New Track and Facilities Transit Project Assessment Process

Final Environmental Project Report – Chapter 3

27-Nov-2020

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This submission was completed and reviewed in accordance with the Quality Assurance Process for this project.

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3 Detailed Project Description

In accordance with Section 9 (2) 2. of *O. Reg. 231/08*, this chapter provides a detailed description of the infrastructure proposed as part of the Project and associated design information for the following components:

- New Tracks and upgrades to Existing Tracks (along Various Rail Corridors)
- Retaining Walls (along Various Rail Corridors)
- Switches (along Various Rail Corridors)
- GO Station Platforms (along Various Rail Corridors)
- Layover and Storage Yard Facilities (along Various Rail Corridors)
- Thickson Road Bridge Expansion (Lakeshore East Corridor)
- Electrification of a portion of the Richmond Hill Corridor, within the City of Toronto

3.1 Overview of Rail Corridors and Subdivisions

GO trains operate across a network of rail corridors in the Greater Toronto and Hamilton Area (GTHA) and beyond. These rail corridors are owned and operated by a variety of railway companies, such as Metrolinx, Canadian National (CN), and Canadian Pacific (CP), as shown in Figure 3-1.

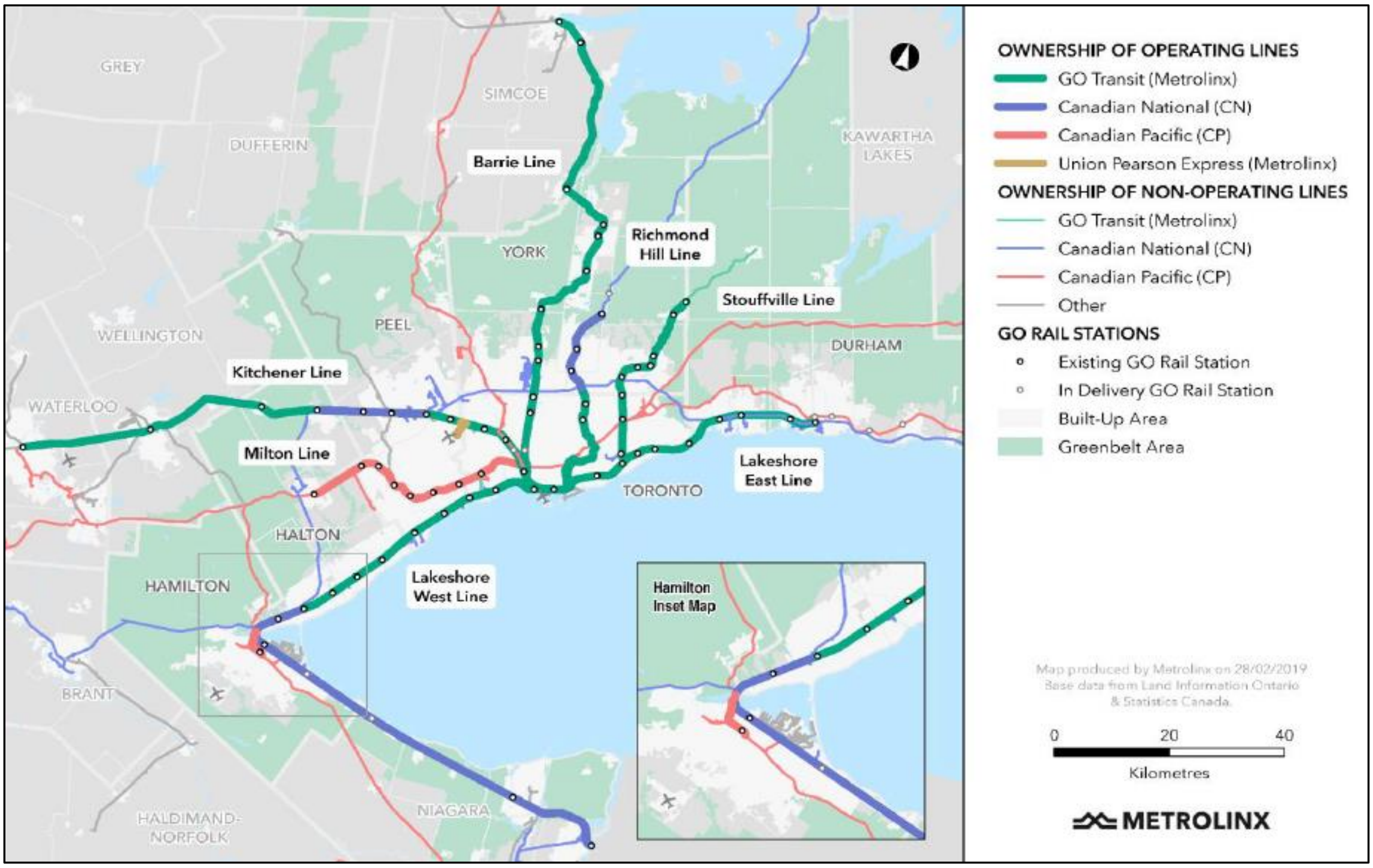


FIGURE 3-1 TRACK OWNERSHIP OF GO RAIL OPERATING LINES

GO rail corridors are identified by name, such as Lakeshore West, and are further separated into subdivision segments based on track ownership. As a result, each subdivision contains different mileage markers determined by the owner, which helps users to indicate specific locations along the corridor (see Table 3-1).

TABLE 3-1 RAIL CORRIDOR AND SUBDIVISION SEGMENTS

GO Corridor	Subdivision Name	Mile From	Mile To
Lakeshore West	Canpa	0	2.6
	Oakville	1	39.3
	Hamilton	57.5	60.1
Niagara	Grimsby	0.6	43.66
Lakeshore East	GO	0	11.68
	Kingston	313.87	332.4
Kitchener	Weston	1.9	16.8
	Halton	11.1	24.1
	Guelph	29.7	62.65
Richmond Hill	Bala	2.1	21
	Don Branch	209.5	206.3

GO Corridor	Subdivision Name	Mile From	Mile To
Milton	Galt	4.5	31.2
Barrie	Newmarket	3	63
Stouffville	Uxbridge	38.71	61
Pearson	Pearson	0	1.8
Union Station	USRC West	0	4.5
	USRC East	0	2.01

These subdivision mileage markers correspond with the proposed infrastructure locations of the Project, as outlined below. Specifically, Table 3-2 provides a detailed list of the proposed project infrastructure components and their locations on each rail corridor. Detailed mapping of all proposed infrastructure is included within the Appendix referenced within Table 3-2**.**

TABLE 3-2 STUDY AREA SEGMENTS, PROPOSED INFRASTRUCTURE AND FIGURE REFERENCES

New Track & Facilities TPAP Study Area Segments		Proposed Infrastructure	Figure Reference	Appendix Reference
Lakeshore West Corridor (LSW)				
Segment LSW-1	Mile 8.10 to Mile 8.60	Track upgrade Mile 2.45 to 2.60 (Canpa subdivision)	Figure LSW-1	**Appendix A1**
Segment LSW-2	Mile 20.20 to Mile 20.70	Track upgrade from Mile 20.44 to 20.80 Track upgrade from Mile 20.58 to 20.88	Figure LSW-2	
Segment LSW-3	Mile 20.70 to Mile 21.20	Track upgrade from Mile 20.44 to 20.80 Track upgrade from Mile 20.58 to 20.88	Figure LSW-3	
Segment LSW-4	Mile 28.50 to Mile 29.00	New Walkers Line Layover from Mile 28.65 to 29.48	Figure LSW-4	
Segment LSW-5	Mile 29.00 to Mile 29.50	New Walkers Line Layover from Mile 28.65 to 29.48	Figure LSW-5	
Kitchener Corridor (KT)				
Segment KT-1	Mile 12.90 to Mile 13.40	Track upgrade from Mile 13.19 to 13.69 Track upgrade from Mile 13.19 to 13.64 Track upgrade from Mile 13.35 to 13.70	Figure KT-1	**Appendix A1**
Segment KT-2	Mile 13.40 to Mile 13.90	Track upgrade from Mile 13.19 to 13.69 Track upgrade from Mile 13.19 to 13.64 Track upgrade from Mile 13.35 to 13.70	Figure KT-2	
Segment KT-3	Mile 16.10 to Mile 16.60	Track upgrade from Mile 16.20 to 16.39 Track upgrade from Mile 11.54 to 16.46 Track upgrade from Mile 11.56 to 16.46 New track from Mile 16.50 to 11.11	Figure KT-3	
Segment KT-4	Mile 16.60 to Mile 11.20 (Weston/Halton Subdivision)	Track upgrade from Mile 11.54 to 16.46 Track upgrade from Mile 16.52 to 11.56 New track from Mile 16.50 to 11.11	Figure KT-4	
Segment KT-5	Mile 11.20 to Mile 11.80	New track from Mile 11.39 to 11.75	Figure KT-5	
Barrie Corridor (BR)				
Segment BR-1	Mile 12.10 to Mile 12.60	New track from Mile 12.19 to 12.53	Figure BR-1	**Appendix A1**

New Track & Facilities TPAP Study Area Segments		Proposed Infrastructure	Figure Reference	Appendix Reference
Segment BR-2	Mile 29.50 to Mile 30.00	Track upgrade from Mile 29.50 to 29.60 New track from Mile 29.54 to 34.62 Track upgrade from Mile 29.96 to 30.29	Figure BR-2	
Segment BR-3	Mile 30.00 to Mile 30.50	New track from Mile 29.54 to 34.62 Track upgrade from Mile 29.96 to 30.29	Figure BR-3	
Segment BR-4	Mile 30.50 to Mile 31.00	New track from Mile 29.54 to 34.62	Figure BR-4	
Segment BR-5	Mile 31.00 to Mile 31.50	New track from Mile 29.54 to 34.62	Figure BR-5	
Segment BR-6	Mile 31.50 to Mile 32.00	New track from Mile 29.54 to 34.62	Figure BR-6	
Segment BR-7	Mile 31.90 to Mile 32.50	New track from Mile 29.54 to 34.62	Figure BR-7	
Segment BR-8	Mile 32.50 to Mile 32.90	New track from Mile 29.54 to 34.62	Figure BR-8	
Segment BR-9	Mile 32.90 to Mile 33.50	New track from Mile 29.54 to 34.62	Figure BR-9	
Segment BR-10	Mile 33.40 to Mile 34.00	New track from Mile 29.54 to 34.62	Figure BR-10	
Segment BR-11	Mile 33.90 to Mile 34.50	New track from Mile 29.54 to 34.62	Figure BR-11	
Segment BR-12	Mile 34.40 to Mile 34.90	New track from Mile 29.54 to 34.62	Figure BR-12	
Segment BR-13	Mile 61.30 to Mile 61.80	New track from Mile 61.40 to 63.40	Figure BR-13	
Segment BR-14	Mile 61.80 to Mile 62.30	New track from Mile 61.40 to 63.40	Figure BR-14	
Segment BR-15	Mile 62.30 to Mile 62.80	New track from Mile 61.40 to 63.40	Figure BR-15	
Segment BR-16	Mile 62.80 to Mile 63.40	New track from Mile 61.40 to 63.40	Figure BR-16	
Stouffville Corridor (ST)				
Segment ST-1	Mile 51.00 to Mile 50.60	Unionville equipment storage yard from Mile 50.70 to 50.31 New Platform at Unionville GO Station New track eastside of new platform from Mile 51.00 to 50.73 Track upgrade from Mile 52.00 to 51.01	Figure ST-1	**Appendix A1**
Segment ST-2	Mile 50.60 to Mile 50.00	Unionville Storage Yard from Mile 50.70 to 50.31	Figure ST-2	
Segment ST-3	Mile 46.30 to Mile 45.80	New Platform at Mount Joy GO Station New passing track for new platform from Mile 46.35 to 45.42	Figure ST-3	

