm from dimensioned distance between such holes.
.4 Centre-to-centre distance between any two groups of holes to vary not more than maximum of the following:

Centre-to-Centre distance in metres	Tolerance in plus or minus mm
less than 10	1
10 to 20	2
20 to 30	3

.5 Correct mispunched or misdrilled members only as directed by Consultant.
.7 Span length tolerances:
.1 Girders and beams: plus or minus 6 mm
.2 Centre-to-centre of bearing stiffeners and bearing plates: plus or minus 3 mm.
.8 Girder support requirements:
.1 Support top and bottom flanges of ends of girders and intermediate bearing locations of continuous girders parallel to each other at 90 degrees to girder web.
.2 Install flat and smooth except as otherwise indicated.
.3 Install bearing stiffeners after girder support requirements have been met.
.4 Correct irregularities of flanges of girders as permitted by Consultant.
.9 Shop splices:
.1 Use complete joint penetration groove welds finished flush.
.2 Details of butt joints to CSA W59.
.3 Use only as approved by Consultant.

3.04 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, protecting and cleaning of steel.
.2 Submit manufacturer's field services consisting of product use recommendations and

periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Ensure manufacturer's representative is present before installation and during critical periods of installation.

.4 Schedule site visits:

.1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.

.2 At the time of installation.

.3 Upon completion of the Work, after cleaning is carried out.

3.05 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM A 53/A 53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .2 ASTM A 325, Standard Specification for Structural Steel Bolts

.2 CSA Group
- .1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding
- .4 CSA W59, Welded Steel Construction.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for sections, plates, pipe, tubing, bolts and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.4 Steel components to be designed for 75-year design life.

1.03 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground in dry location and in accordance with manufacturer's

recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 MATERIALS

.1 Steel sections and plates: to CSA G40.20/G40.21, Grade 350W.

.2 Steel pipe: to ASTM A 53/A 53M standard weight, galvanized finish.

.3 Welding materials: to CSA W59.

.4 Welding electrodes: to CSA W48 Series.

.5 Bolts and anchor bolts: to ASTM A325.

.6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.02 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Where possible, fit and shop assemble work, ready for erection.

.3 Exposed welds continuous for length of each joint. File or grind exposed welds smooth and flush.

2.03 FINISHES

.1 Galvanizing: hot dipped galvanizing min 915 g/m^2 (Z915) conforming to ASTM A123 and ASTM A153

.2 Zinc-Rich Coating: zinc rich coating, minimum 92% metallic zinc by weight in dry film. Zinc-Rich paint in accordance with chemical component limits and restrictions requirements and VOC limits of CCD-047a, CCD-048 GS-11.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts acceptable for metal fabrications installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions remedied.

3.02 ERECTION - GENERAL

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Consultant such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.4 Exposed fastening devices to match finish and be compatible with material through which they pass.

.5 Supply components for work by other trades in accordance with shop drawings and schedule.

.6 Make field connections with A325 bolts or Weld field connection if indicated on project drawings.

.7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

.8 Touch-up galvanized surfaces with zinc rich primer where damaged or burned by field welding.
- .1 Surface Preparation: Follow ASTM A780 – A2.1.2. It is permissible to use a wire brush.
- .2 Primer: zinc rich coating, minimum 92% metallic zinc by weight in dry film. Apply Zinc-Rich Coating in accordance with manufacturers recommendations.

3.03 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.04 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by metal fabrications installation.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

.1 CSA International
- .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .2 CSA O121-08, Douglas Fir Plywood.
- .3 CSA O141-05(R2009), Softwood Lumber.
- .4 CSA O151-09, Canadian Softwood Plywood.
- .5 CAN/CSA-O325.0-07, Construction Sheathing.
- .6 CAN/CSA-Z809-08, Sustainable Forest Management.

.2 National Research Council Canada (NRC)
- .1 National Building Code of Canada (NBC).

.3 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.4 Green Seal Environmental Standards (GS)
- .1 GS-11-11, Paints and Coatings.

.5 National Lumber Grades Authority (NLGA)
- .1 Standard Grading Rules for Canadian Lumber 2010.

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1113-A2011, Architectural Coatings.

.7 Sustainable Forestry Initiative (SFI)
- .1 SFI-2010-2014 Standard.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for rough carpentry work and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Wood Certification: submit vendor's Chain-of-Custody Certificate number for CAN/CSA-Z809 or FSC or SFI certified wood.

1.03 QUALITY ASSURANCE

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: by grade mark in accordance with applicable CSA standards.
- .1 Plywood, OSB and wood based composite panel construction sheathing identification: by

grademark in accordance with applicable CSA standards.

.2 Sustainable Standards Certification:

.1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wood from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 MATERIALS

.1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:

.1 CAN/CSA-O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.3 CAN/CSA-Z809 or FSC or SFI certified.

.2 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:

.1 Board sizes: "Standard" or better grade.

.2 Dimension sizes: "Standard" light framing or better grade.

.3 Post and timbers sizes: "Standard" or better grade.

.3 Panel Materials:

.1 Douglas fir plywood (DFP): to CSA O121, standard construction.

.1 Urea-formaldehyde free.

.2 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.1 Urea-formaldehyde free.

.3 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.

.1 Urea-formaldehyde free.

.4 Wood Preservative:

.1 Provide preservative treated lumber and plywood in accordance with CSA 080 series standards.

.2 Preservative for field treatment: type recommended by manufacturer to suit specified pressure treated product.

.5 Coatings: in accordance with manufacturer's recommendations for surface conditions:

.6 Fasteners: to CAN/CSA-G164, for exterior work and pressure- preservative treated lumber.

.7 Nails, spikes and staples: to CSA B111.

.8 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fiber plugs, recommended for purpose by manufacturer.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for rough carpentry installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.02 PREPARATION

.1 Treat surfaces of material with wood preservative, before installation.

.2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3-minute soak on lumber and 1 minute soak on plywood.

.3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

3.03 INSTALLATION

.1 Comply with requirements of National Building Code of Canada (NBC), supplemented by the following paragraphs.

.2 Install furring and blocking as required to space-out and support work as required.

.3 Align and plumb faces of furring and blocking to tolerance of 1:600.

.4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.5 Use caution when working with particle board. Use dust collectors and high-quality respirator masks.

.6 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.7 Countersink bolts where necessary to provide clearance for other work.

3.04 FIELD TREATMENT

.1 Comply with AWPA M4 and revisions specified in CSA O80 Series, Supplementary Requirements to AWPA M2.

.2 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of recommended preservative before installation.

.3 Remove chemical deposits from surfaces of treated wood to receive applied finish.

3.05 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

1.02 REFERENCE STANDARDS

.1 Manitoba Transportation and Infrastructure Traffic Control Devices Regulation

.2 ASTM International
- .1 ASTM A 123/A 123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM A 276, Standard Specification for Stainless Steel Bars and Shapes.
- .3 ASTM B 209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate Metric.
- .4 ASTM B 210M, Standard Specification for Aluminum-Alloy Drawn Seamless Tubes Metric.
- .5 ASTM B 211M, Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire Metric.

.3 Canadian General Standards Board (CGSB)
- .1 CGSB 62-GP-9M, Prefabricated Markings, Positionable, Exterior, for Aircraft Ground Equipment and Facilities.
- .2 CGSB 62-GP-11M, Marking Material, Retroreflective, Enclosed Lens, Adhesive Backing and Amendment.

.4 CSA Group (CSA)
- .1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CAN/CSA O80 Series, Wood Preservation.
- .3 CSA O121, Douglas Fir Plywood.
- .4 CSA W47.2, Certification of Companies for Fusion Welding of Aluminum.
- .5 CAN/CSA-Z809, Sustainable Forest Management.

.5 Green Seal Environmental Standards (GS)
- .1 GS-11, Paints and Coatings.

.6 The Master Painters Institute (MPI)
- .1 Architectural Painting Specification Manual.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for traffic signage, including product characteristics, performance criteria, physical size, finish and limitations.

1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground and in accordance with manufacturer's recommendations.
- .2 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 MATERIALS

.1 Sign supports:
- .1 Timber posts:
  - .1 Sawn timber posts:
    - .1 Type: treated
    - .2 Dimensions: as indicated.
  - .2 Posts to be treated in accordance with CAN/CSA O80 Series
- .2 Fasteners: bolts, nuts, washers and other hardware for roadside signs to be galvanized steel.

.2 Signboards:
- .1 Aluminum sheet: to ASTM B 209M, precut to required dimensions
  - .1 Thickness for signboards up to 750 mm wide: 1.6 mm minimum.
  - .2 Thickness for signboards 750-1200 mm wide: 2.1 mm minimum.
- .2 Aluminum materials: to ASTM B 209M
- .3 Reflective sheeting and tape: to CGSB 62-GP-11M. Adhesive, class of reflectivity and colour as indicated.
- .4 Transparent tape: flexible, smooth-surfaced, moisture resistant tape with pressure sensitive adhesive.

2.02 FABRICATION

.1 Signboards:
- .1 Aluminum blanks:
  - .1 Degrease, etch and bonderize with chemical conversion coating.
  - .2 Clean surfaces with xylene thinner. Dry.
  - .3 For non-reflective signs, spray face with one coat vinyl pretreatment coating and two finish coats of required colour.
  - .4 Remove sharp edges and burrs.

- .2 Reflective background sheeting and lettering:
  - .1 Cut and apply in accordance with manufacturer's instructions.
  - .2 Apply adhesive coated material with heat lamp vacuum applicator or by squeeze roll application method. Apply pressure sensitive material with roller or

squeegee.

.3 Edge wrap sheeting on each extrusion prior to bolting extrusions. Match pieces of sheeting from different rolls for each signboard to ensure uniform appearance and brilliance by day and night.

.3 Clean signboards completely and apply transparent tape over top edge and extending 25 mm minimum down back and front of signboard.

.2 Sign identification:

.1 Apply sign number and date of installation with 25 mm high stencil painted black letters on lower left back face of each signboard.

3 EXECUTION

3.01 INSTALLATION

.1 Sign support:

.1 Erect posts plumb and square to details as indicated.

.2 Wooden post installation:

.1 Excavate post holes to 200 mm minimum diameter. Compact bottom of hole to provide firm foundation. Set post and backfill in 150 mm layers with excavated material. Compact each layer before placing each subsequent layer.

.2 Signboard:

.1 Fasten signboard(s) to supporting posts and brackets as indicated.

3.02 CORRECTING DEFECTS

.1 Correct defects, identified by Consultant, in sign message, consistency of reflectivity, colour or illumination.

3.03 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.04 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by traffic signage installation and salvage operations.

END OF SECTION

1 GENERAL

1.01 MEASUREMENT AND PAYMENT

.1 Earthwork quantities shown on drawings are estimated, contractor to confirm and assume responsibility for actual installed earthwork quantities.

.2 Measure granular sub-base in cubic meters compacted in-place by quality control survey (see Section 3.04 Site Quality Control) of material incorporated into Work and accepted by Consultant.

.1 Payment of granular sub-base is to be considered incidental to the works and shall be included in the lump-sum price of the contract.

.3 Measure clay fill in cubic meters compacted in-place by quality control survey (see Section 3.04 Site Quality Control) of material incorporated into Work and accepted by Consultant.

.1 Payment of clay fill is to be considered incidental to the works and shall be included in the lump-sum price of the contract.

.4 Measure excavation of sub-base and subgrade materials used to correct deficiencies in subgrade discovered during proof rolling in cubic meters.

.1 Measure backfill of subgrade with granular sub base and replacement of granular sub base material under this Section.

.5 Measure water in units of 1000 L for water authorized by Consultant and applied.

.6 Measure clearing and grubbing in square meters.

.7 Measure geotextile and erosion control matting materials in square meters not including overlaps.

1.02 DEFINITIONS

.1 Clearing: Consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.1 Close-cut clearing: Consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.

.2 Clearing isolated trees: Consists of cutting off to not more than specified height above ground of designated trees and disposing of felled trees and debris.

.3 Underbrush clearing: Consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.

.2 Grubbing: Consists of excavation and disposal of stumps and roots, boulders and rock fragments to not less than specified depth below existing ground surface.

1.03 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600kN-m/m³).
- .2 ASTM D5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles
- .3 ASTM D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
- .4 ASTM D3786, Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method
- .5 ASTM D4833, Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
- .6 ASTM D4751, Standard Test Methods for Determining Apparent Opening Size of a Geotextile
- .7 ASTM D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity
- .8 ASTM D6637, Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method
- .9 ASTM D7748, Standard Test Method for Flexural Rigidity of Geogrids, Geotextiles, and Related Products

.2 CSA International
- .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.3 Manitoba Infrastructure Standard Construction Specifications (MISCS)
- .1 MISCS 701(i), Construction Specification for Granular Base Course
- .2 MISCS 900, Material Specification for Aggregate – Granular Sub Base Course
- .3 MISCS 1004M – Material Specification for Aggregate – Drainfill
- .4 MISCS 1295 – Material Specification for Supply and Installation of Geotextile Fabric – Geotextile
- .5 MISCS 1297 – Material Specification for Erosion Control – Stone Rip-Rap
- .6 MISCS 1298 – Material Specification for Erosion Control – Supply and Place Erosion Control Blanket

1.04 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit Granular material sieve analysis and proctor tests.

.3 Submit manufacturers performance specification for Geotextile, Geo Grid and Combination GeoGrid.

.4 Submit manufacturers performance specification for Erosion Control Matting

.5 Submit seed mixture, product date and application rate.

1.05 QUALITY ASSURANCE AND QUALITY CONTROL

.1 Contractor to perform as many field tests as required to ensure work conforms to the

requirements in the Contract, regardless of the minimum required field tests.

.2 Contractor to provide a minimum 1 field density test for every 1000 m^3 of material placed.
.1 Field Density tests in accordance with ASTM D6938.

.3 Granular sub-base tolerance to MISC 701(i) – Construction Specification for Granular Base Course

2 PRODUCTS

2.01 MATERIALS

.1 Granular Sub-Base to MISCS 900 – Class 'C'.

.2 Road gravel to MISCS 900 – Class 'C'

.3 Drain rock to MISCS 1004M – Type 'A' Drainfill or approved equal.

.4 Rip-Rap to MISCS 1297 – Class 450.

.5 Clay Fill.

2.02 GEOTEXTILE

.1 Geotextile fabric – non-woven
.1 Mass 270 g/m^2 minimum in accordance with ASTM D5261
.2 Tensile Strength 910N minimum in accordance with ASTM D4632 Grab test
.3 Bursting Strength in accordance with ASTM D3786 Diaphragm Tester
.4 Elongation at Failure in accordance with ASTM D 4632
.5 CBR Puncture 2220N minimum in accordance with ASTM D4833
.6 Apparent Opening Size in accordance with ASTM D4751
.7 Permittivity in accordance with ASTM D4491

.2 Geo Grid
.1 Polyester greogrid.
.2 Minimum 110.9 kN/m Tensile Strength at Ultimate Strain in accordance with ASTM D6637(Method B).
.3 Minimum 20.1 kN/m Creep Rupture Strength in accordance with ASTM D5262/D6992.
.4 Minimum 66.7 kN/m Long Term Design Strength (LTDS).

.3 Combination GeoGrid
.1 Minimum 30 kN/m Ultimate tensile strength in accordance with ASTM D6637
.2 Minimum 12 kN/m Tensile Strength at 2% Strain in accordance with ASTM D6637
.3 Minimum 22 kN/m Tensile Strength at 5% Strain in accordance with ASTM D6637
.4 Minimum 2,000,000 mg-cm Flexural Rigidity in accordance with ASTM D7748

2.03 Erosion Control Matting

.1 Double sided erosion control matting
.1 Top and bottom photodegradable nets

.2 Minimum 11.4 lbs/in MD Tensile Strength in accordance with ASTM D6818

.3 Minimum Functional Longevity 12 months

.4 For 2:1 – 3:1 slopes

.5 Bio Degradable pins in accordance with manufacturer recommendations.

2.04 Native Prairie Mix Grass Seed

.1 The seed mixture shall be appropriate for the location of the project site and time off installation, and shall be in accordance with Manitoba Water Services Board Standard Construction Specification.

.2 The seed mixture shall be selected by the Contractor with input from the supplier.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions:
- .1 Examine soil report available in Section 00 31 00 – Available Project Information
- .2 Before commencing work verify and establish locations of buried services on and adjacent to site.

.2 Evaluation and Assessment:
- .1 Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Contractor to pay costs of relocating services.
- .2 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory approved by Consultant.
- .3 Not later than 48 hours before backfilling or filling with approved material, notify testing agency so that compaction tests can be carried out.
  - .1 Compaction test to be paid for by Contractor
  - .2 Compaction tests required between each lift of granular base material on each side of the bridge.
- .4 Before commencing work, conduct, with Consultant, condition survey of existing structures, trees and plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

3.02 PREPARATION

.1 Temporary Erosion and Sedimentation Control:
- .1 Use temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties, in accordance with MISCS Erosion Control.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.2 Protection of in-place conditions:
- .1 Protect excavations from freezing.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Consultant's approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.3 Protect buried services that are to remain undisturbed.

.4 Removal:
- .1 Remove obsolete buried services within 2 m of foundations. Cap cut-offs.
- .2 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.5 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

.6 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.

.7 Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade elsewhere.

3.03 EXCAVATION

.1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Municipal regulations.

.2 Excavate as required to carry out work, in all materials met.
- .1 Do not disturb soil or rock below bearing surfaces. Notify Consultant when excavations are complete.
- .2 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.
- .3 Fill excavation taken below depths shown without Consultant's written authorization with compacted granular material as directed by the Consultant.

3.04 SITE QUALITY CONTROL

.1 Fill material and spaces to be filled to be inspected and approved by Consultant.

.2 Contractor to provide Consultant with a surveyed surface comprised of cross-sections at minimum 10m increments, at the following milestones:
- .1 Clear and grub area
- .2 Topsoil stripping
- .3 Sub-cut/Abutment Excavations
- .4 Final clay fill
- .5 Final c-base fill
- .6 Final road gravel fill

.7 And at the interface between changes of material specification for the roadway fill matrix.

.3 Surveyed surfaces to encompass design limits only.

3.05 CLEARING

.1 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, grass and rubbish occurring within cleared areas.

.2 Clear as indicated by Consultant, by cutting at height of not more than 200 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

.3 Cut off branches and cut down trees overhanging area cleared as directed by Consultant.

.4 Cut off unsound branches on trees designated to remain as directed by Consultant.

.5 Grub out isolated tree stumps.

.6 Prune individual trees as indicated.

3.06 GRUBBING

.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 200 mm below ground surface.

.3 Grub out visible rock fragments and boulders.

.4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

.5 Leave ground surface in condition suitable for grading operations to approval of Consultant.

3.07 BACKFILLING

.1 Start backfilling only after inspection and receipt of written approval by Consultant.

.2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.

.3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.

.4 Compaction of subgrade:

.1 Excavate to design subgrade elevation, ensuring that all topsoil, silt, loose fill, debris, organic material (including tree roots), existing foundation elements, tanks etc. are removed. Over excavate as required to remove unacceptable soil.

.2 The exposed sub-grade should be inspected by the Consultant and proof rolled as directed by the Consultant to identify weak areas. Weak areas should be sub-cut and repaired as directed by the Consultant. Caution should be exercised to limit construction

traffic on the sub-grade at all times.

.3 Where proof rolling does not identify the presence of underlying weak zones, the sub-grade surface should be compacted to a minimum of 98% of standard proctor maximum dry density (spmdd).

.4 Place clay fill and sub base over the compacted sub-grade and compact to a minimum of 98% spmdd respectively.

.5 Where required to replace sub-cut areas or to bring the site up to grade, a well graded granular fill (granular pit run) free from stones greater than 75mm in diameter should be utilized. The fill should be placed in maximum 200mm thick lifts and compacted to a minimum 98% spmdd.

.5 Placing:

.1 Place backfill, fill and basecourse material in 150 mm lifts. Add water as required to achieve specified density.

.2 Place clay in 300mm lifts compacted with sheepsfoot packer. Add water as required to achieve specified densities.

.3 Place in accordance with MISCS 701(i).

.6 Geotextile, Geogrid and Combination Geogrid

.1 Each roll shall be labeled or tagged to provide product identification sufficient for inventory and quality control purposes.

.2 Rolls shall be furnished with suitable wrapping for protection against moisture and extended ultra-violet exposure prior to placement. If stored outdoors, the rolls shall be elevated and protected with a waterproof cover.

.3 Contractor shall prepare the subgrade in advance of placing the geotextile to achieve a smooth, even surface, clear of topsoil, organics and disturbed soil.

.4 Geotextile, Geogrid and Combination Geogrid shall be placed free of wrinkles, rolls or bulges.

.5 Geotextile, Geogrid and Combination Geogrid shall have a minimum overlap of 500mm at all seams.

.6 Damaged, torn or punctured non-woven geotextile, geogrid and combination grid shall be repaired. The damaged section shall be exposed and a patch placed over the damaged section. Patch shall be installed to maintain a minimum overlap of 500mm around the damaged area.

.7 Erosion Control Matting

.1 Contractor shall prepare the subgrade in advance of placing the erosion control to achieve a smooth and even surface.

.2 Erosion control matting shall be installed parallel to the flow of water and anchored in accordance with manufacturers recommendations.

.3 Overlap erosion control matting to allow for anchoring through the nets of both matts. Minimum 4” overlap.

.8 Compaction: compact each layer of material to following densities for material to ASTM D 698:

.1 To underside of basecourses: 98%.

.2 Basecourses: 98%.

.3 Elsewhere: 95%.

.9 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in

trenches and within 600 mm of foundations.

.10 Against foundations backfill with compacted granular sub base or drain rock as indicated on project drawings.

3.08 GRADING

.1 Grade to ensure that water will drain away from structures, walls and excavations to disposal areas approved by Consultant. Grade to be gradual between finished spot elevations as indicated.

3.09 Seeding

.1 The timing, procedure for seeding and rate of application shall adhere to suppliers recommendations.
.1 Contractor responsible to adhere to all requirements.

.2 After distributing seeds, harrow the soil to ensure the seeds and soil are mixed.

.3 Watering plan shall be in accordance with suppliers recommendations.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Dispose of cleared and grubbed material off site daily.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

1 GENERAL

1.01 MEASUREMENT AND PAYMENT

.1 Measure rip-rap in tonnes of material placed.

.2 A unit conversion of 1.55 tonnes/m^3 will be assumed for this Project.

.3 Quantities shown on the drawings are approximate, contractor to confirm and assume responsibility for actual installed quantities.

.4 Payment for rip-rap is to be considered part of the lump-sup contract price.

1.02 REFERENCE STANDARDS

.1 Manitoba Infrastructure Standard Construction Specifications (MISCS)
  .1 MISCS 1297, Material Specification for Erosion Control – Stone Rip-Rap.

1.03 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Fold up metal banding, flatten and place in designated area for recycling.

.3 Divert left over aggregate materials from landfill to area indicted by owner.

.4 Divert left over geotextiles to local plastic recycling facility.

2 PRODUCTS

2.01 STONE

.1 Hard, dense durable quarry stone, free from seams, cracks or other structural defects, to meet following size distribution for use intended:
  .1 Rip-rap to MISCS – Class 450.

2.02 GEOTEXTILE FILTER

.1 Geotextile fabric to be non-woven, mass 270 g/m^2 minimum in accordance with ASTM D5261

3 EXECUTION

3.01 PLACING

.1 Where rip-rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated.

.2 Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material

and compact to provide firm bed.

.3 Place geotextile on prepared surface in accordance with manufacturers recommendations. Vehicular traffic over geotextile not permitted.

.4 Place rip-rap to thickness and area and details as indicated.

.5 Place stones in manner approved by Consultant to secure surface and create a stable mass. Place larger stones at bottom of slopes.

.6 Hand placing:
- .1 Use larger stones for lower courses and as headers for subsequent courses.
- .2 Stagger vertical joints and fill voids with rock spalls or cobbles.
- .3 Finish surface evenly, free of large openings and neat in appearance, and free of organics.

END OF SECTION

1 GENERAL

1.01 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: submit manufacturer's printed product literature, specifications and datasheet.

.3 Sub-surface investigation report: when site conditions differ from those indicated, submit written notification to Consultant and await further instructions.

.4 Submit schedule of planned sequence of driving to Consultant for review, as specified.

.5 Spliced piles: when authorized, submit design details of splice complete with signature and stamp of qualified professional engineer registered or licensed in project province.

.6 Submit shop drawing of pile shoes include material and weld details.

.7 Equipment:
- .1 Submit prior to pile installation for review by Consultant, list and details of equipment for use in installation of piles.
- .2 Impact hammers: submit manufacturer's written data as specified.
- .3 Non-impact methods; submit characteristics to evaluate performance.

.8 Submit drive ability analysis as specified, to Consultant for approval of hammers.

.9 Quality assurance submittals:
- .1 Test reports: submit one digital copy of certified test reports for piles from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.02 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's instructions.

.2 Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.

.3 Replace damaged piles as directed by Consultant.

1.03 EXISTING CONDITIONS

.1 Notify Consultant in writing if subsurface conditions at site differ from those indicated and await further instructions from Consultant.

1.04 SCHEDULING

.1 Provide schedule of planned sequence of driving to Consultant for review, not less than two weeks prior to commencement of pile driving.

2 PRODUCTS

2.01 MATERIALS

.1 Piles to meet requirements of CAN/CSA-G40.20/G40.21, Grade 350W, non-galvanized

.2 Splice piles only with written approval of Consultant.
- .1 When permitted, provide details for Consultant review.
- .2 Design details of splice to be dated, signed and stamped by professional engineer registered or licensed in the Province of Manitoba.

2.02 EQUIPMENT

.1 Impact hammers: provide manufacturer's name, type, rated energy per blow at normal working rate, mass of striking parts of hammer, mass of driving cap and type and elastic properties of hammer and pile cushions.

.2 Hammer:
- .1 Hammers to be selected on basis of drive ability analysis using wave equation theory, performed to show that piles can be driven to levels indicated.
- .2 Drive ability analysis to include, but not be limited to, following: hammer, cushion, and cap block details; static soil parameters; quake and damping factors, total soil resistance, blow count, pile stresses and energy throughput at representative penetrations.
- .3 When required criteria can not be achieved with the proposed hammer, use larger hammer and take other measures as required.

3 EXECUTION

3.01 PREPARATION

.1 Protection:
- .1 Protect adjacent structures, services and work of other sections from hazards due to pile driving operations.
- .2 Arrange sequencing of pile driving operations and methods to avoid damages to adjacent existing structures.
- .3 When damages occur, remedy damaged items to restore to original or better condition at own expense.

.2 Ensure that ground conditions at pile locations are adequate to support pile driving operation and load testing operation.
- .1 Make provision for access and support of piling equipment during performance of Work.

.3 Pre-boring of holes may be acceptable to facilitate pile alignment control, in accordance with Geotechnical soils report.

3.02 INSTALLATION

.1 Install piles for one abutment based on surveyed pile positions.
- .1 Confirm and adjust surveyed pile points of opposite abutment based on installed pile positions of first abutment.
- .2 Ensure piles for second abutment are squared and true to installed piles on first abutment, and to the designed roadway alignment.

.2 Leads: construct pile driver leads to provide free movement of hammer.
- .1 Hold leads in position at top and bottom, with guys, stiff braces, or other means approved by Consultant, to ensure support to pile while being driven.
- .2 Length: Provide sufficient length of leads to ensure that use of follower is unnecessary.

.3 Followers:
- .1 Provide followers of such size, shape, length and mass to permit driving pile in desired location to required depth and resistance.
- .2 Provide followers with socket or hood carefully fitted to top of pile to minimize loss of energy and prevent damage to pile.
- .3 Drive applicable load test piles using similar follower.

.4 Factored structural design load applied to each pile as indicated on plans.

.5 Minimum factored ULS pile capacity as indicated on plans.

.6 Installation of each pile will be subject to review of Consultant.
- .1 Consultant to approve final driving of all piles prior to removal of pile driving rig from site.

