# APPENDIX I
# R.V. Anderson Associates Limited Structural Assessments

# Dixie-Dundas Flood Mitigation

## Dixie Road Bridge Feasibility Report

Prepared for:
Matrix Solutions Inc.



**RVA 184319**

**September 13, 2023**

R.V. Anderson Associates Limited
2001 Sheppard Avenue East Suite 300
Toronto Ontario M2J 4Z8 Canada
Tel 416 497 8600 Fax 855 833 4022
www.rvanderson.com

September 13, 2023 RVA 184319

Matrix Solutions Inc.
6865 Century Ave, Unit 3001
Mississauga, ON L5N 7K2

**Attention: Ms. Amanda McKay, P.Eng., PMP**

Dear Ms. McKay:

Re: Dixie Road Bridge Feasibility Review

**R.V. Anderson Associates Limited (RVA)** is pleased to submit this Technical Memorandum draft to **Matrix Solutions Inc. (Matrix)** regarding the above project.

The purpose of this Technical Memorandum is to assess the best replacement structure for the Dixie Road Bridge. This includes evaluating the optimal structure as well as the required road work associated with said structure for each of the proposed channel options provided by Matrix. RVA is well suited to undertake this project since we can leverage our experience in structural and road design. Our team understands the project requirements for design and is confident in that our recommendations provide the best option with the information available.

Please do not hesitate to contact the undersigned if you have any further questions or comments.

Yours very truly,

**R.V. ANDERSON ASSOCIATES LIMITED**

David O'Sullivan, P.Eng., PMP
Principal

# Dixie-Dundas Flood Mitigation
# Dixie Road Bridge Feasibility Report

## TABLE OF CONTENTS



### LIST OF TABLES

# 1.0 BACKGROUND INFORMATION

An extreme rainfall event flooded the east side of the City of Mississauga on July 8, 2018. In coordination with Matrix Solutions Incorporated (Matrix) and R.V. Anderson Associates Limited (RVA), the City of Mississauga is carrying out a Feasibility Study to determine options for preventing future flooding upstream of the bridge.

Matrix have prepared three potential alternatives for the approach to flood mitigation:

**Option 1:** Channel conveyance with minimized footprint.

**Option 2:** Channel conveyance by making room for the creek.

**Option 3:** Flood containment with mitigation for upstream impacts.

RVA was tasked with proposing a conceptual replacement structure for Dixie Road Bridge for each of those options. The following sections will present the proposed replacement structure for each of the options. The span configuration for the proposed bridge structure, hydraulic improvements at the structure location, new road profile associated with each bridge option and their impacts, constructability for each option, and structure costs will be presented.

# 2.0 RECOMMENDED SPAN CONFIGURATION

The following section will present the three (3) proposed bridge span configuration to replace the existing Dixie Road Bridge crossing the Little Etobicoke Creek. Preliminary profiles for all three (3) options can be found in APPENDIX A.

## 2.1 Option 1 – Minimize footprint

The proposed span configuration for Option 1 is a 26 metres single-span precast prestressed concrete girder bridge. NU1600 girders would be used for the superstructure, bringing the depth of the new superstructure to approximately 2.3 metres. The bottom of the new superstructure would be at an elevation of approximately 123.7 metres. This elevation established by Matrix Solutions would provide a 0.5 metre freeboard for climate change resiliency above the regional flood level of 123.2 metres and would meet current CAN/CSA-S6-14 requirements. This option would raise the current road crown vertical alignment, at the Dixie Road Bridge location, by approximately 1.7 metres.

## 2.2 Option 2 – Making room for the creek

The proposed span configuration for Option 2 is a 45 metres two-span precast prestressed concrete girder bridge. NU900 girders would be used for the superstructure, bringing the depth of the new superstructure to 1.6 metres. The bottom of the new superstructure would be located at elevation 123.1 metres. This elevation established by Matrix Solutions would provide a 0.4 metre freeboard for climate change resiliency above the regional flood level of 122.7 metres and would meet current CAN/CSA-S6-14 requirements. This option would raise the current alignment, at the Dixie Road Bridge location, by approximately 0.4 metres. This option would require the construction of a pier and foundation in the proposed new larger hydraulic channel.

## 2.3 Option 3 – Flood containment with mitigation for upstream impacts

The proposed span configuration for Option 3 is a 28 metres single-span precast prestressed concrete girder bridge. NU1600 girders would be used for the superstructure, bringing the depth of the new superstructure to 2.3 metres. The bottom of the new superstructure would be located at elevation 124.5 metres. This elevation established by Matrix Solutions would provide a 0.4 metre freeboard for climate change resiliency above the regional flood level of 124.1 metres and would meet current CAN/CSA-S6-14 requirements. This option would raise the current alignment, at the Dixie Road Bridge location, by approximately 2.5 metres.

# 3.0 HYDRAULICS

The following section will explain how all three (3) options are improving the hydraulic opening at the Dixie Road Bridge location.

Like previously shown in Section 2, all three (3) options would replace the existing structure with a new structure with a longer span than the current one. Assuming 2:1 slope from the bridge abutment down to the bottom of the new improved channel, all three options would provide a significant increase to the hydraulic opening compared to the existing conditions. Table 3-1 summarizes the water elevation for all three (3) options during a 1-in-100 years storm, for the Regional Flood Level, and the elevation at the bottom the superstructure. These elevations were provided by Matrix Solution Inc. based on the hydraulic modelling of the three (3) conceptual designs.

**Table 3.1 – Critical water level for each option**

| | 1-in-100 years Level | Regional Flood Level | Bottom of superstructure |
|---|---|---|---|
| **Option 1** | 122.1 m | 123.2 m | 123.7 m |
| **Option 2** | 122.0 m | 122.7 m | 123.1 m |
| **Option 3** | 123.1 m | 124.1 m | 124.5 m |

Option 1, with a 26 metres span, would result in an opening of approximately 74.8 $m^2$. With a 45 metres two-span structure, Option 2 would result in the largest hydraulic opening of all options with an area of 113.4 $m^2$. This area is divided in two sections, one for the smaller channel at the bottom of the creek which would be 13.4 $m^2$ for normal water flows, then an additional 100 $m^2$ capacity during storm events. Finally, the hydraulic opening for Option 3 would be of 83.5 $m^2$. The larger opening compared to Option 1 is due to the higher elevation of the structure and longer span, creating a larger opening.

It should be noted that all the previously mentioned areas include the freeboard elevation for climate change resiliency.

# 4.0 IMPACTS

The following section will give a brief description of the anticipated impacts for each of the proposed options.

## 4.1 Option 1 – Minimize footprint

According to RVA's conceptual design, the length of the construction zone for Option 1 would be in excess of 500 metres long. At this stage of design, the final road alignment has not yet been confirmed. With the new structure being approximately 1.7 metres higher than the existing top of roadway, significant vertical road realignment would be required to match the existing road to the new structure. Some retaining walls would be required at specific locations to realign the road. Substantial temporary road protection shoring, including mechanically stabilized earth walls, is also expected to be required to maintain traffic during removal of existing structure, construction of new structure and realignment of the road during the different stages of construction.

## 4.2 Option 2 – Make room for the creek

The length of the construction zone for Option 2 is anticipated to be approximately 300 metres long. The small increase in elevation, especially compared to Option 1 and 3, would require a shorter length of the existing road to be realigned vertically. At this stage, it's anticipated that no retaining walls will be required to realign the roadway and that no significant shoring will be required as well. Excavation to increase the hydraulic opening for the Little Etobicoke Creek will require more effort compared to Option 1 and 3. Minimal road protection shoring is anticipated with this option in order to stage construction while maintaining traffic.

### 4.3 Option 3 – Flood containment with mitigation for upstream impacts

At this stage, the construction zone for Option 3 is estimated to be in excess of 600 metres long. The final value could be much larger as the new propose structure would be 2.3 metres higher than existing top of roadway. Significant vertical road realignment over a long distance would be required to bring the roadway to the new structure height. Some retaining walls would be required at specific locations to realign the road. Substantial temporary road protection shoring, including mechanically stabilized earth walls, is also expected to be required to maintain traffic during removal of existing structure, construction of new structure and realignment of the road during the different stages of construction.

## 5.0 CONSTRUCTABILITY

All three (3) options presented would be constructed using a staged approach. This approach is required to maintain a minimum of four lanes of traffic and a left-turning lane throughout the construction of the new structure. Three main stages would be required to construct the new structure while maintaining an acceptable level of traffic on Dixie road. The three proposed stages are as follows:

**Stage 1.** Traffic will be moved on the western two thirds of the existing bridge. Proper traffic control would be implemented and the eastern third of the existing bridge would be demolished and removed. The first third of the new structure would then be constructed all the while maintaining traffic on the remaining two thirds of the existing structure.

**Stage 2.** Once Stage 1 is completed, traffic will be diverted onto the first third of the new structure and the western third of the existing structure. The middle section of the existing bridge will be demolished and removed. The middle third of the new structure will be constructed.

**Stage 3.** Once Stage 2 is completed, traffic will be diverted on the eastern two third of the new structure. The remaining section of the existing structure will be demolished and removed. The final third of the new structure would then be constructed, and traffic allowed on the full structure once Stage 3 was completed.

Following the opening of the completed new Dixie Road Bridge, channel work as well as site work could be completed while maintaining a safe work site for the workers and the through traffic.

All three (3) options will require the existing channel to be excavated to create a larger hydraulic opening.

The road elevation at the location of the structure will be raised by approximately 1.7 metres for Option 1, and by about 2.5 metres for Option 3. This difference in elevation between the new road alignment and the existing will require some shoring to be in place during the staged construction to stabilize the new higher embankment next to the existing road until the construction is over. Having proper shoring in place while maintaining adequate lane width for the traffic will be an additional challenge for these two options.

Option 2 will require a bridge pier to be constructed in the newly excavated channel to support to the two spans of the structure. This pier and its foundation will require access to construction equipment to bottom. Since the road alignment will only be raised by 0.4m, it is anticipated that minimum or no shoring will be required to retain the new road embankment during construction.

## 6.0 COST ESTIMATE

Based on the proposed geometry for the three (3) options, a preliminary cost estimate was prepared for each new structure. Table 6-1 presents a high-level cost estimates for all three structures. The cost presented in Table 6-1 includes the new replacement structure as well the anticipated items required for the realign the existing road with the new bridge structure. A preliminary breakdown of the items and cost can be found in Appendix B.

**Table 6.1 – Cost estimate for three (3) options.**

| | Configuration | Cost |
|---|---|---|
| **Option 1** | One span, 26m | $ 7,600,000 |
| **Option 2** | Two spans, 45m | $ 5,400,000 |
| **Option 3** | One span, 28m | $ 8,400,000 |

# 7.0 SUMMARY AND PREFERRED OPTION

As discussed previously in this report, all three options presented increased the hydraulic opening to various degrees. While Options 1 and 3 involved a smaller bridge structure, it was noted that the impact on the surrounding area would be much larger compared to Option 2. The increase in final elevation for the roadway would require significant vertical road realignment compared to Option 2 and in turn increase the cost of Options 1 and 3. Table 7-1 summarizes the differences between the three (3) proposed options.

**Table 7.1 – Comparison of the three (3) options**

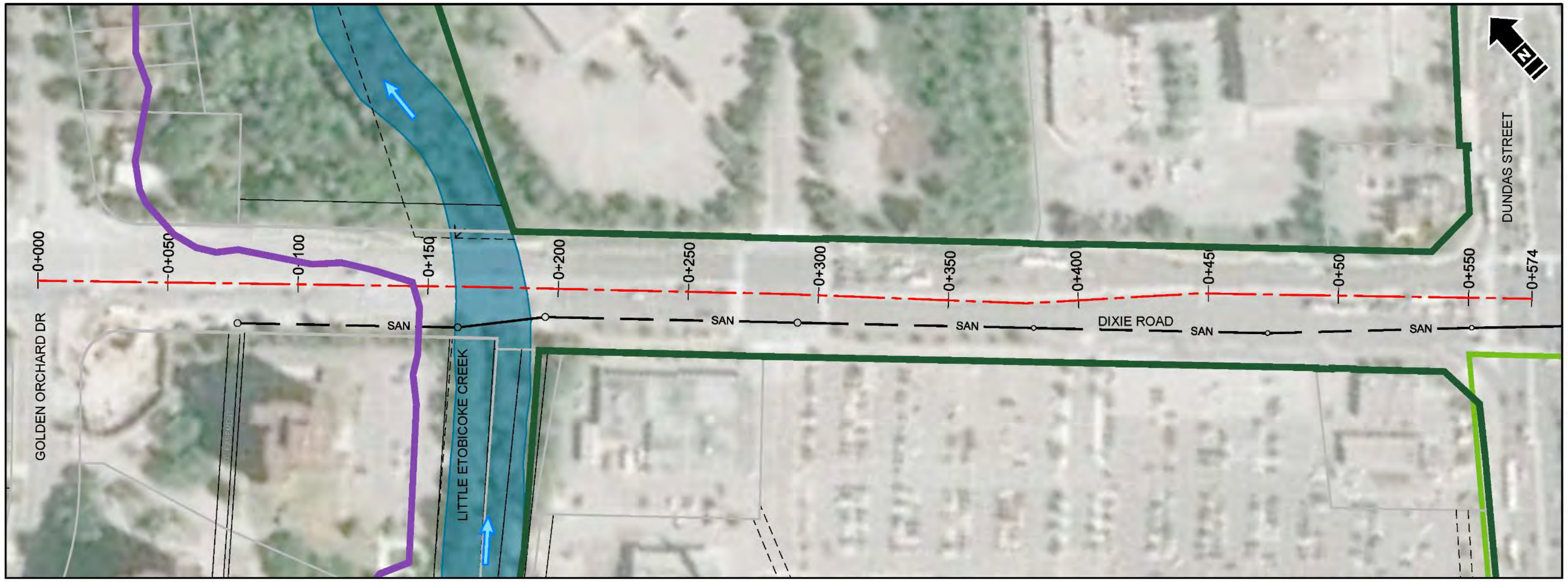
| | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| **Span configuration** | 1 Span – 26 m | 2 Spans – 45 m | 1 Span – 28 m |
| **Freeboard** | 0.5 m | 0.4 m | 0.4 m |
| **Hydraulic opening** | 74.8 $m^2$ | 113.4 $m^2$ | 83.5 $m^2$ |
| **Constructability** | Standard | Standard | Standard |
| **Impact** | Large | Small | Largest |
| **Price** | $ 7,600,000 | $ 5,400,000 | $ 8,200,000 |

After evaluating all three options, RVA believes that the two-span structure (Option 2) is the best option. When comparing all three proposed option, it becomes clear that Option 2 present the best value. The shallower superstructure will provide the least impact on the vicinity of the project while also providing the largest hydraulic opening as well as the lowest cost.

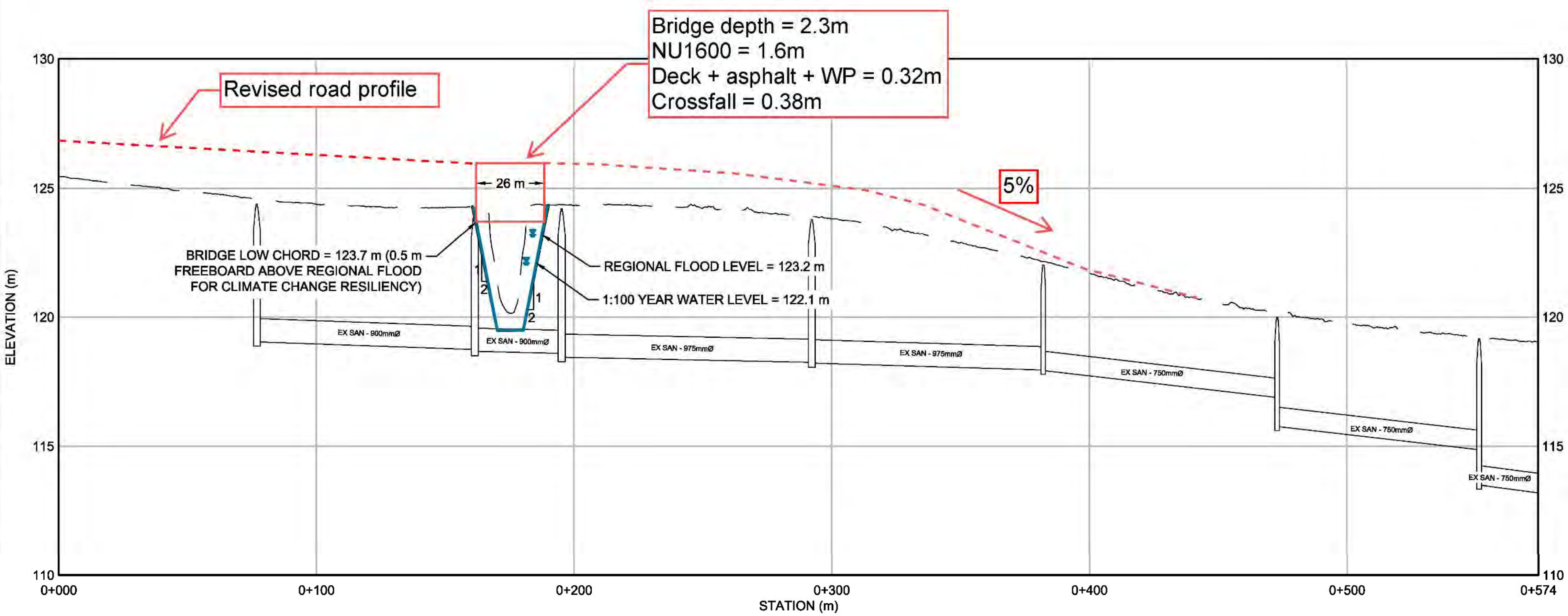
The next step of this project will be to proceed with the Environmental Assessment (EA). Each option will be evaluated, with input from the public and regulatory agencies, to select the preferred option. Once the preferred option has been chosen, the project will move forward with the preliminary design.