New Track & Facilities TPAP Study Area Segments		Proposed Infrastructure	Figure Reference	Appendix Reference
Segment ST-4	Mile 45.80 to Mile 45.30	New Island Platform at Mount Joy GO Station New passing track for new platform from Mile 46.35 to 45.42	Figure ST-4	
Lakeshore East Corridor (LSE)				
Segment LSE-1	Mile 323.90 to Mile 323.40 (Kingston Subdivision)	New storage/reversal pocket track northside of Mile 323.36 to Mile 323.76	Figure LSE-1	**Appendix A1**
Segment LSE-2	Mile 10.10 to Mile 10.70	New third track from Mile 10.44 to Mile 11.76 Thickson Road Bridge expansion north side of Mile 10.67 Retaining Wall at Thickson Road	Figure LSE-2	
Segment LSE-3	Mile 10.70 to Mile 11.20	New track northside of new platform from Mile 11.56 to Mile 11.74 New third track from Mile 10.44 to Mile 11.76 Retaining Wall at Thickson Road	Figure LSE-3	
Segment LSE-4	Mile 11.20 to Mile 11.70	New Platform at Oshawa GO Station Retaining Wall at Oshawa GO Station New track northside of new platform from Mile 11.56 to Mile 11.74 New third track from Mile 10.44 to Mile 11.76	Figure LSE-4	
Richmond Hill Corridor (RH)				
Segment RH-1	Mile 1.60 to Mile 2.15	Electrification of the rail corridor (along Bala subdivision) Track upgrade from Mile 1.90 to 2.86	Figure RH-1	**Appendix A1**
Segment RH-2	Mile 2.15 to Mile 2.50	Electrification of the rail corridor (along Bala subdivision) Track upgrade from Mile 1.90 to 2.86 Track upgrade from Mile 2.37 to 2.86	Figure RH-2	
Segment RH-3	Mile 2.50 to Mile 3.10	Electrification of the rail corridor (along Bala subdivision) Track upgrade from Mile 1.90 to 2.86 Track upgrade from Mile 2.37 to 2.86 Track upgrade to Don Valley Layover from Mile 208.60 to Mile 209.50 (along Don Branch) Don Valley Layover from Mile 209.00 to 207.93 (along Don Branch) Retaining Wall at Don Valley Layover	Figure RH-3	

New Track & Facilities TPAP Study Area Segments		Proposed Infrastructure	Figure Reference	Appendix Reference
Segment RH-4	Mile 3.10 to Mile 3.60	Electrification of the rail corridor (along Bala subdivision) Don Valley Layover from Mile 209.00 to 207.93 (along Don Branch) Retaining Wall at Don Valley Layover	Figure RH-4	
Segment RH-5	Mile 3.60 to Mile 4.10	Electrification of the rail corridor (along Bala subdivision) Don Valley Layover from Mile 209.00 to 207.93 (along Don Branch) Retaining Wall at Don Valley Layover	Figure RH-5	
Segment RH-6	Mile 4.10 to Mile 4.65	Electrification of the rail corridor (along Bala subdivision)	Figure RH-6	

3.2 Standards and Codes

The infrastructure proposed as part of the New Track and Facilities TPAP has been designed in accordance with industry best practices while adhering to applicable codes and standards that include but are not limited to:

- The Ontario Electrical Safety Code;
- CSA Standards (Codes and Standards Group);
- American Railway Engineering and Maintenance-of-Way Association (AREMA) standards;
- Metrolinx GO Transit Track Standards;
- The GO Transit Design Requirements Manual;
- The Metrolinx Maintenance Facilities Design Manual;
- Transport Canada Standards;
- Metrolinx Survey Standards;
- The Ontario Building Code;
- Metrolinx Performance Standards for Structures Passing Over Electrified Corridors;
- Ontario Ministry of Transportation (MTO) Drainage Manuals;
- Electrification Enabling Works Standards, Drawings and Specifications;
- Capital Projects Group Crime Prevention Through Environmental Design – Recommended Practice Guide;
- Stormwater Management Planning and Design Manual, Ministry of the Environment and Climate Change (MECP);
- Toronto and Region Conservation Authority (TRCA) Technical Guidelines for Stormwater Management Submissions;
- Conservation Halton Technical Guidelines for Stormwater Management Submissions;
- Lake Simcoe Regional Conservation Authority (LSRCA) Technical Guidelines for Stormwater Management Submissions; and
- Central Lake Ontario Conservation Authority (CLOCA) Technical Guidelines for Stormwater Management Submissions.

3.2.1 Electrification Enabling Works Standards

As the first step in establishing the high-level requirements and mandatory criteria for design and implementation of the electrified system, Metrolinx has established a comprehensive set of Electrification Enabling Works Standards, Drawings and Specifications based on a combination of available knowledge, experience, industry best practice and worldwide standards. Taken as a whole, these specifications outline the applicable design standards and performance requirements to be met as part of delivering a safe, efficient and reliable electrified system (which is applicable to the electrified portion of the Richmond Hill Corridor discussed within this EPR).

3.3 Train Service Specification (TSS)

The Train Service Specification (TSS) is the output of transportation modelling studies performed by Metrolinx and is one of the tools used to better understand the requirements needed to support Metrolinx's GO Expansion Program. The GO Expansion program seeks to improve mobility within the GTHA by establishing a framework that, when implemented, will upgrade the existing GO Transit commuter rail service to two-way all-day service on most corridors. The TSS modelling exercise supported Metrolinx in defining the GO Rail network improvements required to meet the estimated demand levels. Specifically, Metrolinx has developed a 2041 concept for GO Expansion that entails incremental rail changes towards increased service levels across the network. The TSS-1 scenario represents the level of service Metrolinx expects at the start of service for GO Expansion.

The TSS that forms the basis for the New Track and Facilities TPAP (TSS-1) represents a leap forward for Metrolinx, as the existing commuter rail service has customarily been scheduled to emphasize morning-inbound, evening-outbound "commuter" trains that have traditionally offered limited mid-day or late-night service. The expanded rail service is intended to better address underserved travellers with more frequent public transit opportunities while meeting the growing overall demand for transit within the GTHA. It supports "reverse commuting" – that is, travel from the urban core to outlying destinations – while also providing a much more attractive mid-day and late-night service that will enable travelers to plan their trips much more easily, conveniently, and with the attraction of much less lost time waiting for the next train or having to contort travel plans to suit a train schedule.

Just as importantly, the expanded rail service will offer more convenient connections to intercity train services that originate and terminate at Union Station, and to domestic and international air services at Toronto Pearson International Airport and Billy Bishop Toronto City Airport.

In short and except where rail corridors are not currently owned by Metrolinx, the future expanded rail service will reflect frequencies (headways) close to 10 minutes on some routes during 'core' hours and will more typically be 15 or 30 minutes in both directions "all day".

3.4 Conceptual Engineering Design Process

The infrastructure proposed as part of the New Track & Facilities TPAP is based on route capability and utilization studies that have been completed by Metrolinx to establish:

- the infrastructure configuration necessary to provide sufficient capacity to operate the peak services specified in TSS-1.
- the strategy for how infrastructure will optimized for operational efficiency.

The Reference Concept Designs that were prepared to satisfy these objectives formed the basis for the impact assessment studies that were undertaken and documented within this EPR. A more detailed list of the infrastructure components included in the scope of the Project is provided in Table 3-2.

3.4.1 Key Design Assumptions

The following sections outline the key assumptions that guided the conceptual engineering design.

3.4.1.1 Track Design

Metrolinx is completing several projects that will support the objectives of GO Expansion that are not included within the scope of this Project or other ongoing TPAPs. Collectively, these projects have been characterized as 'Early Works' for the purposes of this study. Specifically, the New Track and Facilities TPAP has assumed that Early Works projects are complete/existing infrastructure for the purposes of developing the conceptual design and identifying potential environmental effects. The following is a summary of Early Works projects that were assumed to be complete for the purposes of the New Track and Facilities TPAP:

- GO Stations that are currently under construction within New Track & Facilities Study Area segments;
- Station improvements that are underway at existing GO Stations (customer service and safety improvements, including PA systems, platform edge tiles, display boards, etc.);
- Active rail corridor improvements (e.g., construction of the Stouffville Rail Corridor double-track, construction of the Barrie Rail Corridor double-track, etc.);
- Grade separations proposed within New Track & Facilities Study Area segments; and
- Tunnel/bridge expansions located in New Track & Facilities Study Area segments.

3.4.1.2 Switches

Switches enable trains to be guided from one track to another and there are no pertinent design assumptions applicable to switches for the New Track and Facilities TPAP. Refer to Section 3.6 for a further discussion of proposed switches within this Project.

3.4.1.3 Retaining Walls

The grading design for trackwork will minimize the amount of non-Metrolinx land required through the use of retaining walls, where feasible. Retaining walls are currently proposed within the Lakeshore East Rail Corridor to reduce property encroachment; and along the Don Branch to support the construction of the Don Valley Layover (refer to Section 3.7 for further details).

Property and drainage requirements will be further investigated during future project phases. This may result in the construction of additional retaining walls where expanding the corridor grade is not feasible. The locations of currently proposed retaining walls that were assessed for the New Track and Facilities TPAP are shown on Figures LSE-2, LSE-3, LSE-4, RH-3, RH-4 and RH-5 contained in **Appendix A1.** Any additional retaining walls that are identified/proposed during future project phases will be considered and assessed using the Addendum procedures further discussed in Section 9 of this report.

3.4.1.4 New GO Station Platforms

A conceptual design for new tracks in various locations along the GO rail corridor has been prepared as part of the TPAP, as detailed in Section 3.5. These areas of new track result in the need for new platforms at the following GO Stations, which are depicted visually in Figures ST-1, ST-3, ST-4 and LSE-4 in **Appendix A1**:

- Mount Joy GO Station (Stouffville Rail Corridor)
- Oshawa GO Station (Lakeshore East Rail Corridor)
- Unionville GO Station (Stouffville Rail Corridor)

GO Station platform widths will be based on track centrelines and are typically as follows:

- Width of Island Platform: 7.4m
- Width of Side Platform: 3.6m – 4.9m

The applicable train rolling stock will determine the minimum platform length at each GO station and will be confirmed during future project phases.

3.4.1.5 Layover/Storage Facilities Design

See **Appendix A2** for conceptual site plans of each proposed layover/storage yard facility. It is assumed that a detailed design phase will be required to further advance these designs prior to construction.

