JLR No.: 27777-000
Revision: 00

May 23, 2018

Conceptual Design Report

Pedestrian Link from Energy Court Parking Lot to Elgin at Larch Parking Lot

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

Value through **service** and **commitment**

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1.0 Introduction

J.L. Richards & Associates Limited (JLR) was retained by the City of Greater Sudbury (CGS) to prepare a conceptual design complete with an Opinion of Probable Construction Cost (OPCC) for the proposed pedestrian bridge between the Energy Court Parking Lot and the Elgin at Larch Parking Lot over the Canadian Pacific Railway (CPR) tracks in downtown Sudbury.

2.0 Conceptual Design Assumptions

The following is an outline of the general assumptions made in the preparation of this conceptual design and Class C OPCC.

2.1 General Bridge Layout, Dimensions, and Materials

Conceptual drawings are attached in Appendix A. These drawings show the layout and dimensions used in the preparation of this OPCC.

A galvanized steel structure was selected for the bridge given steel's superior stiffness and fatigue resistance. Given the span of the bridge, deflection and vibration will be two major comfort considerations in detailed design. A steel structure will have increased mass and stiffness which will result in increased user comfort, at a lower cost than an aluminum bridge. Aluminum would have better corrosion resistance; however, galvanized steel also has a proven performance. Painted steel could also be considered and would come with lower capital cost, but increased maintenance cost.

2.2 Bridge Access and Accessibility Requirements

Due to the height of the bridge and the relatively flat terrain surrounding the bridge location, the length of ramp required to meet Accessibility for Ontarians with Disabilities Act (AODA) requirements is approximately 140 m. Through discussions with the CGS, it was determined that the accessibility requirements would be met by providing an AODA-compliant ramp on the west side of the bridge and an elevator on the east side of the bridge. Both options have approximately the same order-of-magnitude cost, with the elevator being marginally more cost-effective.

<u>Ramp</u>

Due to the distance to the utilities to service an elevator on the west side of the bridge and the distance between the bridge and the parking lot, it was determined that the ramp option would be preferable. To avoid the need to construct a walkway that would essentially run alongside the ramp, it was determined that stairs should not be provided and that all pedestrian traffic would flow on the ramp. It was assumed that the ramp would be 3 m wide to be able to accommodate all pedestrian traffic.

Elevator

On the east side of the bridge, due to the limited space available and the upcoming Elgin Greenway project, it was determined that the passenger elevator option was preferable to maintain existing parking spaces. A small vestibule would be provided at each elevator level to prevent snow accumulation against the elevator doors and water migration into the elevator core. Electrical panels and mechanical components for the elevators would be located in locked closets within the vestibules and these vestibules would be monitored with CCTV cameras to prevent vandalism.

The elevator sumps would be tied in to the sanitary sewer system at a maximum distance of 25 m from the elevator sump and a sump pump would be provided for the elevator sump.

Stairs

A staircase will be provided on the east side of the bridge. The staircase will be 3 m wide.

2.3 Geotechnical Considerations and Proposed Foundations

JLR reviewed the geotechnical report for the McKeown School of Architecture, which is located less than 100 m from the location of the proposed bridge. The geotechnical report, which was provided by the CGS, recommended the use of micropiles.

Through discussions with EBS Geostructural, it was determined that the bridge abutments could likely be supported on three micropiles at each end of the bridge. A combined bridge and elevator raft foundation (13 m x 11 m x 0.6 m) supported by grouted micropiles has been included in the costing for the foundations.

The suspended concrete stairs on the east side of the bridge would be supported on a central pier and insulated shallow spread footing. This will require confirmation from the Geotechnical Engineer based on subsurface soil conditions.

The ramp will be supported on one pier at each landing, which will be supported on 2 micropiles.

2.4 Excavation, Dewatering, and Backfill

Due to the proximity of the CN Railway Corridor, an engineered shoring system would likely be required to support the proposed excavations and allowances are provided within the cost estimate.

The contaminated soil at the site is classified as “non-hazardous”. The contaminated soil would be transported to the Falconbridge smelter site for capping. This would be confirmed during the Environmental Site Assessment (ESA).

Due to groundwater conditions in Downtown Sudbury, it is assumed that dewatering will be required during the foundation work. At this time, we have assumed a moderate dewatering program (less than 45L/s) to be required over a (4) month period with water treatment of the groundwater required.

Excavations would be backfilled with Granular 'B' Type II material.