# Appendix A

# ALIGNMENTS




## PLAN




## DIXIE ROAD PROFILE

**LEGEND**

- FLOOD PROTECTION LANDFORM
- CREEK CENTRELINE
- CREEK MODIFICATIONS (BANKFULL CHANNEL)
- CREEK MODIFICATIONS (FLOODPLAIN)
- SPECIAL POLICY AREA (SPA)
- LITTLE ETOBICOKE CREEK WATERSHED BOUNDARY
- TRCA REGULATION LIMIT
- EASEMENT
- FLOW DIRECTION
- CROSS-SECTION

1 : 2,000 metres — 20 0 20 40 — HORIZONTAL SCALE

1 : 200 metres — 2 0 2 4 — VERTICAL SCALE

**NOT FOR CONSTRUCTION**

REFERENCE:

1. EXISTING CHANNEL ELEVATIONS BASED ON SURVEY BY MMM (2013). FLOODPLAIN AND DIXIE ROAD ELEVATIONS BASED ON TRCA LIDAR SURVEY (2017).
2. THE 900 mm DIAMETER SANITARY SEWER IS HIGHLIGHTED ON THIS DRAWING AS A KEY INFRASTRUCTURE CONFLICT AT DIXIE ROAD. THE SANITARY SEWER INFORMATION WAS OBTAINED FROM REGION OF PEEL GIS DATA. ADDITIONAL LINEAR INFRASTRUCTURE CROSSING BELOW LEC ARE SHOWN ON THE CONCEPTUAL PROFILE DRAWINGS 1-2, 2-2, 3-2 BASED ON REGION OF PEEL GIS DATA AND DRAWING RECORDS.
3. BASE PLANS WILL BE ADVANCED DURING PRELIMINARY DESIGN TO FURTHER DOCUMENT INFRASTRUCTURE CONFLICTS AND RELOCATION REQUIREMENTS FOR ROADWAYS, PROPERTY LIMITS, SANITARY SEWERS, WATERMAINS, AND UTILITIES.
4. THE REGIONAL WATER LEVEL IS BASED ON MODELLING THE CONCEPTUAL ALTERNATIVE SOLUTION USING THE 1D_2-D MIKE FLOOD MODEL DEVELOPED BY MMM (2015) AND ADVANCED BY MATRIX (2018).
5. THE 1:100 YEAR WATER LEVEL IS ESTIMATED FROM MODELLING THE CONCEPTUAL ALTERNATIVE SOLUTIONS USING THE TRCA HEC-RAS MODEL (2016).

**REVISION**

| No. | DATE | DESCRIPTION | BY | CHK. | DRN. |
|---|---|---|---|---|---|
| A | 2020-05-12 | ISSUED FOR REVIEW | AD | SB | KW |

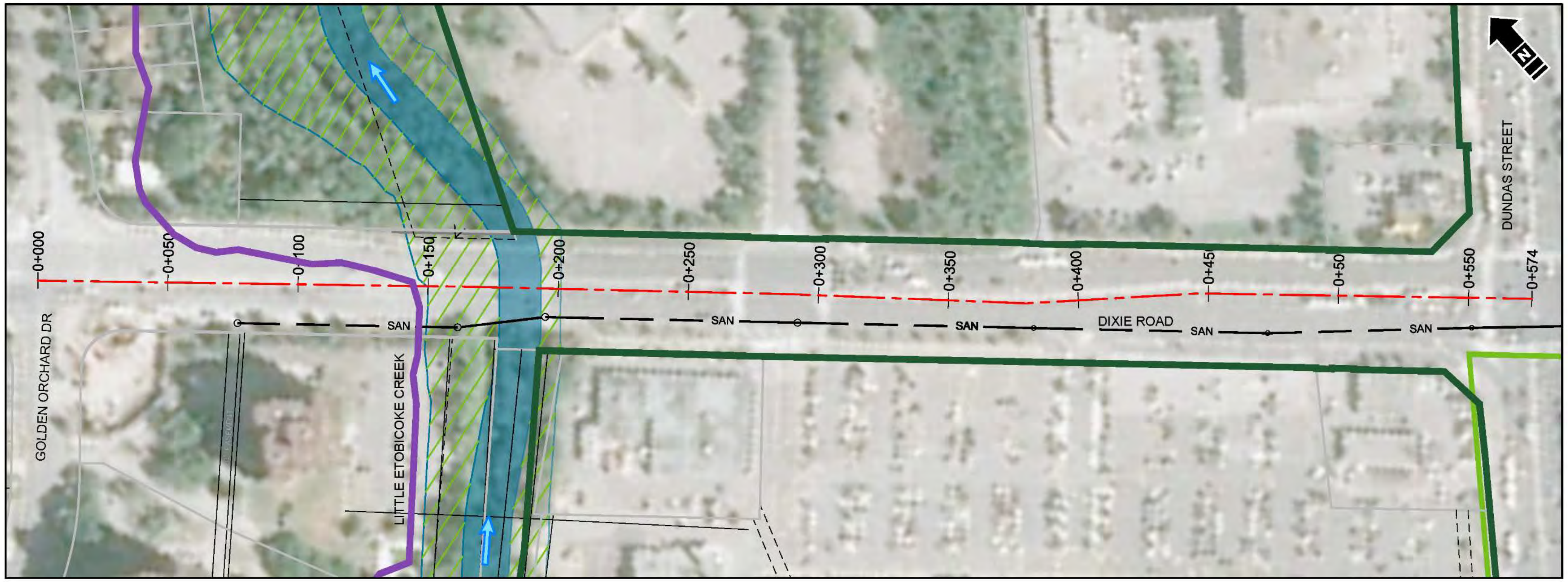
Matrix Solutions Inc. ENVIRONMENT & ENGINEERING

CITY OF MISSISSAUGA
DIXIE-DUNDAS FLOOD MITIGATION

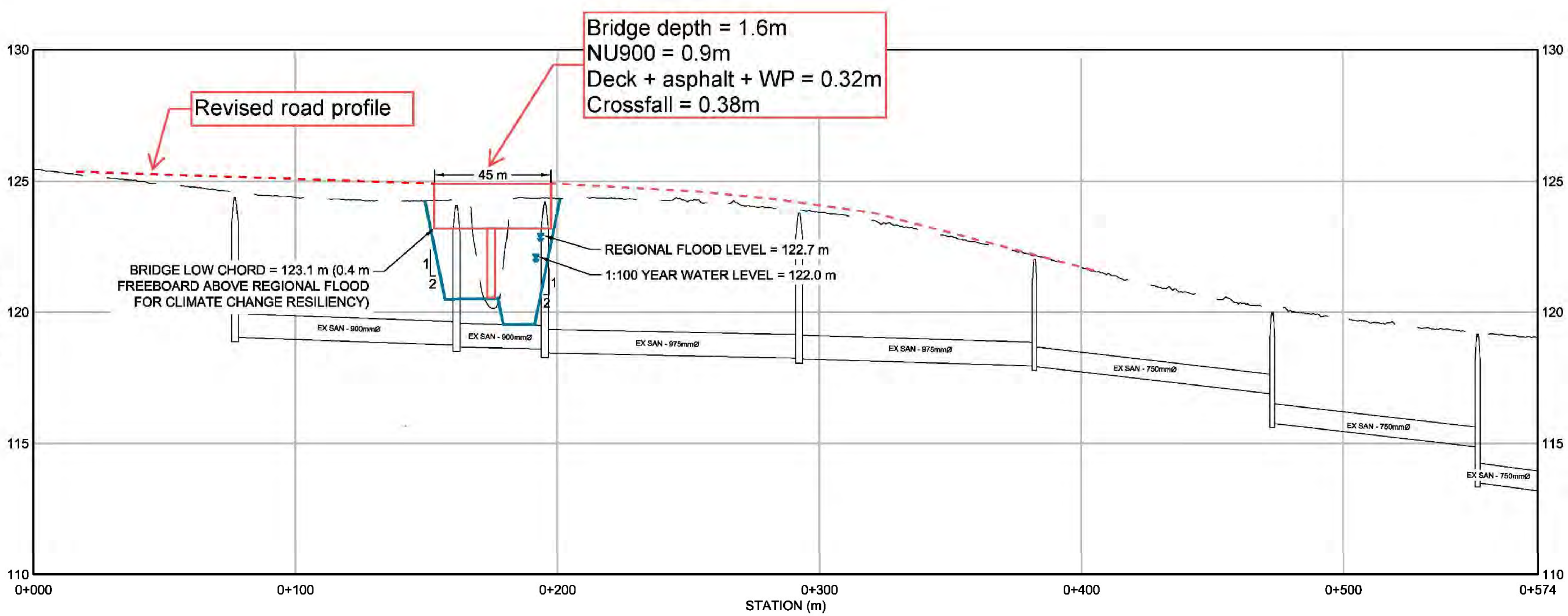
**OPTION 1**
**MINIMIZED FOOTPRINT**
**CONCEPTUAL DIXIE ROAD CROSSING**

| DATE: | TECHNICAL: | REVIEWER: | DRAWN: |
|---|---|---|---|
| MAY 2020 | A.DOHERTY | S.BRAUN | K.WEILER |

| PROJECT: | REVISION: | DRAWING: |
|---|---|---|
| 24603-531 | A | RVA-1 |




## PLAN




## DIXIE ROAD PROFILE

**LEGEND**

- FLOOD PROTECTION LANDFORM
- CREEK CENTRELINE
- CREEK MODIFICATIONS (BANKFULL CHANNEL)
- CREEK MODIFICATIONS (FLOODPLAIN)
- SPECIAL POLICY AREA (SPA)
- LITTLE ETOBICOKE CREEK WATERSHED BOUNDARY
- TRCA REGULATION LIMIT
- EASEMENT
- FLOW DIRECTION
- CROSS-SECTION

1 : 2,000 metres — HORIZONTAL SCALE

1 : 200 metres — VERTICAL SCALE

**NOT FOR CONSTRUCTION**

REFERENCE:

1. EXISTING CHANNEL ELEVATIONS BASED ON SURVEY BY MMM (2013). FLOODPLAIN AND DIXIE ROAD ELEVATIONS BASED ON TRCA LIDAR SURVEY (2017).
2. THE 900 mm DIAMETER SANITARY SEWER IS HIGHLIGHTED ON THIS DRAWING AS A KEY INFRASTRUCTURE CONFLICT AT DIXIE ROAD. THE SANITARY SEWER INFORMATION WAS OBTAINED FROM REGION OF PEEL GIS DATA. ADDITIONAL LINEAR INFRASTRUCTURE CROSSING BELOW LEC ARE SHOWN ON THE CONCEPTUAL PROFILE DRAWINGS 1-2, 2-2, 3-2 BASED ON REGION OF PEEL GIS DATA AND DRAWING RECORDS.
3. BASE PLANS WILL BE ADVANCED DURING PRELIMINARY DESIGN TO FURTHER DOCUMENT INFRASTRUCTURE CONFLICTS AND RELOCATION REQUIREMENTS FOR ROADWAYS, PROPERTY LIMITS, SANITARY SEWERS, WATERMAINS, AND UTILITIES.
4. THE REGIONAL WATER LEVEL IS BASED ON MODELLING THE CONCEPTUAL ALTERNATIVE SOLUTION USING THE 1D_2-D MIKE FLOOD MODEL DEVELOPED BY MMM (2015) AND ADVANCED BY MATRIX (2018).
5. THE 1:100 YEAR WATER LEVEL IS ESTIMATED FROM MODELLING THE CONCEPTUAL ALTERNATIVE SOLUTIONS USING THE TRCA HEC-RAS MODEL (2016).

**REVISION**

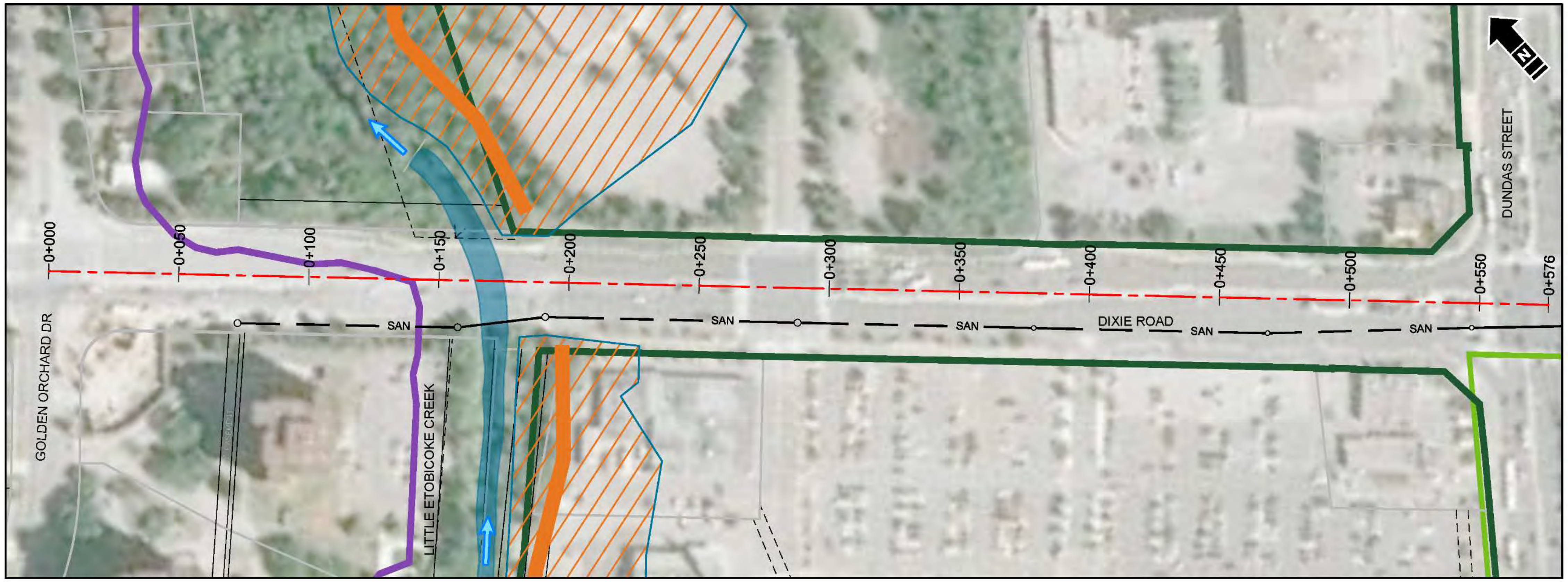
| No. | DATE | DESCRIPTION | BY | CHK. | DRN. |
|---|---|---|---|---|---|
| A | 2020-05-12 | ISSUED FOR REVIEW | AD | SB | KW |

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

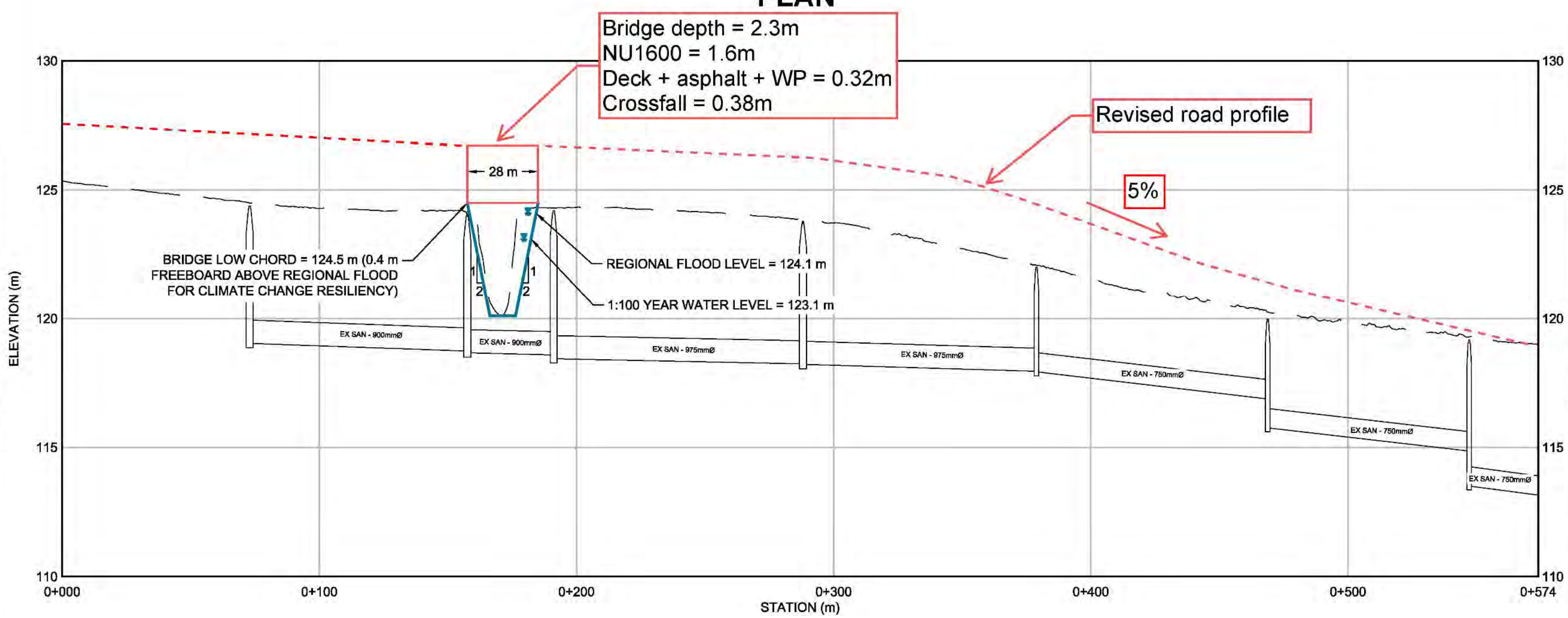
CITY OF MISSISSAUGA
DIXIE-DUNDAS FLOOD MITIGATION