.7 Drive each pile in accordance with criteria provided in the Geotechnical Report.
- .1 Determine required driving resistance from load test on a test pile as directed by Consultant.
- .2 Prior to final set drive piles without interruption for a sufficient interval to break or prevent development of freeze.

.8 Drive each pile to practical refusal or embedment depth.
- .1 Do not overdrive to cause damage to piles.
- .2 To the approval of the Geotechnical Engineer.

.9 Drive each pile to pile tip elevation as indicated.

3.03 APPLICATION / DRIVING

.1 Use driving caps and cushions to protect piles.
- .1 Reinforce pile heads as required by Consultant.
- .2 Piles with damaged heads as determined by Consultant will be rejected.

.2 Install pile driving shoes on all piles.

.3 Hold piles securely and accurately in position while driving using piling jig with maximum 12mm of clearance between pile and piling jig.

.4 Deliver hammer blows along axis of pile.

.5 Restrike already driven piles lifted during driving of adjacent piles to confirm set.

.6 Remove loose and displaced material from around piles after completion of driving, and leave clean, solid surfaces.

.7 Cut off piles neatly and squarely at elevations as indicated.
- .1 Provide sufficient length above cut-off elevation so that part damaged during driving is cut off.

.8 Remove cut-off lengths from site on completion of work.

3.04 DRIVING TOLERANCES

.1 Pile heads to be within 25 mm of locations as indicated.

.2 Pile plumbness to be within 2% of vertical or 2% of batter angle for battered piles.

3.05 OBSTRUCTIONS

.1 Where obstruction is encountered that causes sudden unexpected change in penetration resistance or deviation from specified tolerances, contact Consultant.
- .1 Proceed as directed by Consultant.

3.06 REPAIR AND RESTORATION

.1 Leave rejected pile in place, place adjacent pile and modify pile cap as directed by Consultant.

3.07 FIELD QUALITY CONTROL

.1 Measurement:
- .1 Contractor to pay for and hire qualified Professional Engineer to record accurate records of driving for each pile, including:
  - .1 Type and make of hammer, stroke or related energy.
  - .2 Other driving equipment including water jet, driving cap, cushion.
  - .3 Pile size and length, location of pile in pile group, location or designation of pile group.
  - .4 Sequence of driving piles in group.
  - .5 Number of blows per meter for entire length of pile and number of blows per 25 mm for last 150 mm, or as directed by Geotechnical Engineer.
    - .1 Mark out piles with chalk on the inside face of the piles.
    - .2 Keep exposed face clean from marks.
  - .6 Final tip and cut-off elevations.
  - .7 Other pertinent information such as interruption of continuous driving, pile damage.
- .2 Provide Consultant with digital copy of records.

3.08 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess

materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.01 MEASUREMENT AND PAYMENT

.1 Measure topsoil stripping in cubic meters.

.2 Measure topsoil placement in square meters multiplied by the designed thickness on drawings.

1.02 DEFINITIONS

.1 Compost:
- .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil amendment.
- .2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
- .3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below 25), and contain no toxic or growth inhibiting contaminates.
- .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category A.

1.03 REFERENCE STANDARDS

.1 Agriculture and Agri-Food Canada:
- .1 The Canadian System of Soil Classification, Third Edition, 1998

.2 Canadian Council of Ministers of the Environment (CCME):
- .1 PN1340, Guidelines for Compost Quality

.3 Canadian Society of Landscape Architects (CSLA)/Canadian Nursery Landscape Association (CNLA):
- .1 Canadian Landscape Standard
- .2 Canadian Nursery Stock Standard

1.04 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Quality control submittals:
- .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.
- .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.05 QUALITY ASSURANCE

.1 Qualifications: Submit proof of qualifications when requested by Consultant.

1.06 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Consultant.

.3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

2 PRODUCTS

2.01 TOPSOIL

.1 Topsoil for seeded areas: mixture of particulates, micro-organisms and organic matter which provides suitable medium for supporting intended plant growth.
  .1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70% sand, minimum 7 % clay, and contain 2 to 10% organic matter by weight.
  .2 Contain no toxic elements or growth inhibiting materials.
  .3 Finished surface free from:
    .1 Debris and stones over 50 mm diameter.
    .2 Coarse vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
  .4 Consistency: Friable when moist.

2.02 SOURCE QUALITY CONTROL

.1 Advise Consultant of sources of topsoil and manufactured topsoil to be used with sufficient lead time for testing.

.2 Contractor is responsible for amendments to imported soil as specified.

3 EXECUTION

3.01 STRIPPING OF TOPSOIL

.1 Begin topsoil stripping of areas as indicated after area has been cleared of stumps, rocks, 100 mm and over invasive and noxious plants and their reproductive parts brush, weeds and grasses and removed from site.

.2 Strip topsoil to a change in material properties or to a maximum 150mm below ground surface unless indicated otherwise.
  .1 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.

.3 Stockpile in locations as directed by Consultant.
  .1 Stockpile height not to exceed 2 m.
  .2 Protect stockpile from adverse weather conditions, contamination from invasive plant

material, and compaction.

.3 Avoid placing stockpile in low areas where natural drainage or storm water could pond, or erode these materials during inclement weather.

.4 Dispose of unused topsoil in an environmentally responsible manner but do not use as landfill.

3.02 PREPARATION OF EXISTING GRADE

.1 Verify that grades are correct.

.1 If discrepancies occur, notify Consultant and do not start work until instructed by Consultant.

.2 Grade soil, eliminate uneven areas and low spots, ensure positive drainage.

.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.

.1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.

.2 Remove debris which protrudes more than 75 mm above surface.

.3 Dispose of removed material off site.

.4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.

.1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.03 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

.1 Place topsoil after Consultant has accepted subgrade.

.2 Spread topsoil in uniform layers not exceeding 50 mm.

.3 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

.4 Avoid spreading or grading in wet, frozen, or saturated state.

3.04 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage.

.1 Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by Consultant.

.1 Leave surfaces smooth, uniform and firm against deep footprinting.

3.05 CLEANING

.1 Proceed with cleaning in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area organized and tidy at end of each day.

.2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

.2 Upon completion remove surplus materials, rubbish, tools and equipment.

.1 Clean and reinstate areas affected by Work.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.1 Divert unused fertilizer from landfill to official hazardous material collections site.

END OF SECTION

APPENDIX E

ISSUED FOR CONSTRUCTION DRAWINGS

SAMSON
ARCHITECTURE | ENGINEERING

RM OF DUFFERIN
McEACHERN BRIDGE REPLACEMENT STRUCTURE
CARMAN, MANITOBA

SAMSON
ARCHITECTURE I ENGINEERING
162 - 10TH STREET
BRANDON, MB R7A 4E6
PH: (204) 727-0747

DRAWING LIST

CIVIL		
SHEET	TITLE	ISSUE
C-001	LEGAL AND TOPOGRAPHICAL SURVEY	2
C-101	PROPOSED SITE PLAN	2
C-301	SECTIONS	2

STRUCTURAL		
SHEET	TITLE	ISSUE
S-001	TH25-01 BORE HOLE LOGS	2
S-002	TH25-02 BORE HOLE LOGS	2
S-101	SUBSTRUCTURE PLAN	2
S-102	SUPERSTRUCTURE PLAN	2
S-301	SECTIONS	2
S-501	DETAILS	2
S-502	DETAILS	2
S-503	DETAILS	2

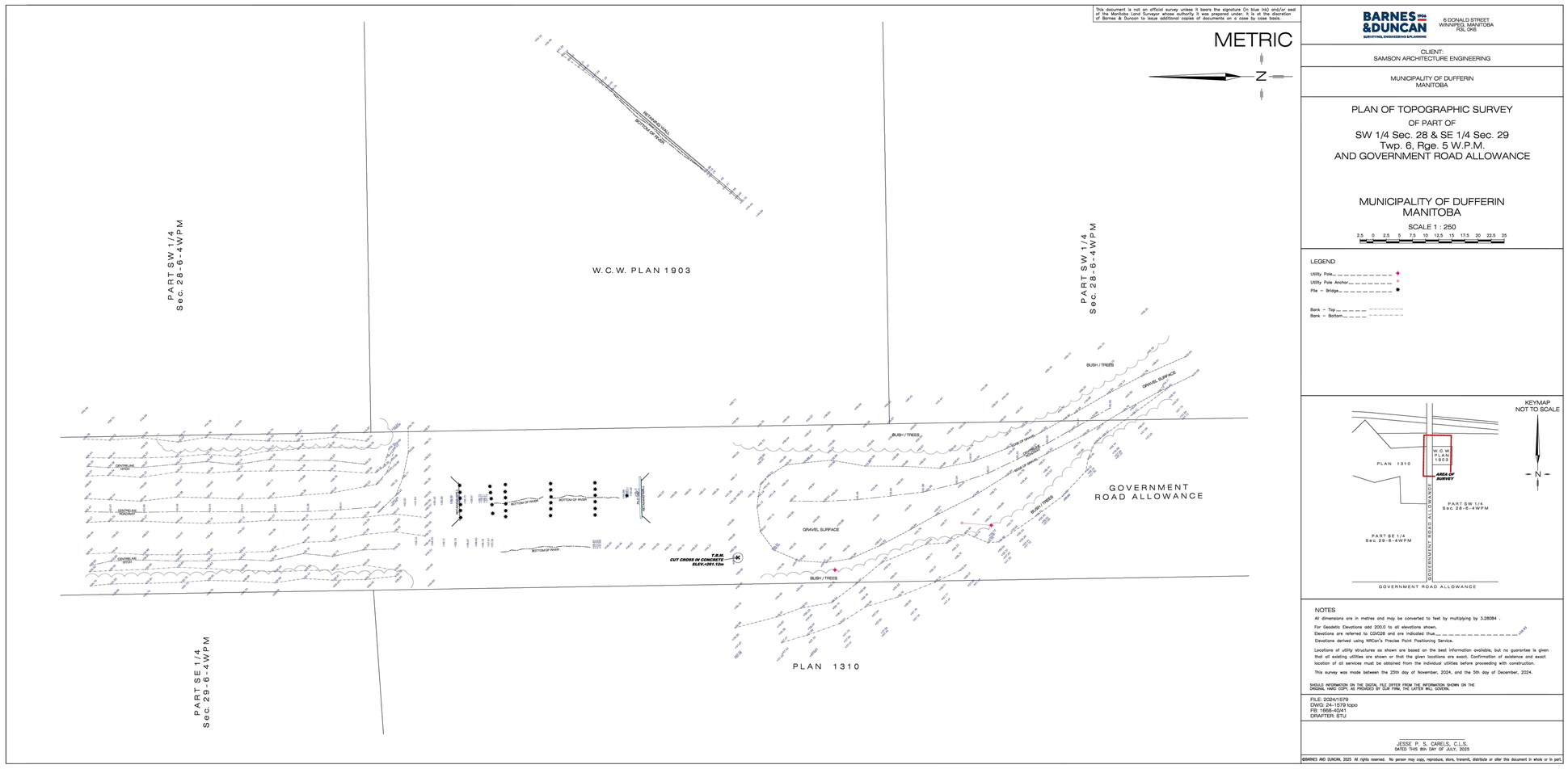
PROJECT NUMBER: SEI2024-049

NOTES:

1) PROPOSED GRADE DESIGN REFERENCES EXISTING SURFACE ELEVATIONS GATHERED BY BARNES AND DUNCAN; LEGAL/TOPOGRAPHIC SURVEY SEE C-001 FOR SURVEY.

2) PROPERTY BOUNDARIES SHOWN ON THE DRAWING HAVE BEEN CERTIFIED BY BARNES AND DUNCAN ON DECEMBER 5, 2024.

NO	ISSUED	DATE
2	ISSUED FOR CONSTRUCTION	2025-11-28
1	ISSUED FOR PERMIT	2025-07-03
NO	ISSUED	DATE



This document is not an official survey unless it bears the signature (in blue ink) and/or seal of the Manitoba Land Surveyor whose authority it was prepared under. It is at the discretion of Barnes & Duncan to issue additional copies of documents on a case by case basis.

METRIC

N

BARNES & DUNCAN 1906 SURVEYING, ENGINEERING & PLANNING

6 DONALD STREET
WINNIPEG, MANITOBA
R3L 0M3

CLIENT:
SAMSON ARCHITECTURE ENGINEERING

MUNICIPALITY OF DUFFERIN
MANITOBA

PLAN OF TOPOGRAPHIC SURVEY

OF PART OF
SW 1/4 Sec. 28 & SE 1/4 Sec. 29
Twp. 6, Rge. 5 W.P.M.
AND GOVERNMENT ROAD ALLOWANCE

MUNICIPALITY OF DUFFERIN
MANITOBA

SCALE 1 : 250

2.5 0 2.5 5 7.5 10 12.5 15 17.5 20 22.5 25

LEGEND

Utility Pole
Utility Pole Anchor
Pile – Bridge
Bank – Top
Bank – Bottom

KEYMAP
NOT TO SCALE

NOTES

All dimensions are in metres and may be converted to feet by multiplying by 3.28084 .

For Geodetic Elevations add 200.0 to all elevations shown.
Elevations are referred to CGVD28 and are indicated thus
Elevations derived using NRCan's Precise Point Positioning Service.

Locations of utility structures as shown are based on the best information available, but no guarantee is given that all existing utilities are shown or that the given locations are exact. Confirmation of existence and exact location of all services must be obtained from the individual utilities before proceeding with construction.

This survey was made between the 25th day of November, 2024, and the 5th day of December, 2024.

SHOULD INFORMATION ON THE DIGITAL FILE DIFFER FROM THE INFORMATION SHOWN ON THE ORIGINAL HARD COPY, AS PROVIDED BY OUR FIRM, THE LATTER WILL GOVERN.

FILE: 2024/1579
DWG: 24-1579 topo
FB: 1668-40/41
DRAFTER: BTJ

JESSE P. S. CARELS, C.L.S.
DATED THIS 8th DAY OF JULY, 2025

NORTH ARROW

N

NOTE:

THE GENERAL CONTRACTOR MUST VERIFY ALL DIMENSIONS, DATUMS AND LEVELS NOTED ON THESE DRAWINGS WITH SITE CONDITIONS. ANY DISCREPANCIES, ERRORS OR OMISSIONS MUST BE REPORTED TO THE ARCHITECT OR ENGINEER PRIOR TO COMMENCING ANY RELATED WORK.

DO NOT SCALE DRAWINGS.

SAMSON
ARCHITECTURE | ENGINEERING
162 - 10TH STREET
BRANDON, MB R7A 4E6
PH: (204) 727-0747

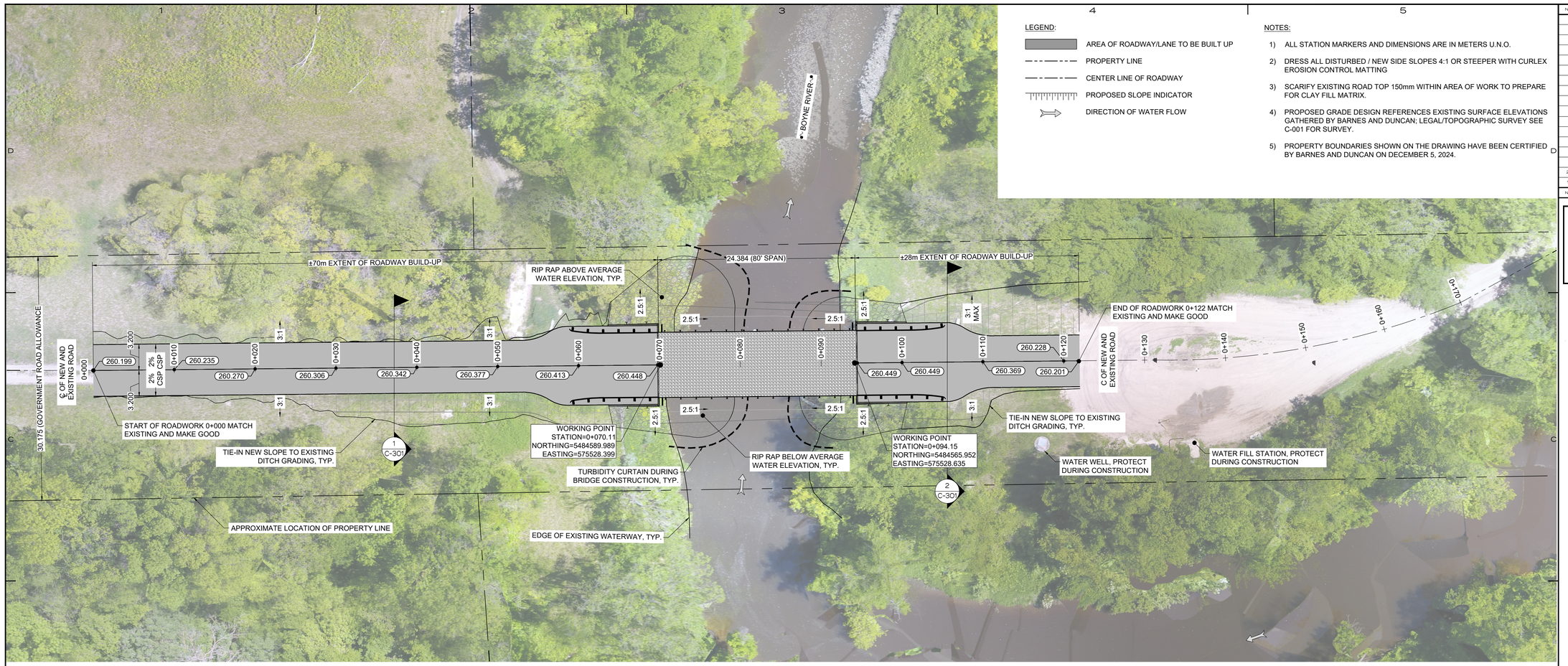
PROJECT LOCATION
CARMAN MB

PROJECT NAME
RM OF DUFFERIN
McEACHERN BRIDGE
REPLACEMENT STRUCTURE

DRAWING TITLE
LEGAL AND TOPOGRAPHICAL SURVEY

PROJECT NUMBER	DATE	
SE12024-049	JULY 03, 2025	
DRAWING NUMBER	SHEET SIZE	SCALE
C-001	(24" X 36")	AS NOTED
	DRAWN BY: BJ	CHECKED BY: PD

1 TOPOGRAPHICAL SURVEY PLAN
SCALE: NTS



1 PROPOSED ROADWAY ALIGNMENT

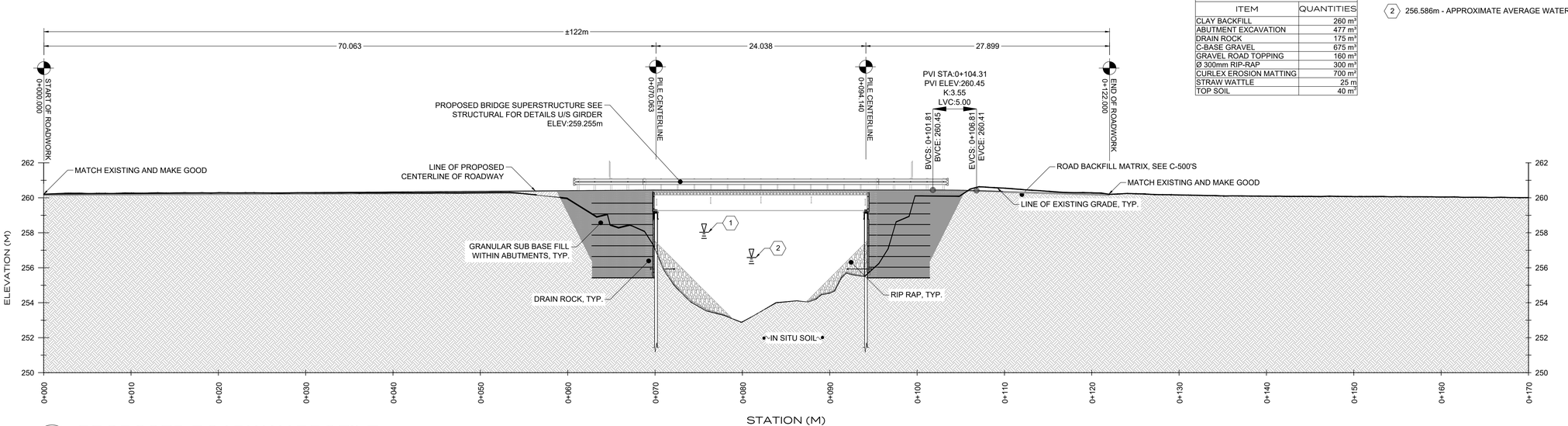
SCALE: 1:250

LEGEND:

- AREA OF ROADWAY/LANE TO BE BUILT UP
- PROPERTY LINE
- CENTER LINE OF ROADWAY
- PROPOSED SLOPE INDICATOR
- DIRECTION OF WATER FLOW

NOTES:

1) ALL STATION MARKERS AND DIMENSIONS ARE IN METERS U.N.O.
2) DRESS ALL DISTURBED / NEW SIDE SLOPES 4:1 OR STEEPER WITH CURLEX EROSION CONTROL MATTING
3) SCARIFY EXISTING ROAD TOP 150mm WITHIN AREA OF WORK TO PREPARE FOR CLAY FILL MATRIX.
4) PROPOSED GRADE DESIGN REFERENCES EXISTING SURFACE ELEVATIONS GATHERED BY BARNES AND DUNCAN; LEGAL/TOPOGRAPHIC SURVEY SEE C-001 FOR SURVEY.
5) PROPERTY BOUNDARIES SHOWN ON THE DRAWING HAVE BEEN CERTIFIED BY BARNES AND DUNCAN ON DECEMBER 5, 2024.



2 PROPOSED ROADWAY PROFILE

VERT EXAGGERATION:2
HORZ SCALE:1:250

APPROXIMATE QUANTITIES (COMPACTED IN-PLACE)

ITEM	QUANTITIES
CLAY BACKFILL	260 m³
ABUTMENT EXCAVATION	477 m³
DRAIN ROCK	175 m³
C-BASE GRAVEL	675 m³
GRAVEL ROAD TOPPING	160 m³
Ø 300mm RIP-RAP	300 m³
CURLEX EROSION MATTING	700 m²
STRAW WATTLE	25 m
TOP SOIL	40 m³

KEY NOTES:

1. 258.030m - 1:33 YEAR WATER ELEVATION
2. 256.586m - APPROXIMATE AVERAGE WATER ELEVATION

NO	ISSUED	DATE
2	ISSUED FOR CONSTRUCTION	2025-11-28
1	ISSUED FOR PERMIT	2025-07-03
NO	ISSUED	DATE

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
Samson Engineering Inc.
No. 3050 Expiry: April 30, 2026

PROVINCE OF MANITOBA
P. M. DORN
Member
21651
REGISTERED PROFESSIONAL ENGINEER

NORTH ARROW

NOTE:

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DO NOT SCALE DRAWINGS.

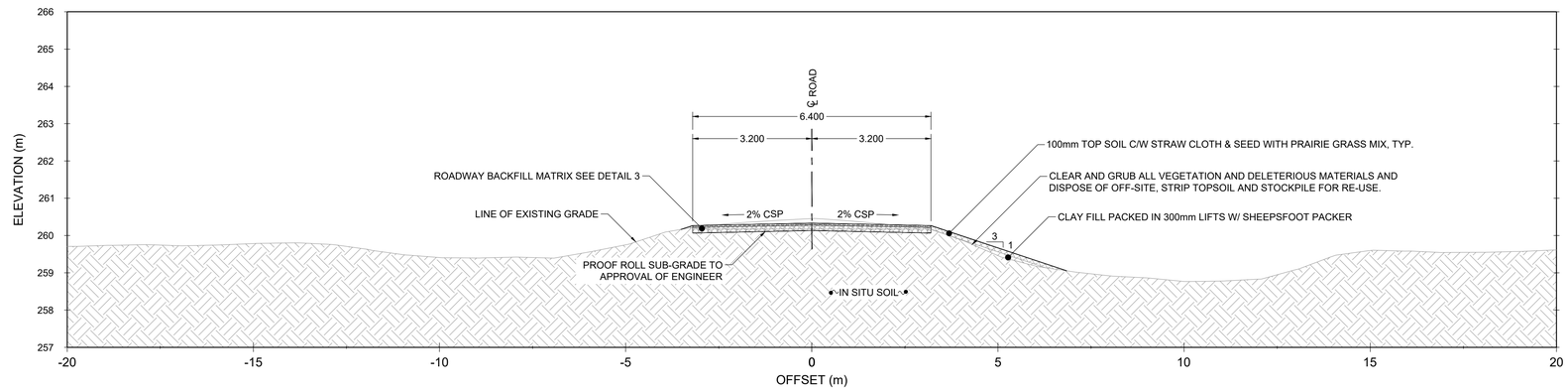
SAMSON
ARCHITECTURE | ENGINEERING
162 - 10TH STREET
BRANDON, MB R7A 4E6
PH: (204) 727-0747

PROJECT LOCATION: CARMAN MB

PROJECT NAME: RM OF DUFFERIN MCEACHERN BRIDGE REPLACEMENT STRUCTURE

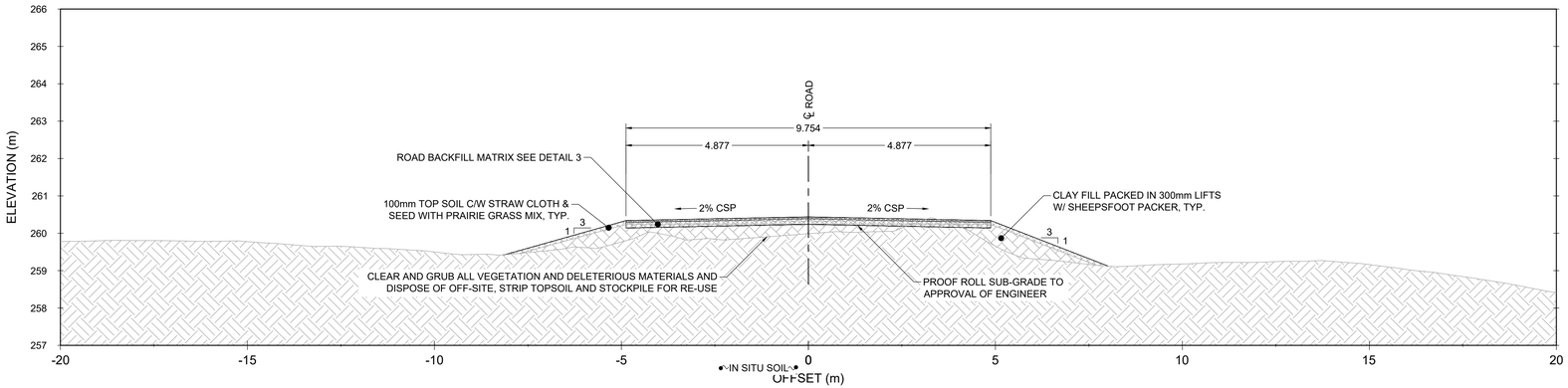
DRAWING TITLE: PROPOSED SITE PLAN

PROJECT NUMBER	DATE	
SEI2024-049	JULY 03, 2025	
DRAWING NUMBER	SHEET SIZE	SCALE
C-101	(24" X 36")	AS NOTED
	DRAWN BY: BJ	CHECKED BY: PD



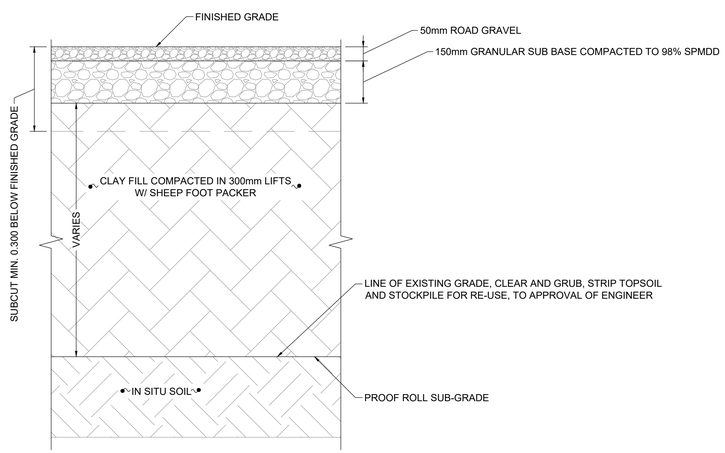
1 TYPICAL ROADWAY SECTION

SCALE: 1:75



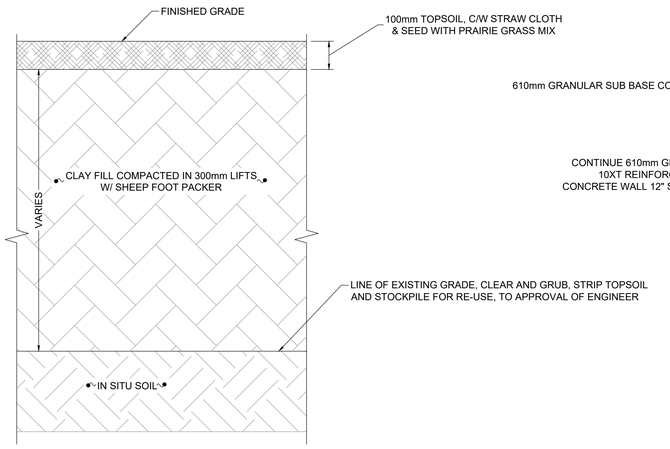
2 WATER FILL STATION ROADWAY SECTION

SCALE: 1:75



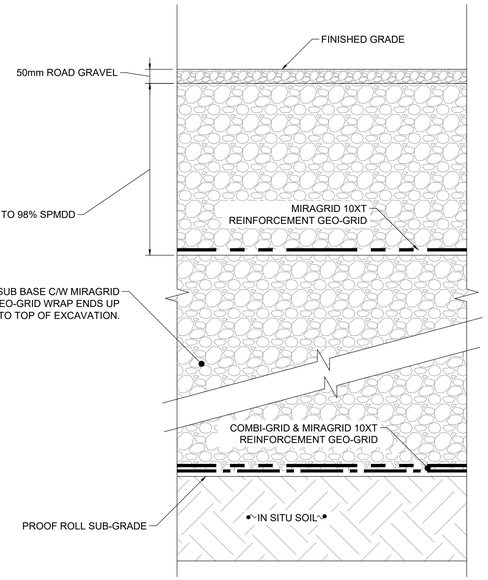
3 TYP. ROADWAY BACKFILL MATRIX

SCALE: 1:10



4 TYP. SIDE SLOPE/DITCH BACKFILL MATRIX

SCALE: 1:10



5 BRIDGE ABUTMENT BACKFILL MATRIX

SCALE: 1:10

NO	ISSUED	DATE
2	ISSUED FOR CONSTRUCTION	2025-11-28
1	ISSUED FOR PERMIT	2025-07-03
NO	ISSUED	DATE

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
Samson Engineering Inc.
No. 3050 Expiry: April 30, 2026

PROVINCE OF MANITOBA
P. M. DORN
Member 21651
REGISTERED PROFESSIONAL ENGINEER

NORTH ARROW

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ARCHITECTURE | ENGINEERING
162 - 10TH STREET
BRANDON, MB R7A 4E6
PH: (204) 727-0747

PROJECT LOCATION
CARMAN MB

PROJECT NAME
RM OF DUFFERIN
McEACHERN BRIDGE
REPLACEMENT STRUCTURE

DRAWING TITLE
SECTIONS

PROJECT NUMBER	DATE
SE12024-049	JULY 03, 2025
DRAWING NUMBER	SHEET SIZE / SCALE
C-301	(24" X 36") AS NOTED
	DRAWN BY: BJ / CHECKED BY: PD

NOTES:

1) SEE TTES GEOTECHNICAL ENGINEERING REPORT FOR FURTHER DETAILS.
2) PROJECT NUMBER: 25-GEO-SAMSON-CARMAN. SUBMITTED ON JULY 2, 2025.