2.5 Railway Clearance

The railway clearance used in the preparation of this OPCC was 7.01 m (23 feet) in accordance with *Standards Respecting Railway Clearance* published by Transport Canada in 1992.

2.6 Topography

No site-specific surveys were prepared during the preparation of this conceptual design. The design was based on the CGS aerial survey.

Approximate property boundaries were assumed based on the Government of Ontario's Make a Topographic Map application and plan of surveys provided by the CGS.

2.7 Snow Removal

The CGS has indicated that they would prefer for the bridge to be covered to eliminate any snow removal requirements. However, the snow on the stairs and ramp would need to be cleared by CGS Operations. The cost for snow removal was not included in this OPCC.

2.8 Landscaping and Approaches

The landscaping on the east side of the bridge would be included as part of the Elgin Greenway and would not form part of the scope of this project. The landscaping on the west side would consist of low shrubs and flower beds.

The approach work on the west side of the bridge is assumed to be encapsulated within the parking lot and has not been included in this opinion of probable cost.

2.9 Lighting

Lighting design would be based on meeting the requirements of Crime Prevention through Environmental Design (CPTED) and less on aesthetic lighting requirements.

2.10 Electrical Service

It was assumed that electrical service for the bridge lighting and elevators would be fed from a nearby electrical source (±75 m) with sufficient available power. Closed circuit television (CCTV) cameras would be installed on the bridge and in the vestibules.

2.11 Consultant Fees

The consultant fees (10% of Construction Value) include engineering fees for detailed design, tendering, and contract administration. An allowance of $60,000 was included for the geotechnical investigation.

2.12 Coordination with the Canadian Pacific Railway and Monitoring Programs

Any additional requirements from CPR such as coordination and monitoring programs for work around the railway tracks are excluded from this OPCC.

2.13 Land Acquisition

No allowance has been made for potential land acquisition.

2.14 Expected Services Life of Bridge Components

The expected service life of the bridge, elevator, and concrete elements is 75 years.

2.15 Maintenance

In order to determine an approximate maintenance cost for the bridge, it was assumed that a minor rehabilitation project would be undertaken every 10 years, with a capital cost of approximately 5% of the initial project cost (approximately $267,000). At the 40th year, it was assumed that a major rehabilitation would be undertaken, with a capital cost of approximately 25% of the initial project cost (approximately $1,500,000).

The present value of the future capital costs was determined following the method outlined in the MTO Financial Analysis Manual, dated 1993. The MTO Financial Analysis Manual recommends multiplying costs by a discount rate of 6% in order to account for the fact that expenditures occur over different time periods.

2.16 Winter Operating Cost

An allowance of $25,000 per year was carried for winter operations. This allowance includes de-icing and sanding operations. Operation costs have been discounted similarly to the maintenance costs as outlined above.

3.0 Class C Opinion of Probable Construction Cost

The Class C Opinion of Probable Construction Cost (OPCC) is attached in Appendix B.

4.0 Conceptual Design Options

4.1 Ramp at Both Ends

The approximate cost for a ramp, including the foundations and guardrails/handrails, is $1,227,000. A similar cost should be expected for a ramp at the east end of the bridge if the CGS elects to eliminate the elevator.

Due to the height of the bridge required for minimum clearance over the railway tracks and AODA requirements, the required length of the ramp is approximately 140 m. It should be noted that there is limited space available between the railway tracks and Elgin Street.

4.2 Elevators at Both Ends

The cost for the east elevator and stairs, including the elevator shaft, roof, vestibules, mechanical components, and stairs, is approximately $571,150. However, at the west end of the bridge, the distance between the location of the proposed bridge abutment and the sanitary sewer system, where the elevator sump must be tied in, is significantly greater than on the east side. Therefore, a stronger sump pump and a greater length of piping (including excavation and backfill work) will be required for the west elevator.

In addition, the distance between the elevator and the electrical service is significantly longer on the west side of the bridge. This challenge could be resolved by running electrical service on the bridge and feeding the elevator from the service on the east side of the bridge.

If the ramp is eliminated from the west side of the bridge, a walkway will need to be constructed between the parking lot and the bridge.

Additional construction budget would have to be allocated to resolve these issues.

4.3 Uncovered Bridge

The CGS has directed JLR to prepare the OPCC based on a covered bridge. The cost for a covered bridge is included in the OPCC. If the CGS elects to remove the bridge coverings and construct an uncovered bridge, the costs would need to be revisited as there are potential structural efficiencies achieved with a covered bridge which may result in higher structural costs associated with the lower architectural costs of an uncovered bridge.