**OPTION 2**
**MAKE ROOM FOR THE CREEK**
**CONCEPTUAL DIXIE ROAD CROSSING**

| DATE: MAY 2020 | TECHNICAL: A.DOHERTY | REVIEWER: S.BRAUN | DRAWN: K.WEILER |
|---|---|---|---|
| PROJECT: 24603-531 | | REVISION: A | DRAWING: RVA-2 |




## PLAN




## DIXIE ROAD PROFILE

**LEGEND**

- FLOOD PROTECTION LANDFORM
- CREEK CENTRELINE
- CREEK MODIFICATIONS (BANKFULL CHANNEL)
- CREEK MODIFICATIONS (FLOODPLAIN)
- SPECIAL POLICY AREA (SPA)
- LITTLE ETOBICOKE CREEK WATERSHED BOUNDARY
- TRCA REGULATION LIMIT
- EASEMENT
- FLOW DIRECTION
- CROSS-SECTION

1 : 2,000 metres — HORIZONTAL SCALE (20, 0, 20, 40)

1 : 200 metres — VERTICAL SCALE (2, 0, 2, 4)

**NOT FOR CONSTRUCTION**

REFERENCE:

1. EXISTING CHANNEL ELEVATIONS BASED ON SURVEY BY MMM (2013). FLOODPLAIN AND DIXIE ROAD ELEVATIONS BASED ON TRCA LIDAR SURVEY (2017).
2. THE 900 mm DIAMETER SANITARY SEWER IS HIGHLIGHTED ON THIS DRAWING AS A KEY INFRASTRUCTURE CONFLICT AT DIXIE ROAD. THE SANITARY SEWER INFORMATION WAS OBTAINED FROM REGION OF PEEL GIS DATA. ADDITIONAL LINEAR INFRASTRUCTURE CROSSING BELOW LEC ARE SHOWN ON THE CONCEPTUAL PROFILE DRAWINGS 1-2, 2-2, 3-2 BASED ON REGION OF PEEL GIS DATA AND DRAWING RECORDS.
3. BASE PLANS WILL BE ADVANCED DURING PRELIMINARY DESIGN TO FURTHER DOCUMENT INFRASTRUCTURE CONFLICTS AND RELOCATION REQUIREMENTS FOR ROADWAYS, PROPERTY LIMITS, SANITARY SEWERS, WATERMAINS, AND UTILITIES.
4. THE REGIONAL WATER LEVEL IS BASED ON MODELLING THE CONCEPTUAL ALTERNATIVE SOLUTION USING THE 1D_2-D MIKE FLOOD MODEL DEVELOPED BY MMM (2015) AND ADVANCED BY MATRIX (2018).
5. THE 1:100 YEAR WATER LEVEL IS ESTIMATED FROM MODELLING THE CONCEPTUAL ALTERNATIVE SOLUTIONS USING THE TRCA HEC-RAS MODEL (2016).

**REVISION**

| No. | DATE | DESCRIPTION | BY | CHK. | DRN. |
|---|---|---|---|---|---|
| A | 2020-05-12 | ISSUED FOR REVIEW | AD | SB | KW |

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

CITY OF MISSISSAUGA
DIXIE-DUNDAS FLOOD MITIGATION

# OPTION 3
# FLOOD CONTAINMENT
# CONCEPTUAL DIXIE ROAD CROSSING

| DATE: | TECHNICAL: | REVIEWER: | DRAWN: |
|---|---|---|---|
| MAY 2020 | A.DOHERTY | S.BRAUN | K.WEILER |

| PROJECT: | REVISION: | DRAWING: |
|---|---|---|
| 24603-531 | A | RVA-3 |

# Appendix B

# COST ESTIMATE

| BRIDGE STRUCTURE | | | Option 1 | | Option 2 | | Option 3 | |
|---|---|---|---|---|---|---|---|---|
| | UNIT | PRICE | QTY | TOTAL | QTY | TOTAL | QTY | TOTAL |
| Dewatering & Shoring | LS | $40,000 | 1 | $40,000.00 | 1 | $40,000.00 | 1 | $40,000.00 |
| Demolish Existing Bridge (in three stages) | LS | $500,000 | 1 | $500,000.00 | 1 | $500,000.00 | 1 | $500,000.00 |
| Piles | m | $400 | 1200 | $480,000.00 | 1200 | $480,000.00 | 1200 | $480,000.00 |
| Concrete in Piers | $m^3$ | $1,700 | 0 | $ | 120 | $204,000.00 | | $ |
| Concrete in Abutment | $m^3$ | $1,700 | 550 | $935,000.00 | 500 | $850,000.00 | 650 | $1,105,000.00 |
| Concrete in Wing Walls | $m^3$ | $1,700 | 100 | $170,000.00 | 50 | $85,000.00 | 150 | $255,000.00 |
| Backfill to Structure | $m^3$ | $90 | 2500 | $225,000.00 | 500 | $45,000.00 | 3000 | $270,000.00 |
| Bearings | ea | $800 | 34 | $27,200.00 | 51 | $40,800.00 | 34 | $27,200.00 |
| Precast Girders | LS | - | 1 | $442,000.00 | 1 | $573,750.00 | 1 | $476,000.00 |
| Concrete in Deck, Diaphragms and Approach Slabs | $m^3$ | $1,700 | 450 | $765,000.00 | 750 | $1,275,000.00 | 480 | $816,000.00 |
| Sidewalks on Bridge | $m^3$ | $1,700 | 70 | $119,000.00 | 120 | $204,000.00 | 80 | $136,000.00 |
| Bridge Deck Waterproofing | $m^2$ | $50 | 780 | $39,000.00 | 1350 | $67,500.00 | 820 | $41,000.00 |
| Parapet Walls | $m^3$ | $2,500 | 13 | $32,500.00 | 22 | $55,000.00 | 14 | $35,000.00 |
| Railings | m | $500 | 52 | $26,000.00 | 90 | $45,000.00 | 54 | $27,000.00 |
| Paving - HL1 | tn | $110 | 126 | $13,860.00 | 220 | $24,200.00 | 136 | $14,960.00 |
| TOTAL FOR BRIDGE STRUCTURE | | | | $3,814,560.00 | | $4,489,250.00 | | $4,223,160.00 |

| Roads / Civil | UNIT | PRICE | QTY | TOTAL | QTY | TOTAL | QTY | TOTAL |
|---|---|---|---|---|---|---|---|---|
| Temporary Roadway Protection - TL-2 | LS | $40,000 | 1 | $500,000.00 | 1 | $100,000.00 | 1 | $600,000.00 |
| Excavation | LS | $100 | 7500 | $750,000.00 | 750 | $75,000.00 | 8500 | $850,000.00 |
| Fill | tn | $15 | 38000 | $570,000.00 | 3800 | $57,000.00 | 38000 | $570,000.00 |
| Granular A and B for Roadway | tn | $20 | 12960 | $259,200.00 | 6480 | $129,600.00 | 12960 | $259,200.00 |
| Asphalt (Top and Base) | tn | $95 | 3420 | $324,900.00 | 1710 | $162,450.00 | 3420 | $324,900.00 |
| Curb, Gutter and Subdrain | m3 | $75 | 800 | $60,000.00 | 400 | $30,000.00 | 800 | $60,000.00 |
| MH and CB Structures | ea | $3,000 | 16 | $48,000.00 | 8 | $24,000.00 | 16 | $48,000.00 |
| Top Soil and Sod | m2 | $6 | 3200 | $19,200.00 | 1600 | $9,600.00 | 3200 | $19,200.00 |
| Guiderails | m | $150 | 450 | $67,500.00 | 750 | $112,500.00 | 450 | $67,500.00 |
| Biowalls / Retaining Walls | m2 | $750 | 350 | $262,500.00 | 0 | $ | 500 | $375,000.00 |
| Traffic Staging / Control | LS | - | 1 | $150,000.00 | 1 | $75,000.00 | 1 | $200,000.00 |
| Erosion and Sediment Controls | LS | - | 1 | $50,000.00 | 1 | $25,000.00 | 1 | $50,000.00 |
| Utility Relocations (mainly o/h hydro) | LS | - | 1 | $700,000.00 | 1 | $150,000.00 | 1 | $700,000.00 |
| Trees / Plantings | LS | - | 1 | $30,000.00 | 1 | $10,000.00 | 1 | $30,000.00 |
| TOTAL FOR ROADS / CIVIL | | | | $3,791,300.00 | | $960,150.00 | | $4,153,800.00 |

| | | | |
|---|---|---|---|
| TOTAL AMOUNT | **$7,605,860.00** | **$5,449,400.00** | **$8,376,960.00** |

Does NOT include Harmonized Sales Tax (HST)

# Dixie-Dundas Flood Mitigation

Dundas Street Bridge Feasibility Report

Prepared for:
Matrix Solutions Inc.



**RVA 184319**

**August 27, 2021**

R.V. Anderson Associates Limited
2001 Sheppard Avenue East Suite 300
Toronto Ontario M2J 4Z8 Canada
Tel 416 497 8600 Fax 855 833 4022
www.rvanderson.com

August 27, 2021 RVA 184319

Matrix Solutions Inc.
6865 Century Ave, Unit 3001
Mississauga, ON L5N 7K2

**Attention: Mr. Andrew Doherty, P.Eng.**

Dear Mr. Doherty:

Re: Dundas Street Bridge Feasibility Review

**R.V. Anderson Associates Limited (RVA)** is pleased to submit this Technical Memorandum to **Matrix Solutions Inc. (Matrix)** regarding the above project.

The purpose of this Technical Memorandum is to assess the best replacement structure for the Dundas Street Bridge. This includes evaluating the optimal structure as well as the required road work associated with said structure for each of the proposed channel options provided by Matrix. RVA is well suited to undertake this project since we can leverage our experience in structural and road design. Our team understands the project requirements for design and is confident in that our recommendations provide the best option with the information available.

Please do not hesitate to contact the undersigned if you have any further questions or comments.

Yours very truly,

**R.V. ANDERSON ASSOCIATES LIMITED**

François Duguay, M.Eng., P.Eng.
Intermediate Structural Engineer

David O'Sullivan, P.Eng., PMP
Senior Associate, Structural Engineer

# Dixie-Dundas Flood Mitigation
# Dundas Street Bridge Feasibility Report

## TABLE OF CONTENTS



**LIST OF TABLES**

# 1.0 BACKGROUND INFORMATION

An extreme rainfall event flooded the east side of the City of Mississauga on July 8, 2018. In coordination with Matrix Solutions Incorporated (Matrix) and R.V. Anderson Associates Limited (RVA), the City of Mississauga is carrying out a Feasibility Study to determine options for preventing future flooding upstream of the Dundas Street Bridge at Little Etobicoke Creek.

Matrix has prepared three potential alternatives for the approach to flood mitigation:

**Option 1:** 25 m span with downstream floodplain conveyance improvements.

**Option 2:** 38 m span without downstream floodplain conveyance improvements.

**Option 3:** 38 m span with downstream floodplain conveyance improvements.

RVA was tasked with proposing a conceptual replacement structure for the Dundas Street Bridge for each of those options. The following sections will present the proposed replacement structure for each of the options. The span configuration for the proposed bridge structure, hydraulic improvements at the structure location, new road profile associated with each bridge option and their impacts, constructability for each option, and structure costs will be presented.

# 2.0 RECOMMENDED SPAN CONFIGURATION

The following section will present the three (3) proposed bridge span configuration to replace the existing Dundas Street Bridge crossing the Little Etobicoke Creek . Preliminary profiles for all three (3) options can be found in APPENDIX A.

The configuration for each bridge option assumes that the bridge is built out to the ultimate required widening to accommodate the Dundas BRT, a width of approximately 43 metres.

## 2.1 Option 1 – 25 m Span With Downstream Floodplain Conveyance Improvements

The proposed span configuration for Option 1 is a 25-metre single-span precast prestressed concrete box girder bridge. B900 box girders would be used for the superstructure, bringing the depth of the new superstructure to approximately 1.6 metres. The bottom of the new superstructure would be at an elevation of approximately 115.3 metres. This option would raise the current road crown vertical alignment, at the Dundas Street Bridge location, by approximately 0.75 metres.

## 2.2 Option 2 – 38 m Span Without Downstream Floodplain Conveyance Improvements

The proposed span configuration for Option 2 is a 38 metres three-span precast prestressed concrete box-girder bridge. B700 box-girders would be used for the superstructure, bringing the depth of the new superstructure to 1.37 metres. The bottom of the new superstructure would be located at elevation 115.2 metres. This option would raise the current alignment, at the Dundas Street Bridge location, by approximately 0.5 metres. This option would require the construction of a pier and foundation in the proposed new larger hydraulic channel.

## 2.3 Option 3 – 38 m Span With Downstream Floodplain Conveyance Improvements

The proposed span configuration for Option 3 is a 38 metres three-span precast prestressed concrete box-girder bridge. B700 box-girders would be used for the superstructure, bringing the depth of the new superstructure to 1.37 metres. The bottom of the new superstructure would be located at elevation 114.8 metres. This option would raise the current alignment, at the Dundas Street Bridge location, by approximately 0.2 metres. This option would require the construction of a pier and foundation in the proposed new larger hydraulic channel.

# 3.0 HYDRAULICS

The following section will explain how all three (3) options are improving the hydraulic opening at the Dundas Street Bridge location.

Like previously shown in Section 2, all three (3) options would replace the existing structure with a new structure with a longer span than the current one. Assuming 2:1 slope from the bridge abutment down to the bottom of the new improved channel, all three options would provide a significant increase to the hydraulic opening compared to the existing conditions. Table 3-1 summarizes the water elevation for all three (3) options during a 1-in-100 years storm, for the Regional Flood Level, and the elevation at the bottom the superstructure. These elevations were provided by Matrix Solution Inc. based on the hydraulic modelling of the three (3) conceptual designs.

**Table 3.1 – Critical water level for each option**

| | 1-in-100 years + 1m Level | Regional Flood Level | Bottom of superstructure |
|---|---|---|---|
| **Option 1** | 115.1 m | 115.3 m | 115.3 m |
| **Option 2** | 115.2 m | 115.2 m | 115.2 m |
| **Option 3** | 114.8 m | 114.8 m | 114.8 m |

Option 1, with a 25-metre span, would result in a hydraulic opening of approximately 52 $m^2$. With a 38 metres three-spans structure, Option 2 would result in a hydraulic opening of approximately 89$m^2$. This area is divided in two sections, one for the smaller channel at the bottom of the creek which would be 22 $m^2$ for normal water flows, then an additional 67 $m^2$ capacity during storm events. Finally, the hydraulic opening for Option 3 would be of 76 $m^2$. This area is divided in two sections, one for the smaller channel at the bottom of the creek which would be 22 $m^2$ for normal water flows, then an additional 54 $m^2$ capacity during storm events.

It should be noted that all the previously mentioned areas for Option 2 and 3 does not consider the reduction in cross-sectional area due to the concrete piers.

## 4.0 IMPACTS

The following section will give a brief description of the anticipated impacts for each of the proposed options. It should be noted that the final road alignments have not yet been confirmed.

### 4.1 Option 1

According to the conceptual design, the length of the construction zone for Option 1 would be approximately 190 metres in length. With the new structure being approximately 0.75 metres higher than the existing top of roadway, some vertical road realignment would be required to match the existing road to the new structure. Some small retaining walls or additional property may be required west of the structure on the north and south sides to maintain the impact of the new structure to the right-of-way. Some temporary road protection shoring may be required to maintain traffic during removal of existing structure, construction of new structure and realignment of the road during the different stages of construction.