3.4.1.6 Thickson Road Bridge Expansion (Town of Whitby)

A conservative assessment of potential impacts resulting from the expansion of the Thickson Road Bridge was completed on the basis of the anticipated area of disturbance and typical construction activities. Therefore, environmental impacts associated with this work will need to be further assessed following the TPAP, once a detail design has been prepared. This design will then need to be reviewed and EPR Addendum requirements confirmed to determine whether an Addendum to this EPR is required. See Figures LSE-2 and LSE-3 in **Appendix A1** for the location of the proposed Thickson Road Bridge Expansion.

3.4.1.7 Electrification – Richmond Hill Corridor (City of Toronto)

The Richmond Hill Rail Corridor will be partially electrified from its southern terminus at the Union Station Rail Corridor north to approximately Mile 4.4/Pottery Road in the City of Toronto. Electrification is needed for the efficient operation of trains in and out of Union Station and will accommodate all necessary structural clearances within the rail ROW related to bridges & rail overpasses, utilities and utility poles, etc.

A conservative Overhead Catenary System (OCS) Impact and Vegetation Removal Zone was established as part of the TPAP for the purposes of assessing potential environmental effects. The exact locations of OCS foundations and poles will be determined during detailed design.

See Figures RH-2 to RH-5 in **Appendix A1** for conceptual design and location of proposed infrastructure.

3.4.2 Siting of New Layover Facility & Storage Yard Locations

As part of the Pre-Planning Phase of the TPAP, a significant amount of conceptual engineering work was completed to arrive at the preferred layover/storage yard locations to ensure they are feasible from a constructability and operational standpoint. This conceptual engineering work considered operational adequacy, environmental constraints, constructability and potential impacts on utilities and property owners when identifying potential locations.

Specifically, the following criteria were seen as beneficial by Metrolinx when identifying the preferred layover and storage facility locations that formed the basis of assessment within the New Track and Facilities TPAP:

- Locations that align with and achieve the operational requirements of the TSS;
- Close proximity to major GO stations;
- Proximity of proposed layover/storage facilities to existing rail tracks;
- Consideration of existing utilities and potential utility conflicts;
- Sufficient property to satisfy the minimum size requirements of proposed layover/storage facilities; and
- Consideration of track geometry.

This exercise identified the following locations for proposed layover and storage yard facilities:

- Walkers Line Layover (Lakeshore West Corridor – City of Burlington)
- Unionville Storage Yard (Stouffville Corridor – City of Markham)

- Don Valley Layover (Richmond Hill Corridor – City of Toronto)

A Reference Concept Design was developed for each of these sites that formed the basis for the assessment of potential environmental impacts that is documented within this EPR. Note that as this Project is proceeding under *Ontario Regulation 231/08*, *Transit Projects and Metrolinx Undertakings*, it is not necessary for Metrolinx to further define the rationale, planning alternatives, or alternative solutions that were considered to achieve the stated objective of this project – namely, to build new infrastructure as follows along various rail corridors, that will enable Metrolinx to deliver targeted service levels: new tracks within existing Metrolinx rail Rights-of-way (ROW), modifications or upgrades to existing tracks within existing Metrolinx rail ROW, three (3) new layover/storage facilities, new GO station platforms, bridge expansion/modification, and electrification of a portion of the Richmond Hill Rail Corridor within the City of Toronto.

3.4.2.1 Selection of a Preferred Layover on the Lakeshore West Rail Corridor

The route capability and utilization studies referenced within Section 3.4 identified the need for a storage facility near Burlington GO Station on the Lakeshore West rail corridor to accommodate:

- Turnback capabilities at Burlington GO Station;
- Peak rail services that originate at Burlington GO Station, as well as capability for services originating/terminating at Aldershot GO Station;
- Reduced rail congestion on the Lakeshore West rail corridor; and
- The ability to serve as the terminus of electrification of the Lakeshore West corridor.

An initial site was identified during the Pre-Planning Phase of the TPAP that met the above requirements in the vicinity of Plains Road/Fairview Street in the City of Burlington. This site was referred to by Metrolinx as the “Beach Layover” for the purposes of TPAP planning. The location was chosen in part for its ideal location and size, which accommodated the required storage and servicing needs to meet the TSS-1 service levels previously discussed in Section 3.3.

The 71,526 m^2 Beach Layover site is currently being used for industrial purposes and significant property acquisition and business relocation would be required to implement the proposed layover. Specifically, the site is currently being used by a producer of printing inks, coatings, pigments, polymers, liquid and solid compounds, and application materials. A Phase I Environmental Site Assessment (ESA) was conducted in November 2019 for the proposed Beach Layover that sought to identify potential sources of environmental contamination on the basis of historical records review and site reconnaissance. This investigation determined that there is potential for environmental contamination from on-site and off-site historical and current land uses, and further study was recommended to assess soil and groundwater quality in accordance with applicable Ontario Ministry of the Environment, Conservation and Parks (MECP) standards. Hence, while the extent of contamination from both on-site and off-site sources at the Beach Layover site is unknown, it is understood to be significant based on the results of the Phase I ESA.

Additional areas of concern were identified for the Beach Layover site during the Pre-Planning Phase of the TPAP as Metrolinx completed environmental investigations and met with local stakeholders. This included the identification of several potential utility conflicts related to gas, watermain, sanitary sewer, storm sewer and culverts. All such assets at the Beach Layover site would require relocation/reservicing.

Metrolinx completed an analysis upon consideration of this new information to determine whether an alternate site along the Lakeshore West rail corridor could provide sufficient storage space to meet the TSS-1 service requirements. This resulted in the identification of a new location in the vicinity of Walkers Line/Harvester Road, in the City of Burlington and to the west of Appleby GO Station [henceforth known as the '**Walkers Line Layover Facility**']. The 'new' Walkers Line Layover Facility location provided many benefits compared to the Beach Layover location, including:

- The Walkers Line Layover location makes greater use of Metrolinx's existing property for track storage;
- The overall footprint of the Walkers Line Layover is smaller than that of the Beach site, reducing the extent of potential environmental impacts;
- The existing, undeveloped condition[1] of the proposed Walker Line Layer site reduces the impacts associated site preparation (e.g. no demolition is required) and will result in less disruption or displacement to existing businesses;
- The preliminary screening that was completed during the options analysis indicated that surrounding land uses pose less of a contamination risk at the Walkers Line site. This was subsequently confirmed during a follow-up Phase 1 ESA (contained within **Appendix O**).

The above considerations led Metrolinx to select the Walkers Line site as the preferred location to host a layover on the Lakeshore West rail corridor.

Although this Project is proceeding in accordance with *O. Reg. 231/08* and it is not necessary for Metrolinx to define the rationale, planning alternatives, or alternative solutions that were considered to achieve the stated objective of the Project, there was thought to be benefit in describing the iterative design and planning process that led to the inclusion of the Walkers Line Site within this EPR; particularly as the original Beach Layover site was the subject of extensive consultation during the Pre-Planning Phase of the TPAP. Discussions with local stakeholders such as the City of Burlington, Halton Region and Conservation Halton commenced in Spring 2019, and the site was presented to the public during the initial round of public meetings that were held in February 2020 (refer to Chapter 8 and **Appendix P** for additional details on these discussions).

Furthermore, the selection of the Walkers Line site as the preferred location for a layover was made during the assessment of potential environmental impacts and following the collection of baseline conditions data. Therefore, the baseline conditions reporting contained within the Appendix to this EPR (e.g. **Appendix B1**, **Appendix C1**, **Appendix D1**, etc.) refer to both the previously considered Beach Layover site as well as the new Walkers Line location, which is beneficial for the following reasons:

- Any assessment work completed for the previously considered Beach Layover location may be of use to Metrolinx or others, should there be interest in developing this site in the future; and
- By documenting the Beach Layover within the EPR, Metrolinx's TPAP documentation reflects the iterative process that occurred during the Pre-Planning Phase of the TPAP, providing transparency and clarity to those individuals and stakeholders that may have been affected by, or had an interest in, consideration of the previous location.

Please note that the Walkers Line Layover is the only layover/storage facility on Metrolinx's Lakeshore West Rail corridor where approval is being sought under *Ontario Regulation 231/08*, *Transit Projects and Metrolinx Undertakings*.

3.4.2.2 Walkers Line Layover Facility Location

The preferred location for a layover on the Lakeshore West Rail Corridor is within the City of Burlington at a site that has been dubbed 'Walkers Line' (see Figures LSW-4 and LSW-5 in **Appendix A1** for

[1] The Walkers Line Layover Facility components (i.e., staff parking, sanding towers, access road, etc.) is proposed on an adjacent property, which is developed with a bus storage/parking lot and a staff building. However, the south portion of the property (which is directly adjacent to the ROW) is largely vacant.

mapping illustrating this location). The Walkers Line site was selected because it exhibits the following characteristics:

- The site is within close proximity to Appleby GO Station.
- Metrolinx owns the Lakeshore West rail corridor; therefore, a portion of the proposed site is owned by Metrolinx and contained within the existing rail ROW.
- At approximately 12.3 acres, the site is large enough to accommodate the required track geometry and infrastructure for the required number of trains. The intended use of the facility will be for storage only; no maintenance services will be carried out at this location.
- The layover location can be easily accessed by staff and emergency respondents.

Refer to Section 3.9 for additional detail regarding the proposed Walkers Line Layover Facility conceptual design and function.

3.4.2.3 Unionville Storage Yard Facility Location

The preferred location for a storage facility on Metrolinx's Stouffville corridor is within the City of Markham at a site that has been dubbed the 'Unionville Storage Yard' (see Figures ST-1 and ST-2 in **Appendix A1** for mapping illustrating this location). The Unionville Storage Yard was selected because it exhibits the following characteristics:

- The site is within close proximity to Unionville GO Station.
- At approximately 1.7 acres, the site is large enough to accommodate the required track geometry and infrastructure for the required number of trains. The intended use of the facility will be for storage only; no maintenance services will be carried out at this location.
- The location is easily accessible by emergency respondents and staff.

Refer to Section 3.9 for additional detail regarding the proposed Unionville Storage Yard Facility conceptual design and function.

3.4.2.4 Don Valley Layover Facility Location

The preferred location for a layover facility along the Richmond Hill Rail Corridor is within the City of Toronto's Don River Valley (see Figures RH-3, RH-4 and RH-5 in **Appendix A1** for mapping illustrating proposed Don Valley Layover location). The Proposed Don Valley Layover location was selected because it exhibits the following characteristics:

- The site is within close proximity to Union Station.
- The site has existing tracks from previous train operations; therefore, no additional tracks will be required.
- Metrolinx owns the Don Branch rail corridor; therefore, a portion of the proposed site is owned by Metrolinx.
- The site is large enough to accommodate the required infrastructure for train storage.
- The facility is easily accessible by emergency respondents and permeant staff.

Union Station is currently a bottleneck in the GO Transit network. By situating a layover site on the Metrolinx-owned Don Branch, trains will be allowed to quickly and efficiently drop passengers at Union Station and allow for improved movement and reduced congestion. The site is ideally located to Union Station to allow for off-peak train storage.

Refer to Section 3.9 for additional detail regarding the proposed Don Valley Layover Facility conceptual design, site layouts, and function.