TTES Consulting Ltd. — **SUMMARY TEST HOLE LOG** — **TEST HOLE ID: TH25-01** — **SHEET 1 of 4**

Client:	Samson Engineering Inc.	**Job Number:**	25MB-GEO-SAMSON-CARMAN	**Top of Pipe Elev.:**	260.80 m
Project:	McEachern Bridge Road 22W over Boyne River	**Date Drilled:**	2025-03-05	**Ground Elev.:**	259.97 m
Site:	TH25-01	**Northing:**	5,484,544.99 m	**Water Elev.:**	256.22 m
Location:	South of Bridge	**Easting:**	575,529.47 m		
Drilling Method:	125 mm Solid Stem Auger				

Columns: Elevation (m) | Depth (m) (ft) | Graphics | Description and Classification | Piezo. Log | Depth (m) | Sample Type | Sample No. | Recovery % | STANDARD PENETRATION TESTING (Uncorrected - N) (blows/0.15 m) 20 40 60 80 | Cu (kPa) Pocket Pen * Torvane ◆ PL MC LL (%) 20 40 60 80

Elevation 260.0 to 246.0 m; Depth 0 to 14 m (0 to 46 ft). Samples: S01, S02, S03, S04, S05, S06, S07, S08, S09.

- **CLAY FILL** - Dark brown, frozen, high plasticity.
- **LEAN CLAY (CL)** - Light brown, dry, soft, low plasticity, with to and fine to coarse grained sand, with to and silt.
- Firm below 2.0 m.
- Particle Size Analysis at 3.1 m: 0.0% Gravel, 0.1% Coarse Grained Sand, 0.3% Medium Grained Sand, 31.8% Fine Grained Sand, 41.9% Silt, 26.0% Clay.
- Atterberg Limits at 3.1 m: 30% Liquid Limit, 18% Plastic Limit, 12% Plasticity Index.
- Grey and wet below 4.3 m.
- Particle Size Analysis at 6.1 m: 0.0% Gravel, 0.0% Coarse Grained Sand, 0.6% Medium Grained Sand, 42.5% Fine Grained Sand, 31.6% Silt, 25.3% Clay.
- Atterberg Limits at 6.1 m: 31% Liquid Limit, 17% Plastic Limit, 14% Plasticity Index.
- **FAT CLAY (CL)** - Grey, damp, firm, high plasticity, trace fine to coarse grained sand, with silt.

Contractor: TTES Consulting Ltd. Inspector: Justin Ham Approved: Kyle Hamilton Date: 2025-03-18

TTES Consulting Ltd. — **SUMMARY TEST HOLE LOG** — **TEST HOLE ID: TH25-01** — **SHEET 2 of 4**

(Header information as Sheet 1.)

Elevation 246.0 to 232.0 m; Depth 14 to 28 m (46 to 92 ft). Samples: S10, S11, S12, S13, S14.

- Stiff below 19.2 m.
- Trace gypsum inclusions below 21.4 m.

Contractor: TTES Consulting Ltd. Inspector: Justin Ham Approved: Kyle Hamilton Date: 2025-03-18

TTES Consulting Ltd. — **SUMMARY TEST HOLE LOG** — **TEST HOLE ID: TH25-01** — **SHEET 3 of 4**

(Header information as Sheet 1.)

Elevation 232.0 to 218.0 m; Depth 28 to 42 m (92 to 138 ft). Samples: S15, S16, S17.

- **SILT TILL (CL)** - Dark grey, damp, loose, no to low plasticity, with clay, some to and fine to coarse grained sand, trace fine to coarse grained gravel.
- Suspected cobbles below 39.0 m.

Contractor: TTES Consulting Ltd. Inspector: Justin Ham Approved: Kyle Hamilton Date: 2025-03-18

TTES Consulting Ltd. — **SUMMARY TEST HOLE LOG** — **TEST HOLE ID: TH25-01** — **SHEET 4 of 4**

(Header information as Sheet 1.)

Elevation 218.0 to 204.0 m; Depth 42 to 56 m (138 to 184 ft). Sample: S18.

Notes:
1. End of test hole at 43.7 m at power auger refusal on suspected cobbles and boulders.
2. Test hole backfilled with auger cuttings to grade.
3. Standpipe piezometer installed adjacent to test hole at Northing: 5,484,544.99, Easting: 575529.47, Elevation: 259.97 m. 50 mm slotted screen was installed 6.15 m to 7.68 m below ground surface, with 0.91 m stick up above gound surface. The annulus was backfilled with sand from 8.3 m to 5.8 m, bentonite chips from 5.8 m to 4.6 m, auger cuttings from 4.6 m to 1.5 m, and bentonite chips from 1.5 m to ground surface.
4. Water level measured in the standpipe piezometer on March 14, 2025 shown.

Contractor: TTES Consulting Ltd. Inspector: Justin Ham Approved: Kyle Hamilton Date: 2025-03-18

NO	ISSUED	DATE
2	ISSUED FOR CONSTRUCTION	2025-11-28
1	ISSUED FOR PERMIT	2025-07-03

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
Samson Engineering Inc.
No. 3050 Expiry: April 30, 2026

PROVINCE OF MANITOBA — P. M. DORN — Member 21651 — REGISTERED PROFESSIONAL ENGINEER

NORTH ARROW

NOTE:
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DO NOT SCALE DRAWINGS.

SAMSON ARCHITECTURE | ENGINEERING
162 - 10TH STREET
BRANDON, MB R7A 4E6
PH: (204) 727-0747

PROJECT LOCATION	CARMAN MB
PROJECT NAME	MUNICIPALITY OF DUFFERIN McEACHERN BRIDGE REPLACEMENT
DRAWING TITLE	TH25-01 BORE HOLE LOGS
PROJECT NUMBER	SEI2024-049
DATE	JULY 03, 2025
DRAWING NUMBER	S-001
SHEET SIZE	(24" X 36")
SCALE	AS SHOWN
DRAWN BY	BR
CHECKED BY	PD

TTES Consulting Ltd. **SUMMARY TEST HOLE LOG** **SHEET 1 of 4**

TEST HOLE ID: TH25-02

Client:	Samson Engineering Inc.	**Job Number:**	25MB-GEO-SAMSON-CARMAN	**Top of Pipe Elev.:**	N.A. m
Project:	McEachern Bridge Road 22W over Boyne River	**Date Drilled:**	2025-03-06	**Ground Elev.:**	260.19 m
Site:	TH25-02	**Northing:**	5,484,605.75 m	**Water Elev.:**	N.A. m
Location:	North of Bridge	**Easting:**	575,528.89 m		
Drilling Method:	125 mm Solid Stem Auger				

Elevation (m)	Depth (m)	Description and Classification	Sample Type	Sample No.
260.2	0	CLAY FILL (CL) - Light brown, frozen, low plasticity, some topsoil.		
			Grab	S01
		LEAN CLAY (CL) - Light brown, dry, soft, low plasticity, with to and fine to coarse grained sand, with to and silt.		
			Grab	S02
		- Wet below 3.1 m.	Grab	S03
			Grab	S04
		- Grey below 5.5 m.	Grab	S05
		FAT CLAY (CL) - Grey, damp, firm, high plasticity, trace fine to coarse grained sand, with silt.		
			Grab	S06
			Grab	S07
			Grab	S08

Columns: Elevation (m) 260.2 – 246.2; Depth (m) 0 – 14; Depth (ft) 0 – 46; Graphics; Piezo. Log; Depth (m); Sample Type; Sample No.; Recovery %; STANDARD PENETRATION TESTING (Uncorrected - N) (blows/0.15 m) 20 40 60 80; Cu (kPa) Pocket Pen * Torvane ◆; PL MC LL (%) 20 40 60 80.

Contractor: TTES Consulting Ltd. Inspector: Justin Ham
Approved: Kyle Hamilton Date: 2025-03-18

TTES Consulting Ltd. **SUMMARY TEST HOLE LOG** **SHEET 2 of 4**

TEST HOLE ID: TH25-02

Client:	Samson Engineering Inc.	**Job Number:**	25MB-GEO-SAMSON-CARMAN	**Top of Pipe Elev.:**	N.A. m
Project:	McEachern Bridge Road 22W over Boyne River	**Date Drilled:**	2025-03-06	**Ground Elev.:**	260.19 m
Site:	TH25-02	**Northing:**	5,484,605.75 m	**Water Elev.:**	N.A. m
Location:	North of Bridge	**Easting:**	575,528.89 m		
Drilling Method:	125 mm Solid Stem Auger				

Elevation (m)	Depth (m)	Description and Classification	Sample Type	Sample No.
246.2	14			
			Grab	S09
			Grab	S10
		- Trace gypsum inclusions below 21.4 m.		
		- Particle Size Analysis at 23.5 m: 0.0% Gravel, 0.0% Coarse Grained Sand, 0.2% Medium Grained Sand, 4.7% Fine Grained Sand, 30.4% Silt, 64.8% Clay. - Atterberg Limits at 23.5 m: 62% Liquid Limit, 21% Plastic Limit, 41% Plasticity Index.	Grab	S11
		- Stiff below 26.3 m.	Grab	S12

Columns: Elevation (m) 246.2 – 232.2; Depth (m) 14 – 28; Depth (ft) 46 – 92.

Contractor: TTES Consulting Ltd. Inspector: Justin Ham
Approved: Kyle Hamilton Date: 2025-03-18

TTES Consulting Ltd. **SUMMARY TEST HOLE LOG** **SHEET 3 of 4**

TEST HOLE ID: TH25-02

Client:	Samson Engineering Inc.	**Job Number:**	25MB-GEO-SAMSON-CARMAN	**Top of Pipe Elev.:**	N.A. m
Project:	McEachern Bridge Road 22W over Boyne River	**Date Drilled:**	2025-03-06	**Ground Elev.:**	260.19 m
Site:	TH25-02	**Northing:**	5,484,605.75 m	**Water Elev.:**	N.A. m
Location:	North of Bridge	**Easting:**	575,528.89 m		
Drilling Method:	125 mm Solid Stem Auger				

Elevation (m)	Depth (m)	Description and Classification	Sample Type	Sample No.
232.2	28		Grab	S13
		- Soft, transitioning from fat clay to silt till below 31.7 m.	Grab	S14
		SILT TILL (CL) - Dark grey, damp, loose, no to low plasticity, with clay, some to and fine to coarse grained sand, trace fine to coarse grained gravel.		
			Grab	S15
		- Compact, suspected cobbles below 37.6 m.	Grab	S16
		- Particle Size Analysis at 40.9 m: 5.0% Gravel, 2.7% Coarse Grained Sand, 11.1% Medium Grained Sand, 21.4% Fine Grained Sand, 37.2% Silt, 22.6% Clay. - Atterberg Limits at 40.9 m: 27% Liquid Limit, 14% Plastic Limit, 13% Plasticity Index.	Grab	S17

Columns: Elevation (m) 232.2 – 218.2; Depth (m) 28 – 42; Depth (ft) 92 – 138.

Contractor: TTES Consulting Ltd. Inspector: Justin Ham
Approved: Kyle Hamilton Date: 2025-03-18

TTES Consulting Ltd. **SUMMARY TEST HOLE LOG** **SHEET 4 of 4**

TEST HOLE ID: TH25-02

Client:	Samson Engineering Inc.	**Job Number:**	25MB-GEO-SAMSON-CARMAN	**Top of Pipe Elev.:**	N.A. m
Project:	McEachern Bridge Road 22W over Boyne River	**Date Drilled:**	2025-03-06	**Ground Elev.:**	260.19 m
Site:	TH25-02	**Northing:**	5,484,605.75 m	**Water Elev.:**	N.A. m
Location:	North of Bridge	**Easting:**	575,528.89 m		
Drilling Method:	125 mm Solid Stem Auger				

Elevation (m)	Depth (m)	Description and Classification	Sample Type	Sample No.
218.2	42		Grab	S18
		Notes: 1. End of test hole at 44.7 m at power auger refusal on suspected cobbles and boulders. 2. Test hole backfilled with auger cuttings to grade.		

Columns: Elevation (m) 218.2 – 204.2; Depth (m) 42 – 56; Depth (ft) 138 – 184.

Contractor: TTES Consulting Ltd. Inspector: Justin Ham
Approved: Kyle Hamilton Date: 2025-03-18

NOTES:

1) SEE TTES GEOTECHNICAL ENGINEERING REPORT FOR FURTHER DETAILS.
2) PROJECT NUMBER: 25-GEO-SAMSON-CARMAN. SUBMITTED ON JULY 2, 2025.

NO	ISSUED	DATE
2	ISSUED FOR CONSTRUCTION	2025-11-28
1	ISSUED FOR PERMIT	2025-07-03

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
Samson Engineering Inc.
No. 3050 Expiry: April 30, 2026

PROVINCE OF MANITOBA — P. M. DORN Member 21651 — REGISTERED PROFESSIONAL ENGINEER

NORTH ARROW

NOTE:
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DO NOT SCALE DRAWINGS.

SAMSON ARCHITECTURE I ENGINEERING
162 - 10TH STREET
BRANDON, MB R7A 4E6
PH: (204) 727-0747

PROJECT LOCATION: CARMAN MB

PROJECT NAME: MUNICIPALITY OF DUFFERIN McEACHERN BRIDGE REPLACEMENT

DRAWING TITLE: TH25-02 BORE HOLE LOGS

PROJECT NUMBER	DATE		
SEI2024-049	JULY 03, 2025		
DRAWING NUMBER	SHEET SIZE	SCALE	
S-002	(24" X 36")	AS SHOWN	
	DRAWN BY: BR	CHECKED BY: PD	

PILE SCHEDULE

PILE ID	SIZE	QTY	T/O PILE ELEVATION	PILE LENGTH	MINIMUM EMBEDMENT LENGTH	REFUSAL CRITERIA	NOTES
PL-01	HP14X73	12	259.128	160'	140'	SEE GEOTECHNICAL REPORT, DRIVE ALL PILES TO REFUSAL	BACKWALL PILE
PL-02	HP12X53	8	260.144	40'	30'	N/A	WINGWALL PILE

NOTE: CONTRACTOR TO EXPECT TO DRIVE 160' LONG PL-01 PILES TO ACHIEVE A MINIMUM EMBEDMENT LENGTH OF 140' AND MEET DRIVING REFUSAL CRITERIA AS PER GEOTECHNICAL REPORT

PILE CAP SCHEDULE

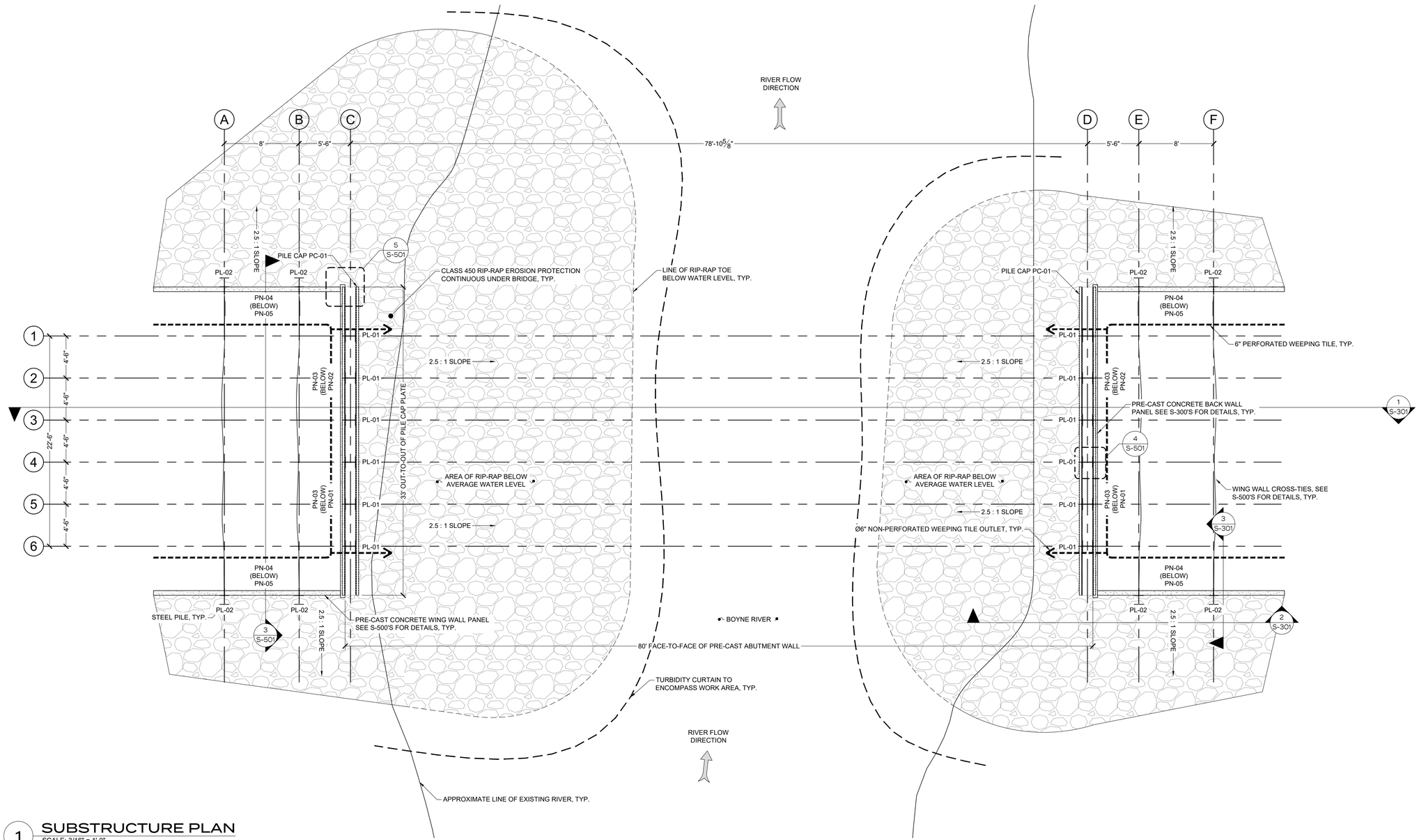
PILE ID	SIZE	QTY	T/O PILE CAP ELEVATION	PILE CAP LENGTH	NOTES
PC-01	2 - MK-01 C/W TOP PLATE MK-02	2	259.185	33'	-

PRE-CAST PANEL SCHEDULE

PANEL ID	SIZE	REINFORCEMENT	QTY	NOTES
PN-01	SEE DETAILS ON S-500'S		2	FOR BACK WALL
PN-02			2	FOR BACK WALL
PN-03			8	FOR BACK WALL
PN-04			4	FOR WING WALL
PN-05			8	FOR WING WALL

NOTES:

1) GRID LINES ARE COINCIDENT WITH CENTER OF PILES.
2) DIMENSIONS ARE TO GRID LINES.
3) PILES TO BE HELD SECURELY IN PLACE WITH JIG TO ENSURE PROPER ALIGNMENT DURING DRIVING.
4) SEE GEOTECHNICAL REPORT FOR PILE INFORMATION. DRIVING CRITERIA AND REFUSAL CRITERIA.
5) INSTALL PILE DRIVING SHOES ON ALL PILES; EXCEPT AS NOTED.
6) MAINTAIN ACCURATE RECORDS OF DRIVING EACH PILE.
7) ALL EXPOSED FACES OF PRE-CAST CONCRETE TO BE FINISHED.
8) ALL ELEVATIONS ARE IN METERS UNLESS NOTED OTHERWISE.



1 SUBSTRUCTURE PLAN
SCALE: 3/16" = 1'-0"

NO	ISSUED	DATE
2	ISSUED FOR CONSTRUCTION	2025-11-28
1	ISSUED FOR PERMIT	2025-07-03
NO	ISSUED	DATE

ENGINEERS GEOSCIENTISTS MANITOBA
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P. M. DORN
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REGISTERED PROFESSIONAL ENGINEER

NORTH ARROW

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DO NOT SCALE DRAWINGS.

SAMSON ARCHITECTURE | ENGINEERING
162 - 10TH STREET
BRANDON, MB R7A 4E6
PH: (204) 727-0747

PROJECT LOCATION: CARMAN MB

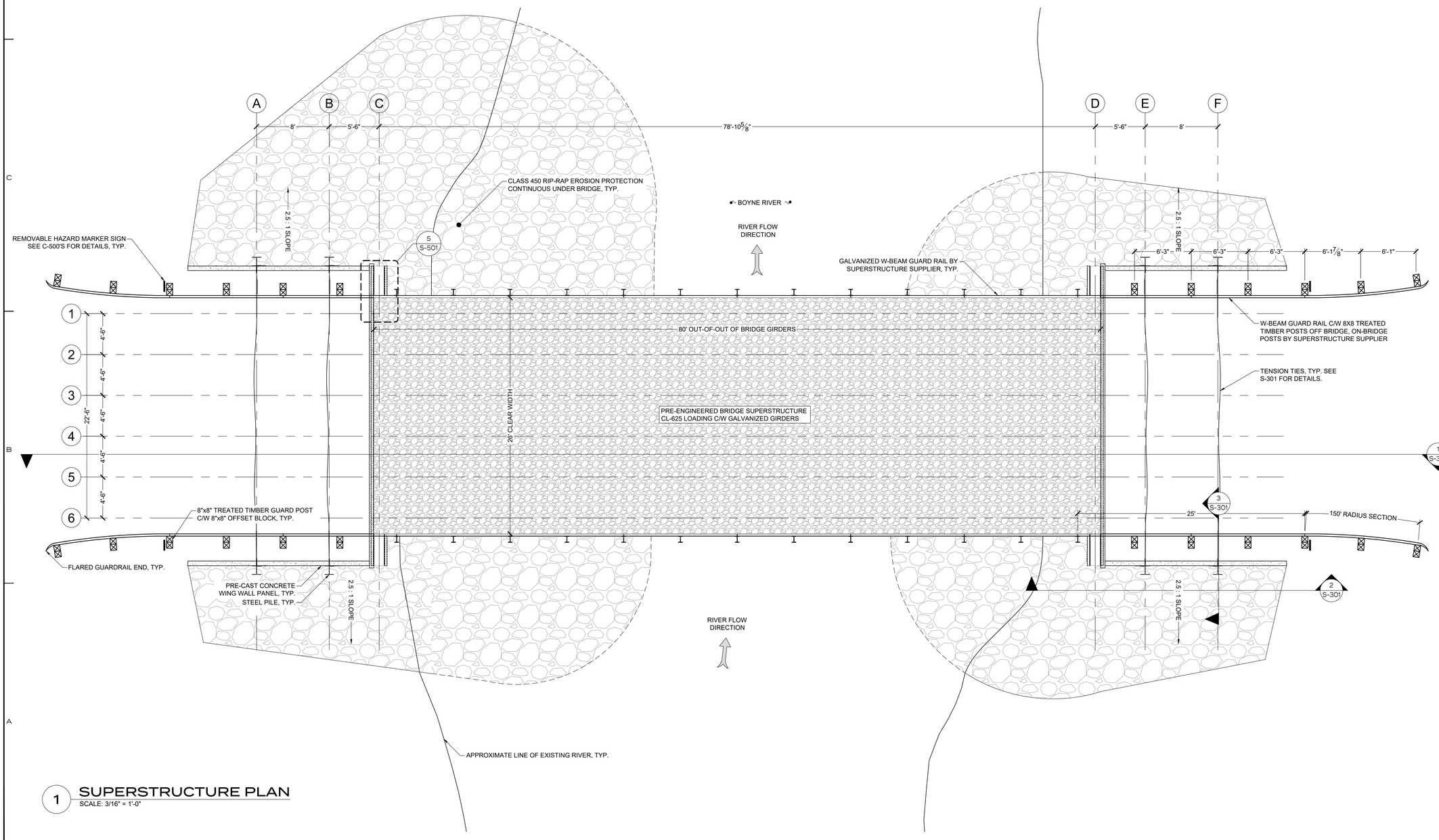
PROJECT NAME: MUNICIPALITY OF DUFFERIN McEACHERN BRIDGE REPLACEMENT

DRAWING TITLE: SUBSTRUCTURE PLAN

PROJECT NUMBER	DATE
SE12024-049	JULY 03, 2025
DRAWING NUMBER	SHEET SIZE / SCALE
S-101	(24" X 36") / AS SHOWN
	DRAWN BY: BR / CHECKED BY: PD

NOTES:

1) GRID LINES ARE COINCIDENT WITH CENTER OF PILES.
2) DIMENSIONS ARE TO GRID LINES.
3) SEE GEOTECHNICAL REPORT FOR PILE INFORMATION. DRIVING CRITERIA AND REFUSAL CRITERIA.
4) ALL EXPOSED FACES OF PRE-CAST CONCRETE TO BE FINISHED.
5) ALL ELEVATIONS ARE IN METERS UNLESS NOTED OTHERWISE.