## 4.2 Option 2

The length of the construction zone for Option 2 is anticipated to be approximately 140 metres in length. With the new structure being approximately 0.5 metres higher than the existing top of roadway, some vertical road realignment would be required to match the existing road to the new structure. Some small retaining walls or additional property may be required west of the structure on the north and south side to maintain the impact of the new structure to the right-of-way. Minimal road protection shoring is anticipated with this option for stage construction while maintaining traffic.

## 4.3 Option 3

At this stage, the construction zone for Option 3 is estimated to be approximately 70 metres in length. A small vertical profile raise would be required to bring the roadway to the new structure height. No retaining walls would be required at specific locations to realign the road. No road protection shoring is expected to be required to maintain traffic during removal of existing structure, construction of new structure and realignment of the road during the different stages of construction.

# 5.0 CONSTRUCTABILITY

All three (3) options presented would be constructed using a staged approach. This approach is required to maintain a minimum of three lanes of traffic throughout the construction of the new structure. Three main stages would be required to construct the new structure while maintaining an acceptable level of traffic on Dundas Street. The three proposed stages are as follows:

**Stage 1.** Traffic will be moved on the northern two thirds of the existing bridge. Proper traffic control would be implemented and the southern third of the existing bridge would be demolished and removed. The first third of the new structure would then be constructed all the while maintaining traffic on the remaining two thirds of the existing structure.

**Stage 2.** Once Stage 1 is completed, traffic will be diverted onto the first third of the new structure and the northern third of the existing structure. The middle section of the existing bridge will be demolished and removed. The middle third of the new structure will be constructed.

**Stage 3.** Once Stage 2 is completed, traffic will be diverted on the southern two thirds of the new structure. The remaining section of the existing structure will be demolished and removed. The final third of the new structure would then be constructed, and traffic allowed on the full structure once Stage 3 was completed.

Following the opening of the completed new Dundas Street Bridge, channel work as well as site work could be completed while maintaining a safe work site for the workers and the through traffic.

All three (3) options will require the existing channel to be excavated to create a larger hydraulic opening.

The road elevation at the location of the structure will be raised by approximately 0.75 metres for Option 1, and by about 0.5 metres for Option 2. This difference in elevation between the new road alignment and the existing, for Option 1, may require some additional shoring to be in place during the staged construction to stabilize the new higher embankment next to the existing road until the construction is over.

Option 2 and 3 will require bridge piers to be constructed in the newly excavated channel to support to the two spans of the structure. This pier and its foundation will require access to construction equipment to bottom. Since the road alignment will only be raised by 0.5 m and 0.2 m respectively, it is anticipated that minimal or no shoring will be required to retain the new road embankment during construction.

## 6.0 COST ESTIMATE

Based on the proposed geometry for the three (3) options, a preliminary cost estimate was prepared for each new structure. Table 6-1 presents a high-level cost estimates for all three structures. The cost presented in Table 6-1 includes the new replacement structure built out to the ultimate 43 metre width to accommodate the Dundas BRT, as well the anticipated items required for the realign the existing road with the new bridge structure. A preliminary breakdown of the items and cost can be found in Appendix B.

**Table 6.1 – Cost estimate for three (3) options.**

| | Configuration | Cost |
|---|---|---|
| **Option 1** | One span, 25m | $ 7,800,000 |
| **Option 2** | Three spans, 38m | $ 9,300,000 |
| **Option 3** | Three spans, 38m | $ 8,800,000 |

## 7.0 SUMMARY AND PREFERRED OPTION

As discussed previously in this report, all three options presented increased the hydraulic opening to various degrees. While Option 1 involves a smaller bridge structure, it was noted that the impacted area would larger compared to Option 2 and Option 3. The increase in final elevation for the roadway would require greater vertical road realignment compared to Option 2 and in turn increase the cost of the roadworks for Option 1. The overall cost for Option 1 remains the lowest when the smaller structure costs are considered. Table 7-1 summarizes the differences between the three (3) proposed options.

**Table 7.1 – Comparison of the three (3) options**

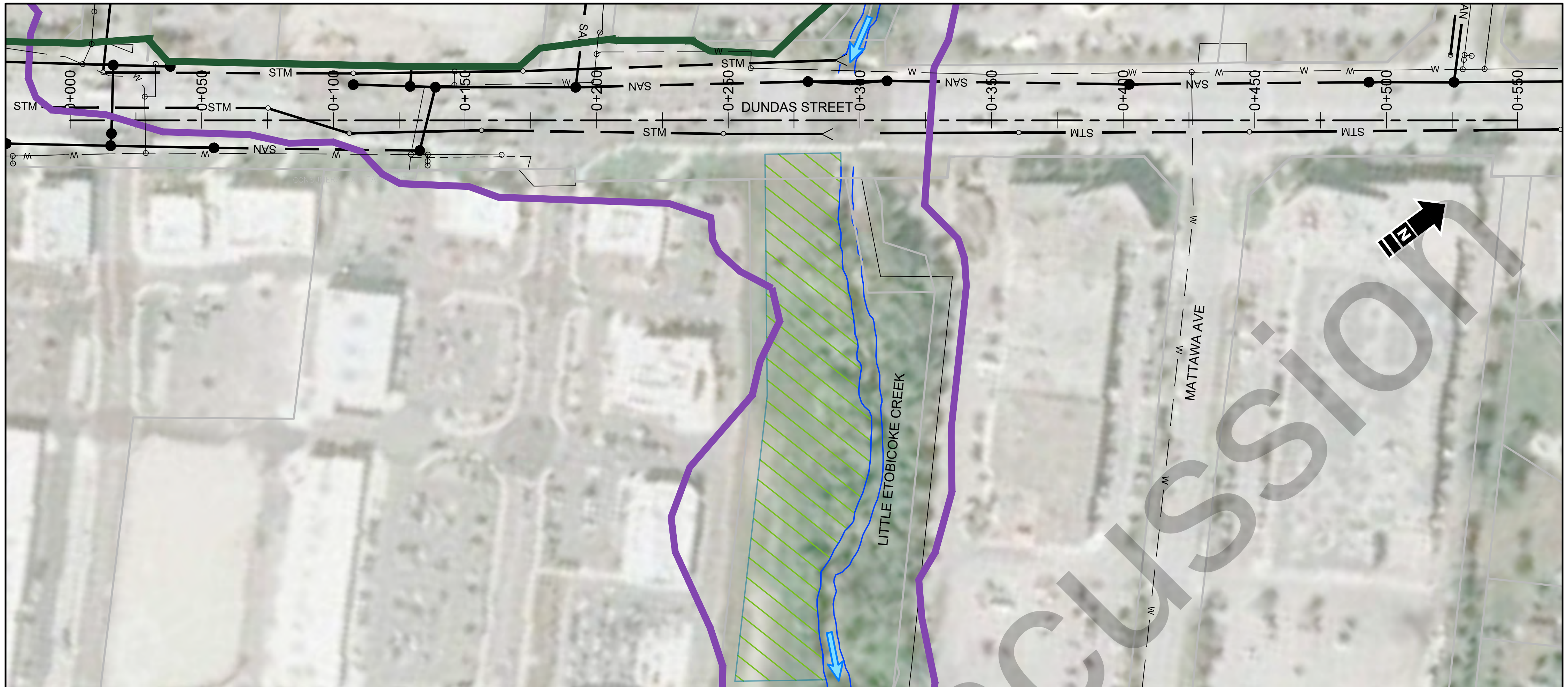
| | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| **Span configuration** | 1 Span – 25 m | 3 Spans – 38 m | 3 Spans – 38 m |
| **Freeboard** | 0.0 m | 0.0 m | 0.0 m |
| **Hydraulic opening** | 52 $m^2$ | 89 $m^2$ | 76 $m^2$ |
| **Constructability** | Standard | Standard | Standard |
| **Impacted Area** | Medium | Smaller | Smallest |
| **Price** | $ 7,800,000 | $ 9,300,000 | $ 8,800,000 |

After evaluating all three options, RVA believes that the Option 1 (25 metre single-span structure with downstream floodplain conveyance improvements) is the lowest cost option. The difference in price should be weighed against the impacts on costs of channel works to determine the best option. The single span option will provide a significant increase in hydraulic opening as well as the lowest cost. It should also be noted that the single span structure would also have the lowest long-term maintenance costs.

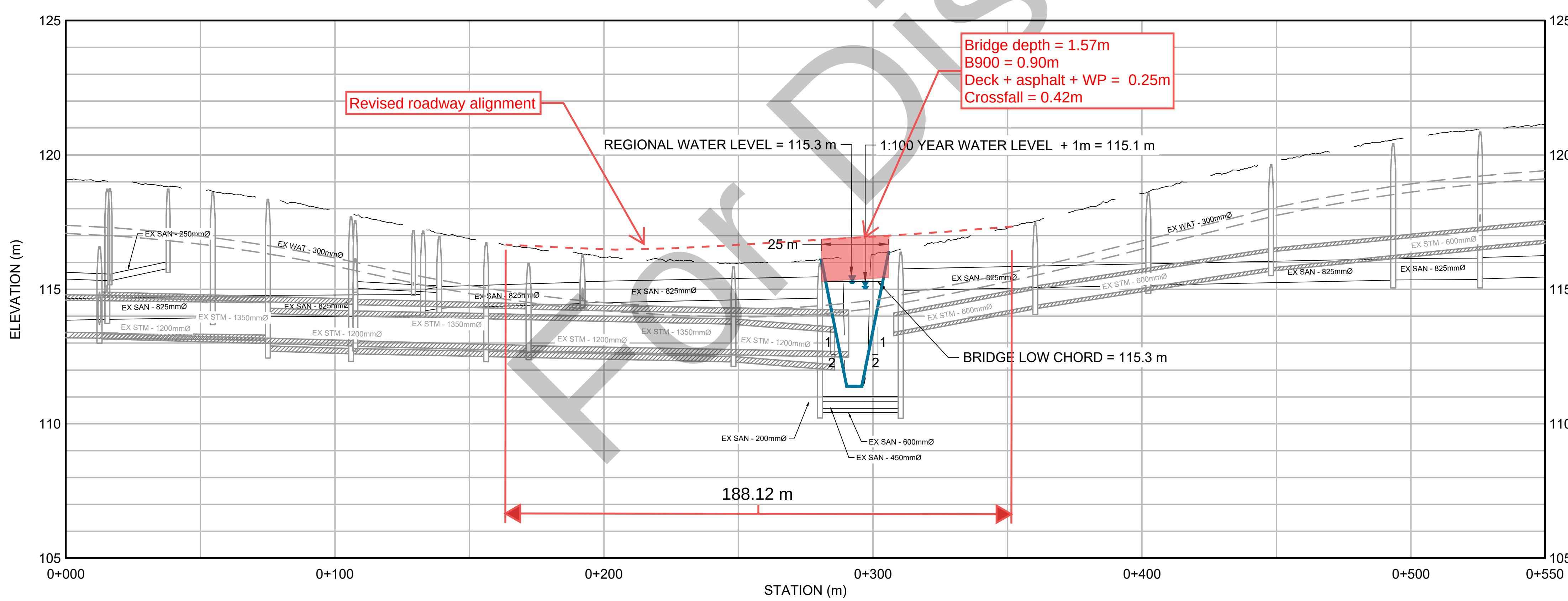
The next step of this project will be to proceed with the Environmental Assessment (EA). Each option will be evaluated, with input from the public and regulatory agencies, to select the preferred option. Once the preferred option has been chosen, the project will move forward with the preliminary design.

# Appendix A

# ALIGNMENTS




## PLAN




## DUNDAS STREET EAST PROFILE

### LEGEND

- FLOOD PROTECTION LANDFORM
- CREEK CENTRELINE
- CHANNEL CONVEYANCE IMPROVEMENTS
- FLOODPLAIN CONVEYANCE IMPROVEMENTS
- SPECIAL POLICY AREA (SPA)
- LITTLE ETOBICOKE CREEK WATERSHED BOUNDARY
- TRCA REGULATION LIMIT
- EASEMENT
- SAN — SANITARY SEWER
- STM — STORM SEWER
- W — WATERMAIN
- FLOW DIRECTION

1 : 2,000 metres — HORIZONTAL SCALE (20, 0, 20, 40)

1 : 200 metres — VERTICAL SCALE (2, 0, 2, 4)

**NOT FOR CONSTRUCTION**

REFERENCE:

1. EXISTING CHANNEL ELEVATIONS BASED ON SURVEY BY MMM (2013). FLOODPLAIN AND DUNDAS STREET ELEVATIONS BASED ON TRCA LIDAR SURVEY (2017).
2. THE SANITARY SEWER INFORMATION WAS OBTAINED FROM REGION OF PEEL GIS DATA (2020) AND ELEVATIONS ARE SHOWN ON DRAWING RECORDS BY PLANMAC ENGINEERING INC. (2015). THE STORM SEWERR INFORMATION WERE PROVIDED BY THE CITY OF MISSISSAUGA DATA (2019) AND ELEVATIONS ARE SHOWN ON DRAWING RECORDS BY PLANMAC ENGINEERING INC. (2015). THE WATERMAIN INFORMATION WAS OBTAINED FROM REGION OF PEEL GIS DATA (2020).
3. BASE PLANS WILL BE ADVANCED DURING PRELIMINARY DESIGN TO FURTHER DOCUMENT INFRASTRUCTURE CONFLICTS AND RELOCATION REQUIREMENTS FOR ROADWAYS, PROPERTY LIMITS, SANITARY SEWERS, WATERMAINS, AND UTILITIES.
4. THE REGIONAL WATER LEVEL IS BASED ON MODELLING THE CONCEPTUAL ALTERNATIVE SOLUTION USING THE 1D-2D MIKE FLOOD MODEL DEVELOPED BY MMM (2015) AND ADVANCED BY MATRIX (2018).
5. THE 1:100 YEAR WATER LEVEL IS ESTIMATED FROM MODELLING THE CONCEPTUAL ALTERNATIVE SOLUTIONS USING THE TRCA HEC-RAS MODEL (2016).

**REVISION**

| No. | DATE | DESCRIPTION | BY | CHK. | DRN. |
|---|---|---|---|---|---|
| A | 2021-07-13 | ISSUED FOR CLIENT REVIEW | AD | SB | KW |

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

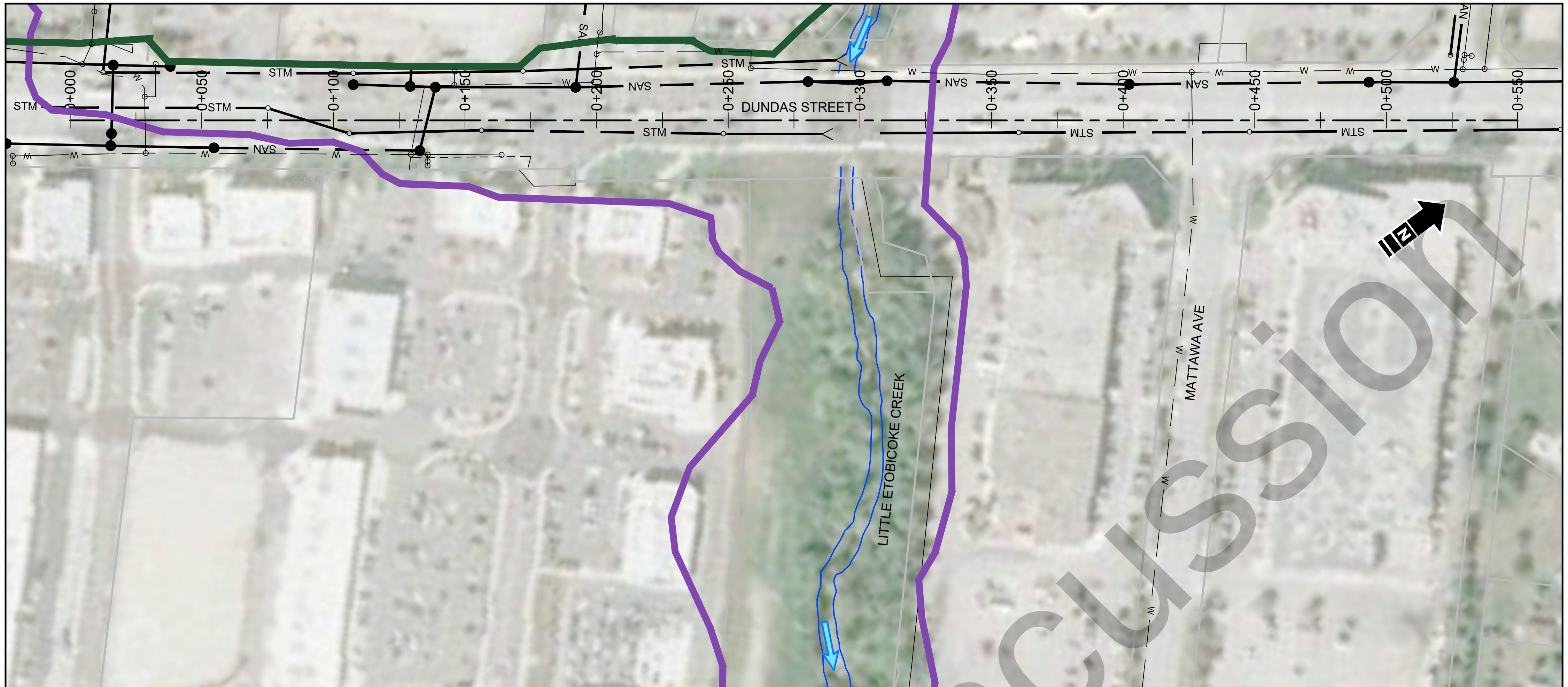
CITY OF MISSISSAUGA
DIXIE-DUNDAS FLOOD MITIGATION