An uncovered bridge would require snow removal in the winter or would need to be heat traced over the full length. The CGS would need to coordinate internally to determine how to remove the snow in the winter. Due to the large turning radius required for municipal tractors and the handrail requirements for the ramp, it would not be possible to plow the bridge with a municipal tractor. Heat tracing would not be economical and could result in significant build-up of ice on the bridge and ice falling onto the rail tracks below.

An uncovered bridge would also require the installation of anti-suicide barriers.

5.0 Legislative Requirements to be Addressed during Design

5.1 Accessibility for Ontarians with Disabilities Act (AODA)

The pedestrian bridge and approaches are required to meet the requirements of the AODA. The requirements for ramps on exterior paths of travel include a maximum 1:15 slope, landings at the top and bottom of the ramp and at intervals a maximum of 9 m apart, and the provision of handrails on both sides of the ramps and intermediate handrails where the ramp is wider than 2,200 mm.

5.2 Municipal Class Environmental Assessment (MCEA)

Municipal projects undertaken by Ontario municipalities, such as the proposed pedestrian bridge, must follow the MCEA process. Appendix 1 of the 2015 Municipal Class Environmental

Assessments (EAs), prepared by the Municipal Engineers Association (MEA), outlines which MCEA Schedule must be followed depending on the type of project and its construction cost. The proposed pedestrian bridge falls in the category of “construction of underpasses or overpasses for pedestrian, cycling, recreational or agricultural use” with a construction cost greater than $2.4M and therefore would require a Schedule C MCEA.

Schedule C Class EAs require the completion of all five phases of the Class EA planning process, including associated public consultation requirements:

- Phase 1: Identify the problem (deficiency) or opportunity.
- Phase 2: Identify alternative solutions to address the problem or opportunity by taking into consideration the existing environment, and establish the preferred solution taking into account public and review agency input.
- Phase 3: Examine alternative methods of implementing the preferred solution.
- Phase 4: Document, in an Environmental Study Report, a summary of the rationale and the planning, design and consultation process of the project.
- Phase 5: Complete contract drawings and documents and proceed to construction and operation.

6.0 Additional Data Required

The following outlines the additional data that will need to be collected prior to commencing detailed design.

6.1 Underground Utility Locates

The location of underground utilities will need to be determined. The presence of underground utilities may affect the layout of the bridge and the ramp foundations.

The CGS has noted that there is a hydro duct bank of fibre-optic cable running along the west side of the rail tracks. The location of this duct bank must be determined to ensure that there is no interference between the duct bank and the bridge foundations.

6.2 Topographic Survey

A topographic survey with legal property boundaries will be required.

6.3 Geotechnical Investigation

A detailed Geotechnical Investigation would be required that outlines the following: existing soil conditions, proposed foundation system options, dewatering recommendations, excavation and backfill recommendations, frost protection, etc.

6.4 Phase 1 and 2 Environmental Site Assessment (ESA)

It is expected that due to the location of the site and the known presence of contaminants in the area, a Phase 1 and 2 Environmental Site Assessment (ESA) would be required to outline the requirements for management of soil and groundwater on the site.

7.0 Estimated Detailed Design and Construction Schedule

The following consists of an estimated schedule for the detailed design and construction of the pedestrian bridge.

- Municipal Class Environmental Assessment (6-10 months)
- Site Investigations (completed in parallel with the MCEA)
  - Underground Utility Locates
  - Topographic Survey
  - Geotechnical Investigation
  - Phase I and II Environmental Site Assessment
- Detailed Design (4-6 months)
- Construction (6-10 months)

8.0 Conclusion

The Class C OPCC for the proposed pedestrian bridge between the Energy Court Parking Lot and the Elgin at Larch Parking Lot, based on the assumptions listed in Section 2.0 above, is $7,144,128. Prior to proceeding with detailed design, the MCEA process must be followed. In addition, underground utility locates, a topographic survey, a geotechnical investigation, and a Phase 1 and 2 Environmental Site Assessment will need to be performed.