3.5 Track Infrastructure

3.5.1 New Tracks/Track Upgrades

New tracks, upgrades to existing tracks, and track realignments are required on various Metrolinx rail corridors as part of achieving targeted GO Expansion service levels. The locations and extent of the proposed new tracks and track upgrades are outlined in Table 3-2**.** For more detailed mapping illustrating proposed track locations refer to **Appendix A1.**

FIGURE 3-2 EXAMPLE OF TRACK INFRASTRUCTURE

3.6 Switch Infrastructure

The purpose of a switch is to enable a train to be guided from one track to another (see Figure 3-3 for an image of a switch). When incorporated into a rail system, switches allow trains to easily move across the network and accommodate increased service. Several new switches (or upgrades to existing switches) are required within the existing rail ROWs/track beds as part of the New Track and Facilities TPAP. Proposed switch locations are listed in Table 3-2 and are shown visually in Figure 3-4 and **Appendix A3**.

FIGURE 3-3 EXAMPLES OF SWITCH INFRASTRUCTURE

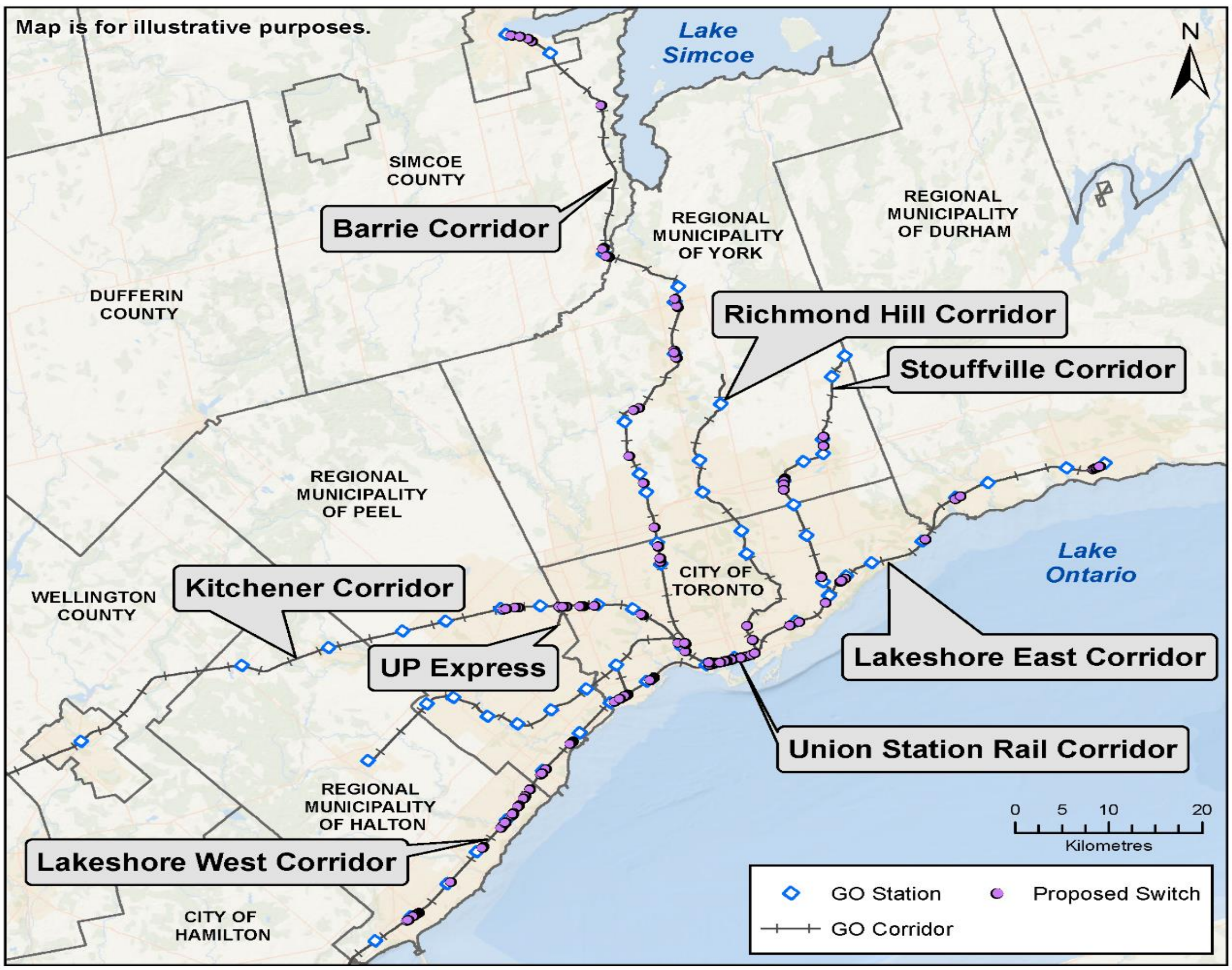


FIGURE 3-4 KEY MAP OF PROPOSED SWITCH LOCATIONS

3.7 Retaining Walls

As part of the conceptual design process, retaining walls were identified at the following locations along the Lakeshore West, Lakeshore East and Richmond Hill (Don Branch) rail corridors to support the construction of the additional railway tracks:

- Track Segment LSW-5: Mile 28.65 to 29.48 (City of Burlington
    - Retaining/wingwall at Walkers Line Layover [Shoreacres Creek Culvert Extension]; length approximately 10 metres on each side of culvert barrel
- Track Segment LSE-2: Mile 10.10 to Mile 10.70 (Town of Whitby)
    - Retaining wall at Thickson Road; length approximately 315 metres
- Track Segment LSE-3: Mile 10.70 to Mile 11.20 (Town of Whitby)
    - Retaining wall at Thickson Road; length approximately 190 metres
- Track Segment LSE-4: Mile 11.20 to Mile 11.70 (City of Oshawa)
    - Retaining wall at Oshawa GO Station; length approximately 231 metres
- Track Segment RH-3: Mile 2.50 to Mile 3.10 (of Toronto)
    - Retaining wall at Don Valley Layover City; length approximately 36 metres
- Track Segment RH-4: Mile 3.10 to Mile 3.60 (City of Toronto)
    - Retaining wall at Don Valley Layover; length approximately 46 metres
    - Retaining wall at Don Valley Layover; length approximately 67 metres
    - Retaining wall at Don Valley Layover; length approximately 191 metres
- Track Segment RH-5: Mile 3.60 to Mile 4.10 (City of Toronto)
    - Retaining wall at Don Valley Layover; length approximately 29 metres

The type, depth and height of retaining walls will be confirmed during detailed design. Typically, a standard 2:1 side slope will be provided with a 1 m flat bottom ditch (in cut sections). Where the standard grading impacts the property line, a reinforced side slope of 1:1.5 may be provided to reduce the amount of land required to tie back to the original ground surface without impacting the property line; however, these details are subject to review and confirmation as part of the detailed design phase.

The following types of retaining walls may be considered for implementation and will be subject to confirmation as part of the detailed design phase:

- Lock block wall – concrete blocks that are stacked to create retaining walls;
- Precast Concrete Lagging with Cantilevered Soldier Pile;
- Precast Concrete Lagging with Solider Pile and Tieback; and
- Sheet Pile.

Retaining walls that may be notable from a public realm perspective will be reviewed by the Metrolinx Design Review Panel (MDRP) during future project phases. Refer to mapping contained in **Appendix A1** for an exhaustive depiction of all proposed retaining wall locations.

3.8 New GO Station Platforms

New platforms at existing GO Stations are proposed as follows and as outlined in Table 3-2.

- Mount Joy GO Station (Stouffville Rail Corridor – City of Markham)
- Oshawa GO Station (Lakeshore East Rail Corridor – City of Oshawa)
- Unionville GO Station (Stouffville Rail Corridor – City of Markham)

It should be noted that only potential environmental impacts associated with the physical footprint/location of proposed platforms have been assessed as part of the New Track and Facilities TPAP. It is assumed that any ancillary GO Station infrastructure (e.g., expanded parking area to accommodate the new platform/increased ridership) has been/will be assessed under separate Environmental Assessment or TPAP studies. For the purposes of the New Track and Facilities TPAP, a conservative assessment of potential platform impacts was completed based on the anticipated area of disturbance. Therefore, environmental impacts associated with the ultimate design will need to be reviewed and EPR Addendum requirements confirmed during the next project phase, if applicable. Refer to mapping contained in **Appendix A1** for locations of proposed GO Station Platforms.

Figure 3-5 and Figure 3-6 depict typical drawings of a GO Station Platform.

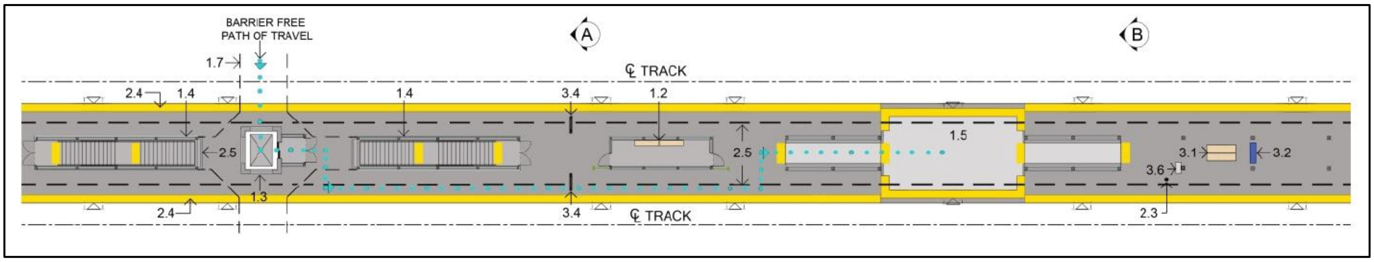


FIGURE 3-5 TYPICAL RAIL PLATFORM CONFIGURATION

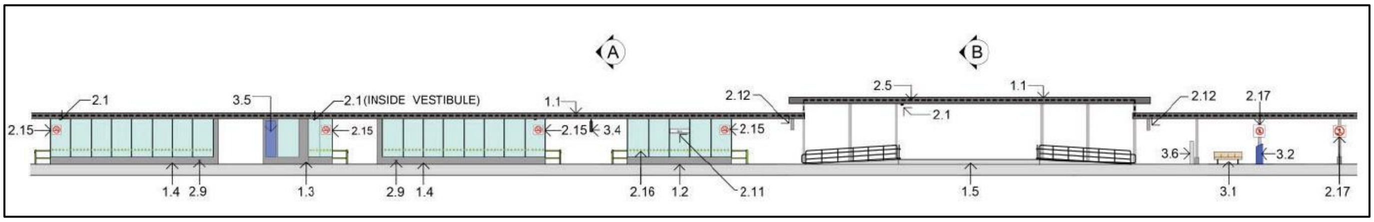


FIGURE 3-6 TYPICAL RAIL PLATFORM ELEVATION

3.9 Layover & Storage Yard Facilities

Two (2) new layover facilities and one (1) new storage yard are required to achieve the targeted GO Expansion service levels. These new facilities will allow Metrolinx to:

- Reduce long-distance non-revenue trips.
- Accommodate train storage during off-peak hours.
- Service and clean trains in close proximity to the corridors they serve.
- Provide flexibility for trains to operate more seamlessly across the network.