**OPTION 1 - 25 m SPAN LENGHT WITH DOWNSTREAM FLOODPLAIN CONVEYANCE IMPROVEMENTS CONCEPTUAL DUNDAS STREET EAST CROSSING**

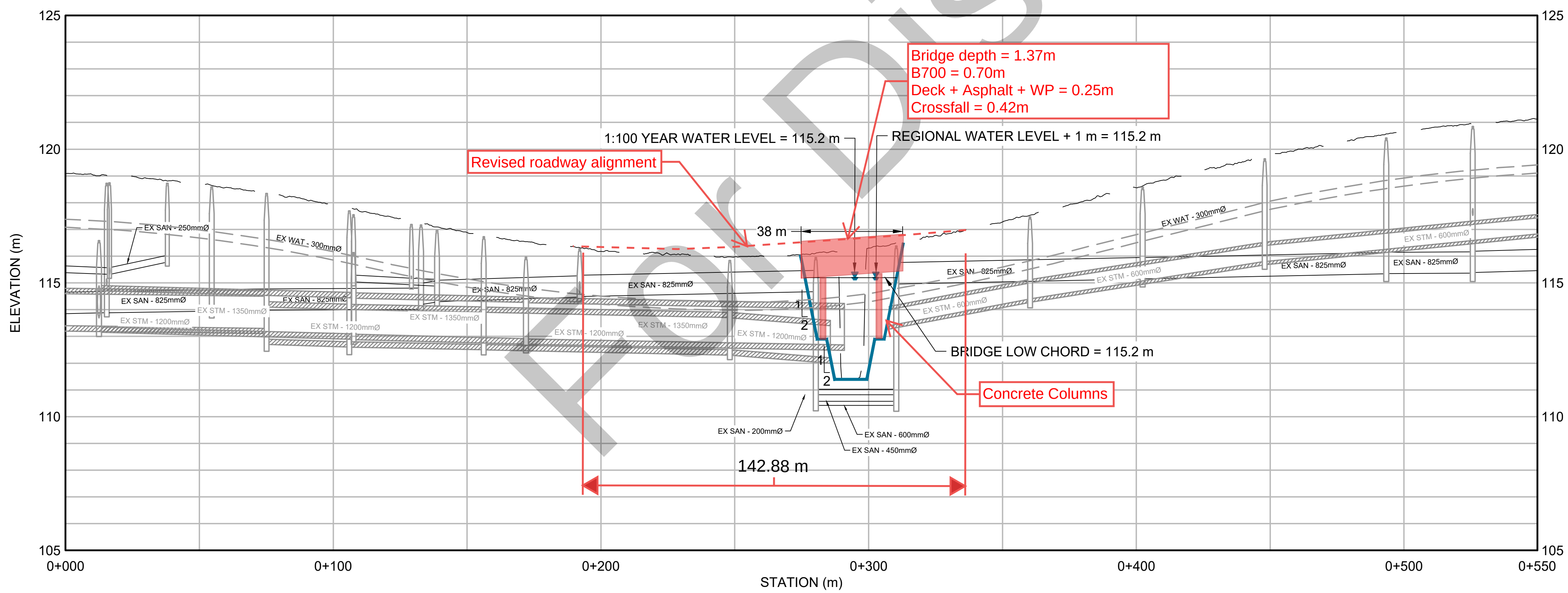
| DATE: JULY 2021 | TECHNICAL: A.DOHERTY | REVIEWER: S.BRAUN | DRAWN: K.WEILER |
|---|---|---|---|
| PROJECT: 24603-531 | | REVISION: A | DRAWING: 1 |



T:\24603 - Dixie-Dundas\531\03 Data\Drafting\C3D\Channel\Production\Figs\Dundas Preliminary 10% Design\24603-Dundas PP.dwg - B-25m + 200m Grading - Tuesday, July 20, 2021 4:48:31 PM - Kim Weiler
Plot 1:1 = Tabloid (L)




## PLAN




## DUNDAS STREET EAST PROFILE

**LEGEND**

- FLOOD PROTECTION LANDFORM
- CREEK CENTRELINE
- CHANNEL CONVEYANCE IMPROVEMENTS
- FLOODPLAIN CONVEYANCE IMPROVEMENTS
- SPECIAL POLICY AREA (SPA)
- LITTLE ETOBICOKE CREEK WATERSHED BOUNDARY
- TRCA REGULATION LIMIT
- EASEMENT
- SAN — SANITARY SEWER
- STM — STORM SEWER
- W — WATERMAIN
- FLOW DIRECTION

1 : 2,000 metres — 20 0 20 40 — HORIZONTAL SCALE

1 : 200 metres — 2 0 2 4 — VERTICAL SCALE

**NOT FOR CONSTRUCTION**

REFERENCE:

1. EXISTING CHANNEL ELEVATIONS BASED ON SURVEY BY MMM (2013). FLOODPLAIN AND DUNDAS STREET ELEVATIONS BASED ON TRCA LIDAR SURVEY (2017).
2. THE SANITARY SEWER INFORMATION WAS OBTAINED FROM REGION OF PEEL GIS DATA (2020) AND ELEVATIONS ARE SHOWN ON DRAWING RECORDS BY PLANMAC ENGINEERING INC. (2015). THE STORM SEWERR INFORMATION WERE PROVIDED BY THE CITY OF MISSISSAUGA DATA (2019) AND ELEVATIONS ARE SHOWN ON DRAWING RECORDS BY PLANMAC ENGINEERING INC. (2015). THE WATERMAIN INFORMATION WAS OBTAINED FROM REGION OF PEEL GIS DATA (2020).
3. BASE PLANS WILL BE ADVANCED DURING PRELIMINARY DESIGN TO FURTHER DOCUMENT INFRASTRUCTURE CONFLICTS AND RELOCATION REQUIREMENTS FOR ROADWAYS, PROPERTY LIMITS, SANITARY SEWERS, WATERMAINS, AND UTILITIES.
4. THE REGIONAL WATER LEVEL IS BASED ON MODELLING THE CONCEPTUAL ALTERNATIVE SOLUTION USING THE 1D-2D MIKE FLOOD MODEL DEVELOPED BY MMM (2015) AND ADVANCED BY MATRIX (2018).
5. THE 1:100 YEAR WATER LEVEL IS ESTIMATED FROM MODELLING THE CONCEPTUAL ALTERNATIVE SOLUTIONS USING THE TRCA HEC-RAS MODEL (2016).

**REVISION**

| No. | DATE | DESCRIPTION | BY | CHK. | DRN. |
|---|---|---|---|---|---|
| A | 2021-07-13 | FOR RVA - CONCEPTUAL DESIGN | AD | SB | KW |

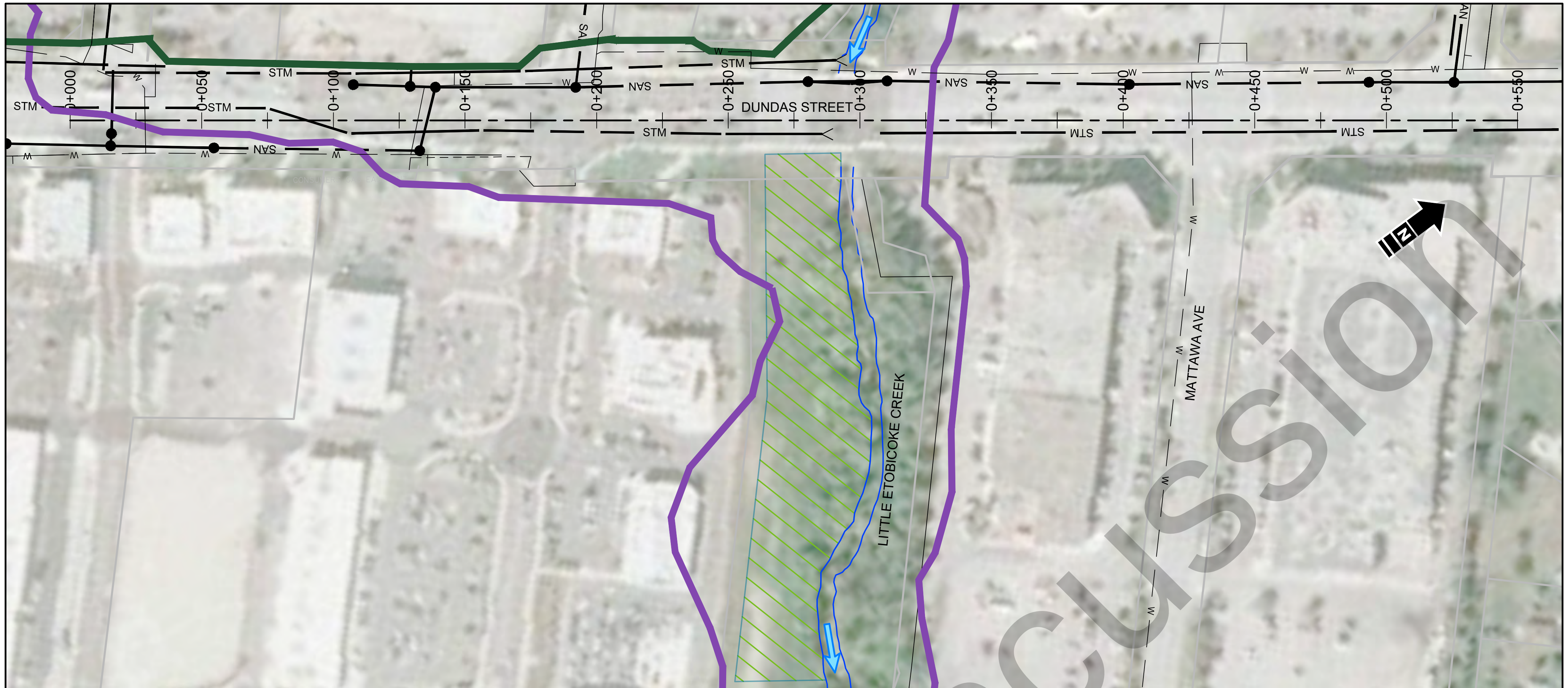
Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

CITY OF MISSISSAUGA
DIXIE-DUNDAS FLOOD MITIGATION

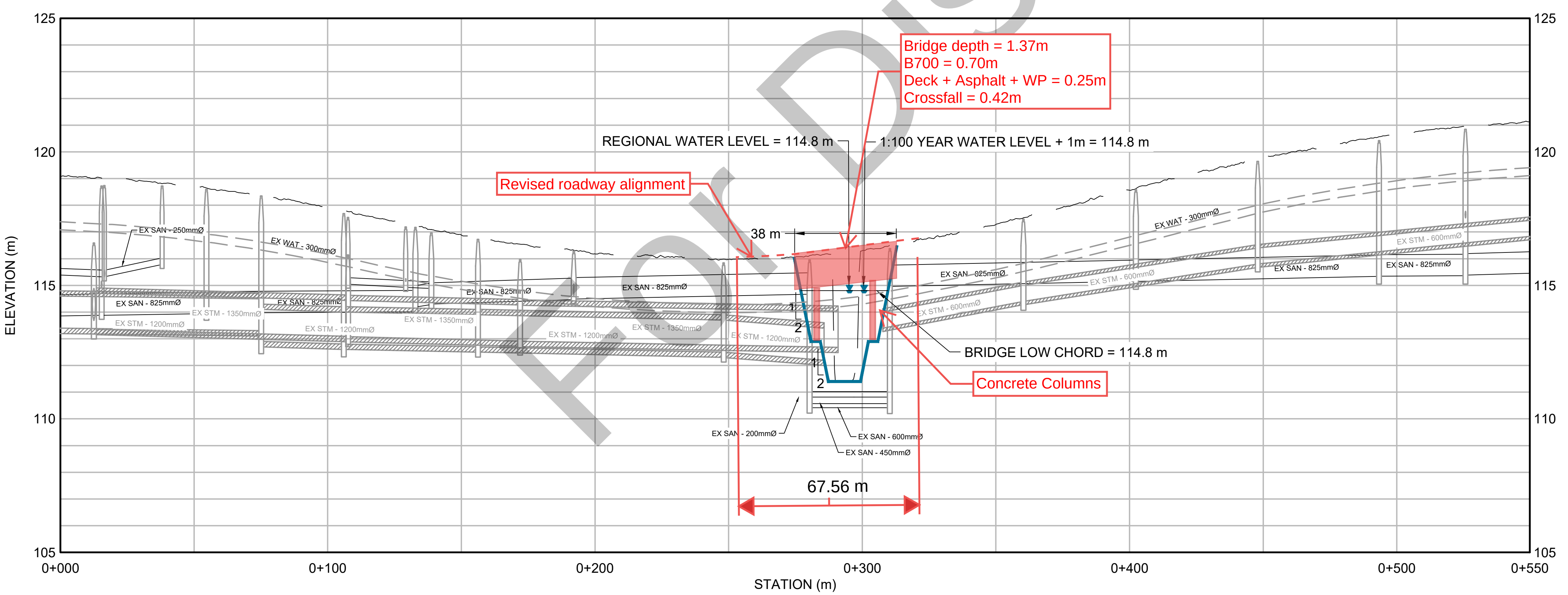
**OPTION 2 - 38 m SPAN LENGHT WITHOUT DOWNSTREAM FLOODPLAIN CONVEYANCE IMPROVEMENTS**
**CONCEPTUAL DUNDAS STREET EAST CROSSING**

| DATE: | TECHNICAL: | REVIEWER: | DRAWN: |
|---|---|---|---|
| JULY 2021 | A.DOHERTY | S.BRAUN | K.WEILER |

| PROJECT: | REVISION: | DRAWING: |
|---|---|---|
| 24603-531 | A | 2 |




## PLAN




## DUNDAS STREET EAST PROFILE

For Discussion

**LEGEND**

- FLOOD PROTECTION LANDFORM
- CREEK CENTRELINE
- CHANNEL CONVEYANCE IMPROVEMENTS
- FLOODPLAIN CONVEYANCE IMPROVEMENTS
- SPECIAL POLICY AREA (SPA)
- LITTLE ETOBICOKE CREEK WATERSHED BOUNDARY
- TRCA REGULATION LIMIT
- EASEMENT
- SAN — SANITARY SEWER
- STM — STORM SEWER
- W — WATERMAIN
- FLOW DIRECTION

1 : 2,000 metres — 20 0 20 40 — HORIZONTAL SCALE

1 : 200 metres — 2 0 2 4 — VERTICAL SCALE

**NOT FOR CONSTRUCTION**

REFERENCE:

1. EXISTING CHANNEL ELEVATIONS BASED ON SURVEY BY MMM (2013). FLOODPLAIN AND DUNDAS STREET ELEVATIONS BASED ON TRCA LIDAR SURVEY (2017).
2. THE SANITARY SEWER INFORMATION WAS OBTAINED FROM REGION OF PEEL GIS DATA (2020) AND ELEVATIONS ARE SHOWN ON DRAWING RECORDS BY PLANMAC ENGINEERING INC. (2015). THE STORM SEWERR INFORMATION WERE PROVIDED BY THE CITY OF MISSISSAUGA DATA (2019) AND ELEVATIONS ARE SHOWN ON DRAWING RECORDS BY PLANMAC ENGINEERING INC. (2015). THE WATERMAIN INFORMATION WAS OBTAINED FROM REGION OF PEEL GIS DATA (2020).
3. BASE PLANS WILL BE ADVANCED DURING PRELIMINARY DESIGN TO FURTHER DOCUMENT INFRASTRUCTURE CONFLICTS AND RELOCATION REQUIREMENTS FOR ROADWAYS, PROPERTY LIMITS, SANITARY SEWERS, WATERMAINS, AND UTILITIES.
4. THE REGIONAL WATER LEVEL IS BASED ON MODELLING THE CONCEPTUAL ALTERNATIVE SOLUTION USING THE 1D-2D MIKE FLOOD MODEL DEVELOPED BY MMM (2015) AND ADVANCED BY MATRIX (2018).
5. THE 1:100 YEAR WATER LEVEL IS ESTIMATED FROM MODELLING THE CONCEPTUAL ALTERNATIVE SOLUTIONS USING THE TRCA HEC-RAS MODEL (2016).