J.L. RICHARDS & ASSOCIATES LIMITED

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Associate
Manager, Ottawa Structural Department

Appendix A

Conceptual Drawings

PRELIMINARY
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No.	ISSUE / REVISION	DD/MM/YY
B	ISSUED FOR CONCEPTUAL DESIGN	10/05/18
A	ISSUED FOR 60% CLIENT REVIEW	19/04/18

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CONSULTANT:

PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:
ENERGY COURT PEDESTRIAN BRIDGE - CONCEPTUAL DESIGN
SUDBURY, ON

DRAWING:
SITE PLAN

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JLR #:	27777-00.1		

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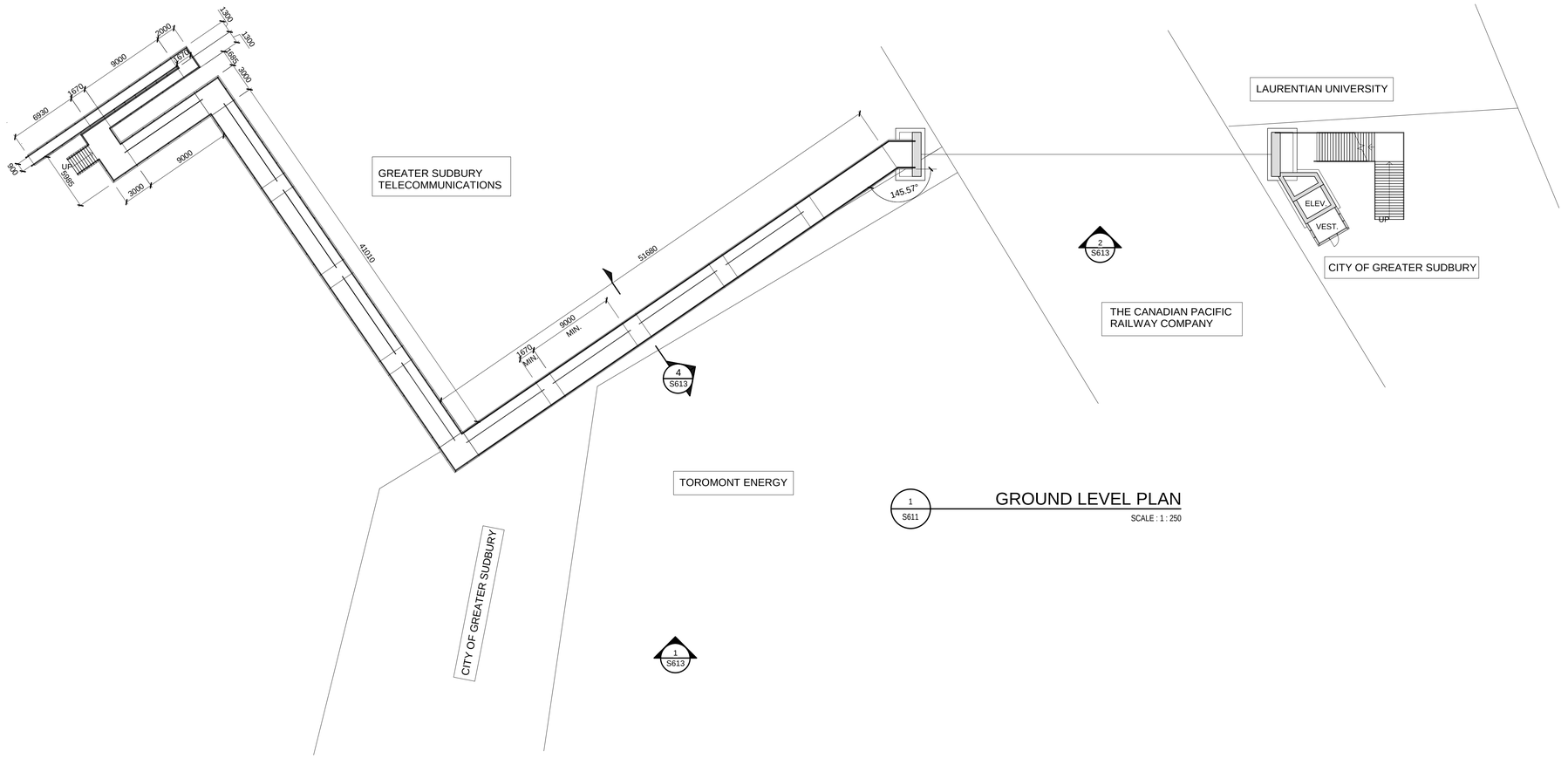

1 / S611 GROUND LEVEL PLAN

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PROJECT:

ENERGY COURT PEDESTRIAN BRIDGE - CONCEPTUAL DESIGN

SUDBURY, ON

DRAWING:

GROUND LEVEL PLAN

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DRAWN:	TM/SWW	DRAWING #:	S611
CHECKED:	MJB		
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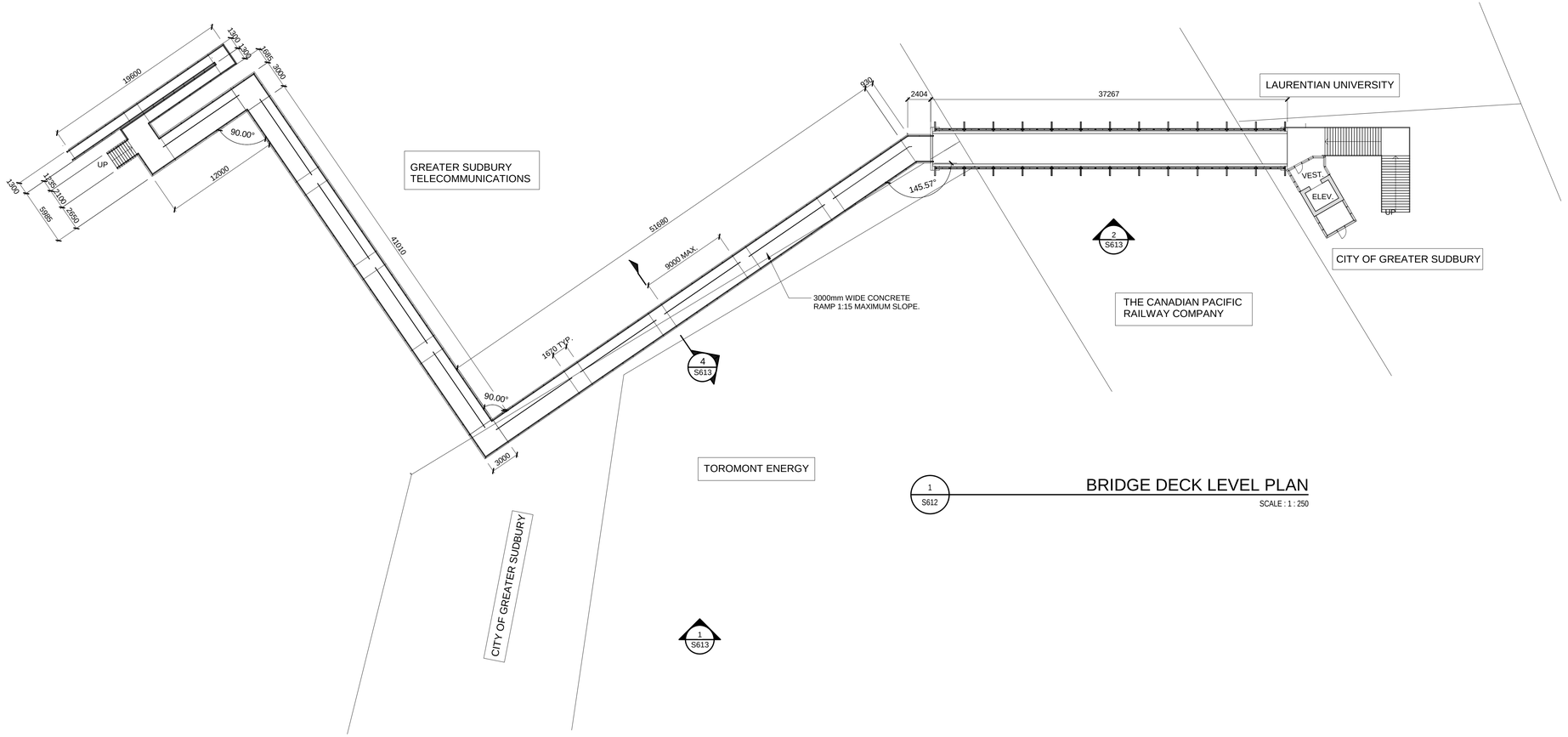