Routine maintenance will be carried out on the vehicles that operate along the rail corridor. The type of maintenance activities that are envisioned at the New Track and Facilities TPAP layover and storage facility sites involve service maintenance (e.g., general cleaning, toilet dumping, refill potable water, etc.).

All layover sites must provide safe access for emergency response vehicles and room to maneuver. Typical emergency vehicle turnaround loops are 10-11 meters in radius; however, in some locations, these turnaround loops have a larger footprint than the available property. In these instances, such as at the Don Valley Layover site, maintenance roadways have been extended to provide sufficient space for a three-point-turn. Unless property constraints dictate otherwise, roadways between tracks have been designed wide enough for various emergency and maintenance vehicles.

The Walkers Line Layover and Unionville Storage Yard are to be electrified. For more information regarding the required electrification infrastructure for these facilities and related documentation concerning potential impacts and mitigation, refer to the GO Rail Network Electrification EPR Addendum.

Detailed descriptions of the two (2) new layover facilities and one (1) new storage yard facility have been provided in the sections that follow.

3.9.1 Walkers Line Layover Facility – Lakeshore West Corridor (City of Burlington)

The Walkers Line Layover site is proposed on the Lakeshore West Corridor, within the City of Burlington, and is bordered by Walkers Line and Harvester Road. The proposed track storage area is within Metrolinx's existing ROW; however, additional property will be required to host the layover's buildings and facilities. This facility will store trains during the daytime as well as overnight, reduce congestion on the Lakeshore West Corridor and minimize non-revenue travel by being near major GO Stations, such as the Appleby GO Station. Only service maintenance is proposed at this location, although the facility will require site lighting and parking for the staff/storage building.

Key Design Elements Include:

- Storage of nine (9) GO Trains (the layover can accommodate up to one diesel locomotive with six consists and eight diesel locomotives with twelve consists);
- Fleet Storage, Crew Services, and Staff Parking;
- East and West connection to the mainline track;
- A staff entrance from Harvester Road (while two access roads are currently shown on the site plan, it is Metrolinx's intent to only construct a single road that provides the most feasible access to the layover facility);
- The track storage infrastructure will be within Metrolinx's existing ROW;
- Additional property will be required for crewing services, electrical power, staff parking, etc.;
- Expansion of an existing culvert over Shoreacres Creek will be required to accommodate needed track storage; and
- Electrification infrastructure.

Please refer to Figure 3-8 and Figure 3-9 for preliminary visual renderings of both the existing and proposed future condition of this site.

3.9.1.1 Site Servicing

Site servicing plans that were developed as part of the RCD are contained in **Appendix A2.** All service connections to the proposed Walkers Line Layover will be further reviewed in consultation with the Region of Halton, the City of Burlington, Enbridge Gas, Burlington Hydro and Metrolinx. The site servicing plan itself is also subject to further revision during detailed design.

The proposed staff and storage building will require domestic water, fire water, sanitary, electrical and gas services. All staff and storage building service requirements will connect to the Region of Halton watermain and sanitary sewer, Burlington Hydro power lines and the Enbridge gas main located on Harvester Road.

The proposed electrical substation building will be serviced from the existing Metrolinx power lines located on the south side of the Lakeshore West Corridor. The substation station building will feed a power line that connects to the OCS poles (to electrify the proposed layover).

It is expected that stormwater runoff will be collected in sewer lines and conveyed to the north, west, and/or east of the developed site. Swales/ditches are to be provided where possible, and a series of catch basins are likely required in the track yard area to drain runoff. Additionally, catch basins are proposed in the paved areas of the site. The proposed track will be drained via a network of subdrains and catch basins connecting to the proposed sanitary sewer, which will ultimately tie into the line servicing the staff and storage buildings and flow into Region of Halton’s sanitary sewer. The proposed ditch on the east side of the access road will direct surface water flow to a storm service that will tie into the existing City of Burlington storm sewer located on Harvester Road.

In accordance with Metrolinx standards, storm sewer system for all new facilities shall include provisions for spill capture and containment. Automated oil shutoff valves and oil/water separators from all drainage lines and drip trays will be installed prior to drainage entering the existing storm system.

Surface run-off for the proposed layover and impervious surfaces will be conveyed through a treatment train system (e.g. bio-swales, catchbasins, and oil-grit separators) prior to discharging into the municipal storm sewer system(s). If absolutely necessary, discharge into Shoreacres Creek may also be considered through consultation with Conservation Halton.

Further analysis is needed during detailed design to develop a treatment train and to determine if the existing sewer in vicinity and/or Shoreacres Creek can accommodate the discharge from the developed portions of the proposed layover.

Detailed site plans developed as part of the reference concept design are contained in **Appendix A2.**

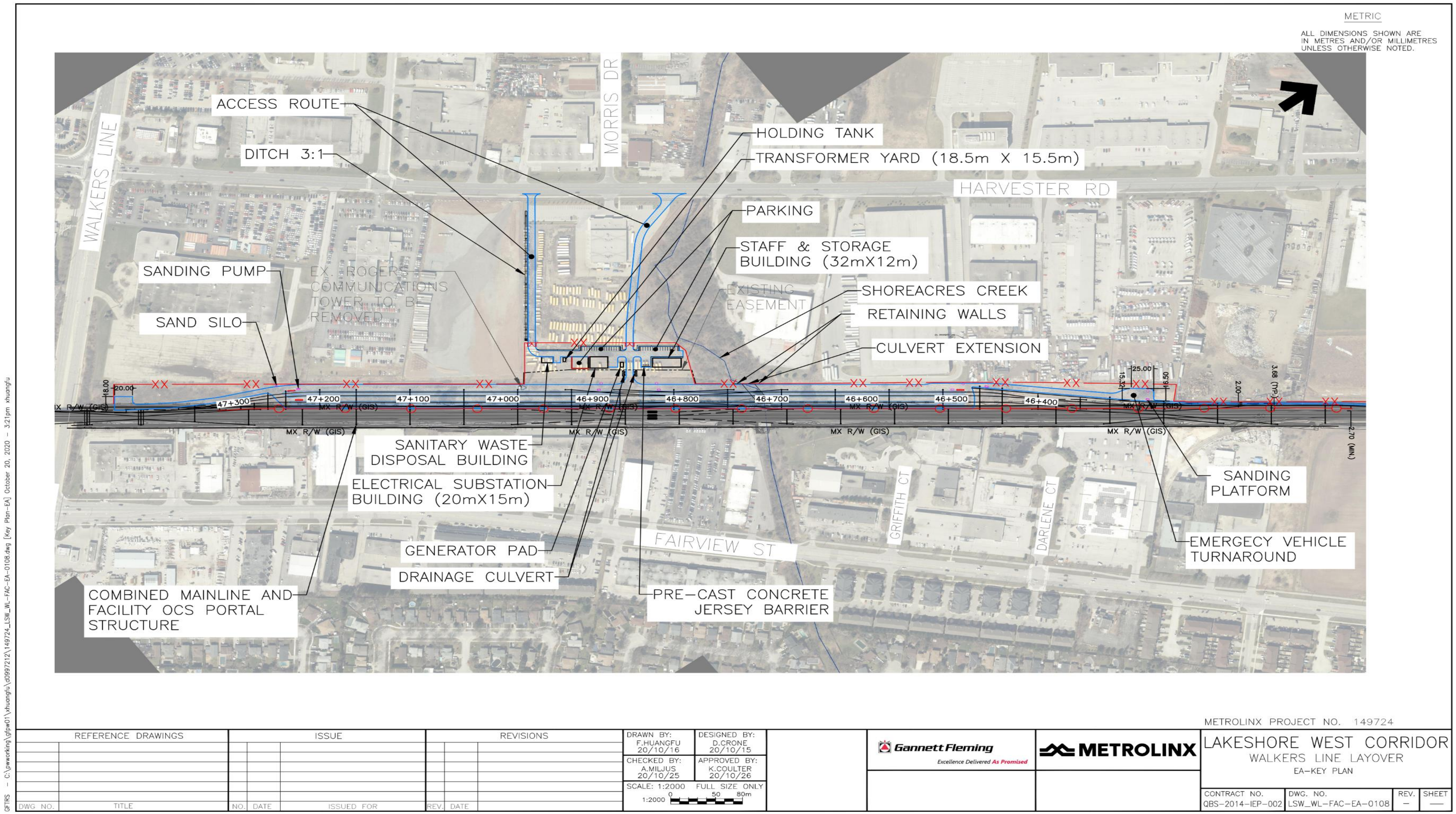


FIGURE 3-7 WALKERS LINE LAYOVER FACILITY KEY PLAN

FIGURE 3-8 EXISTING CONDITION – WALKERS LINE LAYOVER FACILITY SITE

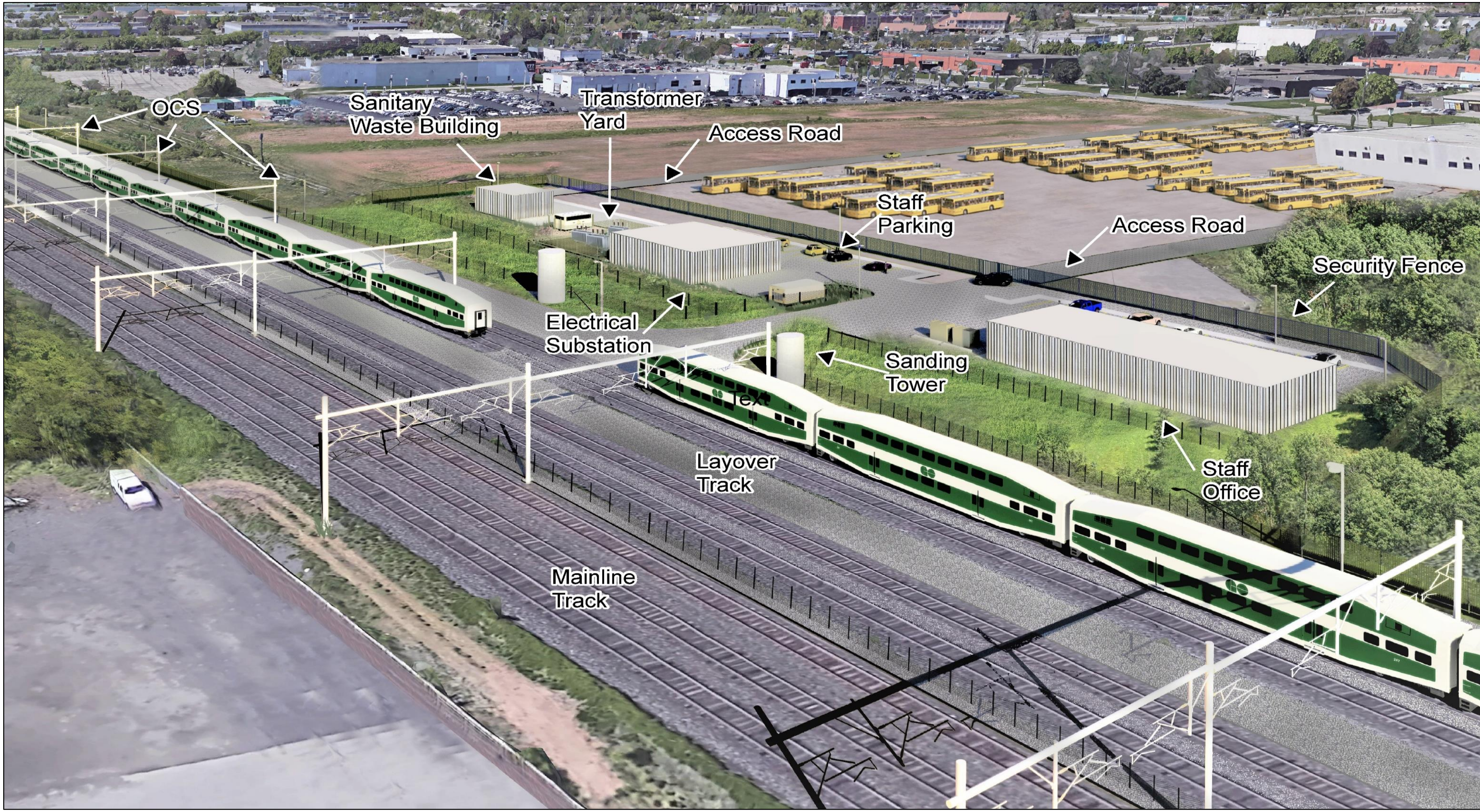


FIGURE 3-9 FUTURE CONDITION – WALKERS LINE LAYOVER FACILITY SITE

3.9.2 Unionville Storage Yard – Stouffville Corridor (City of Markham)

The Unionville Storage Yard site is proposed along the existing Stouffville Rail Corridor in the vicinity of Enterprise Boulevard within the City of Markham (see Figure 3-10). This electrified facility will store trains during the day and overnight, reduce congestion on the rail corridor, and minimize non-revenue travel by being near major GO Stations, such as Unionville GO Station. No maintenance activities are proposed at this site.