**REVISION**

| No. | DATE | DESCRIPTION | BY | CHK. | DRN. |
|---|---|---|---|---|---|
| A | 2021-07-13 | FOR RVA - CONCEPTUAL DESIGN | AD | SB | KW |

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

CITY OF MISSISSAUGA
DIXIE-DUNDAS FLOOD MITIGATION

**OPTION 3 - 38 m SPAN LENGHT WITH DOWNSTREAM FLOODPLAIN CONVEYANCE IMPROVEMENTS CONCEPTUAL DUNDAS STREET EAST CROSSING**

| DATE: | TECHNICAL: | REVIEWER: | DRAWN: |
|---|---|---|---|
| JULY 2021 | A.DOHERTY | S.BRAUN | K.WEILER |

PROJECT: 24603-531 | REVISION: A | DRAWING: 3



Plot 1:1 = Tabloid (L)

T:\24603 - Dixie-Dundas\531\03 Data\Drafting\C3D\Channel\Production\Figs\Dundas Preliminary 10% Design\24603-Dundas PP.dwg - B-38m + 200m Grading - Tuesday, July 20, 2021 4:48:31 PM - Kim Weiler

# Appendix B

# COST ESTIMATE

| BRIDGE STRUCTURE | | | Option 1 | | Option 2 | | Option 3 | |
|---|---|---|---|---|---|---|---|---|
| | UNIT | PRICE | QTY | TOTAL | QTY | TOTAL | QTY | TOTAL |
| Dewatering & Shoring | LS | $40,000 | 1 | $40,000.00 | 1 | $40,000.00 | 1 | $40,000.00 |
| Demolish Existing Bridge (in three stages) | LS | $500,000 | 1 | $500,000.00 | 1 | $500,000.00 | 1 | $500,000.00 |
| Piles | m | $450 | 1600 | $720,000.00 | 1600 | $720,000.00 | 1600 | $720,000.00 |
| Concrete in Piers | $m^3$ | $1,800 | 0 | - | 165 | $297,000.00 | 165 | $297,000.00 |
| Concrete in Abutment | $m^3$ | $1,800 | 760 | $1,368,000.00 | 760 | $1,368,000.00 | 760 | $1,368,000.00 |
| Concrete in Wing Walls | $m^3$ | $1,800 | 50 | $90,000.00 | 50 | $90,000.00 | 50 | $90,000.00 |
| Backfill to Structure | $m^3$ | $95 | 500 | $48,000.00 | 500 | $48,000.00 | 500 | $48,000.00 |
| Bearings | ea | $850 | 72 | $61,000.00 | 144 | $122,000.00 | 144 | $122,000.00 |
| Precast Girders | LS | - | 1 | $2,340,000.00 | 1 | $3,557,000.00 | 1 | $3,557,000.00 |
| Concrete in Deck, Diaphragms and Approach Slabs | $m^3$ | $1,800 | 407 | $733,000.00 | 545 | $981,000.00 | 545 | $981,000.00 |
| Sidewalks on Bridge | $m^3$ | $1,800 | 78 | $140,000.00 | 102 | $184,000.00 | 102 | $184,000.00 |
| Bridge Deck Waterproofing | $m^2$ | $55 | 1020 | $56,000.00 | 1790 | $99,000.00 | 1790 | $98,000.00 |
| Parapet Walls | $m^3$ | $2,600 | 24 | $62,000.00 | 32 | $83,000.00 | 32 | $83,000.00 |
| Railings | m | $600 | 76 | $46,000.00 | 102 | $61,000.00 | 102 | $61,000.00 |
| Paving - HL1 | tn | $120 | 301 | $36,000.00 | 403 | $48,000.00 | 403 | $48,000.00 |
| TOTAL FOR BRIDGE STRUCTURE | | | | $6,240,000.00 | | $8,198,000.00 | | $8,197,000.00 |

| ROADS / CIVIL | UNIT | PRICE | Option 1 QTY | Option 1 TOTAL | Option 2 QTY | Option 2 TOTAL | Option 3 QTY | Option 3 TOTAL |
|---|---|---|---|---|---|---|---|---|
| Temporary Roadway Protection - TL-2 | LS | $40,000 | 1 | $100,000.00 | 1 | $80,000.00 | 1 | - |
| Excavation | LS | - | 1 | $290,000.00 | 1 | $180,000.00 | 1 | $70,000.00 |
| Fill | tn | $17 | 6100 | $105,000.00 | 2300 | $40,000.00 | 200 | $5,000.00 |
| Granular A and B for Roadway | tn | $22 | 7700 | $169,000.00 | 4700 | $104,000.00 | 1500 | $33,000.00 |
| Asphalt (Top and Base) | tn | $95 | 1650 | $157,000.00 | 1020 | $97,000.00 | 320 | $30,000.00 |
| Curb, Gutter and Subdrain | m | $80 | 330 | $26,000.00 | 200 | $16,000.00 | 40 | $3,000.00 |
| Sidewalks | m2 | $75 | 1320 | $99,000.00 | 820 | $62,000.00 | 260 | $20,000.00 |
| MH and CB Structures | ea | $3,300 | 11 | $36,000.00 | 8 | $26,000.00 | 2 | $7,000.00 |
| Top Soil and Sod | m2 | $7 | 1520 | $11,000.00 | 1120 | $8,000.00 | 560 | $4,000.00 |
| Guiderails | m | $1,800 | 150 | $270,000.00 | 120 | $216,000.00 | 90 | $162,000.00 |
| Biowalls / Retaining Walls | m2 | $800 | 50 | $40,000.00 | 20 | $16,000.00 | 0 | - |
| Traffic Staging / Control | LS | - | 1 | $150,000.00 | 1 | $150,000.00 | 1 | $100,000.00 |
| Erosion and Sediment Controls | LS | - | 13 | $40,000.00 | 22 | $30,000.00 | 13 | $20,000.00 |
| Utility Relocations (mainly o/h hydro) | LS | - | 1 | $100,000.00 | 1 | $100,000.00 | 1 | $100,000.00 |
| Trees / Plantings | LS | - | 126 | $30,000.00 | 220 | $20,000.00 | 126 | $10,000.00 |
| TOTAL FOR ROADS / CIVIL | | | | $1,623,000.00 | | $1,145,000.00 | | $564,000.00 |

| | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| TOTAL AMOUNT | $7,900,000 | $9,300,000 | $8,800,000 |

Does NOT include Harmonized Sales Tax (HST)

# Dixie-Dundas Flood Mitigation

## Dixie Road Bridge Feasibility Report

Prepared for:
Matrix Solutions Inc.



**RVA 184319**

**February 24, 2023**

R.V. Anderson Associates Limited
2001 Sheppard Avenue East Suite 300
Toronto Ontario M2J 4Z8 Canada
Tel 416 497 8600 Fax 855 833 4022
www.rvanderson.com

February 15, 2023 RVA 184319

Matrix Solutions Inc.
6865 Century Ave, Unit 3001
Mississauga, ON L5N 7K2

**Attention: Ms. Amanda McKay, P.Eng., PMP**

Dear Ms. McKay:

Re: Dixie Road Bridge Feasibility Review

**R.V. Anderson Associates Limited (RVA)** is pleased to submit this Technical Memorandum draft to **Matrix Solutions Inc. (Matrix)** regarding the above project.

The purpose of this Technical Memorandum is to assess the best replacement structure for the Dixie Road Bridge. This includes evaluating the optimal structure as well as the required road work associated with said structure for each of the proposed channel options provided by Matrix. RVA is well suited to undertake this project since we can leverage our experience in structural and road design. Our team understands the project requirements for design and is confident in that our recommendations provide the best option with the information available.

Please do not hesitate to contact the undersigned if you have any further questions or comments.

Yours very truly,

**R.V. ANDERSON ASSOCIATES LIMITED**

David O'Sullivan, P.Eng., PMP
Principal, Structural Engineer

# Dixie-Dundas Flood Mitigation
# Dixie Road Bridge Feasibility Report

## TABLE OF CONTENTS



## LIST OF TABLES

# 1.0 BACKGROUND INFORMATION

An extreme rainfall event flooded the east side of the City of Mississauga on July 8, 2013. In coordination with Matrix Solutions Incorporated (Matrix) and R.V. Anderson Associates Limited (RVA), the City of Mississauga is carrying out a Environmental Assessment to determine options for preventing future flooding upstream of the bridge.

Matrix have prepared four potential alternatives for the approach to flood mitigation:

**Option 1:** 38 m Total Span, Two Spans – B800 Girders

**Option 2:** 45 m Total Span, Two Spans – B800 Girders

**Option 3:** 50 m Total Span, Three Spans – B800 Girders

**Option 4:** 55 m Total Span, Three Spans – B800 Girders

RVA was tasked with proposing a conceptual replacement structure for Dixie Road Bridge for each of those options. The following sections will present the proposed replacement structure for each of the options. The span configuration for the proposed bridge structure, hydraulic improvements at the structure location, new road profile associated with each bridge option and their impacts, constructability for each option, and structure costs will be presented.

# 2.0 RECOMMENDED SPAN CONFIGURATION

The following section will present the four (4) proposed bridge span configuration to replace the existing Dixie Road Bridge crossing the Little Etobicoke Creek. Preliminary profiles for all four (4) options can be found in APPENDIX A.

## 2.1 Option 1 – 38 m Total Span, Two Spans

The proposed span configuration for Option 1 is a 38 metres two-span precast prestressed concrete box girder bridge. B800 box girders would be used for the superstructure, bringing the depth of the new superstructure to approximately 1.5 metres. The minimum soffit elevation of the new superstructure would be approximately 122.8 metres. This elevation, established by Matrix Solutions, would provide a 0.5 metre freeboard for climate change resiliency above the regional flood level of 122.3 metres and would meet current CAN/CSA-S6-14 requirements. This option would allow for the current road crown vertical alignment to be maintained at the Dixie Road Bridge location.

## 2.2 Option 2 – 45 m Total Span, Two Spans

The proposed span configuration for Option 2 is a 45 metres two-span precast prestressed concrete box girder bridge. B800 box girders would be used for the superstructure, bringing the depth of the new superstructure to approximately 1.5 metres. The minimum soffit elevation of the new superstructure would be approximately 122.8 metres. This elevation, established by Matrix Solutions, would provide a 0.5 metre freeboard for climate change resiliency above the regional flood level of 122.3 metres and would meet current CAN/CSA-S6-14 requirements. This option would allow for the current road crown vertical alignment to be maintained at the Dixie Road Bridge location.

## 2.3 Option 3 - 50 m Total Span, Three Spans

The proposed span configuration for Option 3 is a 50 metres three-span precast prestressed concrete box girder bridge. B800 box girders would be used for the superstructure, bringing the depth of the new superstructure to approximately 1.5 metres. The minimum soffit elevation of the new superstructure would be approximately 122.8 metres. This elevation, established by Matrix Solutions, would provide a 0.5 metre freeboard for climate change resiliency above the regional flood level of 122.3 metres and would meet current CAN/CSA-S6-14 requirements. This option would allow for the current road crown vertical alignment to be maintained at the Dixie Road Bridge location.

## 2.4 Option 4 – 55 m Total Span, Three Spans

The proposed span configuration for Option 4 is a 55 metres three-span precast prestressed concrete box girder bridge. B800 box girders would be used for the superstructure, bringing the depth of the new superstructure to approximately 1.5 metres. The minimum soffit elevation of the new superstructure would be approximately 122.8 metres. This elevation, established by Matrix Solutions, would provide a 0.5 metre freeboard for climate change resiliency above the regional flood level of 122.3 metres and would meet current CAN/CSA-S6-14 requirements. This option would allow for the current road crown vertical alignment to be maintained at the Dixie Road Bridge location.

# 3.0 HYDRAULICS

The following section will explain how all four (4) options are improving the hydraulic opening at the Dixie Road Bridge location.

Like previously shown in Section 2, all four (4) options would replace the existing structure with a new structure with a longer span than the current one. Assuming 2:1 slope from the bridge abutment down to the bottom of the new improved channel, all four options would provide a significant increase to the hydraulic opening compared to the existing conditions. Table 3-1 summarizes the water elevation for all four (4) options during a 1-in-100 years storm, for the Regional Flood Level, and the elevation at the bottom the superstructure. These elevations were provided by Matrix Solution Inc. based on the hydraulic modelling of the four (4) conceptual designs.

**Table 3.1 – Critical water level for each option**

| | Regional Flood Level | Bottom of superstructure |
|---|---|---|
| **Option 1 - Two spans, 38m** | 122.31 m | 122.81 m |
| **Option 2 - Two spans, 45m** | 122.29 m | 122.79 m |
| **Option 3 - Three spans, 50m** | 122.30 m | 122.80 m |
| **Option 4 - Three spans, 55m** | 122.30 m | 122.80 m |

Option 1, with a 38 metres span, would result in an opening of approximately 162 $m^2$. This area is divided in two sections, one for the smaller channel at the bottom of the creek which would be 10.8 $m^2$ for normal water flows, then an additional 152 $m^2$ capacity during storm events. Option 2, with a 45 metres two-span structure, would result in an opening of approximately 194 $m^2$. This area is divided in two sections, one for the smaller channel at the bottom of the creek which would be 12.75$m^2$ for normal water flows, then an additional 181 $m^2$ capacity during storm events. Option 3, with a 50 metres span, would result in an opening of approximately 211 $m^2$. This area is divided in two sections, one for the smaller channel at the bottom of the creek which would be 13.4 $m^2$ for normal water flows, then an additional 198 $m^2$ capacity during storm events. Finally, the hydraulic opening for Option 4 would be of 233 $m^2$. This area is divided in two sections, one for the smaller channel at the bottom of the creek which would be 13.4 $m^2$ for normal water flows, then an additional 219 $m^2$ capacity during storm events. The larger opening compared to Option 1 is due to the higher elevation of the structure and longer span, creating a larger opening.

It should be noted that all the previously mentioned areas include the freeboard elevation for climate change resiliency.

## 4.0 IMPACTS

The following section will give a brief description of the anticipated impacts for each of the proposed options.

## 4.1 Option 1 – 38 m Total Span, Two Spans

According to RVA's conceptual design, the existing road profile is maintained with this option. No vertical road realignment would be required to match the existing road to the new structure. The use of large retaining walls and/or property acquisition would be avoided with this option unless capital improvements such as road widening or active transportation upgrades are added.

## 4.2 Option 2 – 45 m Total Span, Two Spans

According to RVA's conceptual design, the existing road profile is maintained with this option. No vertical road realignment would be required to match the existing road to the new structure. The use of large retaining walls and/or property acquisition would be avoided with this option unless capital improvements such as road widening or active transportation upgrades are added.

## 4.3 Option 3 – 50 m Total Span, Three Spans

According to RVA's conceptual design, the existing road profile is maintained with this option. No vertical road realignment would be required to match the existing road to the new structure. The use of large retaining walls and/or property acquisition would be avoided with this option unless capital improvements such as road widening or active transportation upgrades are added.

## 4.4 Option 4 – 55 m Total Span, Three Spans

According to RVA's conceptual design, the existing road profile is maintained with this option. No vertical road realignment would be required to match the existing road to the new structure. The use of large retaining walls and/or property acquisition would be avoided with this option unless capital improvements such as road widening or active transportation upgrades are added.

# 5.0 CONSTRUCTABILITY

All four (4) options presented would be constructed using a staged approach. This approach is required to maintain a minimum of four lanes of traffic and potentially a left-turning lane (if required) throughout the construction of the new structure. Three main stages would be required to construct the new structure while maintaining an acceptable level of traffic on Dixie road. The three proposed stages are as follows:

**Stage 1.** Traffic will be moved on the western two thirds of the existing bridge. Proper traffic control would be implemented and the eastern third of the existing bridge would be demolished and removed. The first third of the new structure would then be constructed all the while maintaining traffic on the remaining two thirds of the existing structure.

**Stage 2.** Once Stage 1 is completed, traffic will be diverted onto the first third of the new structure and the western third of the existing structure. The middle section of the existing bridge will be demolished and removed. The middle third of the new structure will be constructed.

**Stage 3.** Once Stage 2 is completed, traffic will be diverted on the eastern two third of the new structure. The remaining section of the existing structure will be demolished and removed. The final third of the new structure would then be constructed, and traffic allowed on the full structure once Stage 3 was completed.

Following the opening of the completed new Dixie Road Bridge, channel work as well as site work could be completed while maintaining a safe work site for the workers and the through traffic.

All four (4) options will require the existing channel to be excavated to create a larger hydraulic opening.

The road elevation at the location of the structure will not be raised for any of the four options. And therefore, no complex road protection shoring staging will be needed to accommodate a grade raise.

## 6.0 COST ESTIMATE

Based on the proposed geometry for the four (4) options, a preliminary cost estimate was prepared for each new structure. Table 6-1 presents a high-level cost estimates for all three structures. The cost presented in Table 6-1 includes the new replacement structure as well the anticipated items required for the realign the existing road with the new bridge structure. A preliminary breakdown of the items and cost can be found in Appendix B.

**Table 6.1 – Cost estimate for four (4) options.**

| | Configuration | Cost |
|---|---|---|
| **Option 1** | Two spans, 38m | $ 4,800,000 |
| **Option 2** | Two spans, 45m | $ 5,300,000 |
| **Option 3** | Three spans, 50m | $ 5,900,000 |
| **Option 4** | Three spans, 55m | $ 6,300,000 |

# 7.0 SUMMARY AND PREFERRED OPTION

As discussed previously in this report, all four options presented increased the hydraulic opening to various degrees. The costs of the various options are primarily driven by the size of the required bridge with each option. Prior to reaching these four options, a longer list of options were originally being considered which would raise the road profile. By avoiding any profile raise, the short list of four options presented below have relatively minor influence from road and civil works at the bridge approaches when compared to earlier considered options which required a profile raise.