1 S612 BRIDGE DECK LEVEL PLAN

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ENERGY COURT PEDESTRIAN BRIDGE - CONCEPTUAL DESIGN

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BRIDGE DECK LEVEL PLAN

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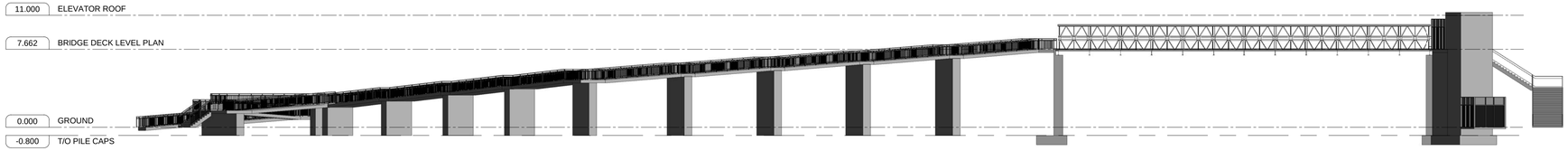

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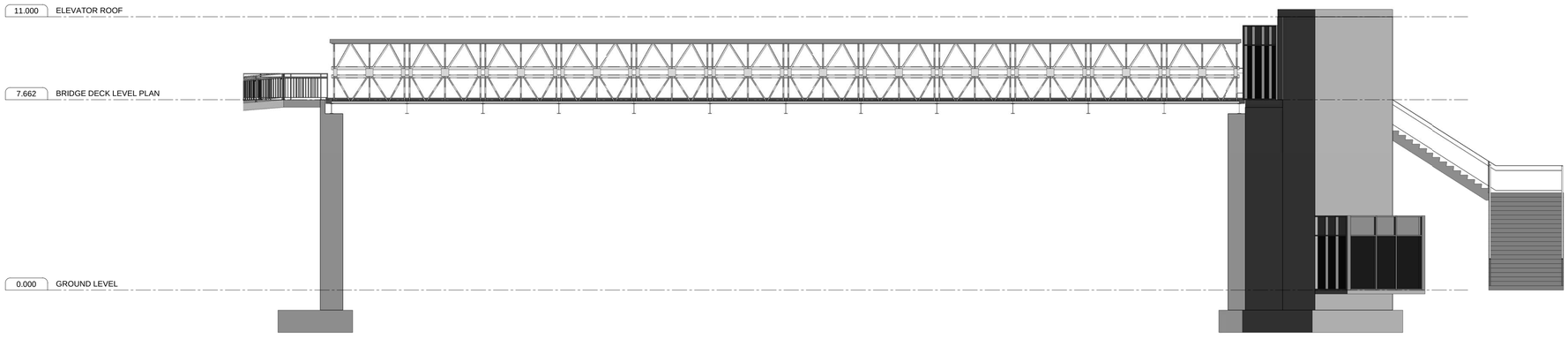

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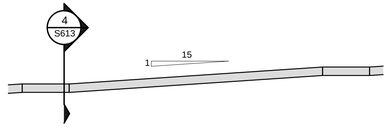

3 / S613 TYPICAL RAMP SECTION DETAIL

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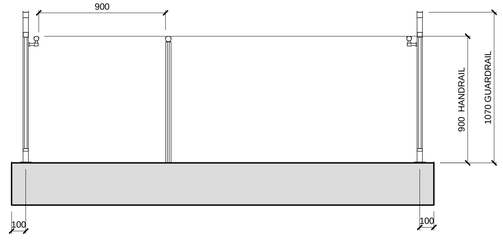

4 / S613 TYPICAL RAMP RAILING SECTION

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ELEVATIONS AND SECTIONS

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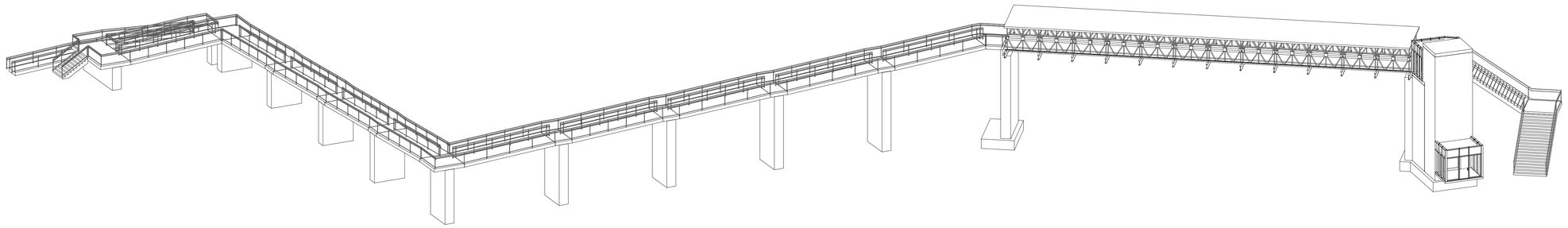