1 SUPERSTRUCTURE PLAN

SCALE: 3/16" = 1'-0"

NO	ISSUED	DATE
2	ISSUED FOR CONSTRUCTION	2025-11-28
1	ISSUED FOR PERMIT	2025-07-03
NO	ISSUED	DATE

ENGINEERS GEOSCIENTISTS MANITOBA
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SAMSON
ARCHITECTURE | ENGINEERING
162 - 10TH STREET
BRANDON, MB R7A 4E6
PH: (204) 727-0747

PROJECT LOCATION
CARMAN MB

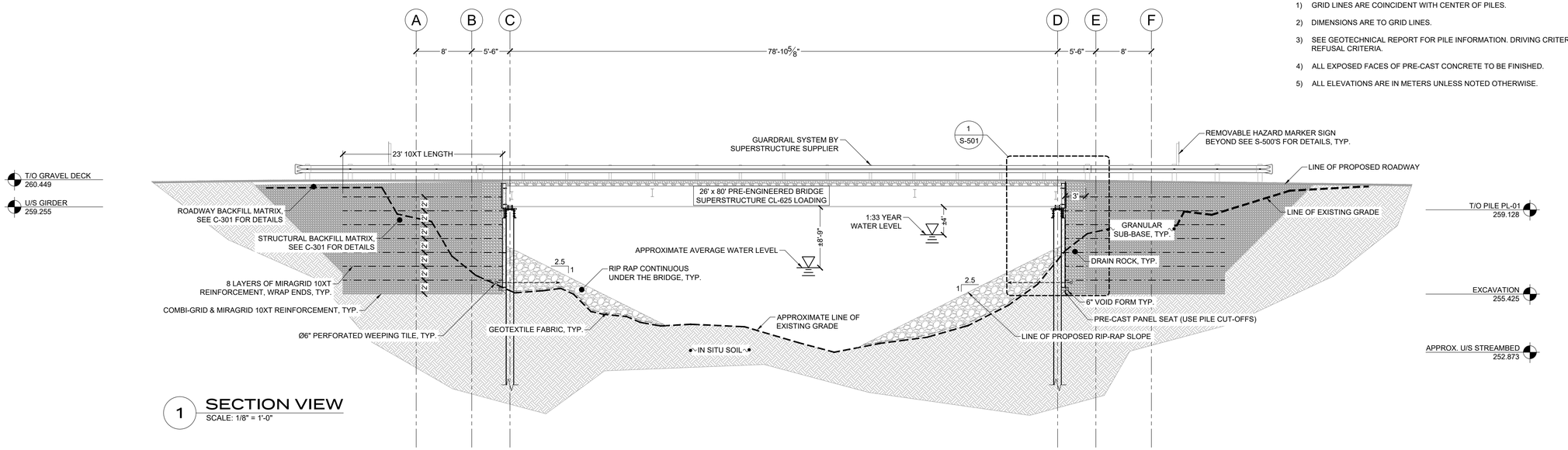
PROJECT NAME
MUNICIPALITY OF DUFFERIN
McEACHERN BRIDGE
REPLACEMENT

DRAWING TITLE
SUPERSTRUCTURE PLAN

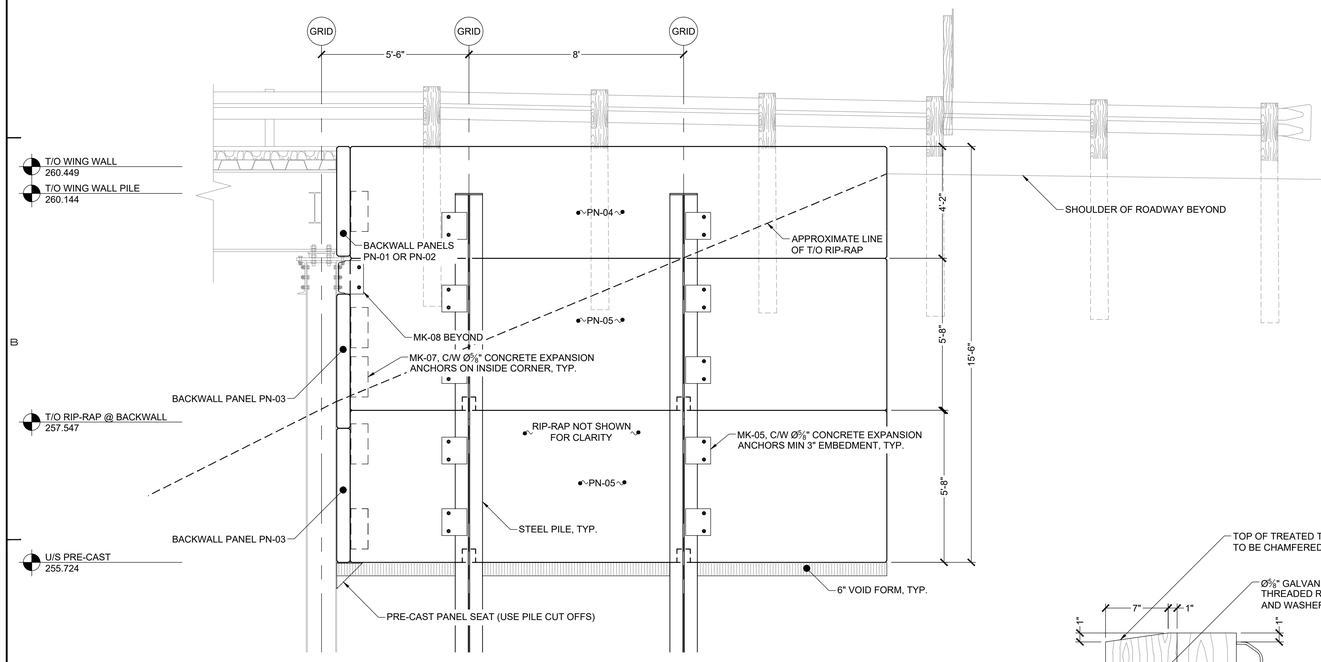
PROJECT NUMBER	DATE
SE12024-049	JULY 03, 2025
DRAWING NUMBER	SHEET SIZE / SCALE
S-102	(24" X 36") AS SHOWN
	DRAWN BY: BJ / CHECKED BY: PD

NOTES:

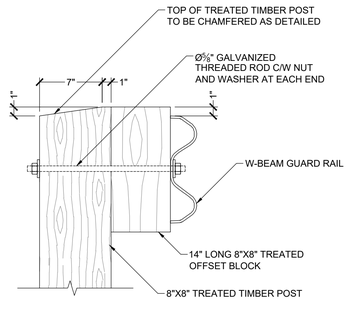
1) GRID LINES ARE COINCIDENT WITH CENTER OF PILES.
2) DIMENSIONS ARE TO GRID LINES.
3) SEE GEOTECHNICAL REPORT FOR PILE INFORMATION. DRIVING CRITERIA AND REFUSAL CRITERIA.
4) ALL EXPOSED FACES OF PRE-CAST CONCRETE TO BE FINISHED.
5) ALL ELEVATIONS ARE IN METERS UNLESS NOTED OTHERWISE.



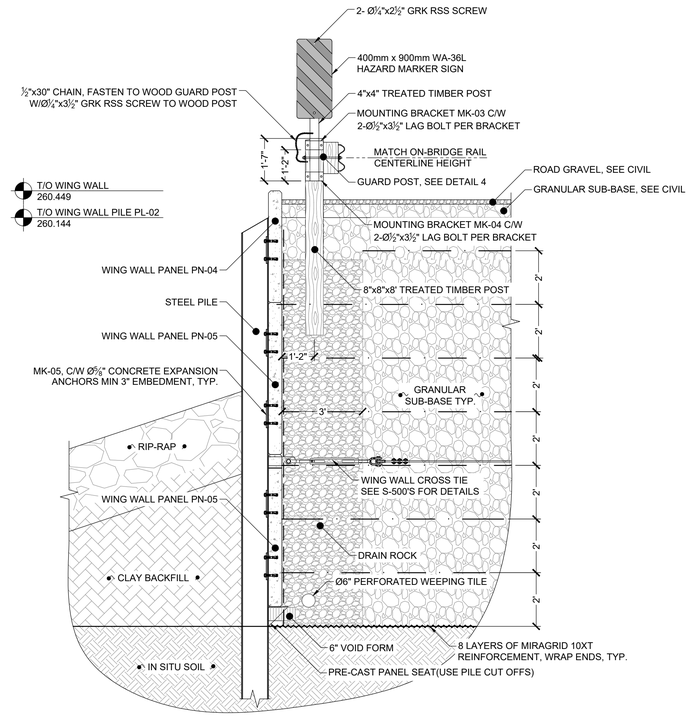
1 SECTION VIEW
SCALE: 1/8" = 1'-0"



2 TYP. WING WALL PROFILE
SCALE: 3/8" = 1' - 0"



4 GUARD POST CONNECTION DETAIL
SCALE: 1-1/2" = 1' - 0"



3 TYP. WING WALL SECTION
SCALE: 3/8" = 1' - 0"

NO	ISSUED	DATE
2	ISSUED FOR CONSTRUCTION	2025-11-28
1	ISSUED FOR PERMIT	2025-07-03
NO	ISSUED	DATE

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
Samson Engineering Inc.
No. 3050 Expiry: April 30, 2026

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NORTH ARROW

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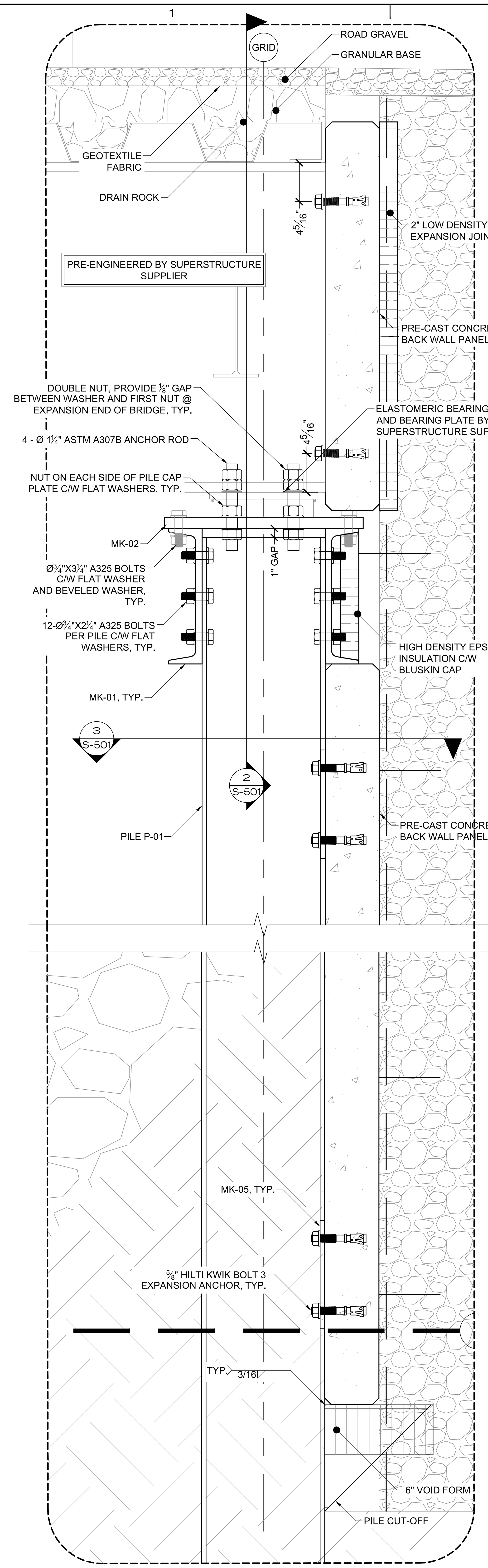
SAMSON ARCHITECTURE | ENGINEERING
162 - 10TH STREET
BRANDON, MB R7A 4E6
PH (204) 727-0747

PROJECT LOCATION: CARMAN MB

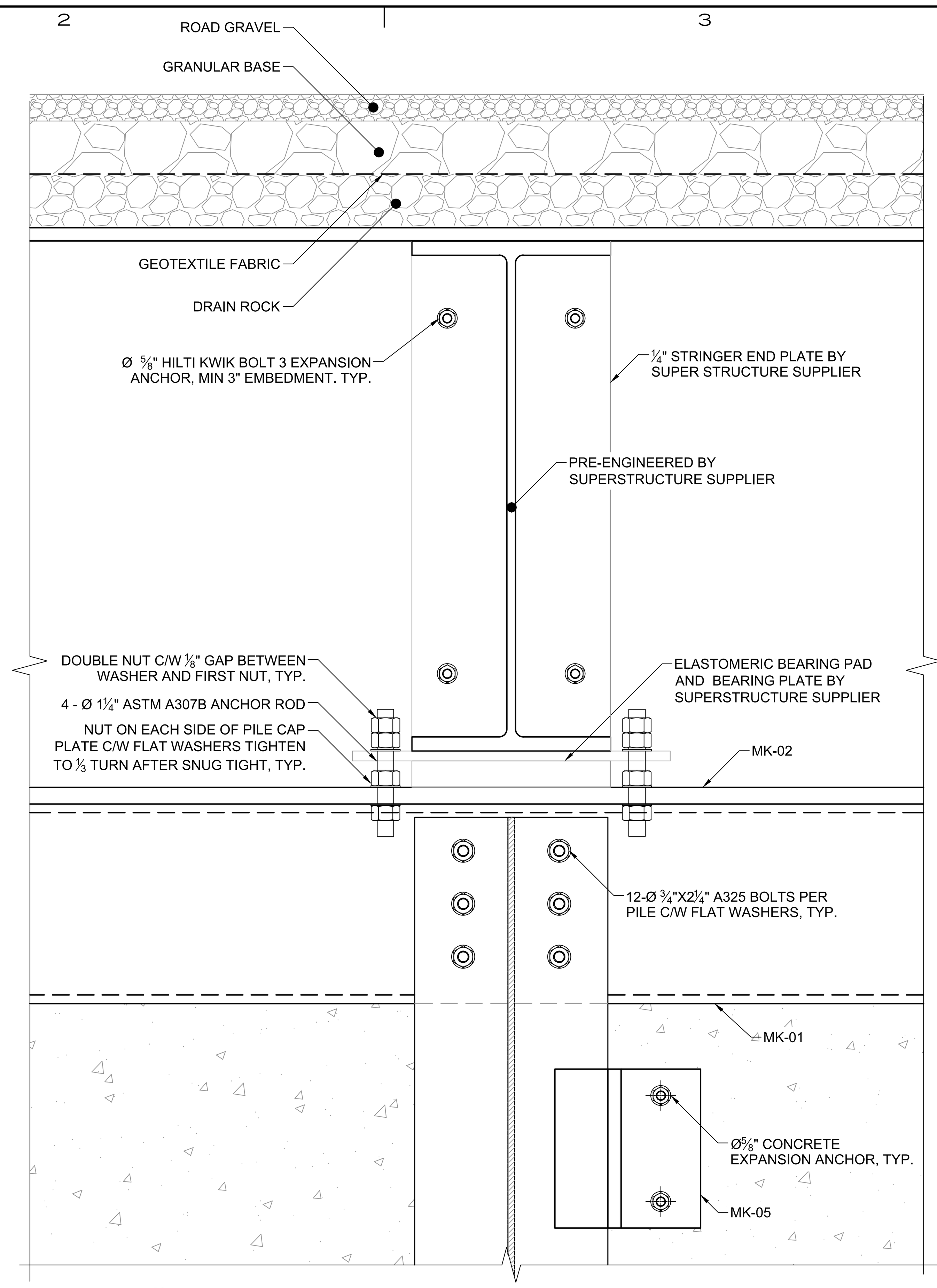
PROJECT NAME: MUNICIPALITY OF DUFFERIN McEACHERN BRIDGE REPLACEMENT

DRAWING TITLE: SECTIONS

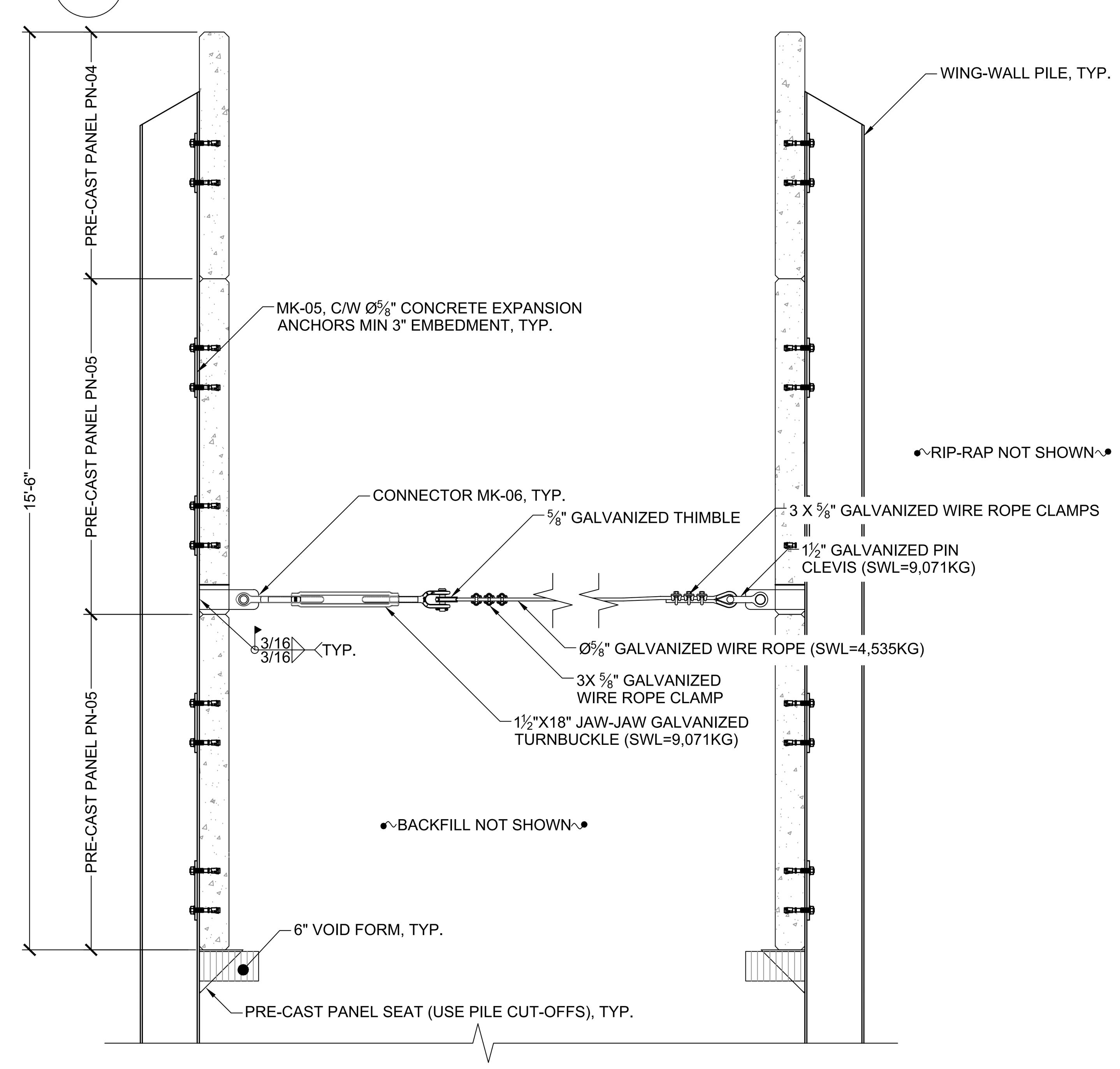
PROJECT NUMBER	DATE	
SEI2024-049	JULY 03, 2025	
DRAWING NUMBER	SHEET SIZE	SCALE
S-301	(24" X 36")	AS SHOWN
	DRAWN BY: BJ	CHECKED BY: PD



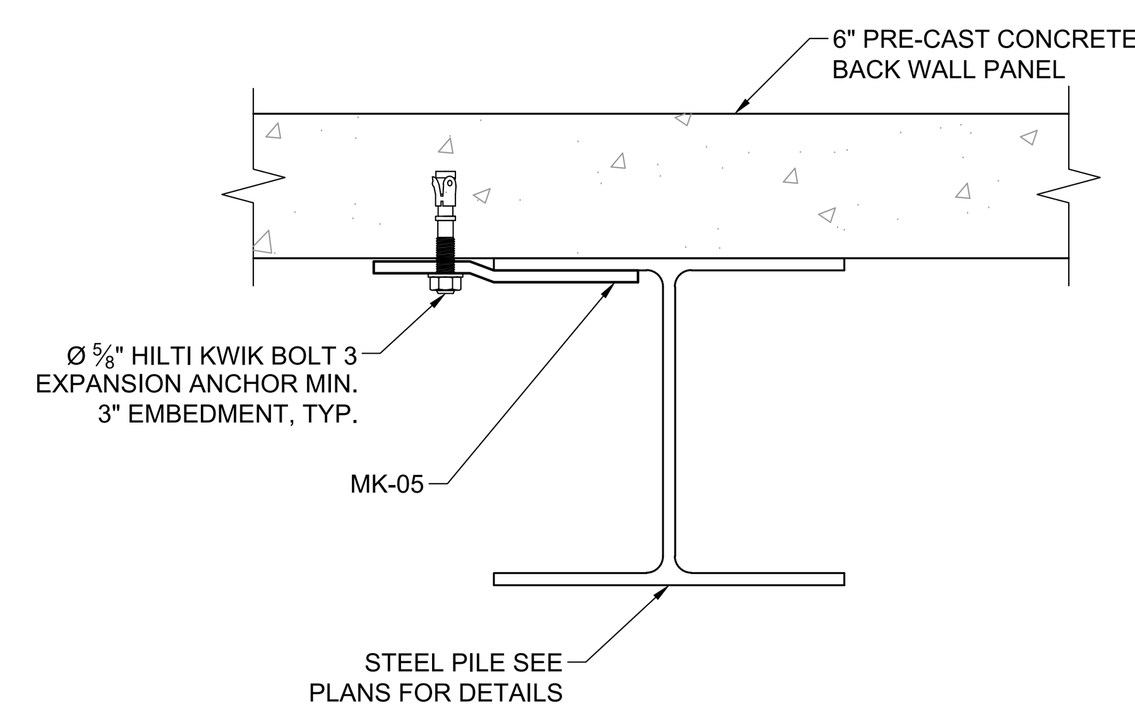
1 BACK WALL SECTION
SCALE: 1 1/2"=1'-0"



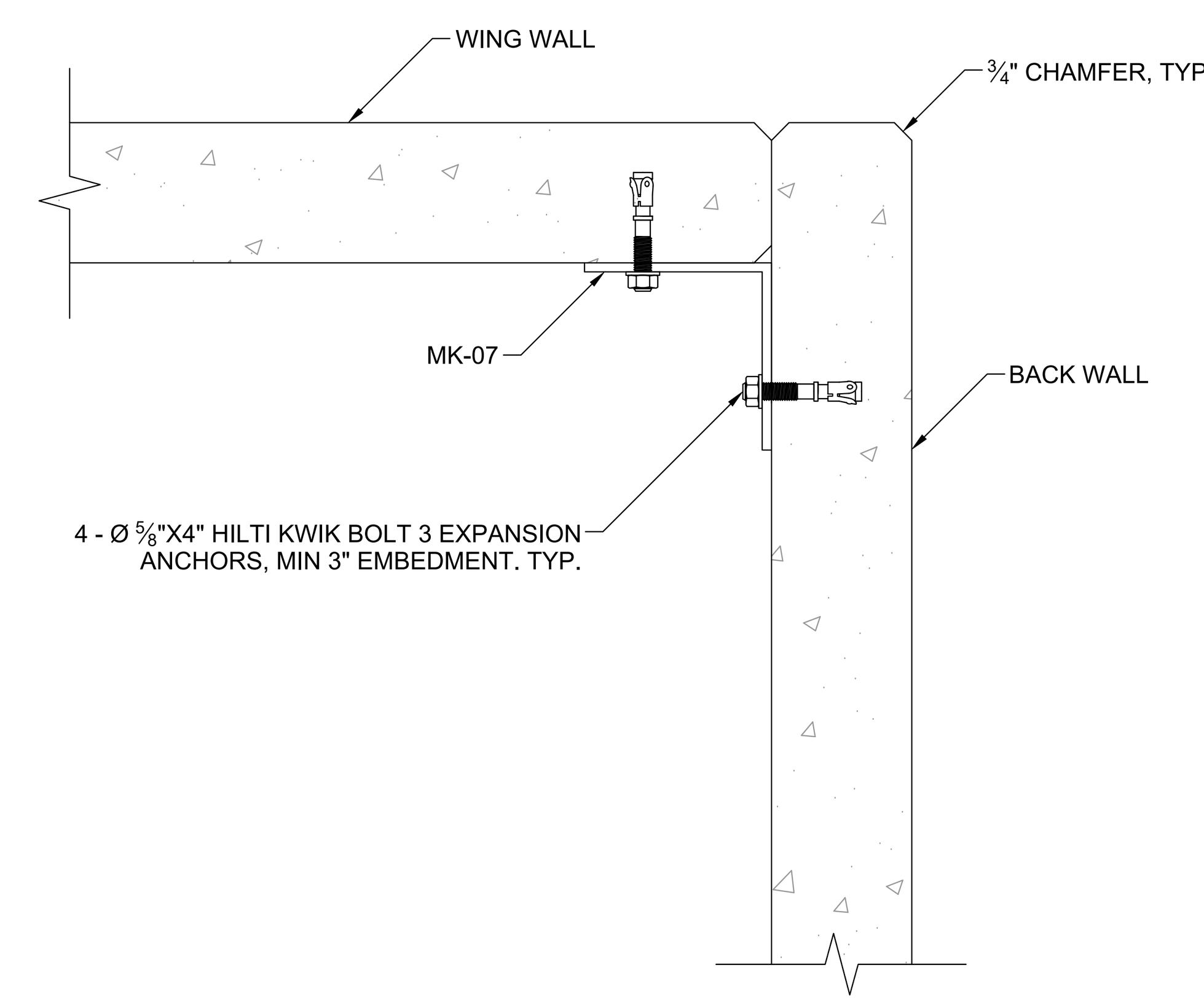
2 BACK WALL SECTION DETAIL
SCALE: 1 1/2"=1'-0"