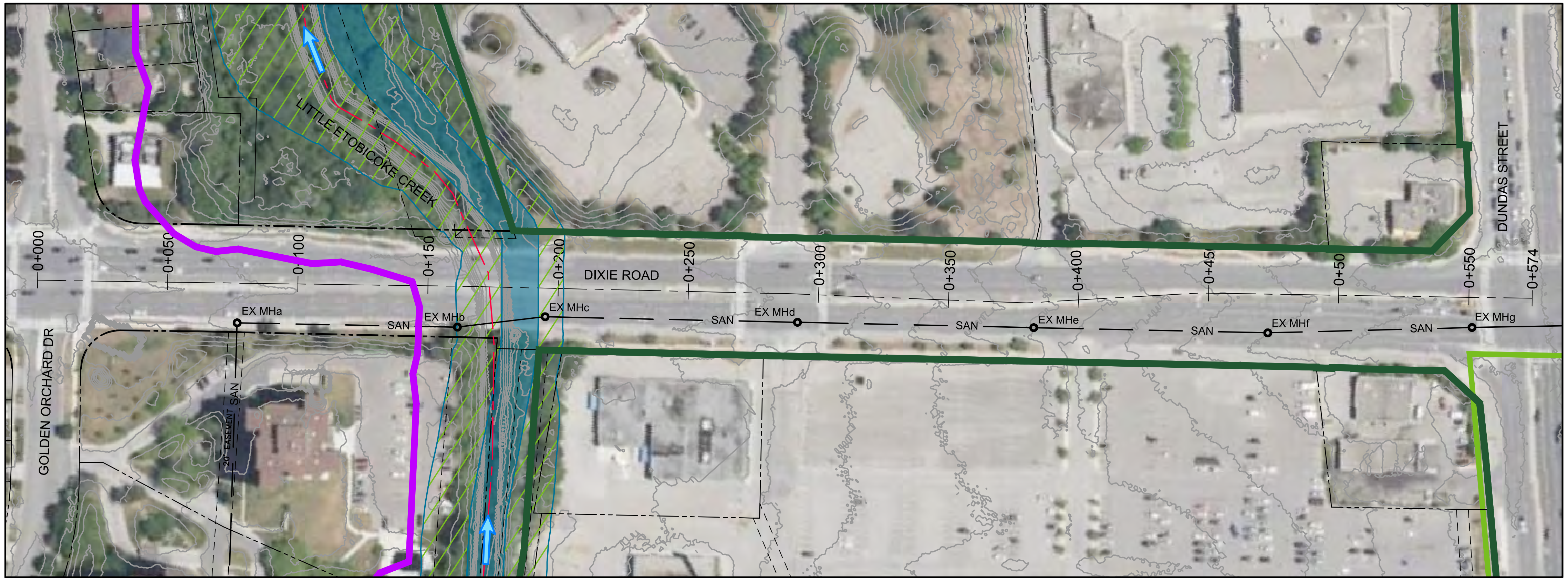
**Table 7.1 – Comparison of the four (4) options**

| | Option 1 | Option 2 | Option 3 | Option 4 |
|---|---|---|---|---|
| **Span configuration** | 2 Spans – 38 m | 2 Spans – 45 m | 3 Spans – 50 m | 3 Spans – 55 m |
| **Freeboard** | 0.5 m | 0.5 m | 0.5 m | 0.5 m |
| **Hydraulic opening** | 162 $m^2$ | 194 $m^2$ | 211 $m^2$ | 233 $m^2$ |
| **Constructability** | Medium | Medium | Medium | Medium |
| **Price** | $ 4,800,000 | $ 5,300,000 | $ 5,900,000 | $ 6,300,000 |

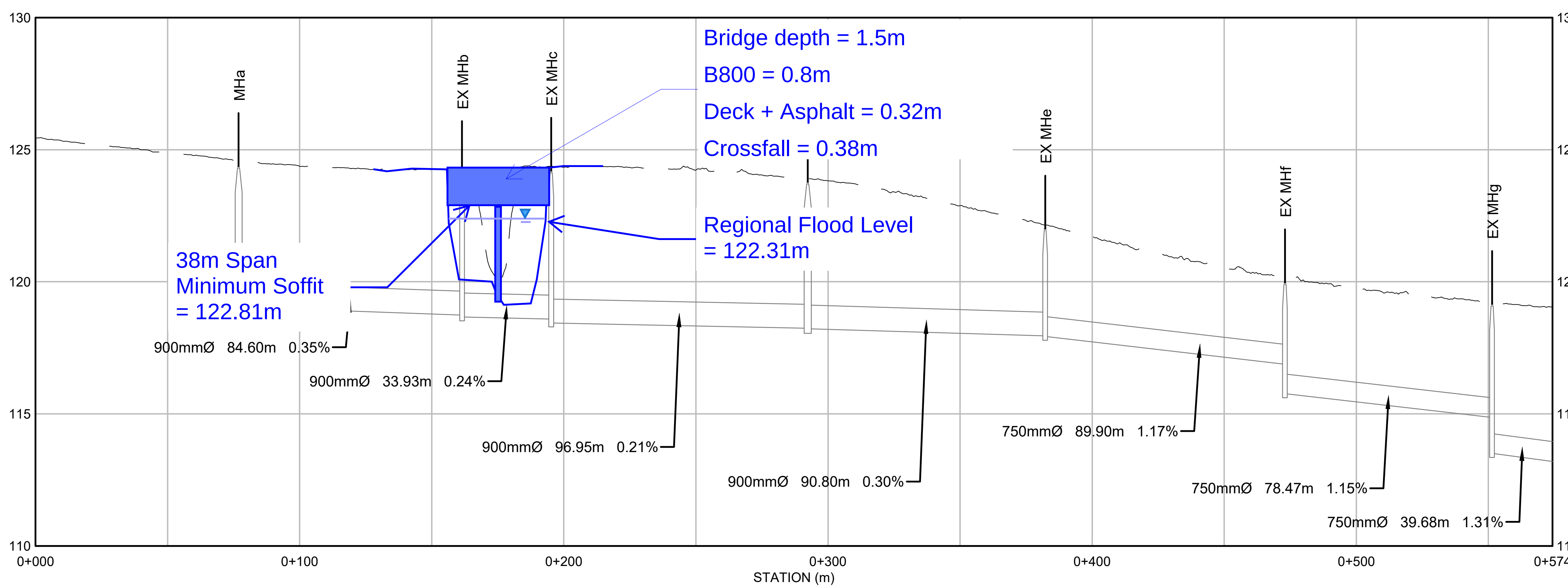
After evaluating all four options, RVA believes that the choice of bridge size and span should be weighed against hydraulic considerations. By using the shallow superstructure of either the B800 girders or NU900 girders, the high costs of raising the roadway profile are mitigated. The costs presented in this report for the different bridge options can be used for comparison purposes in making the decision for the channel configuration.

# Appendix A

# ALIGNMENTS




## PLAN




## DIXIE ROAD PROFLE

**LEGEND**

- EXISTING CREEK CENTRELINE
- PROPERTY LINE
- EASEMENT
- CREEK CONVEYANCE IMPROVEMENTS
- FLOODPLAIN CONVEYANCE IMPROVEMENTS
- SPECIAL POLICY AREA (SPA)
- LITTLE ETOBICOKE CREEK WATERSHED BOUNDARY
- TRCA REGULATION LIMIT
- FLOW DIRECTION

1 : 2,000 metres — HORIZONTAL SCALE

1 : 200 metres — VERTICAL SCALE

Note: 0.5m freeboard above Regional Flood for climate change resiliency

REFERENCE:

1. BASE DIGITAL INFORMATION OBTAINED FROM THE CITY OF MISSISSAUGA, DATA DATED: (SHP AND DGN FORMAT).
2. CONTOUR INFORMATION PROVIDED BY TRCA LiDAR (1m) SURVEY 2017.
3. ADDITIONAL CREEK CONTOUR DATA DERIVED FROM CHANNEL SURVEY (APRIL 2013).

**REVISION**

| No. | DATE | DESCRIPTION | BY | CHK. | DRN. |
|---|---|---|---|---|---|
| A | 2023-02-06 | FOR REVIEW | AH | SB | KW |

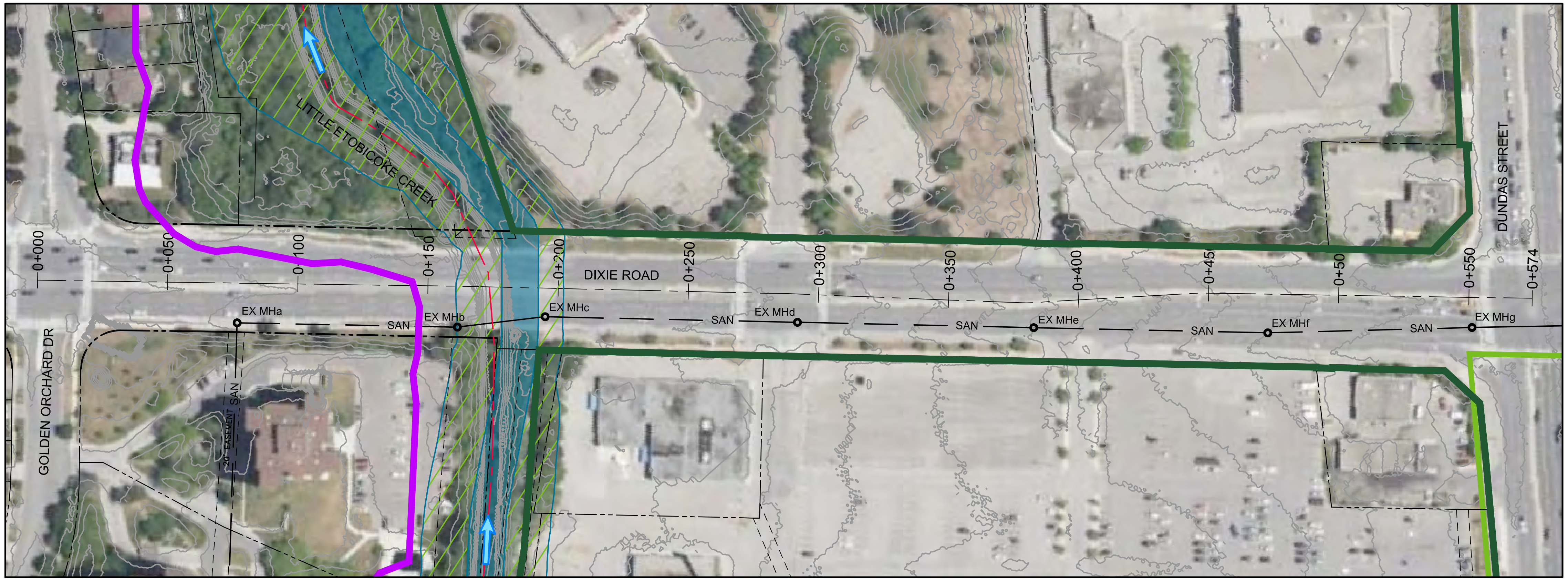
Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

CITY OF MISSISSAUGA
DIXIE-DUNDAS FLOOD MITIGATION

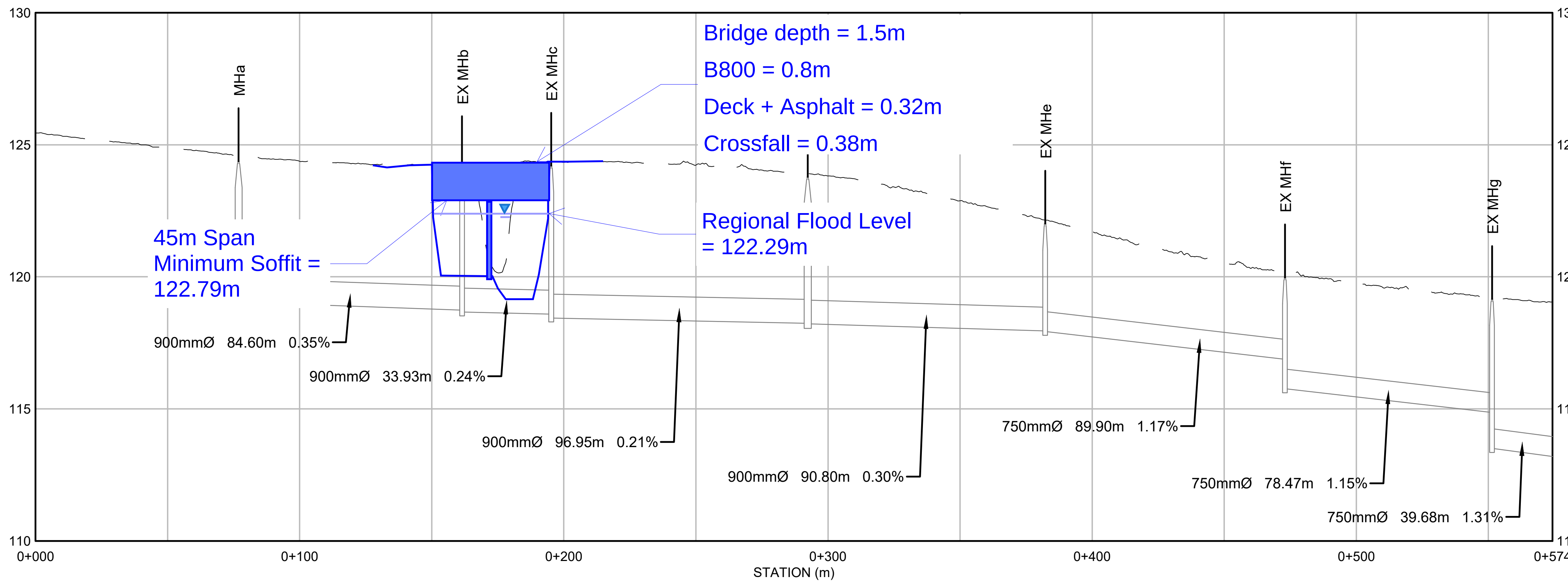
**DIXIE ROAD CROSSING**
38m Span **PLAN / PROFILE**

| DATE: | TECHNICAL: | REVIEWER: | DRAWN: |
|---|---|---|---|
| FEBRUARY 2023 | A.HOFBAUER | S.BRAUN | K. WEILER |

| PROJECT: | REVISION: | DRAWING: |
|---|---|---|
| 24603-531 | A | 1 |




## PLAN




## DIXIE ROAD PROFLE

**LEGEND**

- EXISTING CREEK CENTRELINE
- PROPERTY LINE
- EASEMENT
- CREEK CONVEYANCE IMPROVEMENTS
- FLOODPLAIN CONVEYANCE IMPROVEMENTS
- SPECIAL POLICY AREA (SPA)
- LITTLE ETOBICOKE CREEK WATERSHED BOUNDARY
- TRCA REGULATION LIMIT
- FLOW DIRECTION

1 : 2,000 metres
20 0 20 40
HORIZONTAL SCALE

1 : 200 metres
2 0 2 4
VERTICAL SCALE

Note: 0.5m freeboard above Regional Flood for climate change resiliency

REFERENCE:
1. BASE DIGITAL INFORMATION OBTAINED FROM THE CITY OF MISSISSAUGA, DATA DATED: (SHP AND DGN FORMAT).
2. CONTOUR INFORMATION PROVIDED BY TRCA LiDAR (1m) SURVEY 2017.
3. ADDITIONAL CREEK CONTOUR DATA DERIVED FROM CHANNEL SURVEY (APRIL 2013).