Key Design Elements Include:

- Storage for two (2) GO Trains that can accommodate up to two electric locomotives with four consists on a single track
- Staff parking for six (6) vehicles
- Connection to the mainline track
- A staff entrance from Enterprise Boulevard
- Electrification infrastructure

Please refer to Figure 3-11 and Figure 3-12 for preliminary visual renderings of both the existing and proposed future condition of this site.

3.9.2.1 Site Servicing

Site servicing plans developed as part of the reference concept design are contained in **Appendix A2.** All service connections for the proposed Unionville Storage Yard will be further reviewed in consultation with the City of Markham and other affected utility owners. The site servicing plan itself is also subject to change during the detailed design phase of the project.

A ditch is proposed on the west side of the service road, which will direct the surface water flow to a storm service that will ultimately tie into the existing City of Markham storm sewer located on Enterprise Boulevard.

Electrical services are also required to power illumination and communication items, such as a public announcement system. The proposed Hydro point connection is located on the south side of the site and is proposed to be fed from existing powerline in Enterprise Boulevard.

With regards to the anticipated drainage requirements of the proposed Unionville Storage Yard Facility, one existing ditch/swale parallel to Enterprise Boulevard and one ditch/swale along the west side of the access road should be converted to bio-swale and used to convey runoff from the developed site. These bio-swales will partially mitigate increased runoff and provide quality control within a treatment train that includes oil-grit separators. These bio-swales will also promote onsite infiltration for water balance/erosion control and will discharge to the existing sewer system along Enterprise Boulevard.

In accordance with Metrolinx standards, storm sewer system for all new facilities will include provisions for spill capture and containment. Automated oil shutoff valves and oil/water separators from all drainage lines and drip trays will be installed prior to drainage entering the existing storm system.

Further analysis is needed at the detailed design stage to develop a treatment train and to determine if the existing sewer in Enterprise Boulevard can accommodate the discharge from the developed portions of the proposed site. The detailed design should aim to replicate existing drainage pattern and minimize grading changes, as to avoid additional runoff to the Rouge River and associated wetlands.

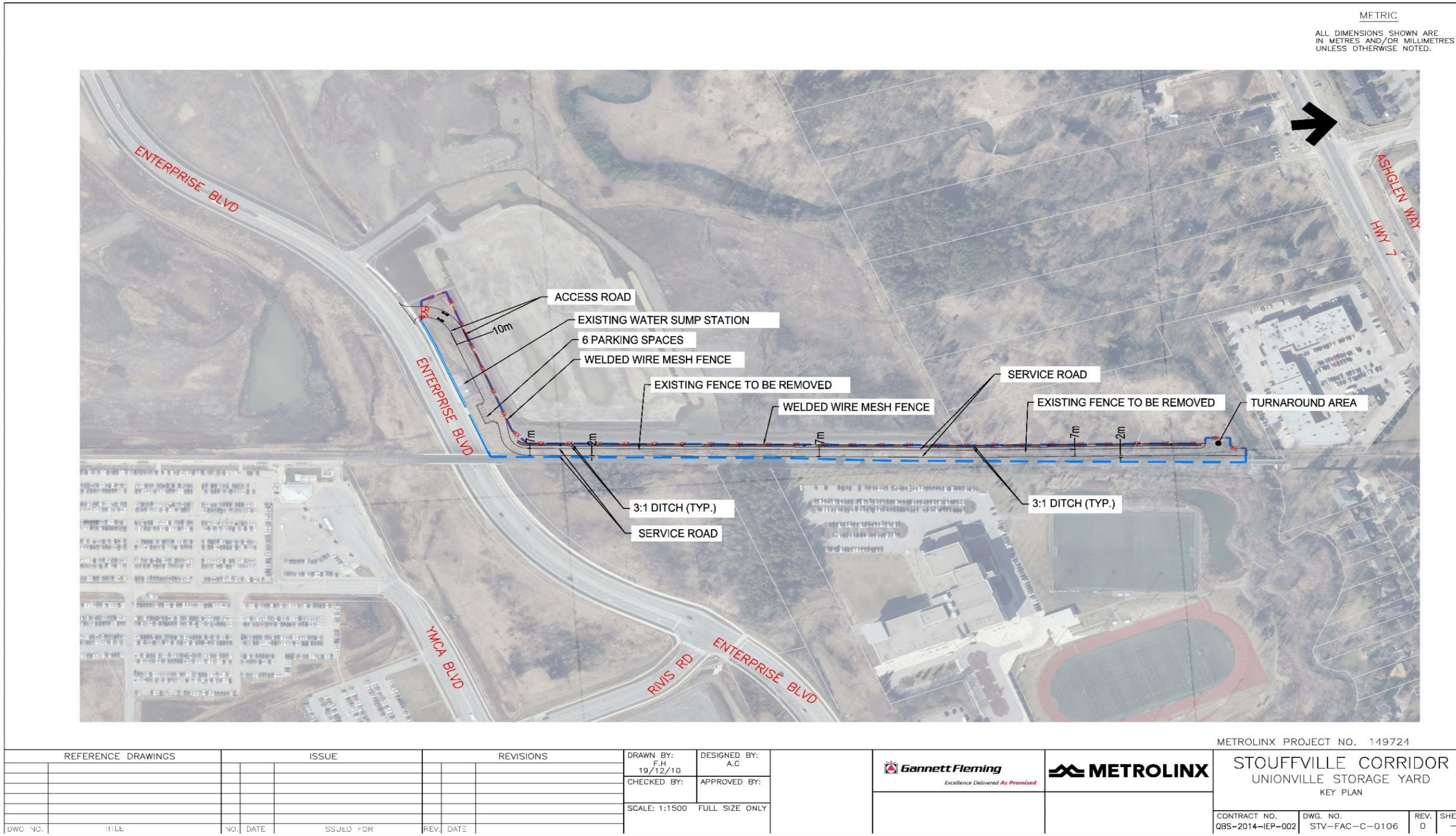


FIGURE 3-10 UNIONVILLE STORAGE YARD FACILITY KEY PLAN

FIGURE 3-11 EXISTING CONDITION – UNIONVILLE STORAGE YARD SITE

FIGURE 3-12 FUTURE CONDITION – UNIONVILLE STORAGE YARD SITE

3.9.3 Don Valley Layover – Richmond Hill Corridor (City of Toronto)

The Don Valley Layover site is proposed on the Metrolinx-owned Don Branch rail corridor that runs parallel to the Don Valley Trail within the City of Toronto (see Figure 3-13). This facility will store trains, reduce congestion on the Union Station Rail Corridor, minimize non-revenue travel by being near Union Station, and service the Barrie and Milton GO rail corridors by utilizing this facility to park trains during off-peak hours. The approximately 2.3 ha site is proposed to store approximately 3 L12 diesel consists, meaning 3 locomotives will be stored with 12 cars each. The Don Valley Layover is a non-electrified facility; wayside power connections will be required. No maintenance activities are proposed at this location, although the facility will require site lighting and parking for the staff/storage building. Access to the site during construction, operation and maintenance will be via a newly constructed access road that will formalize and expand upon an informal route utilized by the Hydro One and the City of Toronto to access a hydro substation and the Prince Edward Viaduct, respectively.

Key Design Elements Include:

- An electrical substation to provide wayside power
- Storage for three (3) GO Trains (that can accommodate up to three diesel locomotives with twelve consists on a single track)
- Crew Services, Sanitary Storage and Staff Parking facilities
- A connection to the mainline track
- An entrance to this facility from the Don Valley Parkway ramp to Bayview Avenue/Bloor Street
- A design that utilizes the currently inactive Don Branch rail corridor (keeping track storage infrastructure on Metrolinx's existing property)
- Additional property will be required for crewing services, wayside power, staff parking, etc.
- Road improvements to access the property may be required
- The design must protect the Lower Don Valley Trail and maintain connectivity to the surrounding community throughout the construction and operation of the layover facility.

The above design elements present Metrolinx's minimum requirements for this layover facility. Additional elements of the design are currently under discussion with key stakeholder such as the City of Toronto and the TRCA. The final Project Agreement will reflect the status of any negotiated upgrades for this facility that go beyond Metrolinx's minimum requirements.

Preliminary artistic renderings have been prepared to illustrate the envisioned "existing" and "future" condition of the proposed Don Valley Layover site. Refer to Figure 3-14 and Figure 3-15 respectively.

3.9.3.1 Site Servicing

Site servicing plans developed as part of the reference concept design are contained in **Appendix A2**. All service connections to the Don Valley layover will be further reviewed in consultation with the City of Toronto, Hydro One, and other applicable stakeholders. The site servicing plan is subject to change during the detailed design phase of the project.

A sanitary service connection to the staff office/storage building is required. The sanitary sewer lines will be directed to a proposed holding tank that will be evacuated on a regular basis. A fire waterline and domestic waterline are also required services for the proposed staff office/storage building. A proposed electrical substation building will be fed from Hydro One's substation located north of the layover facility, which will be confirmed following further coordination with Hydro One. The proposed electrical substation building will provide electrical connections to the layover track, the proposed holding tank, and staff office/storage building.

Runoff from the developed site will be collected in a series of ditches/swales/culverts and eventually discharged over the natural grade into to the Don River. The type of swales used (enhanced, bio-swale, etc.) will be confirmed in subsequent design stages. Drainage from the main facilities will be collected in storm sewers prior to discharging into a ditch/swale north of the Prince Edward Viaduct. Based on an understanding of the City of Toronto’s preferences, track drainage will be separated from typical surface run-off and will be collected by the sanitary system. In accordance with Metrolinx standards, storm sewer system for all new facilities will include provisions for spill capture and containment. Automated oil shutoff valves and oil/water separators from all drainage lines and drip trays will be installed prior to drainage entering the existing storm system.