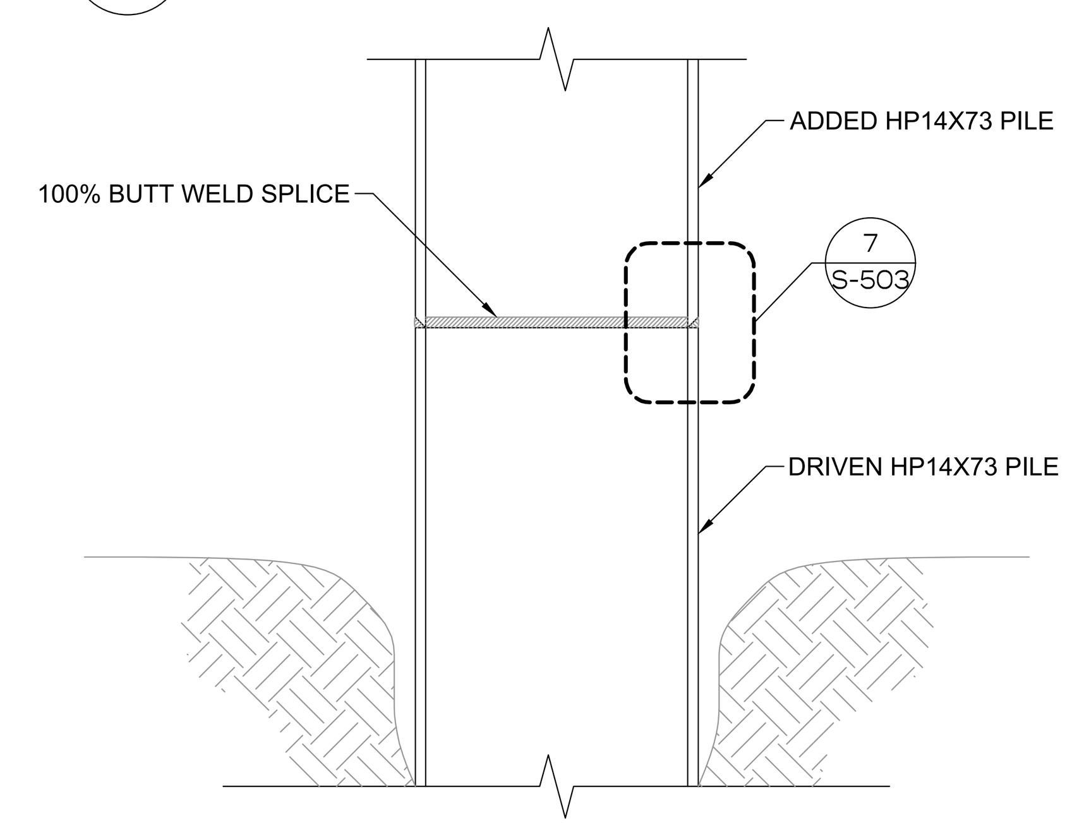
3 TENSION TIE DETAIL
SCALE: 1/2"=1'-0"



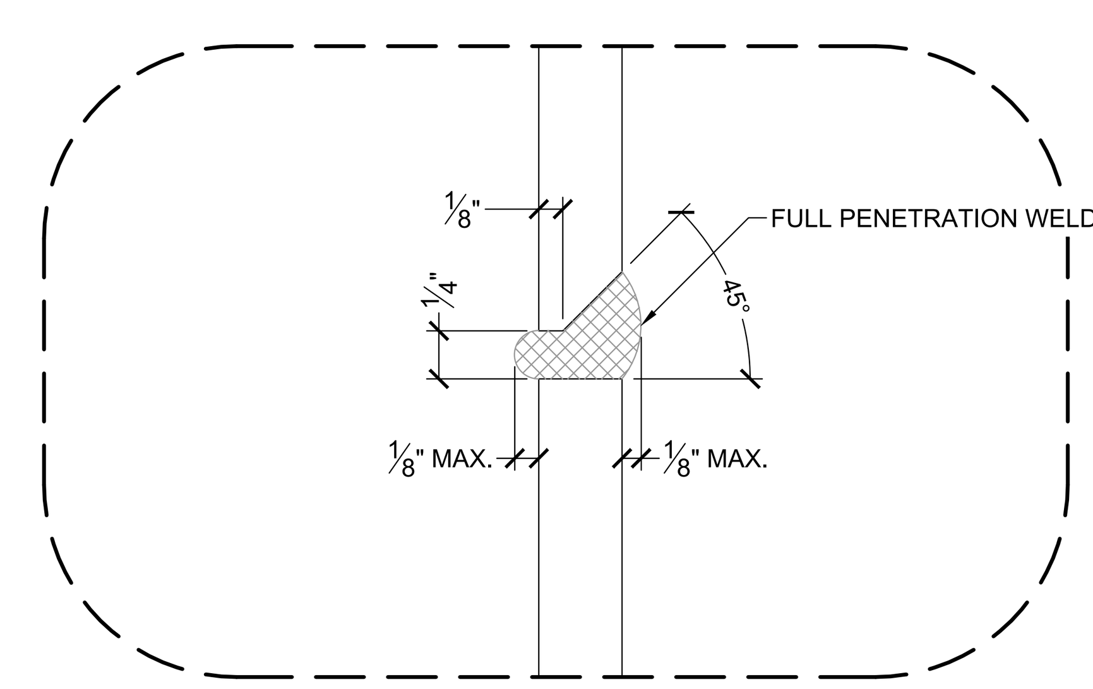
4 PILE TO PRECAST DETAIL
SCALE: 1 1/2"=1'-0"



5 WING WALL ANGLE DETAIL
SCALE: 1 1/2" = 1' - 0"



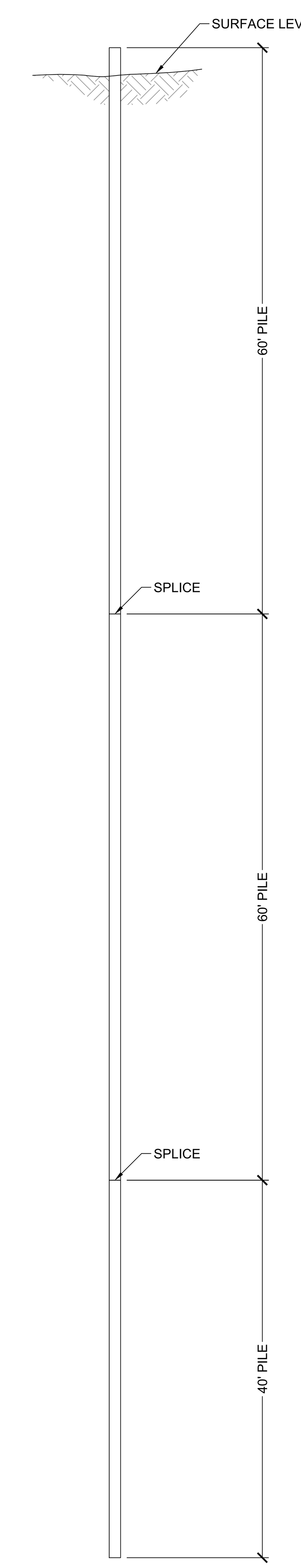
6 PILE SPLICE DETAIL
SCALE: 1 1/2"=1'-0"



7 WELD DETAIL
SCALE: 1"=1'

NOTES:

1) ALL STRUCTURAL BOLTS TO BE TIGHTENED BY TURN-OF-NUT METHOD
2) ALL EXPOSED FACES OF PRE-CAST PANELS TO BE FINISHED
3) ALL MISCELLANEOUS METALS TO BE GALVANIZED
4) ALL FASTENERS TO BE GALVANIZED
5) DRESS ALL FIELD WELDS WITH GOLD GALVANIZE COATING (93% ZINC OR BETTER) PAINT. APPLY AS PER MANUFACTURERS RECOMMENDATIONS
6) NOTIFY ENGINEER OF ANY REQUIRED SITE MODIFICATIONS TO MISCELLANEOUS METALS. OBTAIN WRITTEN APPROVAL PRIOR TO PROCEEDING



8 PILE LENGTH DETAIL
SCALE: 3/32"=1'-0"

NO	ISSUED	DATE
2	ISSUED FOR CONSTRUCTION	2025-11-28
1	ISSUED FOR PERMIT	2025-07-03

ENGINEERS GEOSCIENTISTS MANITOBA
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No. 3050 Expiry: April 30, 2026

NORTH ARROW

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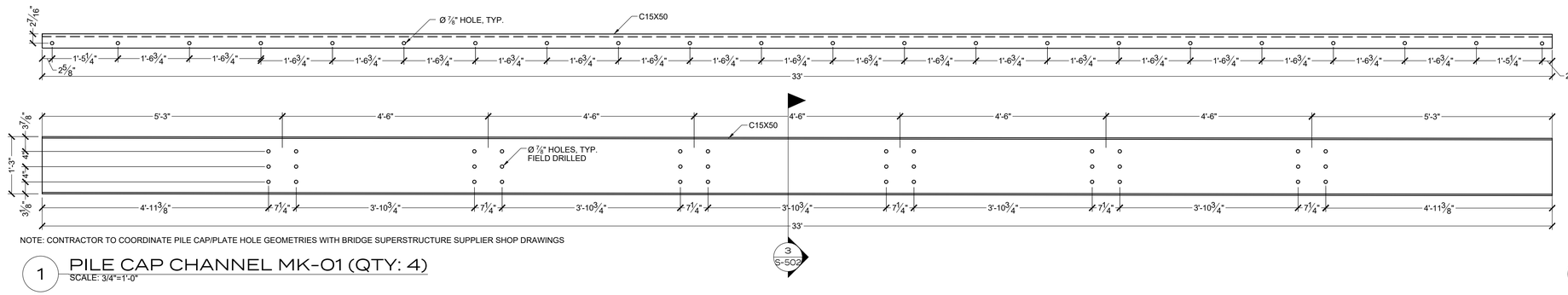
SAMSON
ARCHITECTURE | ENGINEERING
162 - 10TH STREET
BRANDON, MB R7A 4E6
PH: (204) 727-0747

PROJECT LOCATION: CARMAN MB

PROJECT NAME: MUNICIPALITY OF DUFFERIN McEACHERN BRIDGE REPLACEMENT

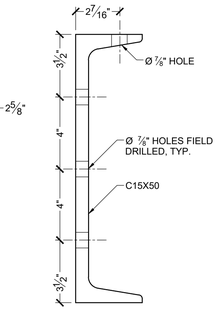
DRAWING TITLE: DETAILS

PROJECT NUMBER	DATE	
SEI2024-049	JULY 03, 2025	
DRAWING NUMBER	SHEET SIZE	SCALE
S-501	(24" X 36")	AS SHOWN
	DRAWN BY	CHECKED BY
	BR	PD

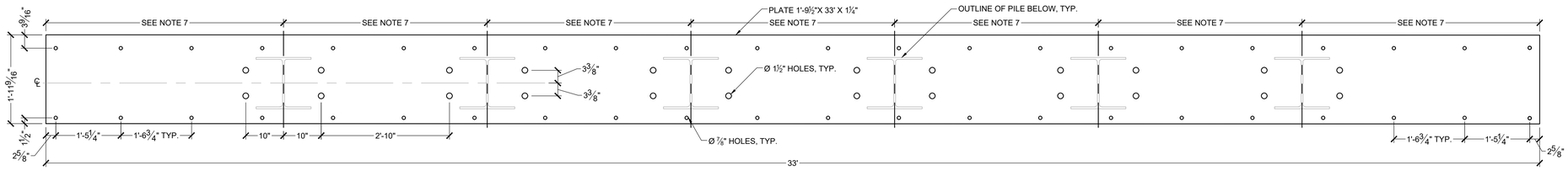


NOTE: CONTRACTOR TO COORDINATE PILE CAP/PLATE HOLE GEOMETRIES WITH BRIDGE SUPERSTRUCTURE SUPPLIER SHOP DRAWINGS

1 PILE CAP CHANNEL MK-01 (QTY: 4)
SCALE: 3/4"=1'-0"

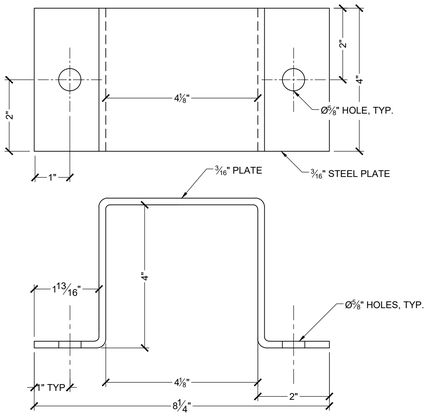


3 MK-01 SECTION
SCALE: 3"=1'-0"

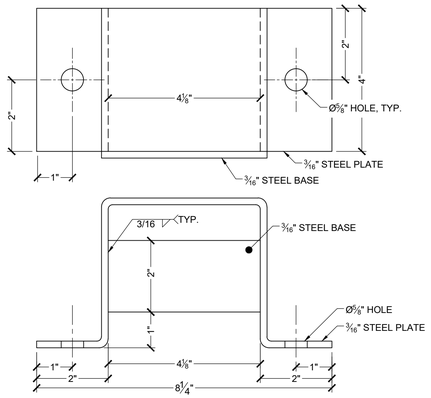


NOTE: CONTRACTOR TO COORDINATE PILE CAP/PLATE HOLE GEOMETRIES WITH BRIDGE SUPERSTRUCTURE SUPPLIER SHOP DRAWINGS

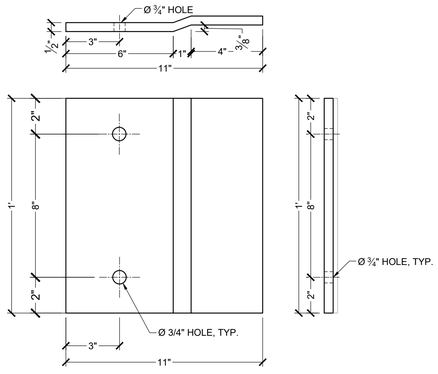
2 PILE CAP PLATE MK-02 (QTY: 2)
SCALE: 3/4"=1'-0"



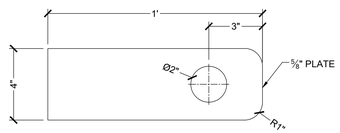
4 MK-03 DETAIL (QTY: 4)
SCALE: 6"=1'-0"



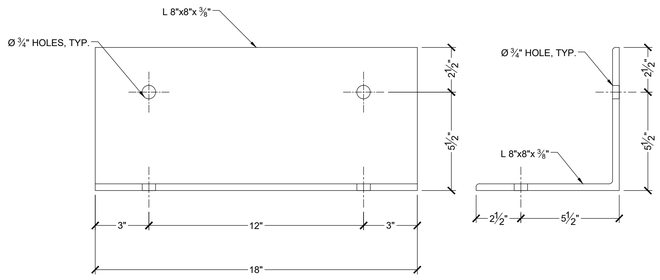
5 MK-04 DETAIL (QTY: 4)
SCALE: 6"=1'-0"



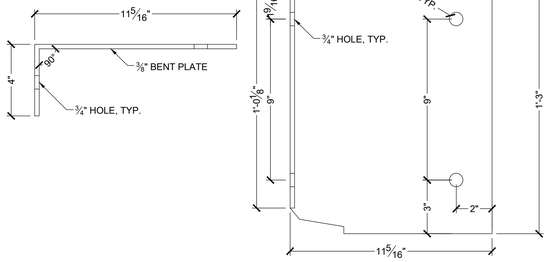
6 MK-05 DETAIL (QTY: 48)
SCALE: 3"=1'-0"



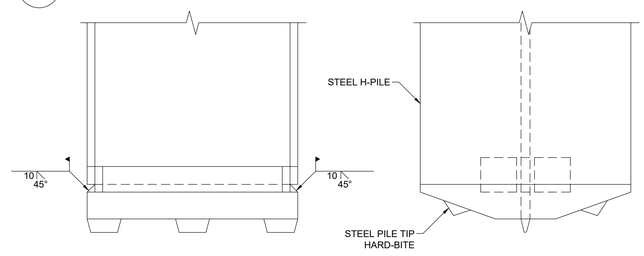
7 MK-06 DETAIL (QTY: 8)
SCALE: 3"=1'-0"



8 MK-07 DETAIL (QTY: 20)
SCALE: 3"=1'-0"



9 MK-08 DETAIL (QTY: 4)
SCALE: 3"=1'-0"



10 PILE DRIVING SHOE DETAIL
SCALE: 3" = 1' - 0"

NOTES:

1) ALL STRUCTURAL BOLTS TO BE TIGHTENED BY TURN-OF-NUT METHOD
2) ALL EXPOSED FACES OF PRE-CAST PANELS TO BE FINISHED
3) ALL MISCELLANEOUS METALS TO BE GALVANIZED
4) ALL FASTENERS TO BE GALVANIZED
5) DRESS ALL FIELD WELDS WITH GOLD GALVANIZE COATING (93% ZINC OR BETTER) PAINT. APPLY AS PER MANUFACTURERS RECOMMENDATIONS
6) NOTIFY ENGINEER OF ANY REQUIRED SITE MODIFICATIONS TO MISCELLANEOUS METALS. OBTAIN WRITTEN APPROVAL PRIOR TO PROCEEDING
7) CENTRELINE DIMENSIONS FOR GIRDER BEARING SEATS TO BE CONFIRMED WITH SUPERSTRUCTURE SUPPLIER

NO	ISSUED	DATE
2	ISSUED FOR CONSTRUCTION	2025-11-28
1	ISSUED FOR PERMIT	2025-07-03
NO	ISSUED	DATE

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
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No. 3050 Expiry: April 30, 2026

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NORTH ARROW

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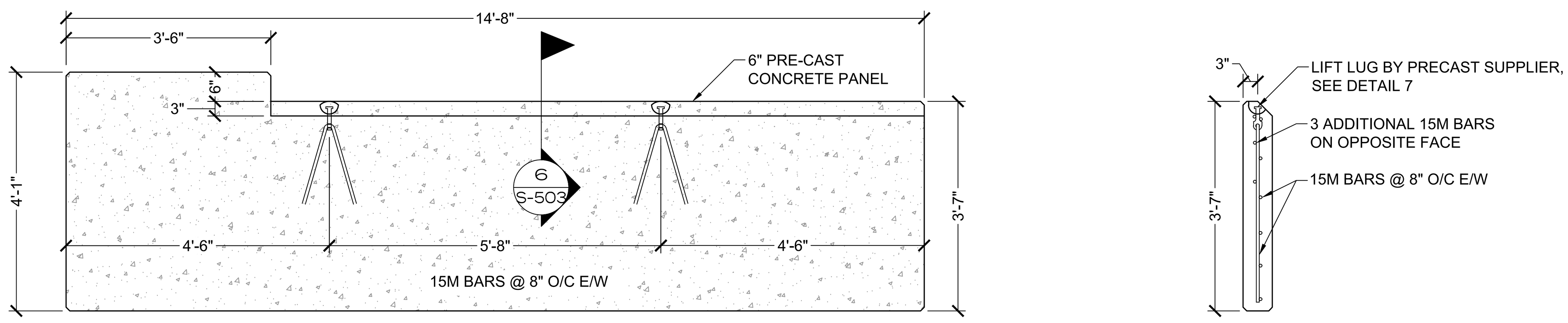
SAMSON
ARCHITECTURE I ENGINEERING
162 - 10TH STREET
BRANDON, MB R7A 4E6
PH: (204) 727-0747

PROJECT LOCATION
CARMAN MB

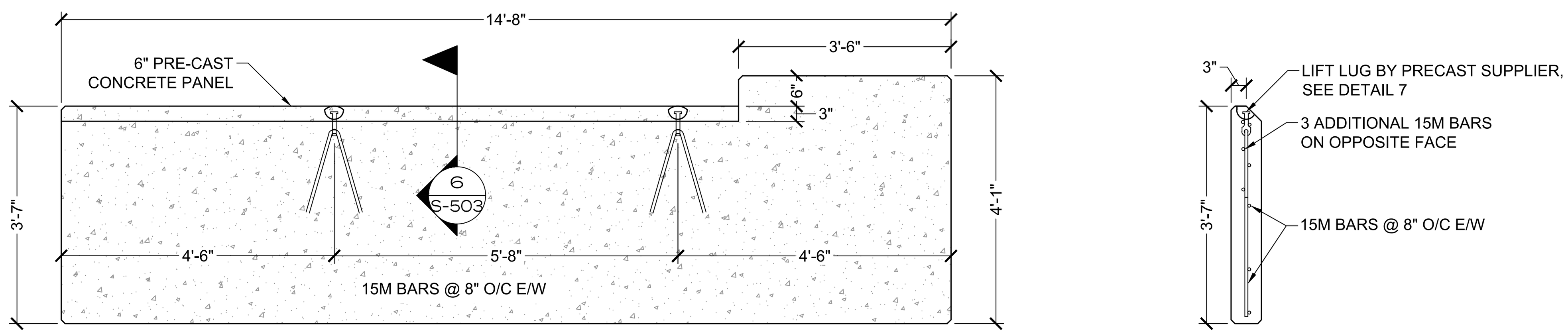
PROJECT NAME
MUNICIPALITY OF DUFFERIN
McEACHERN BRIDGE
REPLACEMENT

DRAWING TITLE
DETAILS

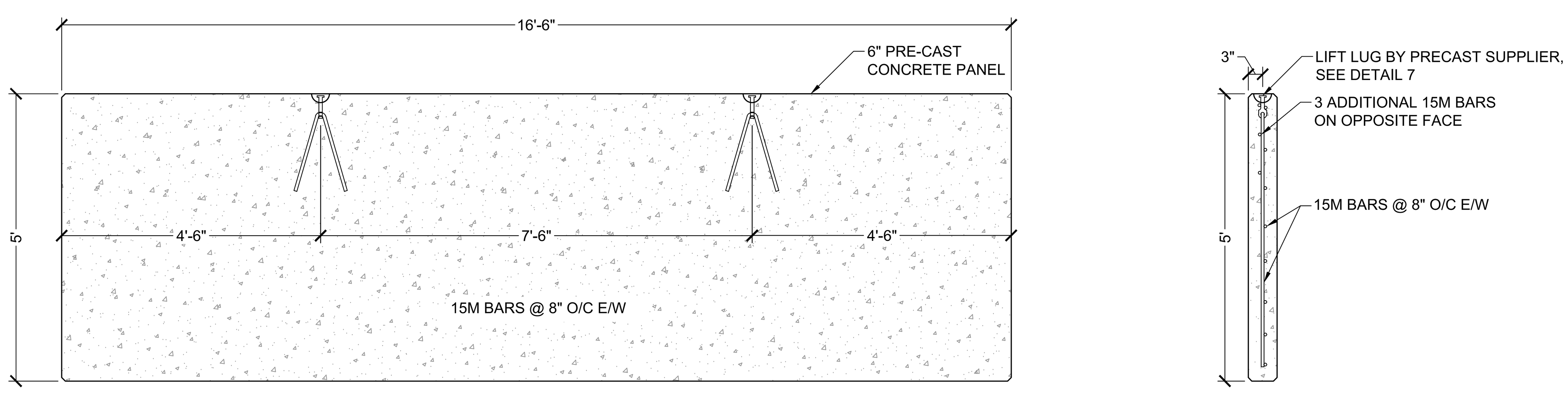
PROJECT NUMBER	DATE	
SEI2024-049	JULY 03, 2025	
DRAWING NUMBER	SHEET SIZE (24" X 36")	SCALE AS SHOWN
S-502	DRAWN BY BR	CHECKED BY PD



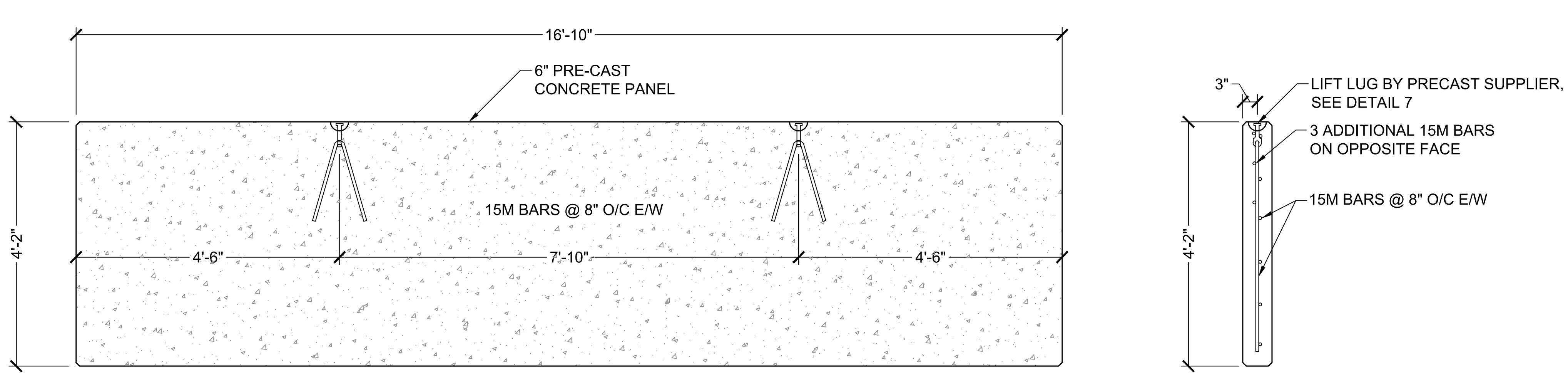
1 PANEL PN-01 DETAIL (QTY = 2)
SCALE: 1/2" = 1' - 0"



2 PANEL PN-02 DETAIL (QTY = 2)
SCALE: 1/2" = 1' - 0"



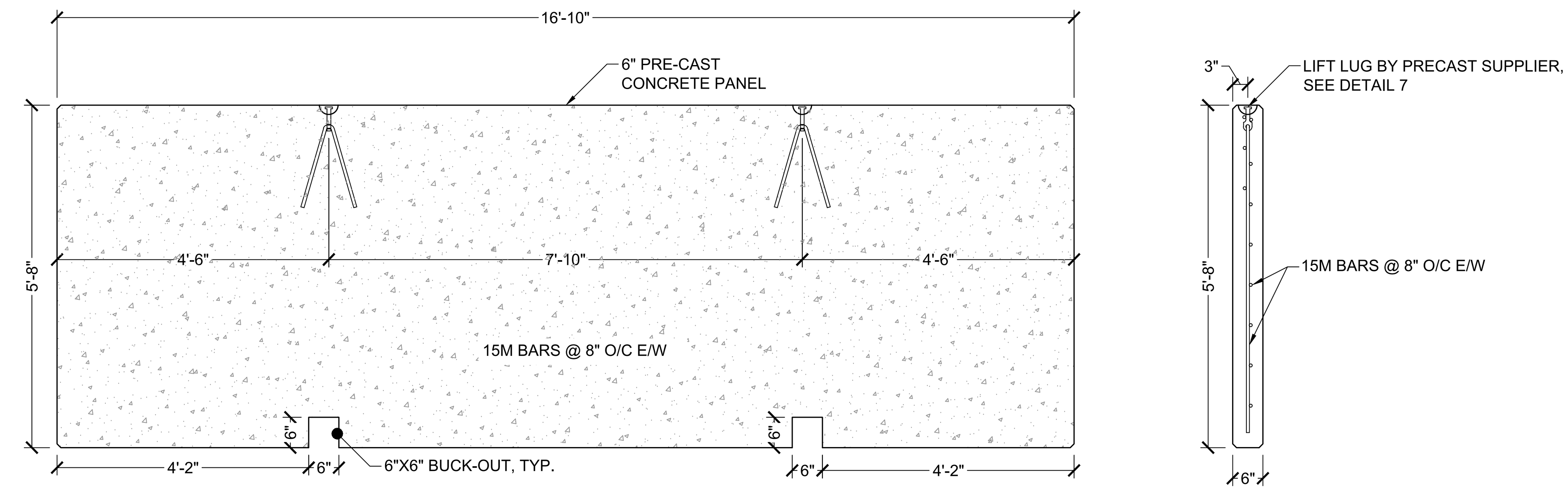
3 PANEL PN-03 DETAIL (QTY = 8)
SCALE: 1/2" = 1' - 0"