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3D VIEW NORTH

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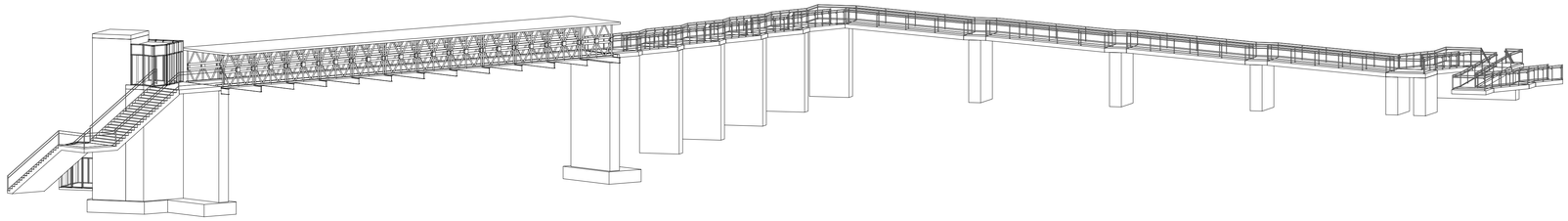

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3D VIEW SOUTH

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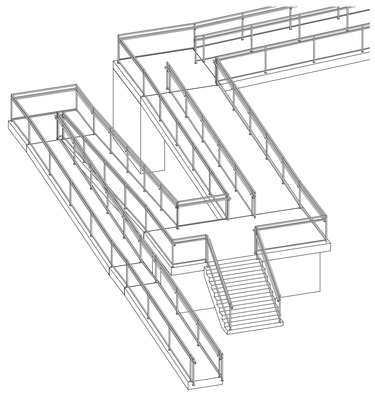

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3D VIEW RAMP ENTRANCE

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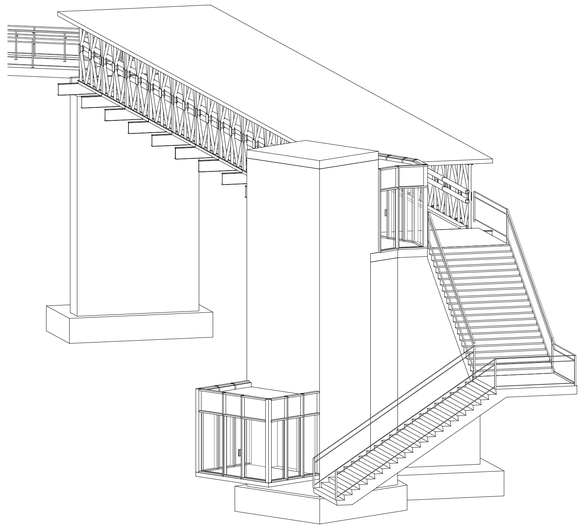

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3D VIEW STAIR ACCESS

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3D VIEWS

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DRAWN:	Author	DRAWING #:
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Appendix B

Class C Opinion of Probable Cost

J.L. Richards and Associates Limited

ENGINEERS ARCHITECTS PLANNERS

Opinion of Probable Construction Costs - Class "C"

Client	**City of Greater Sudbury**		
Project	**Energy Court Pedestrian Bridge**	**JLR Job No.**	**27777-000.1**
Location	**Sudbury, Ontario**		
Date prepared	**May 11, 2018**		