A treatment train system consisting of oil-grit separators will provide further quantity and quality control; however, extensive analysis and coordination with the City of Toronto and TRCA is required during detailed design to determine the requirements and capacity of existing and proposed stormwater measures/infrastructure. Specifically, flow contribution to existing swales, culverts and storm sewers and their capacities are currently unknown. Municipal data for existing downstream infrastructure and any approvals (if required) for discharging runoff from the developed site will be obtained during future project phases. The final site servicing plan will be developed to reflect the detailed design and will utilize municipal data to determine the capacity of receiving bodies and site runoff outfalls.

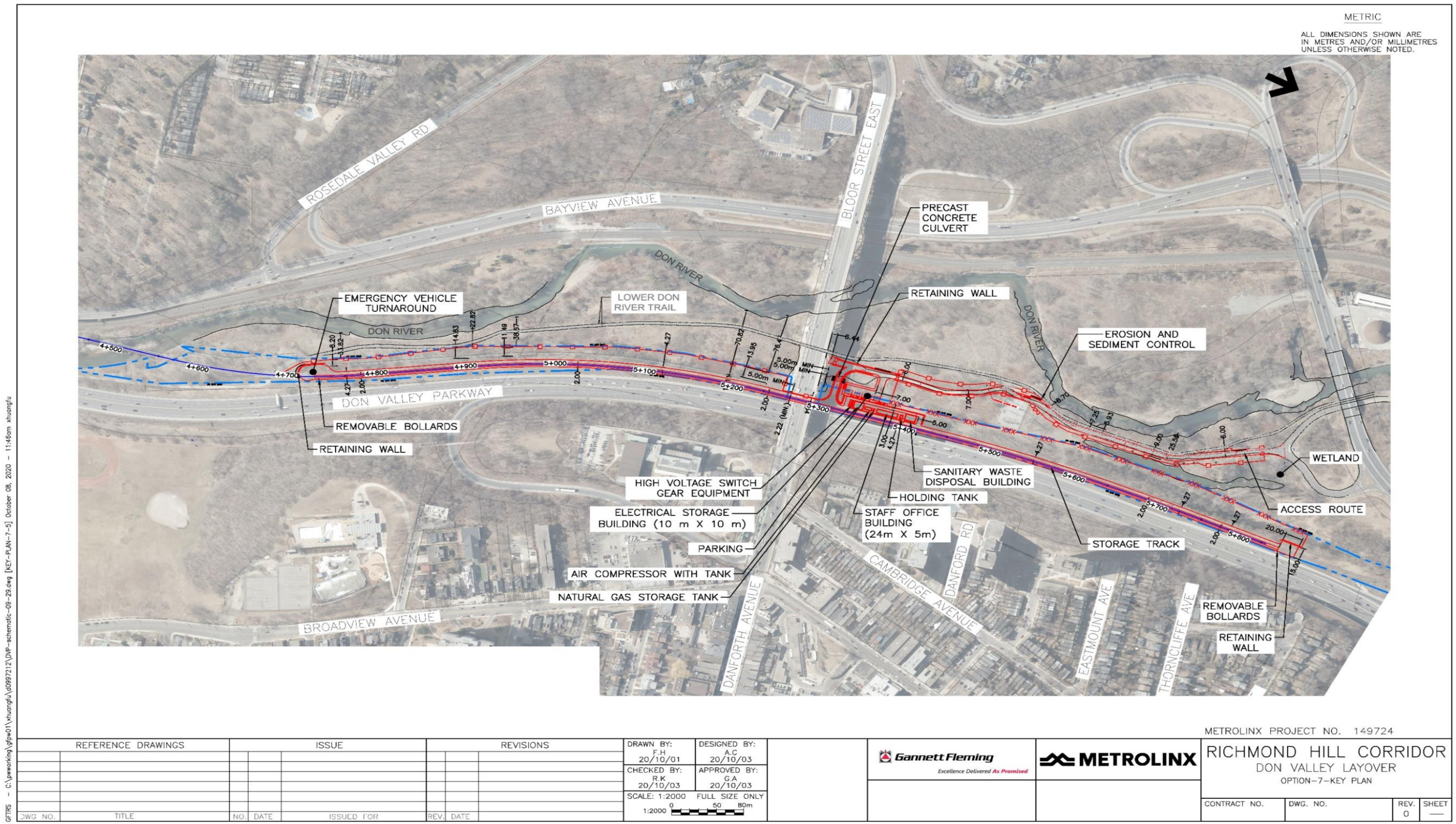


FIGURE 3-13 DON VALLEY LAYOVER KEY PLAN

FIGURE 3-14 EXISTING CONDITION – DON VALLEY LAYOVER SITE

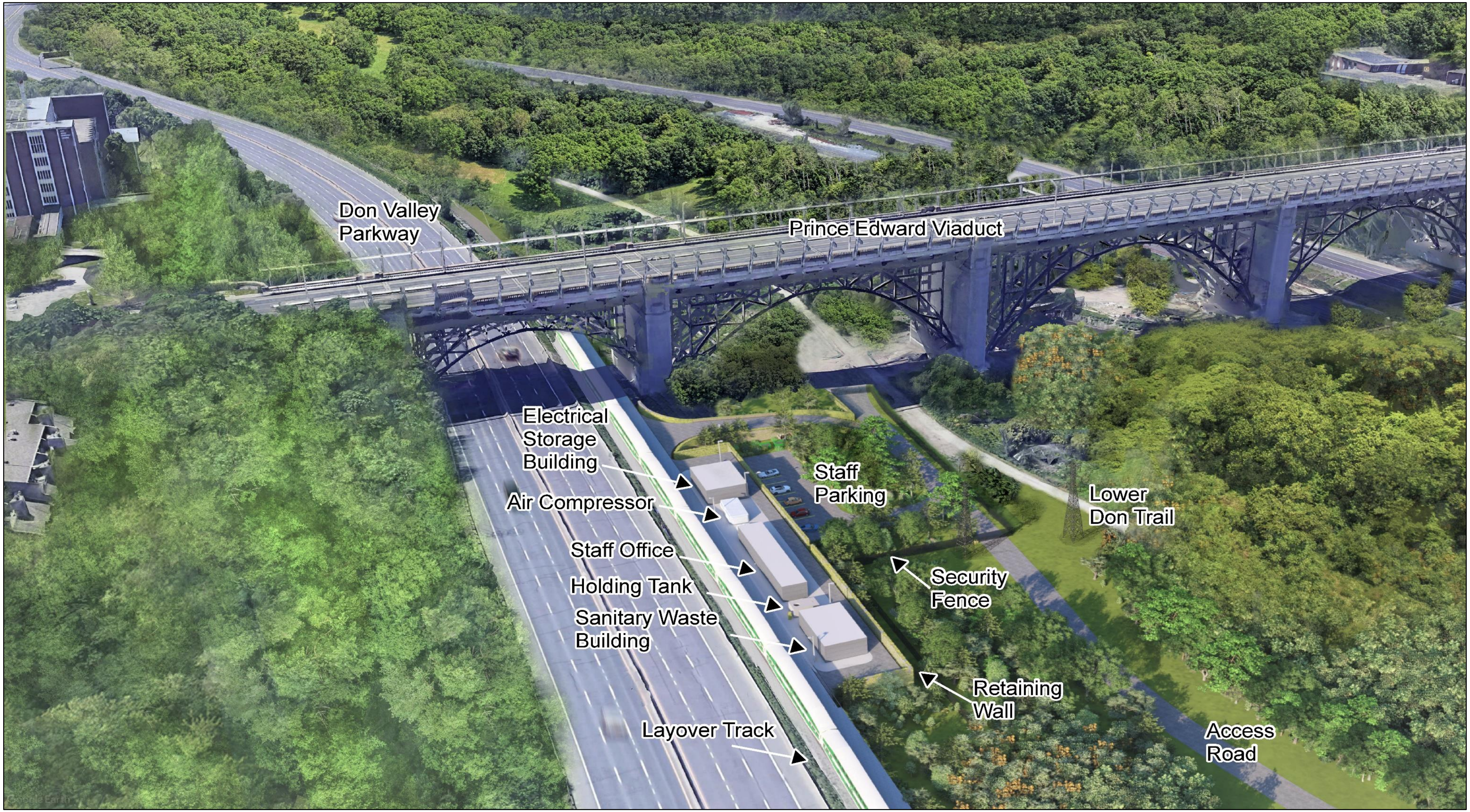


FIGURE 3-15 FUTURE CONDITION – DON VALLEY LAYOVER SITE

3.9.4 Thickson Road Bridge Expansion (Lakeshore East Corridor)

The existing overhead rail structure at Thickson Road South is to be widened to accommodate a new third track extending from the Whitby Maintenance Facility to Oshawa GO Station, in the Town of Whitby (refer to Figures LSE-2 and LSE-3 in **Appendix A1** for location mapping). The assessment of potential impacts for the bridge expansion was completed on the basis of a conservative estimate of the anticipated area of disturbance associated, as presented within the General Arrangement drawing corresponding to Figure 3-16. Therefore, based on the detailed design to be developed post TPAP, environmental impacts associated with the design will need to be reviewed and EPR Addendum requirements confirmed, if applicable.

It should be noted that at the time of completing this EPR, Durham Region was completing its own project to install a multi-use path beneath this structure. Additional consultation with Durham Region will be required during future project phases to ensure both projects are aligned and completed in a way that minimizes impacts to nearby stakeholders, including motorists, pedestrians and cyclists.