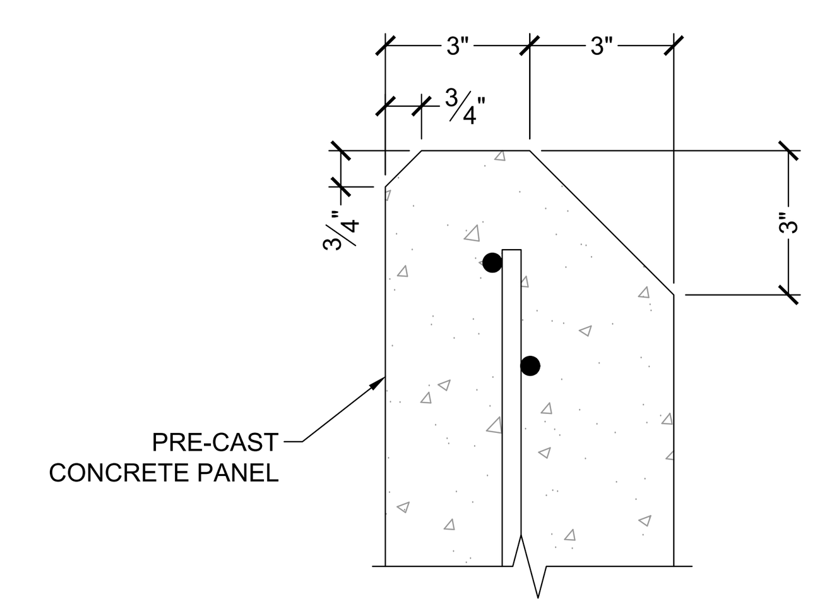
4 PANEL PN-04 DETAIL (QTY = 4)
SCALE: 1/2" = 1' - 0"

NOTES:

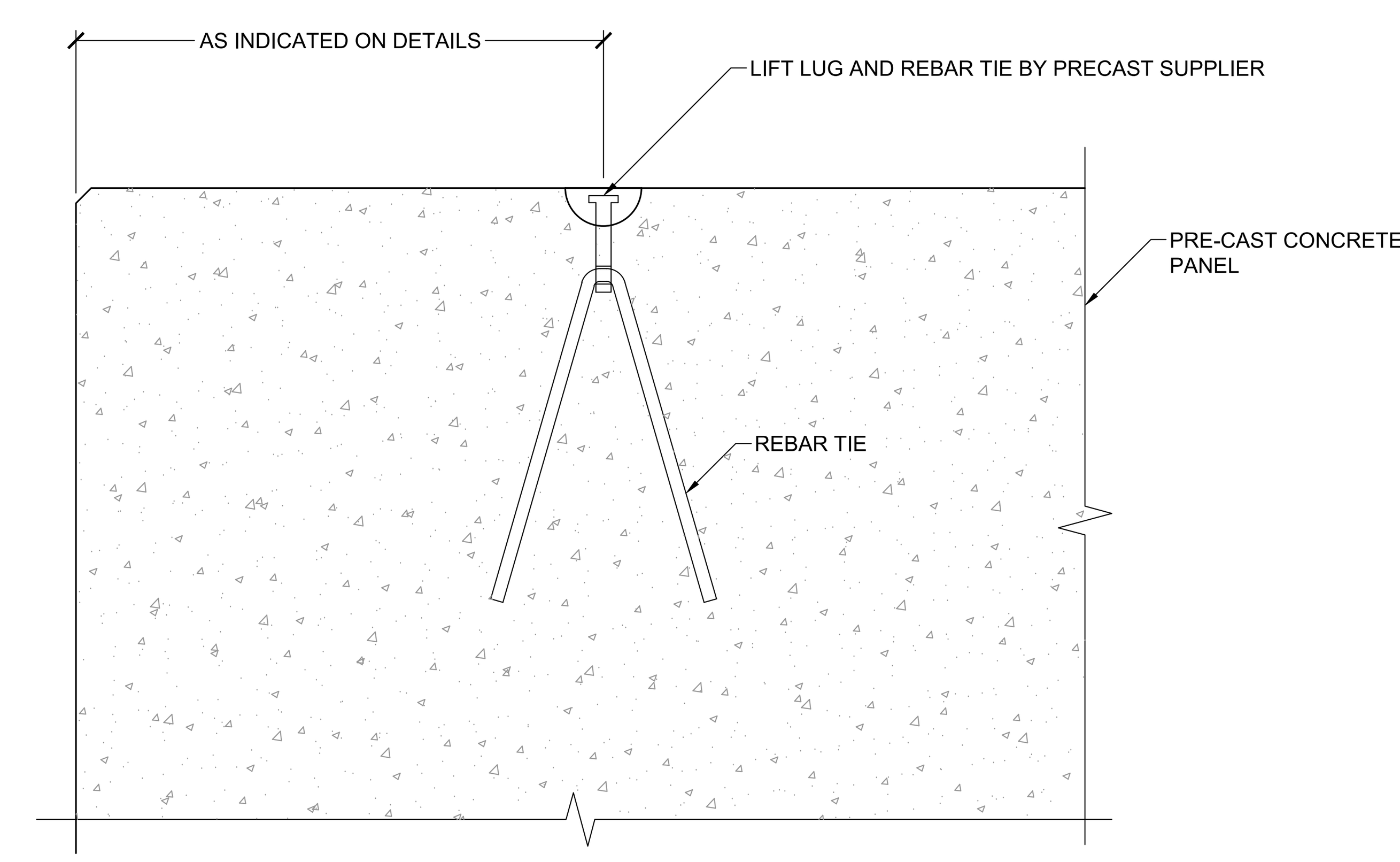
1) ALL STRUCTURAL BOLTS TO BE TIGHTENED BY TURN-OF-NUT METHOD
2) ALL EXPOSED FACES OF PRE-CAST PANELS TO BE FINISHED
3) ALL MISCELLANEOUS METALS TO BE GALVANIZED
4) ALL FASTENERS TO BE GALVANIZED
5) DRESS ALL FIELD WELDS WITH GOLD GALVANIZE COATING (93% ZINC OR BETTER) PAINT. APPLY AS PER MANUFACTURERS RECOMMENDATIONS
6) NOTIFY ENGINEER OF ANY REQUIRED SITE MODIFICATIONS TO MISCELLANEOUS METALS. OBTAIN WRITTEN APPROVAL PRIOR TO PROCEEDING



5 PANEL PN-05 DETAIL (QTY = 8)
SCALE: 3/4" = 1' - 0"



6 PN-01 & PN-02 TOP DETAIL
SCALE: 3" = 1' - 0"



7 LIFT HOOK DETAIL
SCALE: 1 - 1/2" = 1' - 0"

NO	ISSUED	DATE
2	ISSUED FOR CONSTRUCTION	2025-11-28
1	ISSUED FOR PERMIT	2025-07-03

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
Samson Engineering Inc.
No. 3050 Expiry: April 30, 2026

NORTH ARROW

NOTE:

THE GENERAL CONTRACTOR MUST VERIFY ALL DIMENSIONS, DATUMS AND LEVELS NOTED ON THESE DRAWINGS WITH SITE CONDITIONS. ANY DISCREPANCIES, ERRORS OR OMISSIONS MUST BE REPORTED TO THE ARCHITECT OR ENGINEER PRIOR TO COMMENCING ANY RELATED WORK.

DO NOT SCALE DRAWINGS.

SAMSON
ARCHITECTURE | ENGINEERING
162 - 10TH STREET
BRANDON, MB R7A 4E6
PH: (204) 727-0747

PROJECT LOCATION: CARMAN MB

PROJECT NAME: MUNICIPALITY OF DUFFERIN McEACHERN BRIDGE REPLACEMENT

DRAWING TITLE: DETAILS

PROJECT NUMBER	DATE	
SEI2024-049	JULY 03, 2025	
DRAWING NUMBER	SHEET SIZE	SCALE
S-503	(24" X 36")	AS SHOWN
	DRAWN BY	CHECKED BY
	BR	PD

APPENDIX F

DFO PERMIT

SAMSON
ARCHITECTURE | ENGINEERING

Tyson Dyck

From: OP Habitat (DFO/MPO) <DFO.OPHabitat.MPO@dfo-mpo.gc.ca>
Sent: July 17, 2025 8:57 AM
To: Info
Cc: Tyson Dyck; Liam Caldwell
Subject: RE: 25-HCAA-01398 DFO Permit Submission McEachern Bridge (SEI2024-049)

Unclassified - Non-Classifié

Fisheries and Oceans Canada
Ontario and Prairie Region
Fish and Fish Habitat Protection Program
867 Lakeshore Rd.
Burlington, ON
L7S 1A1

Pêches et Océans Canada
Région de l'Ontario et des Prairies
Programme de protection du poisson et de son habitat
867 chemin Lakeshore
Burlington, ON
L7S 1A1

Dear Phil Dorn:

Subject: Bridge Replacement, Boyne River, Rural Municipality of Dufferin (25-HCAA-01398) – Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your proposal on July 7, 2025. We understand that you propose to:

- Remove the existing structure on Boyne River and replace with a 24m clear span bridge and install riprap for a total footprint below the ordinary high water mark of 210m^2;
- Install riprap to allow for fish passage under low flow conditions;
- Re-grade and re-armour embankments on both sides of the creek to match existing hydraulic conditions; and,
- Work in isolation of flow or open water to avoid sedimentation of the watercourse.

In addition, the following aquatic species are subject to the Aquatic Invasive Species Regulations and may be found in the vicinity of your proposed work, undertaking, or activity:

- Zebra Mussel
- Spiny Waterflea

Our review considered the following information:

- Request for Review form and associated documents.

Your proposal has been reviewed to determine whether it is likely to result in:

- the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat which are prohibited under subsections 34.4(1) and 35(1) of the *Fisheries Act*;

- effects to listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act*; and,
- the introduction of aquatic species into regions or bodies of water frequented by fish where they are not indigenous, which is prohibited under section 10 of the *Aquatic Invasive Species Regulations*.

The aforementioned impacts are prohibited unless authorized under their respective legislation and regulations.

To avoid and mitigate the potential for prohibited effects to fish and fish habitat (as listed above), we recommend implementing the measures listed below:

- Carry out the project in accordance with timing windows;
    - No in-water works between April 1 and June 30;
- Capture fish trapped within an isolated or enclosed area and relocate them to the same watercourse or water body;
    - Capture and relocate any fish as per applicable permits;
- Maintain a functioning vegetated riparian zone between the project site and the ordinary high water mark;
    - Limit access to shorelines and banks or areas adjacent to the watercourse or water body;
    - Construct roads, access points and approaches perpendicular to the watercourse or water body;
    - Re-vegetate the affected riparian zone with native species suitable for the project site;
- If replacement rock reinforcement/armouring is required to stabilize eroding areas around bridge structures (e.g., abutments and/or wing walls), the following measures should be incorporated:
    - Place appropriately-sized, clean rocks into the eroding area;
    - Do not obtain rocks from below the ordinary high water mark of any water body;
    - Ensure rock does not interfere with fish passage or constrict the channel width;
- Restore the bed and banks, gradient and contour affected by the project;
- Develop and implement an erosion and sediment control plan for all phases of the project;
    - Conduct all operations in isolation of open or flowing water;
        - Follow Interim in-water site isolation
    - Regularly observe the watercourse or water body for signs of suspended sediment during all phases of the project and take corrective action when and where required;
- Develop a plan to prevent deleterious substances from entering a watercourse or water body.
- Aquatic invasive species are introduced and spread through transporting water, sands and sediments and using contaminated construction equipment. To prevent the spread of aquatic invasive species during construction in aquatic environments:
    - Ensure all equipment arrives on site clean and free of invasive species;
    - Clean, drain and dry any equipment used in the water; and,
    - Never move organisms or water from one body of water to another.

Provided that you incorporate these measures into your plans, the Program is of the view that your proposal is not likely to result in the contravention of the above mentioned prohibitions and requirements.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (Projects near water (dfo-mpo.gc.ca)) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to remain in compliance with the *Fisheries Act*, the *Species at Risk Act* and the *Aquatic Invasive Species Regulations.*

It is also your *Duty to Notify* DFO if you have caused, or are about to cause, the death of fish by means other than fishing and/or the harmful alteration, disruption or destruction of fish habitat. Such notifications should be directed to DFO.OPHabitat.MPO@dfo-mpo.gc.ca or 1-855-852-8320.

We recommend that you notify this office at least 10 days before starting your project and that a copy of this letter be kept on site while the work is in progress. Send your notification to the DFO 10 day notification mailbox: DFO.OP.10DayNotification-Notification10Jours.OP.MPO@dfo-mpo.gc.ca. It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.
If you have any questions with the content of this letter, please contact Emma Bard at emma.bard@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

Emma Bard
Student Biologist, Triage and Planning
Fish and Fish Habitat Protection Program

From: Liam Caldwell <LCaldwell@samsonae.ca>
Sent: Monday, July 7, 2025 3:33 PM
To: OP Habitat (DFO/MPO) <DFO.OPHabitat.MPO@dfo-mpo.gc.ca>
Cc: Info <Info@samsonae.ca>; Tyson Dyck <tdyck@samsonae.ca>
Subject: 25-HCAA-01398 DFO Permit Submission McEachern Bridge (SEI2024-049)

> You don't often get email from lcaldwell@samsonae.ca. Learn why this is important

Hello,

Samson is requesting a review by DFO for the replacement of an existing 115-foot-long 4-span timber bridge with a new 80-foot-long by 26-foot-wide clear span steel bridge located in the Municipality of Dufferin, just east of Carman, Manitoba.

Please find attached the request for review form, our Issued for Permit Design Drawings, Hydraulic Study and Representative Photos of the existing site for DFO to Review.

If you have any questions or require further information, please don’t hesitate to contact our office.

Regards,

Liam Caldwell, EIT

SAMSON
ARCHITECTURE | ENGINEERING

162 - 10th Street
Brandon, MB R7A 4E6
Ph: 204-727-0747
Fax: 204-725-9870

APPENDIX G

MTI PERMIT

SAMSON
ARCHITECTURE | ENGINEERING

Water Management, Planning and Standards
2nd Floor 280 Broadway
Winnipeg, Manitoba R3C 0R8
T 204-945-2121 **F** 204-948-4764
MITWaterReview@gov.mb.ca

November 19, 2025

Our File: Boyne River – 18.13

Samson Engineering Inc.
162 10th Street
Brandon, MB R7A 4E6

Provincial Water Infrastructure Permit for bridge over Boyne River

Attached is the required Provincial Water Infrastructure Permit to construct and maintain an 80' Single-span CL-625 load rated bridge across Boyne River, in accordance with the Provincial Water Infrastructure Application dated July 7, 2025.

As indicated in Condition 1 of the Provincial Water Infrastructure Permit, Da Sheng Liu , District Superintendent must be contacted at either 204-794-6487, or dasheng.liu@gov.mb.ca at least three (3) days prior to commencement of the Works, and at the completion of the Works for a final inspection to confirm compliance with this Permit.

Sincerely,

Digitally signed
by Nardos Kidane
Date: 2025.11.19
07:25:43 -06'00'

Nardos Kidane
Water Management Planning Technologist

Cc: Da Sheng Liu, District Superintendent

Manitoba
Transportation and Infrastructure

2nd Floor 280 Broadway
Winnipeg MB R3C 0R8

Boyne River – 18.13

PROVINCIAL WATER INFRASTRUCTURE PERMIT

In accordance with

Subsection 15.2(1) of *The Water Resources Administration Act*, C.C.S.M. c. W70 (the "Act")

Applicant: Samson Engineering Inc.
162 10th Street
Brandon MB R7A 4E6

Project Description: To construct and maintain an 80' Single-span CL-625 load rated bridge across Boyne River (the "Provincial Water Infrastructure"), to replace the existing 4-span timber bridge (the "Works").

The Applicant is granted Permit by the Minister of Infrastructure (the "Minister"), on behalf of the Government of Manitoba ("Manitoba"), to construct and maintain an 80' Single-span CL-625 load rated bridge across Boyne River (the "Provincial Water Infrastructure"), as described in the Project Description (as further detailed in the July 7, 2025 Application submitted by the Applicant, a copy of which is attached as Schedule "A") subject to the following terms and conditions:

1. Da Sheng Liu, District Superintendent must be contacted at either 204-794-6487, or dasheng.liu@gov.mb.ca at least three (3) days prior to commencement of the Works, and at the completion of the Works for a final inspection to confirm compliance with this Permit.

2. This Permit is valid from the Date of Issue, unless cancelled by the Minister in writing.

General Liability Conditions

3. This Permit does not create, transfer or convey to the Applicant any right or interest in land, or a license or easement or right-of-way in respect of land, even if the Works may be or become affixed to the Provincial Water Infrastructure or any lands owned by Manitoba in and around the Provincial Water Infrastructure.

4. Manitoba makes no representation or warranty of any kind as to the fitness or suitability of the Provincial Water Infrastructure for the Applicant's purposes. The Applicant must ensure that the Provincial Water Infrastructure is fit and suitable for the purposes set out in the Project Description.

5. Manitoba assumes no liability of any nature for any consequence of granting this Permit, excepting the negligent acts and omissions of those that Manitoba is lawfully responsible for. The Applicant shall, and does hereby agree to, indemnify and save harmless and defend Manitoba, its Ministers, officers, employees and agents, from and against all claims, actions, damages, liability and expenses. This includes any and all legal costs arising out of bodily injury (including death) or property damage suffered by third parties in any way attributable to or resulting from the construction of the Works or

their presence on or within the Provincial Water Infrastructure, any activities undertaken by the Applicant in relation to the Works, including any act or omission of the Applicant, or anyone the Applicant is lawfully responsible for.

6. The Applicant agrees to assume all costs associated with or resulting from the Works. Manitoba must not be put to any expense as a consequence of granting this Permit. If Manitoba incurs any costs or expenses caused by, or in any way related to, the undertaking of the Works within the Provincial Water Infrastructure, the actual amount of such costs and expenses shall be charged by Manitoba to the Applicant. This includes (without limitation) costs or expenses to repair any damage to the Provincial Water Infrastructure or to any underground services or utilities on or within the Provincial Water Infrastructure**.** The Applicant agrees to immediately pay such amount(s) upon receiving a written invoice from Manitoba specifying the costs and expenses incurred.

7. Notwithstanding anything contained herein to the contrary, neither party shall be responsible for any indirect, special or consequential damages suffered by the other party as a consequence of the granting of this Permit.

Works Specific Liability Conditions

8. The Applicant must use this Permit in such a way so as to cause as little disturbance as possible to the Provincial Water Infrastructure (not including what is intended by the Works), and must restore any portion of the Provincial Water Infrastructure negatively impacted to its original condition, to the extent practical and reasonable to do so, to the satisfaction of Manitoba.

9. The Applicant is responsible to maintain the Works within the Provincial Water Infrastructure and address all maintenance, erosion and environmental concerns presented to the Applicant, to a condition approved by Manitoba.

10. The Applicant must ensure that appropriate safety measures are taken to keep the worksite and general public safe at all times.

11. The Applicant must promptly notify Manitoba, in writing, with details of any negative incident occurring on the Provincial Water Infrastructure (whether involving personal injury or not).

Work Specific Conditions

12. The Applicant must adhere to all applicable requirements in the attached “General Environmental Requirements Manitoba Infrastructure” dated Dec 2023.

13. The Works must be constructed as described in:

    a. “Rural Municipality of Dufferin, McEachern Bridge Replacement Structure” signed and sealed by Phil Dorn, P. Eng on July 3, 2025.

    b. “Samson Engineering Inc., McEachern Bridge Road 22W Over Boyne River – Geotechnical Investigation and Analysis” signed and sealed by Kyle Hamilton, M.Eng., P Eng., CAMP on July 2, 2025.

c. "Rural Municipality of Dufferin, McEachern Bridge Replacement Boyne River at Road 22W – Hydrologic and Hydraulics Design Assistance – Report on Single-span Bridge Alternative – Rev 1" signed and sealed by Campbell D. MacInnes, Ph.D., P.Eng. (SM) on October 14, 2025.

Should any design changes be made after issuance of the Provincial Water Infrastructure Permit, those changes must be submitted to Manitoba at MITWaterReview@gov.mb.ca for review and approval.

14. The Applicant must, at its own cost, manage, control and maintain the Works in a prudent and reasonable manner, best suited to the use of the Works. The Applicants must ensure that the Works remains free from obstructions of any kind at all times.

15. Any infrastructure installed by the Applicant on the Provincial Water Infrastructure or the Provincial Water Infrastructure right-of-way is the responsibility of the Applicant to maintain as needed or as communicated to the Applicant by Manitoba, to a condition approved by Manitoba.

16. The Applicant will take all steps required to keep deleterious materials and substances from entering the Water Infrastructure and ensure all required silt control and erosion protection measures are maintained and effective.

17. Restoration of the Provincial Water Infrastructure to pre-existing or better condition is required (unless otherwise noted in another condition of this Permit), including restoration of vegetation cover. The Applicant is obliged to provide maintenance after time of seeding to ensure viable growth of vegetation cover until the site has been restored to a condition approved by Manitoba.

18. Equipment, material, and vehicles are not to be stored on the Provincial Water Infrastructure or the Provincial Water Infrastructure right-of-way when not in use.

19. The Applicant must comply with all federal, provincial and municipal laws and regulations, and obtain all licences and permits necessary for the lawful use of the Works within the Provincial Water Infrastructure. Copies of licences and permits issued by other Provincial and Federal regulatory bodies must be made available upon request.

20. The Applicant or the prime consultant must provide Manitoba with copies of the tender package and the as-built drawings for the Works for our records. These drawings must be provided to Manitoba within thirty (30) days of the drawings being finalized.

Suspension or Cancellation Specific Conditions

21. In the event of cancellation in accordance with condition 22, the Works may be ordered to be immediately removed (as Manitoba determines and at Manitoba's sole discretion). Such removal shall be at the Applicant's cost unless otherwise agreed to by Manitoba in writing.

22. This Permit may be immediately cancelled if the Applicant fails to follow any of the conditions in this Permit and fails to correct the breach within one (1) year of being made aware of the breach.

23. Manitoba may, but is not obligated to, fix any breach of this Permit. The Applicant will be liable to Manitoba for the cost of fixing any breach and this cost will be a debt due and owing to Manitoba.

24. If this Permit is cancelled, the Applicant will continue to be liable as set out in this Permit until the Provincial Water Infrastructure is restored to a condition approved by Manitoba.

Other Conditions

25. This Permit is not assignable by the Applicant without the prior written authorization of Manitoba. This Permit shall be binding on the Applicant's successors and permitted assigns.

26. The Applicant acknowledges that the infrastructure built under this Permit is owned and operated by the Applicant. All responsibility for this infrastructure (fiscal or otherwise) is assumed by the Applicant.

27. The Applicant must comply with all applicable laws, regulations and by-laws.

This Permit applies only to Section 15.2(1) of *The Manitoba Water Resources Administration Act W70*. It does not include any other government approvals as may be required by the Applicant to undertake the Works.

Digitally signed by Fisaha Unduche
Date: 2025.11.17 14:50:03 -06'00'

Executive Director, Hydrologic Forecasting & Water Management
for the Minister of Manitoba Transportation and Infrastructure
being the minister under *The Water Resources Administration Act*

Date of Issue: _____

Manitoba
Transportation and Infrastructure

File No.

APPLICATION FOR PERMIT
UNDER SECTION 15.2(1) OF
THE WATER RESOURCES ADMINISTRATION ACT W70

15.2(1) Unless the minister has issued a permit for the activity, a person must not do any of the following:

(a) construct, or otherwise place or establish any works or structures on, over, under, through or across provincial water infrastructure;
(b) place material on, or remove material from, provincial water infrastructure;
(c) perform any activity on or near provincial water infrastructure or use the provincial water infrastructure in a manner that
  (i) affects or has the potential to affect its structural integrity,
  (ii) degrades or has the potential to degrade its vegetation cover or any other covering material intended to limit erosion, or
  (iii) has the potential to impair its function.

Applicant Name: Samson Engineering Inc.

Mailing Address: 162-10th Street Brandon MB R7A 4E6

E-Mail Address: tdyck@samsonae.ca

Telephone: 204-727-0747

Signature: ____ **Date:** 7/7/2025

Name of provincial infrastructure: Boyne River

Legal description of land: Bridge crossing is located in the Rural Municipality of Dufferin on road 22W near the northwest corner of SW 28-6-4-W.

Description of works to be constructed: We will construct a new 80 long clear span CL 625 load rated bridge over the Boyne River, just east of Carman, Manitoba, and to the north of PTH #3. An existing 4-span 115 long timber bridge was damaged and removed between 2013 and 2014. However, the timber abutments and pier piles remained. The new bridge will consist of HP abutment and wingwall piles, steel pile caps, precast concrete backwall and wingwall panels, prefabricated steel super structure complete with a corrugated steel pan deck, and gravel wearing surface. As well as associated riprap and erosion control.

Description of activities to be undertaken: Install turbidity curtains to encompass the existing pier piles and our work along each bank prior to construction.

Demolition: During the winter we will use an excavator to remove and cut off the existing timber pier piles below grade and dispose of them offsite.

Construction: First, we will install the new HP abutment piles using a hydraulic pile driving

rig. Second, we will install steel pile caps and precast concrete backwalls and wingwalls. Third, we will install riprap for erosion control, and a portion of the backfill within the abutments. Fourth, we will crane in the prefabricated steel superstructure. Finally, we will complete the remaining roadway earthworks and install the road gravel.

Attachments (if any): Do_Not_Reuse_Original_Name_invalidOrEmpty

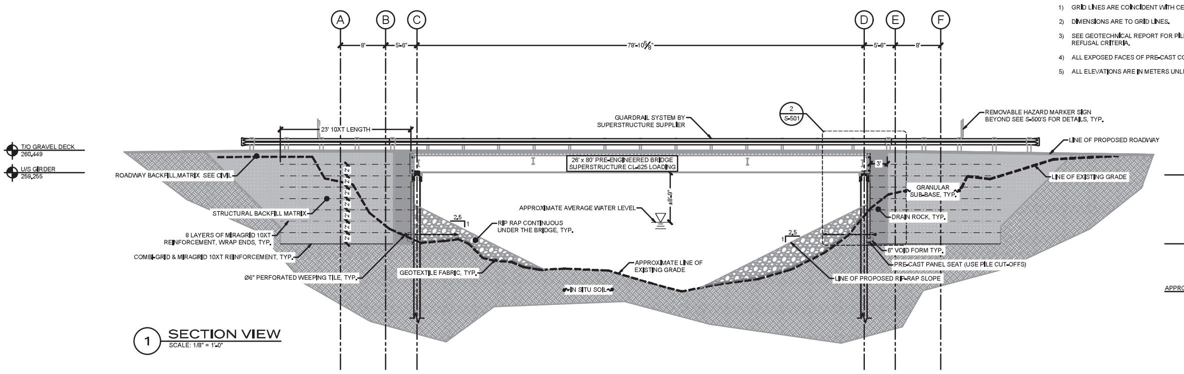
Date of construction: **From:** 11/1/2025 **To:** 6/30/2026

Duration of activity: **From:** **To:**

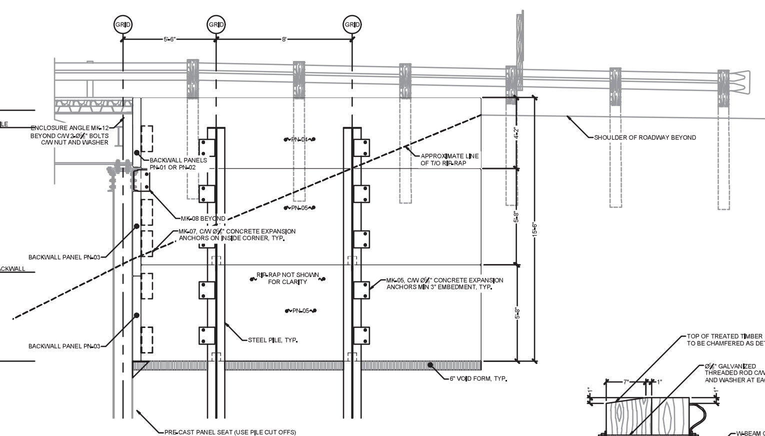
Figure 2. Site characteristics, McEachern Bridge crossing, July 8, 2021, with Boyne River discharge approximately 0.1 CMS and with hydraulics study reach bracketed in yellow (background image: CNES / Airbus 2024 via Google Earth).