ELEMENT	QUANTITY	UNIT	RATE	TOTALS
Additional Investigations/Studies				
Municipal Class Environmental Assessment	1	Allowance	$80,000.00	$80,000.00
Underground Utility Locates	1	Allowance	$10,000.00	$10,000.00
Topographic Survey	1	Allowance	$15,000.00	$15,000.00
Geotechnical investigation	1	Allowance	$60,000.00	$60,000.00
Phase 1 and 2 Environmental Site Assessment (ESA)	1	Allowance	$50,000.00	$50,000.00
SUBTOTAL GEOTECHNICAL ITEMS				**$215,000.00**
Civil Items				
Sheet piling	364	m^2	$400.00	$145,600.00
Excavation	1400	m^3	$54.00	$75,600.00
Dewatering	14	Week	$15,000.00	$210,000.00
Soil disposal	1400	m^3	$54.00	$75,600.00
Backfill	1400	m^3	$80.00	$112,000.00
Landscaping	1	Allowance	$5,000.00	$5,000.00
SUBTOTAL CIVIL ITEMS				**$623,800.00**
Steel Modular Bridge				
Steel modular bridge (includes delivery)	1	Each	$276,000.00	$276,000.00
Guardrails	80	m	$1,000.00	$80,000.00
Plexiglass bridge walls	480	m^2	$455.00	$218,400.00
Bridge roof	120	m^2	$215.00	$25,800.00
Installation of bridge (crane rentals included)	1	Allowance	$100,000.00	$100,000.00
SUBTOTAL STEEL MODULAR BRIDGE				**$700,200.00**
Bridge Foundations				
Pier and footing on rock fill working mat (combined elevator shaft and bridge footing on east side)	2	Each	$130,000.00	$260,000.00
Micropiles (3 per side)	6	Each	$17,000.00	$102,000.00
Granular pads	300	m^3	$80.00	$24,000.00
SUBTOTAL BRIDGE FOUNDATIONS				**$386,000.00**
Passenger Elevator (East End of Bridge)				
Footings (included with bridge foundation)				$0.00
Elevator shaft	1	Each	$92,700.00	$92,700.00
Exterior building enclosure	1	Each	$75,000.00	$75,000.00
Elevator	1	Each	$95,000.00	$95,000.00
Roof	1	Each	$15,000.00	$15,000.00
Concrete landing (at east end of bridge)	12	m^3	$1,300.00	$15,600.00
Vestibule	2	Allowance	$25,000.00	$50,000.00
Mechanical units and associated heating	1	Each	$40,000.00	$40,000.00
Sump tie-ins to sanitary sewer (east)	100	m	$350.00	$35,000.00
Sump pumps	2	Allowance	$5,000.00	$10,000.00
SUBTOTAL ACCESS PASSENGER ELEVATOR				**$428,300.00**
Stairs (East End of Bridge)				
Concrete Piers	4	m^3	$1,500.00	$6,000.00
Concrete footing (2.4m x 2.4m x 0.5m) on soil	18	m^3	$1,500.00	$27,000.00
Granular pads	20	m^3	$80.00	$1,600.00
Concrete stairs	40	m^3	$1,300.00	$52,000.00
Guardrails	25	m	$2,000.00	$50,000.00
Handrails	13	m	$500.00	$6,250.00
SUBTOTAL STAIRS				**$142,850.00**
Ramp (West End of Bridge)				
Concrete landing (at west end of bridge)	12	m^3	$1,500.00	$18,000.00
Concrete ramp	110	m^3	$1,800.00	$198,000.00
Concrete piers	50	m^3	$1,500.00	$75,000.00
Micropiles	18	Each	$17,000.00	$306,000.00
Guardrails	280	m	$2,000.00	$560,000.00
Handrails	140	m	$500.00	$70,000.00
SUBTOTAL STAIRS				**$1,227,000.00**
SUBTOTAL STRUCTURAL ITEMS				**$2,884,350.00**
Electrical				
Hydro utility service	1	Allowance	$50,000.00	$50,000.00
Outdoor lighting (in-rail lighting) (pole lighting - minus $35k)	1	Allowance	$100,000.00	$100,000.00
Transformers, panels to support elevator and lighting	1	Allowance	$25,000.00	$25,000.00
CCTV systems (camera, wiring and conduit)	1	Allowance	$30,000.00	$30,000.00
Distress 'blue light' stations	2	Each	$7,500.00	$15,000.00
SUBTOTAL ELECTRICAL ITEMS				**$220,000.00**
Construction Estimate Subtotal				**$3,943,150.00**
General				
General Costs	1	Allowance	10%	$394,300.00
Mobilization/Demobilization	1	Allowance	3%	$118,300.00
Contractor Profit	1	Allowance	10%	$394,300.00
Consultant Fees	1	Allowance	10%	$394,300.00
Maintenance	1	Allowance	$503,800.00	$503,800.00
Winter Maintenance	1	Allowance	$411,400.00	$411,400.00
Contingency	1	Allowance	25%	$984,578.00
SUBTOTAL GENERAL ITEMS				**$3,200,978.00**
PROJECT TOTAL				**$7,144,128.00**

The following summary is an opinion of probable cost attainable for the described construction as of the date of this report. It is not a prediction of the low tender price. Tendered prices will be influenced by factors such as the tenderer's interpretations of their probable efforts, competitiveness in the market at the time of tendering, etc., which are not within our control or ability to predict.

Opinion of Probable Costs

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