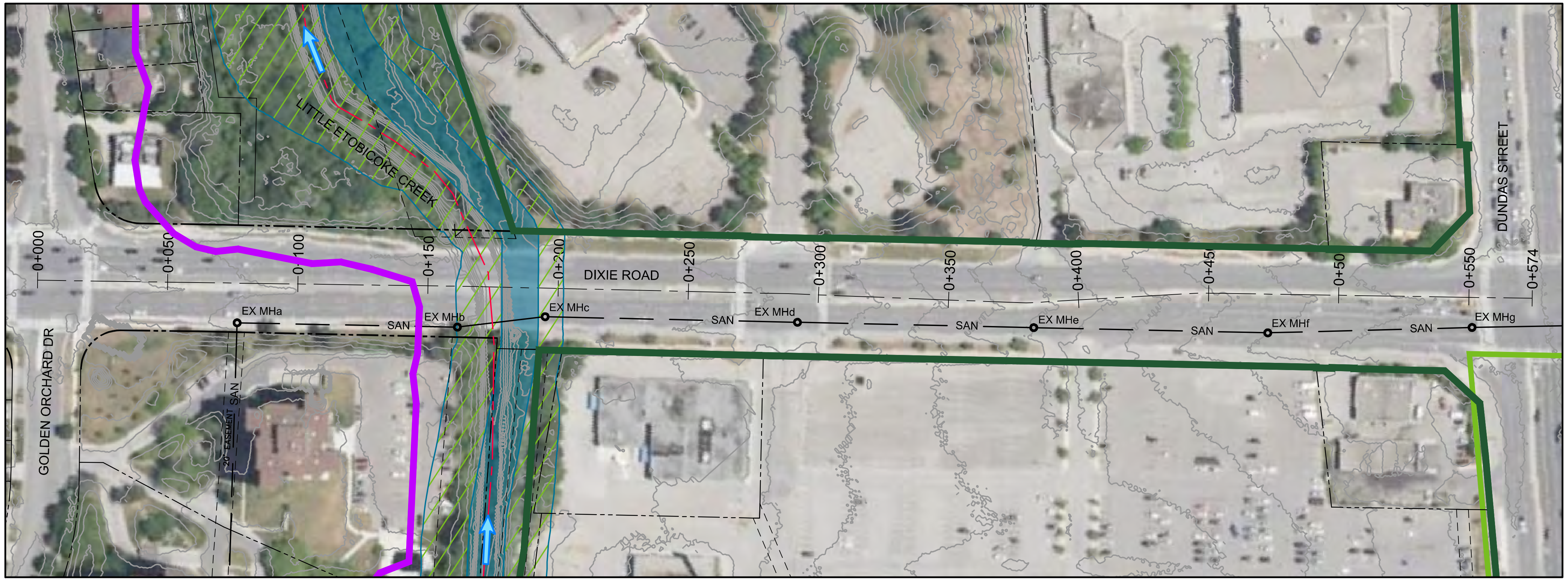
| REVISION | | | | | |
|---|---|---|---|---|---|
| A | 2023-02-06 | FOR REVIEW | AH | SB | KW |
| No. | DATE | DESCRIPTION | BY | CHK. | DRN. |

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

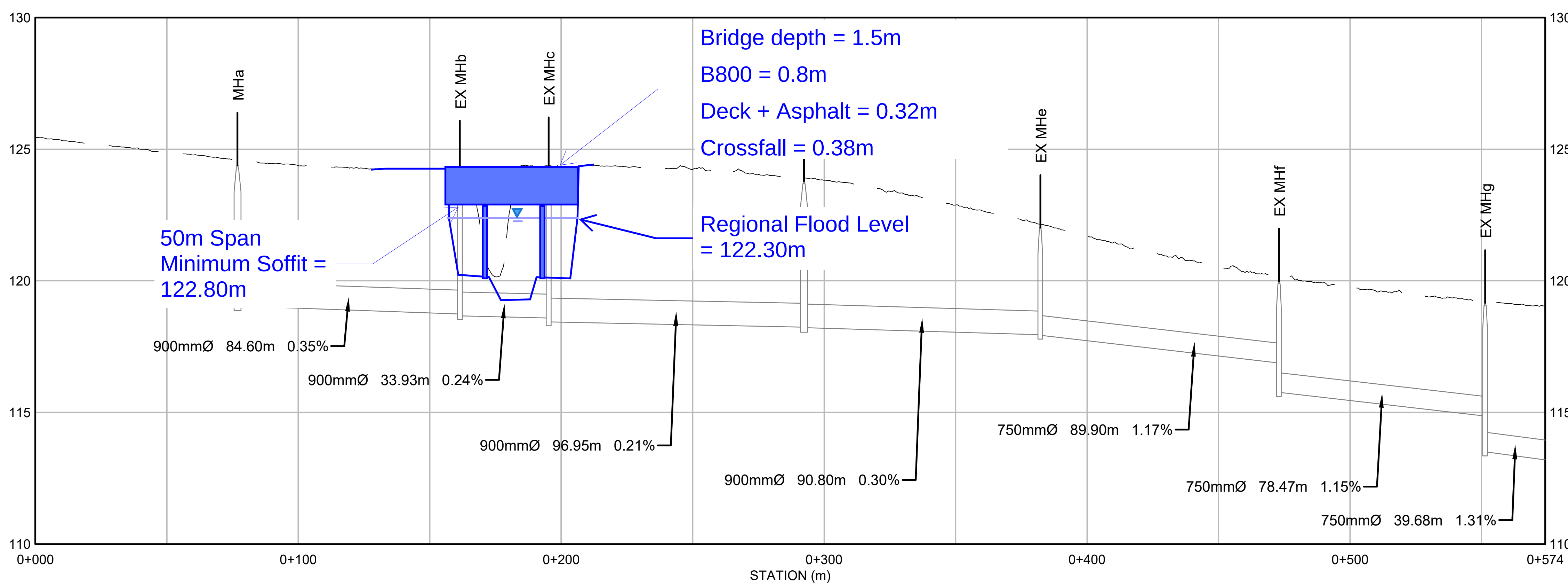
CITY OF MISSISSAUGA
DIXIE-DUNDAS FLOOD MITIGATION

**DIXIE ROAD CROSSING**
45m Span **PLAN / PROFILE**

| DATE: | TECHNICAL: | REVIEWER: | DRAWN: |
|---|---|---|---|
| FEBRUARY 2023 | A.HOFBAUER | S.BRAUN | K. WEILER |
| PROJECT: 24603-531 | | REVISION: A | DRAWING: 1 |




## PLAN




## DIXIE ROAD PROFLE

**LEGEND**

- EXISTING CREEK CENTRELINE
- PROPERTY LINE
- EASEMENT
- CREEK CONVEYANCE IMPROVEMENTS
- FLOODPLAIN CONVEYANCE IMPROVEMENTS
- SPECIAL POLICY AREA (SPA)
- LITTLE ETOBICOKE CREEK WATERSHED BOUNDARY
- TRCA REGULATION LIMIT
- FLOW DIRECTION

1 : 2,000 metres — HORIZONTAL SCALE

1 : 200 metres — VERTICAL SCALE

Note: 0.5m freeboard above Regional Flood for climate change resiliency

REFERENCE:
1. BASE DIGITAL INFORMATION OBTAINED FROM THE CITY OF MISSISSAUGA, DATA DATED: (SHP AND DGN FORMAT).
2. CONTOUR INFORMATION PROVIDED BY TRCA LiDAR (1m) SURVEY 2017.
3. ADDITIONAL CREEK CONTOUR DATA DERIVED FROM CHANNEL SURVEY (APRIL 2013).

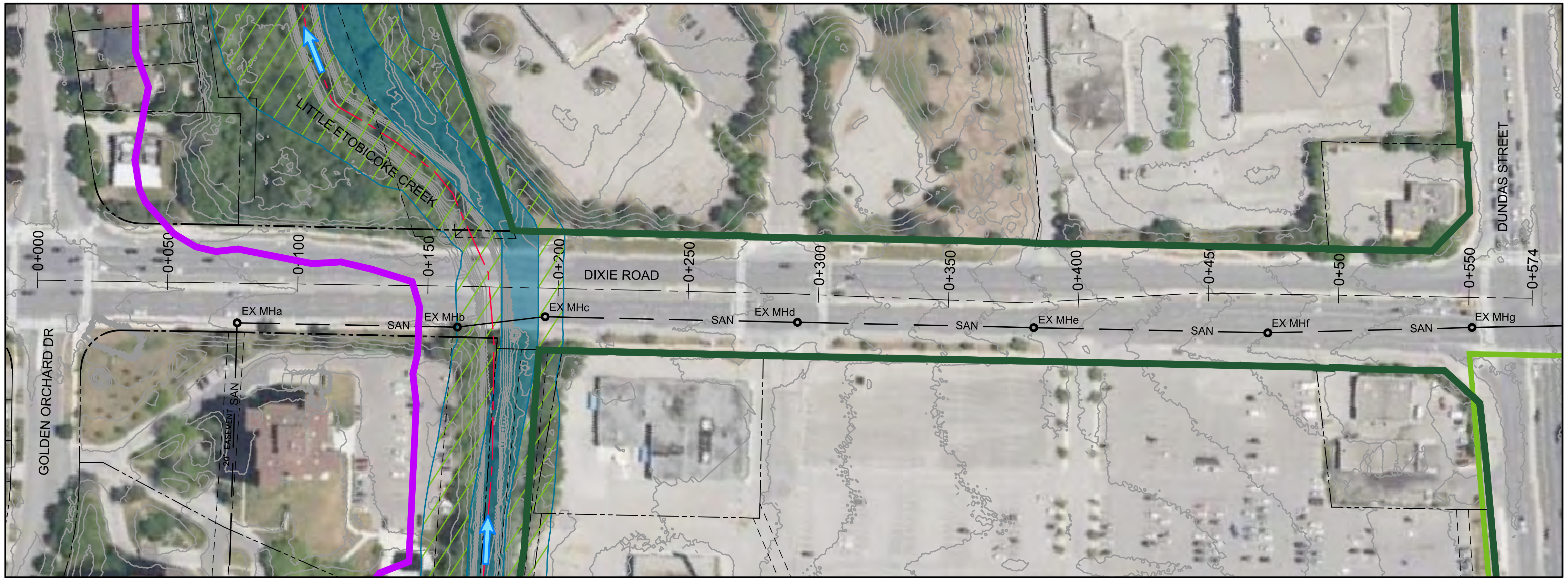
| REVISION | | | | | |
|---|---|---|---|---|---|
| A | 2023-02-06 | FOR REVIEW | AH | SB | KW |
| No. | DATE | DESCRIPTION | BY | CHK. | DRN. |

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

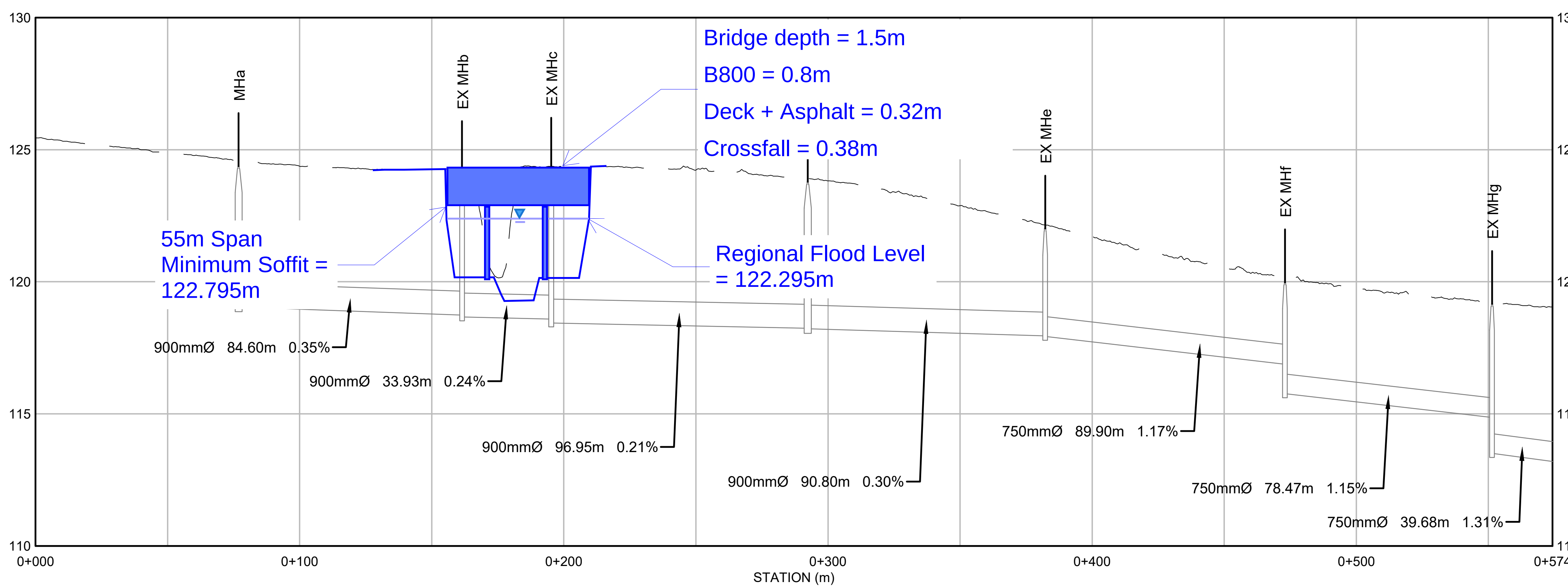
CITY OF MISSISSAUGA
DIXIE-DUNDAS FLOOD MITIGATION

**DIXIE ROAD CROSSING**
**50m Span PLAN / PROFILE**

| DATE: | TECHNICAL: | REVIEWER: | DRAWN: |
|---|---|---|---|
| FEBRUARY 2023 | A.HOFBAUER | S.BRAUN | K. WEILER |
| PROJECT: 24603-531 | | REVISION: A | DRAWING: 1 |




## PLAN




## DIXIE ROAD PROFLE

**LEGEND**

- EXISTING CREEK CENTRELINE
- PROPERTY LINE
- EASEMENT
- CREEK CONVEYANCE IMPROVEMENTS
- FLOODPLAIN CONVEYANCE IMPROVEMENTS
- SPECIAL POLICY AREA (SPA)
- LITTLE ETOBICOKE CREEK WATERSHED BOUNDARY
- TRCA REGULATION LIMIT
- FLOW DIRECTION

1 : 2,000 metres
20 0 20 40
HORIZONTAL SCALE

1 : 200 metres
2 0 2 4
VERTICAL SCALE

Note: 0.5m freeboard above Regional Flood for climate change resiliency

REFERENCE:

1. BASE DIGITAL INFORMATION OBTAINED FROM THE CITY OF MISSISSAUGA, DATA DATED: (SHP AND DGN FORMAT).
2. CONTOUR INFORMATION PROVIDED BY TRCA LiDAR (1m) SURVEY 2017.
3. ADDITIONAL CREEK CONTOUR DATA DERIVED FROM CHANNEL SURVEY (APRIL 2013).

**REVISION**

| No. | DATE | DESCRIPTION | BY | CHK. | DRN. |
|---|---|---|---|---|---|
| A | 2023-02-06 | FOR REVIEW | AH | SB | KW |

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

CITY OF MISSISSAUGA
DIXIE-DUNDAS FLOOD MITIGATION

**DIXIE ROAD CROSSING**
55m Span **PLAN / PROFILE**

| DATE: | TECHNICAL: | REVIEWER: | DRAWN: |
|---|---|---|---|
| FEBRUARY 2023 | A.HOFBAUER | S.BRAUN | K. WEILER |

PROJECT: 24603-531 REVISION: A DRAWING: 1

# Appendix B

# COST ESTIMATE

| BRIDGE STRUCTURE | | | Option 1 - 38m | | Option 2 – 45m | | Option 3 – 50m | | Option 4 – 55m | |
|---|---|---|---|---|---|---|---|---|---|---|
| | UNIT | PRICE | QTY | TOTAL | QTY | TOTAL | QTY | TOTAL | QTY | TOTAL |
| Dewatering & Shoring | LS | $45,000 | 1 | $45,000.00 | 1 | $45,000.00 | 1 | $45,000.00 | 1 | $45,000.00 |
| Demolish Existing Bridge (in three stages) | LS | $580,000 | 1 | $580,000.00 | 1 | $580,000.00 | 1 | $580,000.00 | 1 | $580,000.00 |
| Piles | m | $450 | 1200 | $540,000.00 | 1200 | $540,000.00 | 1200 | $540,000.00 | 1200 | $540,000.00 |
| Concrete in Piers | $m^3$ | $1,900 | 120 | $228,000.00 | 120 | $228,000.00 | 240 | $456,000.00 | 240 | $456,000.00 |
| Concrete in Abutment | $m^3$ | $1,900 | 500 | $950,000.00 | 500 | $950,000.00 | 500 | $950,000.00 | 500 | $950,000.00 |
| Concrete in Wing Walls | $m^3$ | $1,900 | 50 | $95,000.00 | 50 | $95,000.00 | 50 | $95,000.00 | 50 | $95,000.00 |
| Backfill to Structure | $m^3$ | $100 | 500 | $50,000.00 | 500 | $50,000.00 | 500 | $50,000.00 | 500 | $50,000.00 |
| Bearings | ea | $900 | 68 | $61,200.00 | 68 | $61,200.00 | 102 | $91,800.00 | 102 | $91,800.00 |
| Precast Girders | LS | - | 1 | $730,000.00 | 1 | $860,000.00 | 1 | $1,050,000.00 | 1 | $1,150,000.00 |
| Concrete in Deck, Diaphragms and Approach Slabs | $m^3$ | $1,900 | 630 | $1,197,000.00 | 750 | $1,425,000.00 | 830 | $1,577,000.00 | 920 | $1,748,000.00 |
| Sidewalks on Bridge | $m^3$ | $1,900 | 101 | $191,900.00 | 120 | $228,000.00 | 133 | $252,700.00 | 147 | $279,300.00 |
| Bridge Deck Waterproofing | $m^2$ | $60 | 1140 | $68,400.00 | 1350 | $81,000.00 | 1500 | $90,000.00 | 1650 | $99,000.00 |
| Parapet Walls | $m^3$ | $2,800 | 19 | $53,200.00 | 22 | $61,600.00 | 24 | $67,200.00 | 26 | $72,800.00 |
| Railings | m | $600 | 76 | $45,600.00 | 90 | $54,000.00 | 100 | $60,000.00 | 110 | $66,000.00 |
| Paving - HL1 | tn | $130 | 186 | $24,180.00 | 220 | $28,600.00 | 244 | $31,720.00 | 269 | $34,955.56 |
| TOTAL FOR BRIDGE STRUCTURE | | | | $4,859,480.00 | | $5,287,400.00 | | $5,936,420.00 | | $6,257,855.56 |