NOTES:

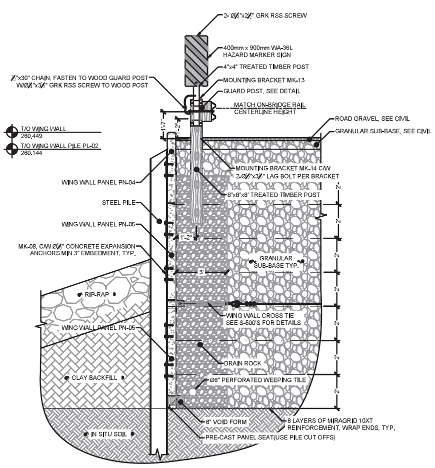
1) GRID LINES ARE COINCIDENT WITH CENTER OF PILES.
2) DIMENSIONS ARE TO GRID LINES.
3) SEE GEOTECHNICAL REPORT FOR PILE INFORMATION. DRIVING CRITERIA AND REFUSAL CRITERIA.
4) ALL EXPOSED FACES OF PRE-CAST CONCRETE TO BE FINISHED.
5) ALL ELEVATIONS ARE IN METERS UNLESS NOTED OTHERWISE.



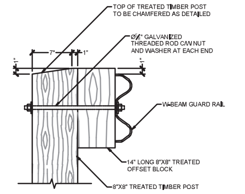
1 SECTION VIEW
SCALE: 1/8" = 1'-0"



2 TYP. WING WALL PROFILE
SCALE: 3/8" = 1'- 0"



3 TYP. WING WALL SECTION
SCALE: 3/8" = 1'- 0"



4 GUARD POST CONNECTION DETAIL
SCALE: 1-1/2" = 1'- 0"

NO	ISSUED	DATE
1	ISSUED FOR PERMIT	2025-07-03

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
Samson Engineering Inc.
No. 3050 Expiry: April 30, 2026

ISSUED FOR PERMIT

PROVINCE OF MANITOBA
P. M. DORN
Member 21651
REGISTERED PROFESSIONAL ENGINEER

NORTH ARROW

NOTE:
THE GENERAL CONTRACTOR MUST VERIFY ALL DIMENSIONS, DATUMS AND LEVELS NOTED ON THESE DRAWINGS WITH SITE CONDITIONS. ANY DISCREPANCIES, ERRORS OR OMISSIONS MUST BE REPORTED TO THE ARCHITECT OR ENGINEER PRIOR TO COMMENCING ANY RELATED WORK.

DO NOT SCALE DRAWINGS.

SAMSON
ARCHITECTURE | ENGINEERING

PROJECT LOCATION: CARMAN MB

PROJECT NAME: MUNICIPALITY OF DUFFERIN McEACHERN BRIDGE REPLACEMENT

DRAWING TITLE: SECTIONS

PROJECT NUMBER	DATE	
SEI2024-049	JULY 3, 2025	
DRAWING NUMBER	SHEET SIZE	SCALE
S-301	(24" X 36")	AS SHOWN
	DRAWN BY	CHECKED BY
	BJ	PD

General Environmental Requirements

Manitoba Transportation and Infrastructure

General Environmental Requirements

All construction shall be governed by the *Standard Construction Specification* set out in the contract and as modified in the Special Provisions.

Erosion and Sediment Control

1. Effective sediment and erosion control measures shall be installed before starting work near water to prevent the entry of sediment into any water course or wetland. Final erosion protection measures shall be installed progressively during the project.
2. Erosion and sediment control measures shall be inspected daily during the course of the work. Repairs or adjustments shall be made immediately if any damage is discovered or if these measures are not effective in controlling erosion and sedimentation.
3. Erosion and sediment control measures shall be maintained until complete revegetation of all disturbed areas is achieved. This period may extend beyond the duration of the construction contract, after which the monitoring of revegetation will be the responsibility of MI.
4. The duration of soil exposure shall be minimized and run-off shall be diverted away from the exposed soil.
5. Construction shall be halted during heavy rains with the exception of those works pertaining to erosion and sediment control.
6. Spoil piles shall not be placed within 30m of the ordinary high-water mark or as directed by the Engineer. Spoil piles shall be positioned and maintained in a manner not to increase sediment into the watercourse.

In-Water Work

7. No in-water work shall occur within fish bearing streams from April 1st to June 15th in Southern Manitoba or April 15th to June 30th in Northern Manitoba of any year to accommodate spawning and nursery periods, unless otherwise noted in the Special Provisions. Boundaries for Northern and Southern Manitoba are identified in the Manitoba Restricted Timing Activity Windows for the Protection of Fish and Fish Habitat (http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/mb-eng.html).
8. Duration of in-water work shall be minimized.
9. Where possible in-water works shall be conducted under low flow, frozen, or dry conditions to reduce impacts to fish and fish habitat.
10. If work must proceed under flowing water conditions, then the work site shall be isolated from the water while maintaining downstream flow around the isolated site unless otherwise directed by the engineer. Placement of clean rip rap does not need to be isolated.
11. Disturbance to the bed and banks of the watercourse or wetland shall be minimized and confined to the immediate work site. Unnecessary removal of riparian vegetation shall be avoided. The bed and banks of the watercourse or wetland shall be

restored to pre-disturbance conditions in accordance with the contract documents or as directed by the Engineer.

12. Unless otherwise specified in the contract documents site isolation methods shall be approved by the Engineer based on an accepted plan or design submittal.
13. Where a cofferdam shall be installed:
    - Cofferdams shall be designed to accommodate any expected high flows during the construction period.
    - Cofferdams shall be constructed using clean, non-erodible materials. Silts and clays are not acceptable materials for the surficial zone of the cofferdam.
    - Materials shall not be taken from below the ordinary high-water mark of any water body.
    - All spoil material and debris shall be removed from the isolated area prior to the removal of the cofferdam.
    - Exposed soil on the banks of the isolated area shall be stabilized before the cofferdam or sediment barrier is removed.
    - All cofferdam materials shall be removed and the watercourse shall be restored to its original shape and profile.
14. Any isolated site shall be de-watered using an appropriately sized screened pipe or other suitable method to ensure fish do not become entrained in the pipe. Pump intakes shall be sized and adequately screened to prevent debris blockage and fish mortality in accordance with the Freshwater Intake End-of-Pipe Fish Screen Guideline (Interim code of practice: End-of-pipe fish protection screens for small water intakes in freshwater (dfo-mpo.gc.ca)).
15. Sediment laden dewatering discharge shall be pumped to a stilling basin, filtering system or through dense terrestrial vegetation a minimum of 30 metres away from the watercourse before re-entry downstream of the construction area, or as noted in the Special Provisions. All pump discharge points shall be lined with clean rock or other acceptable flow dissipating applications in order to prevent erosion and the release of suspended sediments.

Rip Rap

16. Where rock is required for rock armouring or stabilization:
    - Rock rip rap placement shall not damage the bed and/or banks of the watercourse
    - Clean rocks shall be placed by machinery operating from outside of the water.
    - No rocks shall be obtained from below the ordinary high-water mark of any water body.

Revegetation

17. Immediately following construction and decommissioning, all disturbed areas shall be covered with local top soil and seeded. If local topsoil is not available, other organic based covers may be used to allow seed germination.
18. Do not plant the following undesirable/invasive species:
    - Smooth Brome (*Bromus inermis*)
    - Downy Brome (*Bromus tectorum*)

- Crested Wheatgrass (*Agropyron cristatum*)
- Reed Canary Grass (*Phalaris arundinacea*)
- Creeping Red Fescue (*Festuca rubra*)
- Kentucky Bluegrass (*Poa pratensis*)
- Birdsfoot Trefoil (*Lotus corniculatis*)
- Yellow Sweet Clover (Melilotus officinalis)
- White Sweet Clover (Melilotus alba)
- Dutch Clover (Trifolium repens)
- Alsike Clover (Trifolium hybridum)
- Alfalfa (Medicago sativa)
- Meadow Foxtail (Alopecurus pratensis)
- Tufted/Cow/Bird Vetch (Vicia cracca)
- Tall Fescue (Festuca arundinacea

Clearing, Grubbing and Brushing

19. Clearing and grubbing shall NOT be undertaken between April 1st and August 31st of any year unless otherwise specified in order to avoid disturbance to nesting birds and other wildlife species.
20. Where possible, grubbing shall not occur within 2 m (2.5 yards) of standing timber in order to prevent damage to root systems of adjacent standing trees and reduce the occurrence of blow down.
21. Timber stockpile sites shall be located within existing clearings or areas of non-merchantable timber. Stockpile sites shall not be located within 30 meters of a waterbody unless otherwise directed by the Engineer. All stockpiled material shall be removed by April 30 following clearing activities.
22. There shall be no bulldozing of woody debris into standing timber.
23. Existing trails, portages and other travel ways shall not be permanently blocked as a result of clearing and grubbing activities so as not to interfere with other users.
24. All cleared vegetation and debris shall be piled and/or compacted in windrows as close to the ground as possible in preparation for disposal. Windrows shall be no closer than 1 meter to the bush line.

Temporary Water Crossings/Access and Pads

25. Temporary in-water crossings, site access, and pads shall be completely removed prior to April 1st of any given year.
26. Temporary water crossings shall be constructed out of clean stone, rock or crushed rock in accordance with the contract documents or as accepted by the Engineer.
27. Culverts shall be hydraulically sized to accommodate expected flows and fish passage requirements for the duration of the installation. The culvert design must be signed and sealed by a qualified engineer.
28. The temporary crossings, site access and pads shall be removed in their entirety upon completion of the work.
29. Upon removal of the temporary crossings, site access or pads, the site shall be rehabilitated to pre-disturbance conditions.

Blasting Near a Watercourse

30. Use of explosives in or near fish habitat shall follow DFO's Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998) to avoid causing serious harm to fish. This guideline in available online at (Information archivée dans le Web | Information Archived on the Web (publications.gc.ca)).

31. The use of ammonium nitrate-fuel oil mixtures in or near water frequented by fish shall be avoided to prevent the deposit of toxic by-products (ammonia) in water frequented by fish.

Table 1. Setback distance (m) from centre of detonation of a confined explosive to fish habitat to achieve 100 kPa guideline criteria for various substrates.

Substrate Type	Weight of Explosive Charge (kg)							
	0.5	1	2	5	10	25	50	100
	Setback Distance (m)							
Rock	3.6	5.0	7.1	11.0	15.9	25.0	35.6	50.3
Frozen Soil	3.3	4.7	6.5	10.4	14.7	23.2	32.9	46.5
Ice	3.0	4.2	5.9	9.3	13.2	20.9	29.5	41.8
Saturated Soil	3.0	4.2	5.9	9.3	13.2	20.9	29.5	41.8
Unsaturated Soil	2.0	2.9	4.1	6.5	9.2	14.5	20.5	29.0

Machinery, Fuel Storage and Handling

32. All fuel handling and storage shall comply with Storage and Handling of Petroleum Products and Allied Products Regulation 188/2001 under The Dangerous Goods Handling and Transportation Act C.C.S.M. c. D12.

33. Storage of fuel stored in drums or containers of 230 L or less shall comply with the requirements of Manitoba Fire Code.

34. Designated Area(s) shall be established for fuel storage and handling, equipment cleaning, refueling and servicing. Any Designated Area shall be located at least 100m away from any waterbody or wetland and shall be kept clear of snow and/or miscellaneous materials to allow clear access, routine inspection and leak detection.

    - Machinery and equipment shall be washed, refueled and serviced in such a manner that wash water shall not contaminate surface water or be discharged into a surface water body.
    - In the event that a piece of equipment must be refueled or serviced outside a Designated Area, the fuel shall be transported in approved containers. Absorbent pads or other precautions, such as drip trays or a high density polyethylene (HDPE) groundsheet, shall be used to contain the fuel in the event of spillage.

- All mobile equipment that is not in use shall be parked within a Designated Area(s) where possible.

35. Tank vehicles used to deliver fuel to the work site and/or used to move fuel around the work site shall meet the requirements for highway tanks for the shipment of dangerous goods by road set out in CSA Standard B620-14, Highway Tanks and TC Portable Tanks for the Transportation of Dangerous Goods.
36. All fuel storage containers and tank vehicles shall be inspected daily for leaks and spillage. Damaged or leaking fuel storage containers shall be promptly removed from site. All used petroleum products and other regulated hazardous wastes shall be collected and disposed of at a licensed facility in accordance with applicable legislative requirements.
37. As refueling, fuel storage and equipment servicing sites are taken out of service, any required remediation shall be conducted, including the disposal of the contaminated material at an appropriate licensed facility to the satisfaction of the Department.
38. Machinery shall arrive on site in a clean condition and shall be maintained free of fluid leaks.

Emergency Response Plan for Spills

39. Due care and caution shall be taken to prevent spills, at all times.
40. An updated list of key contacts and telephone numbers for reporting spills, problems, etc., shall be kept on-site at all times.
41. A Workplace Hazardous Materials Information System (WHMIS) file shall be maintained on-site for all hazardous materials at the work area. Prior to commencement of the Work, Material Safety Data Sheets (MSDS) shall be available on-site for all hazardous materials to be used. An updated spill response and containment plan for each dangerous good/hazardous waste shall be maintained in the work area at all times.
42. A spill kit or sufficient supply of materials for clean-up or spill containment, for example absorbent material, high density HDPE groundsheets and absorbent oil booms when working near water, shall always be available on site. If necessary, additional material shall be made available on short notice.
43. All personnel responsible for the handling of dangerous goods and hazardous wastes shall be familiar with the on-site response and containment plan.
44. Any reportable spills shall be reported to the Accident Reporting Line at (204) 944-4888 pursuant to Manitoba Regulation 439/87.
45. All spills shall be reported to the Engineer within 24 hours whether it was necessary to report the spill to Manitoba Sustainable Development or not. The spill report shall include the following:
    - personnel responding to the spill
    - material spilled
    - cause of spill
    - estimated amount of material spilled
    - estimated area and volume of soil affected by the spill

- cleanup action undertaken
- means used to contain, transport and dispose of the materials involved

46. In the event that there is a spill onto the ground surface from any piece of equipment, such as a broken hydraulic hose, the entire affected area shall be cleaned up and all contaminated soil shall be appropriately disposed of offsite at an appropriate licensed facility. Such events shall be reported immediately to the Engineer and proof of appropriate disposal provided. Contractor field staff trained in spill containment and management shall always be on site.

Disposal

47. Dispose of all used petroleum products and other regulated hazardous wastes in accordance with the Manitoba "Dangerous Goods Handling and Transportation Act".
48. Dispose of non-reusable demolition and construction debris at a waste disposal ground operating under the authority of a permit pursuant to Manitoba Regulation 150/91 respecting Waste Disposal Grounds. Provide proof of appropriate disposal.
49. Any waste and non-salvageable demolition materials removed from the work site shall be stabilized above the Ordinary High-Water Mark to prevent them from entering any watercourse and/or transported to a designated disposal site.
50. Dispose of all sewage and septage from on-site sanitary facilities in accordance with Manitoba Regulation 83/2003, respecting Onsite Wastewater Management Systems Regulation. Provide proof of appropriate disposal.

Dust and Particulate Control

51. All work shall be conducted in a manner that minimizes the raising of dust from construction operations.
52. Only water or approved dust suppressants shall be used for dust control. The use of waste petroleum or petroleum by-products is not allowed.
53. All vehicles used to haul materials to or from the work site shall have the load covered with a tarpaulin cover during transport to prevent material from falling out and creating dust.
54. All material stock piles or spoil piles shall be maintained as to minimize release of particulate matters. This may include, but is not limited to, covering or stabilization of material stockpiled at the work site as required.

Noise and Noise Limitations

55. All plant and equipment supplied for use on the Project shall be effectively "sound-reduced" by means of proper silencers, mufflers, acoustic linings, acoustic shields or acoustic sheds.
56. Noise By-laws of the adjacent communities and municipal authorities shall be complied with.

57. Any operation of plant or equipment outside the hours as regulated by local government shall require an exemption in writing.

Wildlife

58. Construction camps and worksites shall be kept clean and tidy. All food and garbage waste shall be stored in a secure manner to prevent access and exposure to local wildlife. All food and garbage waste shall be disposed of at an area which has been designated as an appropriate waste disposal site.
59. Nuisance wildlife shall be immediately reported to Manitoba Sustainable Developments local District Office and the Engineer.

Heritage Resources

60. Work shall immediately cease and be suspended at the location where archaeological or historic artifacts are encountered during construction activities. The discovery shall be reported to the Engineer and work at this location shall not resume unless otherwise authorized by the Engineer.

    Work at the location shall be suspended until a Historic Resource Consultant can assess archaeological or historic artifacts that are encountered, and mitigation measures are confirmed with the Manitoba Historic Resources Branch.

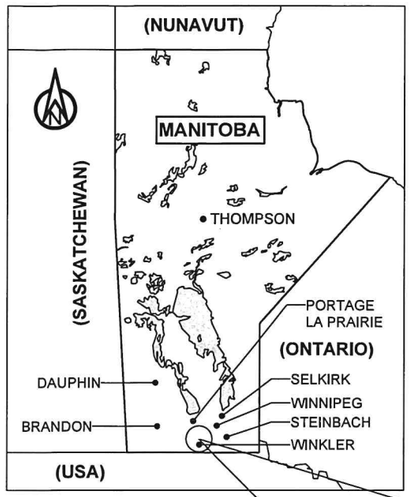
Other

61. The disturbed area shall be minimized to the greatest extent possible and limited to the Department's right-of-way unless otherwise permitted by the Department.
62. Utilization of ditches as a heavy-machinery transportation corridor shall be minimized to the greatest extent possible.
63. Existing drainage patterns shall not be altered.
64. Should there be a need for a water source for compaction or dust suppression or related activity, a temporary authorization for any withdrawal greater than 25,000 litres or 550 gdp shall be required from the Manitoba Sustainable Development Water Use Licensing Section. Contact the Manager of Water Use Licensing Section, at (204) 945-3983 prior to the commencement of the work.
65. Any asphalt plant and temporary asphalt plant sites shall have the necessary licence/permit and shall be operated in accordance with the terms and conditions on their licence/permit.

APPENDIX B

SHOP DRAWINGS

ARMTEC
JANUARY 16, 2026



KEY PLAN
SCALE: NTS

APPROXIMATE LOCATION OF SITE

ENGINEER	OWNER	ARMTEC CUSTOMER
SAMSON ENGINEERING INC. 162 - 10TH STREET BRANDON, MB R7A 4E6 TEL: 204-727-0747	**RM OF DUFFERIN** MANITOBA	**CANOE PROCUREMENT GROUP** 2510 SPARROW DRIVE NISKU, AB T9E 8N5 TEL: 780-955-4083

RM OF DUFFERIN
MCEACHERN BRIDGE REPLACEMENT

CARMAN, MB
24384 LONG x 7925 WIDE BRIDGE-IN-A-BOX
DOUBLE LANE BRIDGE
ARMTEC PROJECT #25-523

ISSUED FOR APPROVAL
NOT FOR CONSTRUCTION

THIS DRAWING HAS BEEN REVIEWED BY SAMSON ENGINEERING INC. AND IS ACCEPTABLE PROVIDED IT MEETS ALL REQUIREMENTS OF THE DRAWINGS & SPECIFICATIONS.
PER _____ DATE Jan 19, 2026

CANADA'S BEST MANAGED COMPANIES

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DRAWING INDEX

DRAWING #	DRAWING TITLE	REV. DATE	REV #
25-523-001	COVER PAGE	2026-01-16	A
25-523-002	BRIDGE PLAN, ELEVATION AND GENERAL NOTES	2026-01-16	A
25-523-003	BRIDGE CROSS SECTION, END OF GIRDER AND OTHER DETAILS	2026-01-16	A
25-523-004	BEARING PLATE AND ANCHOR ROD LAYOUT & DETAILS	2026-01-16	A
25-523-005	SHOP SPLICE CONNECTION DETAILS	2026-01-16	A
25-523-006	BRIDGE INSTALLATION GUIDELINE	2026-01-16	A

GENERAL NOTES

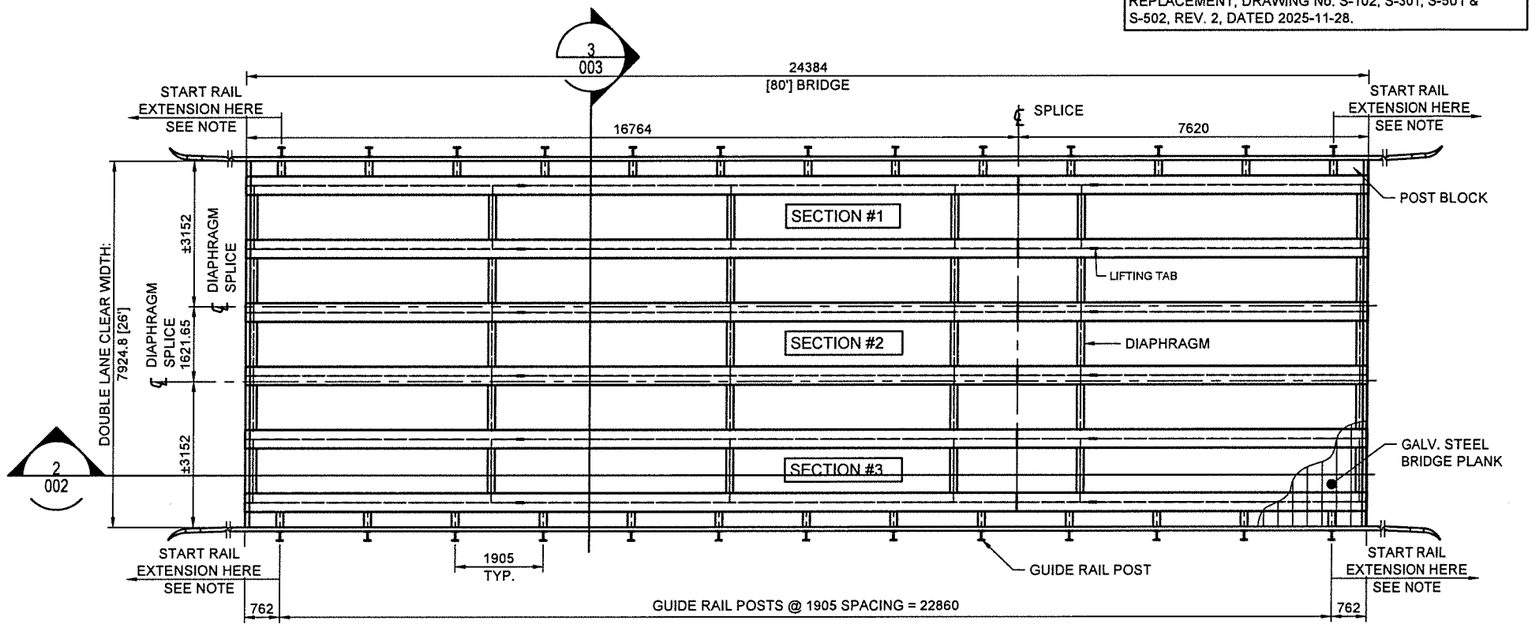
1. DESIGN IN GENERAL CONFORMANCE WITH THE CANADIAN HIGHWAY BRIDGE DESIGN CODE, CAN/CSA S6-19, EXCEPT NOTED OTHERWISE.
2. MATERIALS SHALL CONFORM TO THE FOLLOWING:
   - 2.1. STRUCTURAL STEEL: CAN/CSA-G40.20-04/G40.21-04 GRADE 350W
   - 2.2. STEEL BRIDGE PLANK: ASTM A1011 GRADE 50 ksi
   - 2.3. ANGLES AND MISC. PLATES: GRADE 350W
   - 2.4. STRUCTURAL BOLTS: 7/8" (22 mm) ASTM A325 TYPE 1
   - 2.5. ANCHOR ROD: ASTM F1554 GRADE 55 OR APPROVED EQUIVALENT.
   - 2.6. LAMINATED ELASTOMERIC PAD SHALL MEET THE REQUIREMENTS OF CAN/CSA S6-19.
   - 2.7. PROTECTIVE COATING
     - 2.7.1. STRUCTURAL STEEL: HOT-DIP GALVANIZED, 915 g/m² (Z915) ZINC COATING MASS CONFORMING TO ASTM A123.
     - 2.7.2. STEEL BRIDGE PLANK: GALVANIZED, 915 g/m² (Z915) ZINC MASS CONFORMING TO ASTM A123.
     - 2.7.3. ANGLES AND MISC. PLATES: HOT-DIP GALVANIZED CONFORMING TO ASTM A123.
     - 2.7.4. BOLTS: HOT-DIP GALVANIZED OR MECHANICALLY DEPOSITED, CONFORMING TO ASTM A153.
     - 2.7.5. NUTS: HOT-DIP GALVANIZED OR MECHANICALLY DEPOSITED, CONFORMING TO ASTM A153.
     - 2.7.6. ANCHOR ROD: HOT-DIP GALVANIZED OR MECHANICALLY DEPOSITED, CONFORMING TO ASTM F1554.
     - 2.7.7. BOLTS AND NUTS SHALL BE COATED USING THE SAME ZINC COATING PROCESS (HOT-DIP OR MECHANICALLY DEPOSITED PROCESS).
     - 2.7.8. REPAIR OF DAMAGED GALVANIZED COATING SHALL BE DONE IN ACCORDANCE WITH ASTM A780.
3. ALL STRUCTURAL BOLTS TO BE INSTALLED PER TURN-OF-NUT METHOD.
4. DESIGN LIVE LOAD: CL-625 TRUCK. MAXIMUM LIVE LOAD DEFLECTION = SPAN/480.
5. WELDING ELECTRODE SHALL BE E49XX AND MEET THE REQUIREMENTS OF CSA W59. SHOP WELDING SHALL USE GAS METAL ARC WELDING OR FLUX CORED ARC WELDING PROCESS.
6. GUIDE RAIL SYSTEM MEETS TL-1 LOADING REQUIREMENTS.
7. FIELD WEDLING TO BE PERFORMED BY CWB CERTIFIED WELDER.
8. FIELD INSTALLATION, INSPECTION AND QA/QV ARE BY OTHERS.

GENERAL BRIDGE DATA	
ITEM	DESCRIPTION
BRIDGE LENGTH	24384
BRIDGE SPAN	24044
BRIDGE WIDTH	7925
*OVERALL DEPTH	1253 AT CENTRE OF BRIDGE
STEEL BRIDGE PLANK	108x305x4.55 [4 1/4"x12"x7 GA.] GALV.
WEARING SURFACE	150mm GRAVEL
GIRDER SIZE	W1000x321 [W40x215]
DIAPHRAGM SIZE	W460x52 [W18x35]
GUIDE RAIL POST	W200x27 [W8x18]
POST BLOCK	W460x52 [W18x35]
LIVE LOAD	CL-625 TRUCK
TOTAL BRIDGE WEIGHT	TBD
MAX. SECTION WEIGHT	TBD
* TOP OF RUNNING SURFACE TO UNDERSIDE OF GIRDER	

SUPERSTRUCTURE LOAD AT BEARING / ABUTMENT kN (UNFACTORED)						
LOAD TYPE	EXTERIOR GIRDER		INTERIOR GIRDER		TOTAL AT ABUTMENT	
	P_V	H_T	P_V	H_T	P_V	H_T
DEAD LOAD	124.16		126.81		755.55	
LIVE LOAD (LL)	266.17		266.17		844.89	
LIVE LOAD (LL) WITH DLA	346.02		346.02		1098.36	
WIND LOAD (WL)	15.43	4.88	15.43	4.88	92.56	29.27

NOTE:
1. P_V: VERTICAL LOAD
2. H_T: HORIZONTAL LOAD TRANSVERSE TO THE STRUCTURE
3. DLA: DYNAMIC LOAD ALLOWANCE

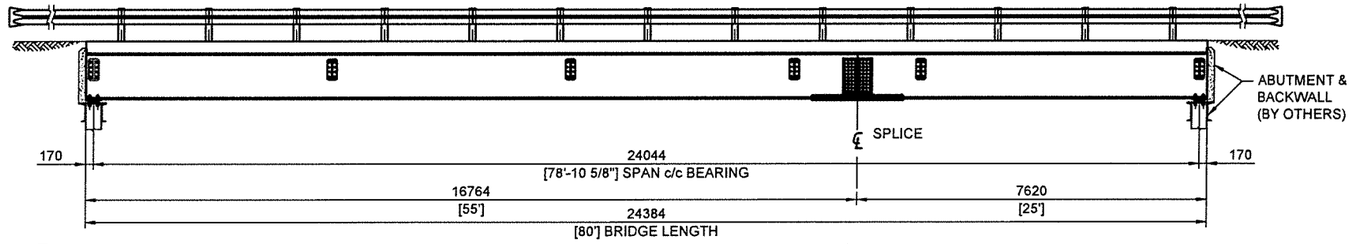
DRAWINGS BASED ON SAMSON ENGINEERING INC. DRAWINGS FOR RM OF DUFFERIN, McEACHERN BRIDGE REPLACEMENT, DRAWING No. S-102, S-301, S-501 & S-502, REV. 2, DATED 2025-11-28.



1 002 BRIDGE PLAN
SCALE 1:125

RAIL EXTENSION NOTE
(ALL GUIDE RAIL TO BE SUPPLIED LOOSE):
7620 STRAIGHT, 3810 @ 45720 RADIUS (CONVEX) & FLARED END

NOTE: POSTS THAT ARE OUTSIDE THE BRIDGE LENGTH ARE BY OTHERS



2 002 BRIDGE ELEVATION
SCALE 1:125

NOTE:
1. WELDING OF GIRDER TOP FLANGES AT SPLICE CONNECTION SHALL BE DONE IN THE SHOP.
2. TIGHENING OF BOLTS AT THE SPLICED LOCATIONS SHALL BE INSPECTED ON SITE BY OWNER'S ENGINEER.

REV.	REVISION NOTE	BY	CK'D	REV'D	DATE
A	ISSUED FOR APPROVAL	CG	-	AR	2026-01-16

ISSUED FOR APPROVAL
NOT FOR CONSTRUCTION

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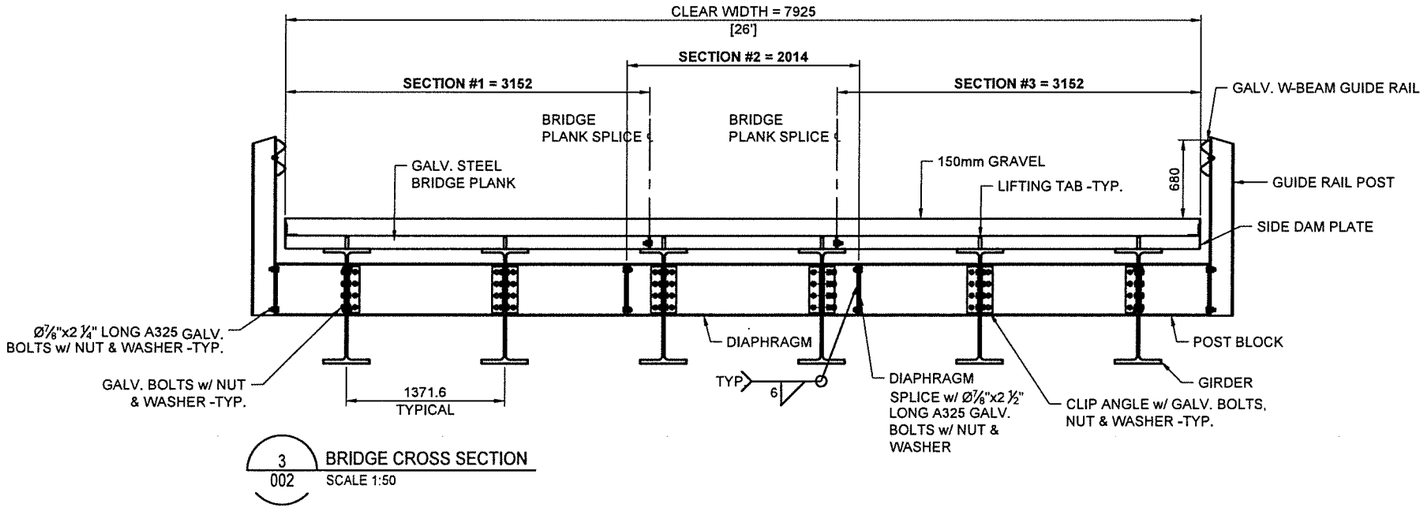
APPROVALS		DATE
DESIGN BY	AR	2026-01-08
DESIGN CHECK	SM	2026-01-08
DRAFT BY	CG	2026-01-09
DRAFT CHECK	-	-

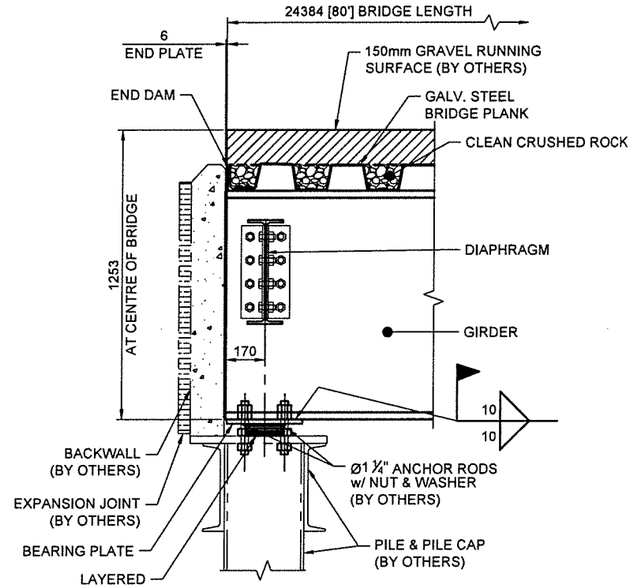
CUSTOMER: CANOE PROCUREMENT GROUP
PROJECT NAME: McEACHERN BRIDGE REPLACEMENT, CARMAN, MB
DRAWING TITLE: BRIDGE PLAN, ELEVATION AND GENERAL NOTES

SALES ORDER NO.	SHEET NO.	SCALE	PROJECT NO.	DRAWING NO.
373853	2 OF 6	AS NOTED	25-523	002

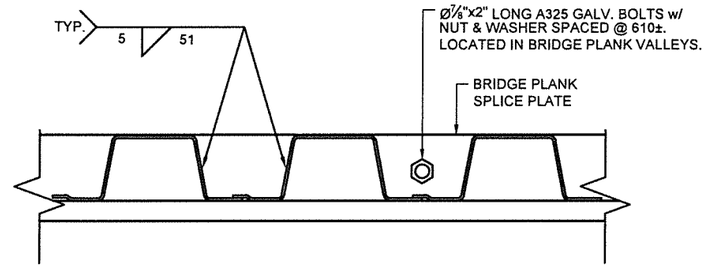


3 / 002 BRIDGE CROSS SECTION
SCALE 1:50

NOTE:
CONNECTION OF THE END PLATE TO THE CONCRETE BACKWALL IS BY OTHERS



4 / 003 END OF GIRDER DETAIL
SCALE 1:25



5 / 003 BRIDGE PLANK SPLICE DETAIL
SCALE 1:10

APPROXIMATE HANDLING WEIGHTS (kg) (FULL BRIDGE LENGTH)	
SECTION 1	TBD
SECTION 2	TBD
SECTION 3	TBD

REV.	REVISION NOTE	BY	CK'D	REV'D	DATE
A	ISSUED FOR APPROVAL	CG	-	AR	2026-01-16

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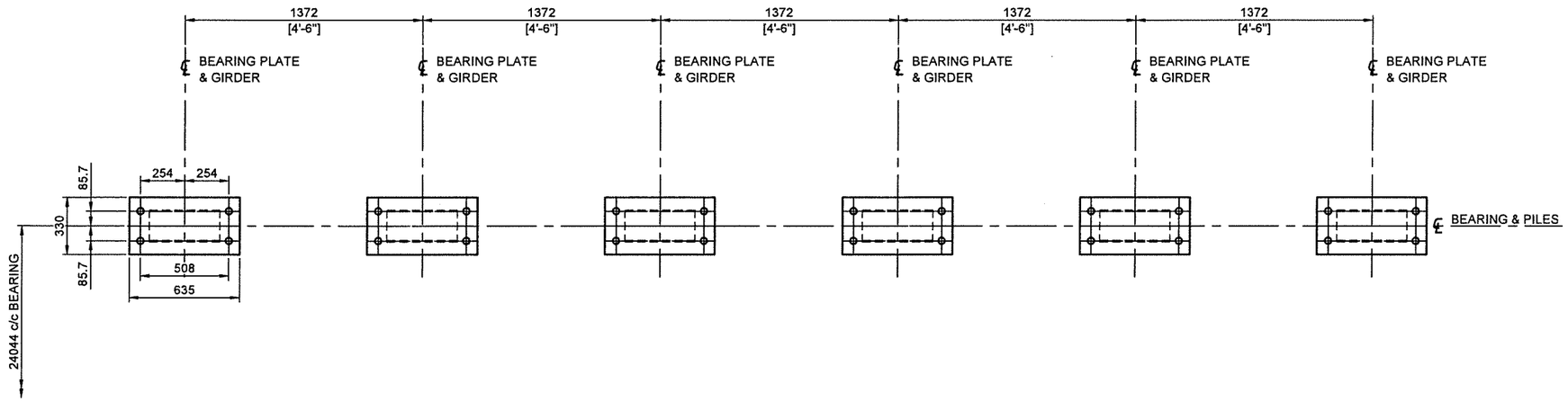
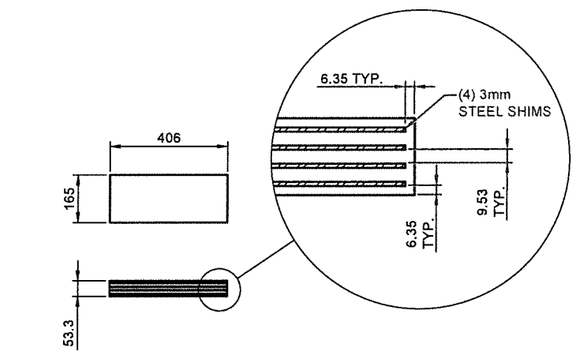
APPROVALS		DATE
DESIGN BY	AR	2026-01-08
DESIGN CHECK	SM	2026-01-08
DRAFT BY	CG	2026-01-09
DRAFT CHECK	-	-

CUSTOMER: CANOE PROCUREMENT GROUP
PROJECT NAME: McEACHERN BRIDGE REPLACEMENT, CARMAN, MB
DRAWING TITLE: BRIDGE CROSS SECTION, END OF GIRDER AND OTHER DETAILS

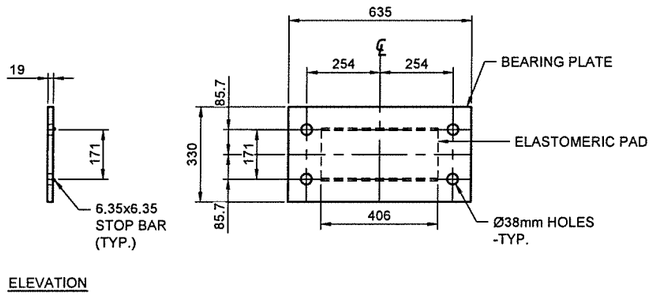
SALES ORDER NO.	SHEET NO.	SCALE	PROJECT NO.	DRAWING NO.
373853	3 OF 6	AS NOTED	25-523	003



6 004 BEARING PLATE AND ANCHOR ROD LAYOUT (FIXED END)
SCALE 1:30

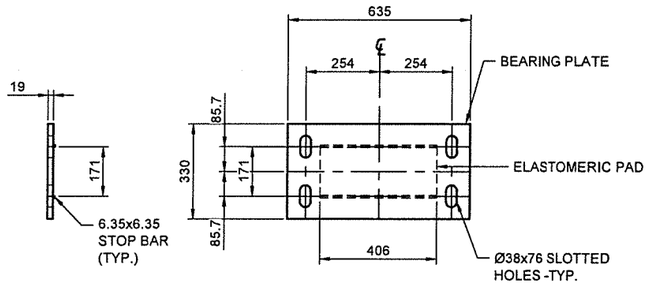


9 004 LAMINATED ELASTOMERIC PAD DETAIL
SCALE 1:20



ELEVATION

7 004 BEARING PLATE DETAIL (FIXED END)
SCALE 1:20



ELEVATION

8 004 BEARING PLATE DETAIL (EXPANSION END)
SCALE 1:20

REV.	REVISION NOTE	BY	CK'D	REV'D	DATE
A	ISSUED FOR APPROVAL	CG	-	AR	2026-01-16

ISSUED FOR APPROVAL
NOT FOR CONSTRUCTION

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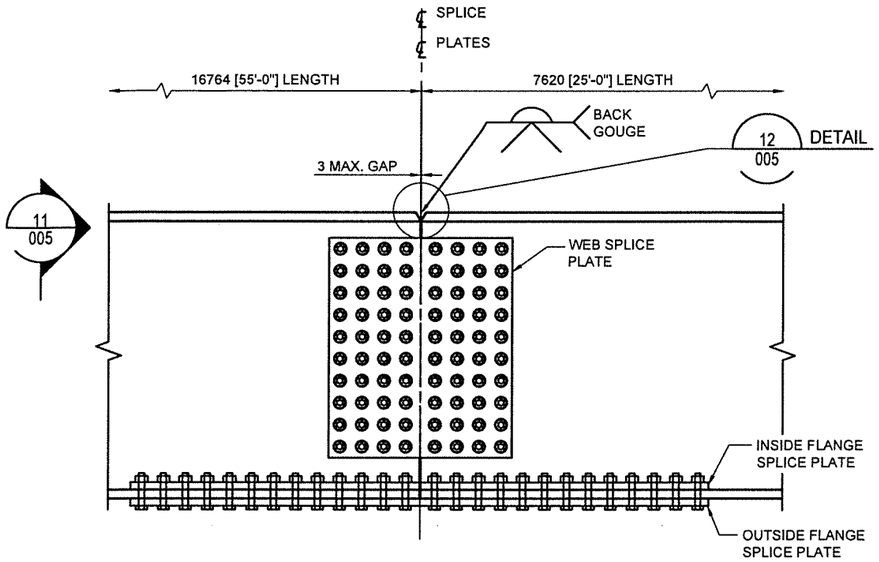
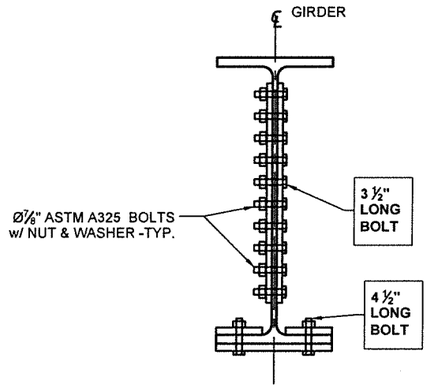
APPROVALS		DATE
DESIGN BY	AR	2026-01-08
DESIGN CHECK	SM	2026-01-08
DRAFT BY	CG	2026-01-09
DRAFT CHECK	-	-

CUSTOMER: CANOE PROCUREMENT GROUP
PROJECT NAME: McEACHERN BRIDGE REPLACEMENT, CARMAN, MB
DRAWING TITLE: BEARING PLATE AND ANCHOR ROD LAYOUT & DETAILS

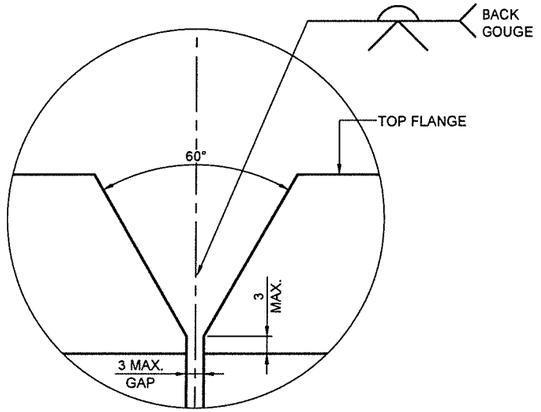
SALES ORDER NO.	SHEET NO.	SCALE	PROJECT NO.	DRAWING NO.
373853	4 OF 6	AS NOTED	25-523	004



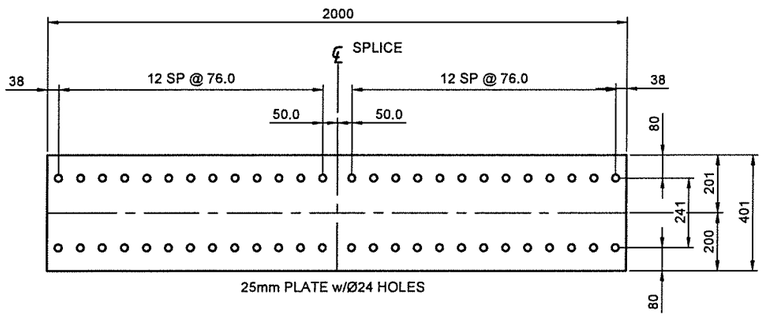
10 005 GIRDER SPLICE DETAIL
SCALE 1:20



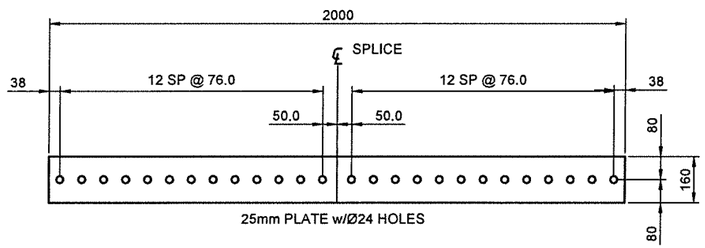
11 005 SECTION
SCALE 1:20



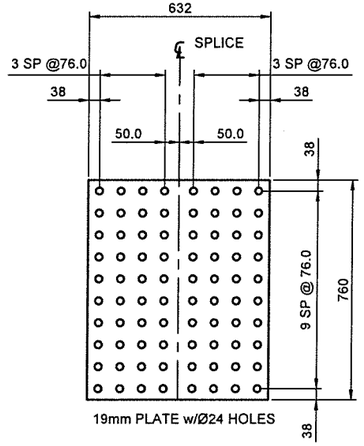
12 005 TOP FLANGE JOINT PREPARATION DETAIL
SCALE 1:20



13 005 GIRDER FLANGE SPLICE PLATE DETAIL (OUTSIDE)
SCALE 1:20



14 005 GIRDER FLANGE SPLICE PLATE DETAIL (INSIDE)
SCALE 1:20



15 005 GIRDER WEB SPLICE PLATE DETAIL
SCALE 1:20

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APPROVALS		DATE
DESIGN BY	AR	2026-01-08
DESIGN CHECK	SM	2026-01-08
DRAFT BY	CG	2026-01-09
DRAFT CHECK	-	-

CUSTOMER: CANOE PROCUREMENT GROUP
PROJECT NAME: McEACHERN BRIDGE REPLACEMENT
CARMAN, MB
DRAWING TITLE: SHOP SPLICE CONNECTION DETAILS

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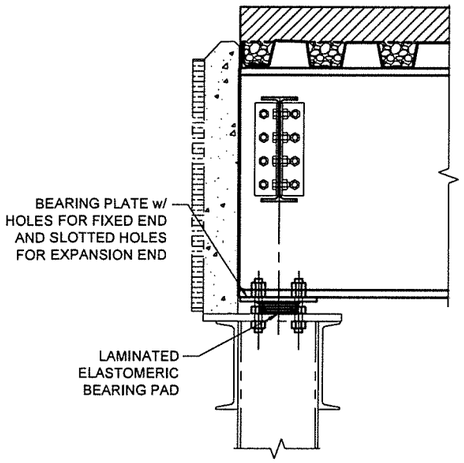
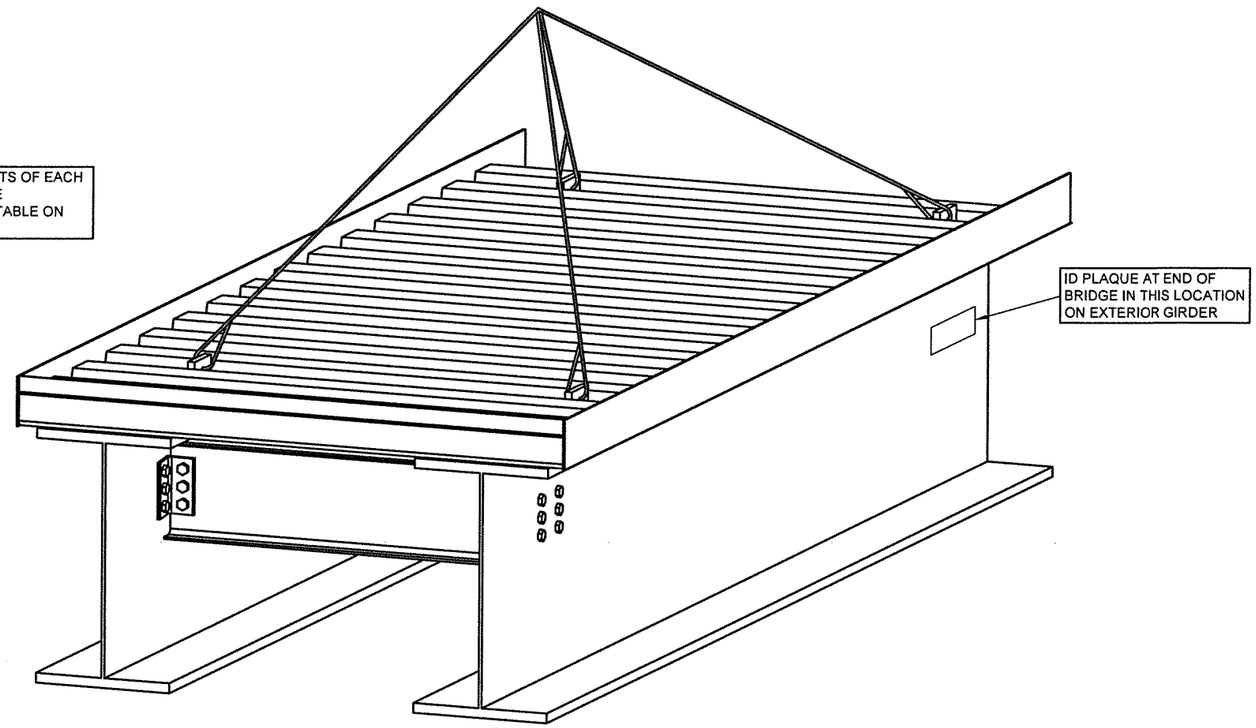


FOR LIFTING PURPOSES, THE WEIGHTS OF EACH BRIDGE SECTION ARE SHOWN IN THE APPROXIMATE HANDLING WEIGHTS TABLE ON SHEET 003.



INSTALLATION GUIDELINE:

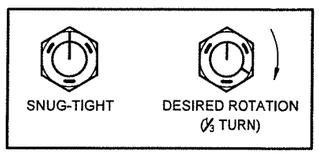
THE FOLLOWING INSTALLATION NOTES PROVIDE A GENERAL BRIDGE INSTALLATION GUIDELINE OF KEY STEPS AND IS NOT MEANT TO BE ALL INCLUSIVE. IT IS THE INSTALLATION CONTRACTOR'S RESPONSIBILITY TO ENSURE THE BRIDGE IS INSTALLED AS REQUIRED BASED ON THE PROJECT REQUIREMENTS.

1. INSTALL ANCHOR BOLTS IN ABUTMENT AS SHOWN IN DRAWING.
2. PLACE LAMINATED ELASTOMERIC BEARING PADS ON ABUTMENTS AS SHOWN IN DRAWINGS. PLACE ALL LOOSE BASE PLATES ONTO PADS ON THE BRIDGE ABUTMENTS.
3. ENSURE PLATES ARE AT THE CORRECT ELEVATION, AND THAT THERE IS GOOD BEARING BETWEEN THE ABUTMENT AND THE BEARING PAD. IF NECESSARY, USE NON-SHRINK GROUT UNDER THE ENTIRE BEARING PAD IN ORDER TO ASSURE 100% BEARING AND PROPER FINAL ELEVATION.
4. LIFT THE BRIDGE IN ACCORDANCE WITH THE FOLLOWING:
   - 4.1. LIFTING FROM THE PRE-INSTALLED LIFTING LUGS IS THE PREFERRED METHOD. LIFT ANGLE SHALL NOT BE MORE THAN 45°. MAXIMUM LIFT CAPACITY IS 10,800 kg PER LUG.
   - 4.2. USE A MINIMUM OF FOUR (4) LIFTING POINTS PER BRIDGE SECTION. IT IS RECOMMENDED TO LIFT FROM POINTS THAT ARE AT LEAST 1/4 TO 1/3 OF THE SPAN LENGTH FROM THE ENDS OF THE BRIDGE. LIFTING CAN ALSO BE PERFORMED FROM THE ENDS OF THE BRIDGE AT THE BASE PLATE LOCATIONS.
5. SET THE BRIDGE ONTO THE LOOSE BASE PLATES.
6. SECTIONS SHALL BE SET IN NUMERICAL ORDER AS SHOWN ON DRAWING WHERE APPLICABLE.
7. AFTER PLACING THE BRIDGE ONTO THE BASE PLATES, ADJUSTMENTS SHOULD BE MADE TO THE BRIDGE POSITION IN ORDER TO PLACE THE BRIDGE AS SHOWN ON THE SHOP DRAWINGS. ONE END OF THE BRIDGE IS DESIGNATED AS THE EXPANSION END AND THIS END MUST HAVE SUFFICIENT SPACE FOR EXPANSION AS DETAILED ON THE DRAWINGS.
8. AFTER WELDING PLATES TO BRIDGE, PLACE NUTS ONTO ANCHOR BOLTS. USE ONE WASHER AND TWO NUTS FOR EACH ANCHOR BOLT UNLESS DETAILED OTHERWISE. ONE END OF THE BRIDGE IS DESIGNATED THE FIXED END. THIS END SHALL HAVE BOTH NUTS INSTALLED TIGHT. THE OTHER END IS DESIGNATED AS THE EXPANSION END AND SHALL HAVE THE FIRST NUT INSTALLED SO THAT THERE IS A 6.4mm GAP BETWEEN NUT AND PLATE AND THE SECOND NUT INSTALLED TIGHT.
9. ALL STRUCTURAL BOLTS TO BE INSTALLED PER TURN-OF-NUT METHOD FOLLOWING CSA S6-14 (CHBDC) CL A10.1.6.7.
10. INSTALL GUIDERAIL SYSTEMS AS PER SHOP DRAWINGS.

TURN-OF-NUT TIGHTENING GUIDELINE:

1. ALIGN THE HOLES IN A JOINT, PLACE SUFFICIENT NUMBER OF BOLTS AND SNUG-TIGHT THE JOINT TO BRING ASSEMBLY PARTS INTO FIRM CONTACT.
2. FOLLOWING THE SNUGGING OF ALL BOLTS, EACH BOLT IN THE JOINT SHALL BE FURTHER TIGHTENED BY APPLICABLE AMOUNT OF RELATIVE ROTATION AS SHOWN BELOW:

NUT ROTATION FROM SNUG-TIGHT CONDITION		
BOLT LENGTH	OUTER FACE OF BOLTED PARTS	TURN FROM SNUG
UP TO FOUR DIAMETERS (4D)	BOTH FACES FLAT (NORMAL TO THE BOLT AXIS)	1/3
OVER 4 DIAMETERS (4D) AND NOT EXCEEDING 8 DIAMETERS (8D)	AS ABOVE	1/2



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DESIGN BY	AR	2026-01-08
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DRAFT BY	CG	2026-01-09
DRAFT CHECK	-	-

CUSTOMER: CANOE PROCUREMENT GROUP
PROJECT NAME: McEACHERN BRIDGE REPLACEMENT, CARMAN, MB
DRAWING TITLE: BRIDGE INSTALLATION GUIDELINE

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