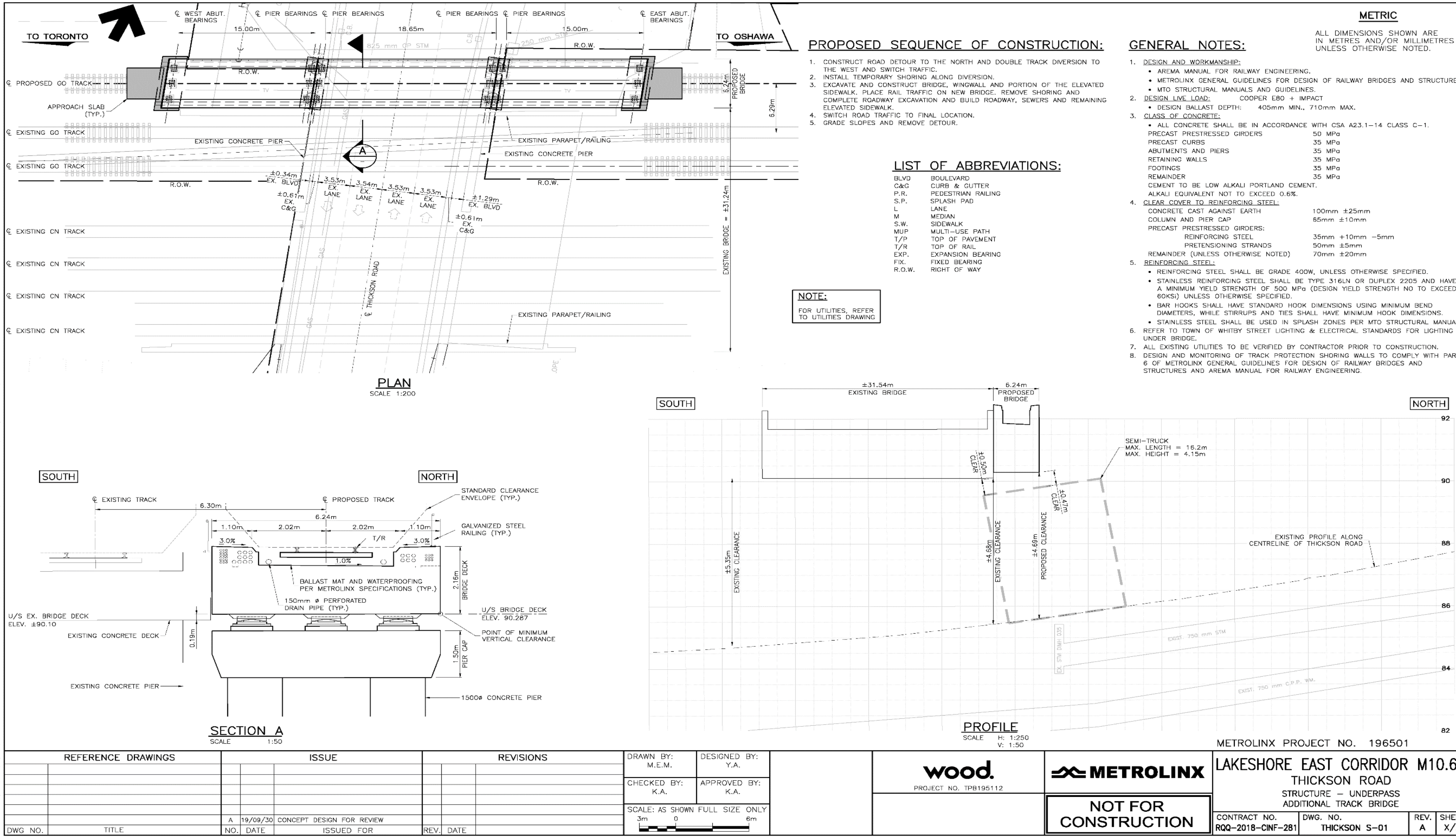


FIGURE 3-16 THICKSON ROAD BRIDGE EXPANSION GENERAL ARRANGEMENT DRAWING

3.10 Electrification - Richmond Hill Corridor

The Richmond Hill rail corridor will be electrified along the Bala Subdivision up to approximately Mile 4.4 (within the City of Toronto) to allow for efficient operations of trains in and out of the USRC (see Figures RH-1 to RH-6 in **Appendix A1**). Traction power supply for electrification of a portion of this corridor will be achieved via the Scarborough Traction Power Substation (TPS) along the Lakeshore East Corridor as previously approved under the GO Rail Network Electrification TPAP (2017) (http://www.metrolinx.com/en/electrification/electric.aspx).

3.10.1 Overhead Contact System (OCS)

The OCS is a fundamental component of the traction power distribution system and generally includes the following infrastructure components:

- OCS pole foundations;
- Portal/cantilever poles; and
- Contact, autotransformer, and feeder wires.

The wiring system (i.e., messenger wire and contact wire) provides efficient transfer of traction power to the pantograph (mounted on the train), and then to the electric drive motors (see Figure 3-17).

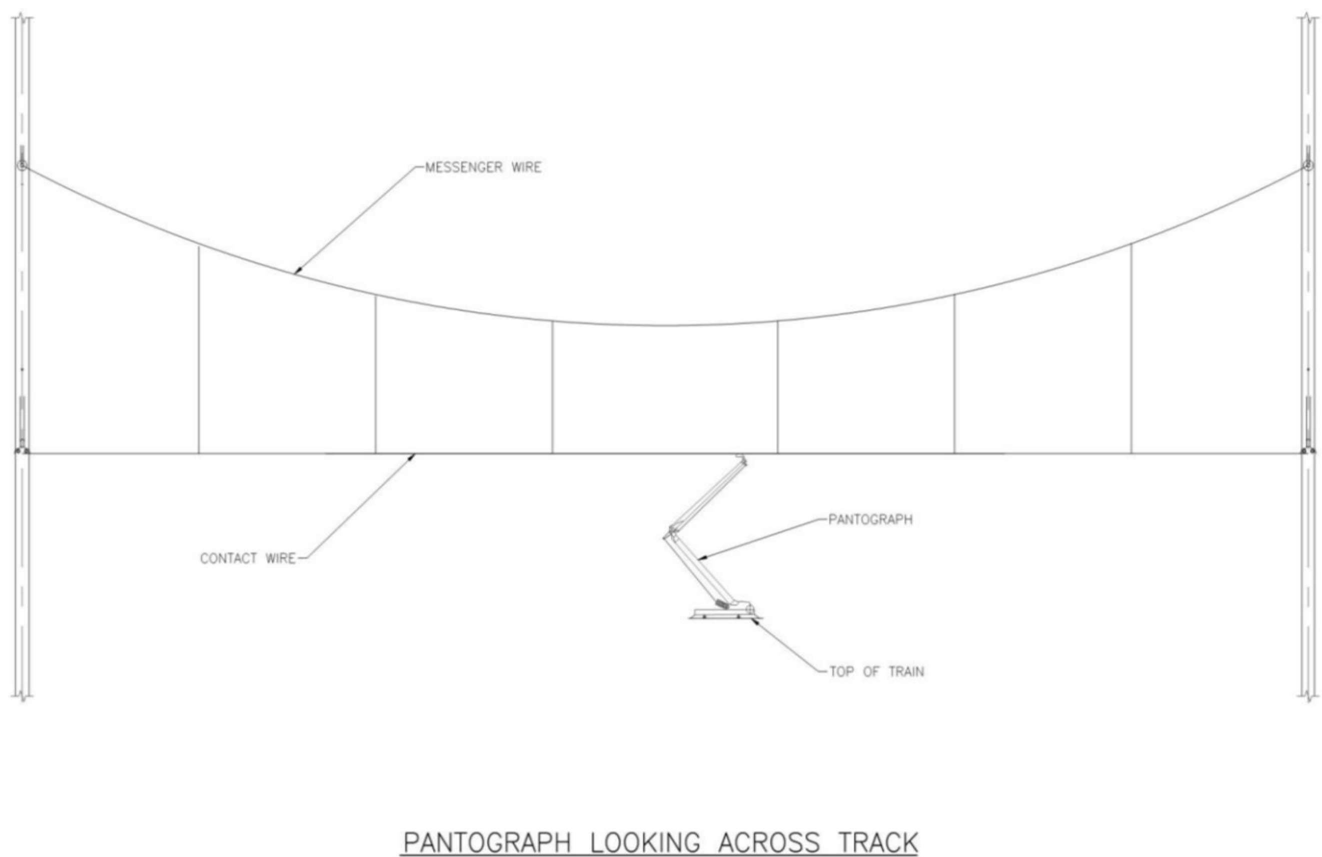


FIGURE 3-17 TYPICAL OCS CONTACT WIRE, MESSENGER WIRE AND PANTOGRAPH

The OCS configuration is generally dependent on a combination of factors including: train speed, wire size, system height (i.e., maximum space between contact wire and messenger wire), climatic conditions, the height of the wire above the track, and track alignment.

In order to ensure efficient transmission of electric traction power to the trains, the contact wire and the pantograph mounted on the train must remain in contact during train operation. While there are many factors that go into achieving good train to OCS dynamics, one of the key components is to control the height of the contact wire above the top of rail. Ideally the contact wire is kept parallel to the tracks. Changes in contact wire height are gradual and controlled. Abrupt changes in the height of the contact wire cause the pantograph to lose contact with the wire. The effects are increased maintenance to both the OCS and the pantograph, decreased useful life, and in extreme conditions, the train will lose power and come to a stop. Proper OCS design takes into account the maximum operating train speed. The higher the train speed the lower the tolerances to changes in the contact wire height.

The height of the OCS wire along a track is known as the wire profile. Just like a cable supports the roadway on a suspension bridge, the messenger cable supports and controls the profile of the Contact Wire. The messenger is supported by OCS structures that serve two purposes; namely, supporting the wires above the track to provide horizontal control of the OCS (which controls things like blow off from wind), and allowing the wire to follow curves in the track. Tension is applied to both the Contact and the messenger to allow the structures to be spaced as far apart as possible while maintaining the tolerances in the contact wire profile. Because metals expand and contract with changes in temperatures, the wires of an OCS system will expand when temperature rise, and contract when temperatures drop. There are two ways to deal with this expansion and contraction of the wires. One is to fix both ends off the OCS wires and allow the wires to sag when it gets warmer and rise when it cools. The other is to fix one end of the OCS wires, while the other is connected to a tensioning device. The first style is known as fixed termination or variable tension, while the second it referred to as Constant Tension or Auto Tension. Both styles will be considered for use on electrification of the Richmond Hill Corridor.

The OCS will be designed to meet the climatic conditions of the GTHA. This includes the extreme temperature, wind, ice conditions as required by the Canadian Standards Association (CSA) for the design and installation of overhead utility lines. No additional lighting is anticipated to be required as a result of implemented OCS infrastructure.

3.10.1.1 OCS Support Structures

The OCS will be suspended from steel support structures (i.e., portals and cantilevers) placed along the corridors, including on bridges and overpasses where required (see Figure 3-18). Generally, the number of tracks to be spanned dictates the type of structure required, i.e., portals are typically used when spanning three or more tracks, whereas cantilevers are used when two or less tracks are spanned. Refer to Figure 3-19 and Figure 3-20 for drawings showing typical portal and cantilever structure designs, respectively.

FIGURE 3-18 EXAMPLE OF OCS SUPPORT STRUCTURES [PORTALS]

3.10.1.2 OCS Vertical Clearance

The contact wire height needs to be designed to accommodate the multiple types of trains that operate along GO corridors (i.e., Double Stacked Freight, GO Electric Multiple Units (EMUs), GO Bi-level trains, VIA Rail, etc.). The height of the portals/cantilevers used to support the OCS wires over the electrified tracks will range between approximately 7.6m to 12m above the top of the highest rail. Contact wire height will range from 6m to 7.6m.

3.10.1.3 Spacing of OCS Support Structures

The OCS support structures will be positioned along the track at a maximum spacing of approximately 65m. The maximum 65m maximum span is dictated by four factors:

- **Track Geometry** - The contact wire must always be in contact with the pantograph such that electric power traction can be maintained. The maximum poles spacing can only be achieved on straight track. As the curves on the track become tighter, the spacing between the poles decreases.

- **Dynamic, Construction and Maintenance Tolerances** - Several other variables must be taken into account when determining maximum pole spacing including: dynamic tolerances for the train and the pantograph, maintenance tolerance for the track, and dynamic and construction tolerances for the OCS itself.
- **OCS System Height** - The system height is the measured distanced between the messenger and the contact wire at the supporting structures. The system height essentially determines how far apart support structures can be placed.
- **Other Rail ROW Aspects** - Other ROW aspects that will decrease structure spacing include overhead structures, undergrade structures, track crossovers and turnouts, stations.

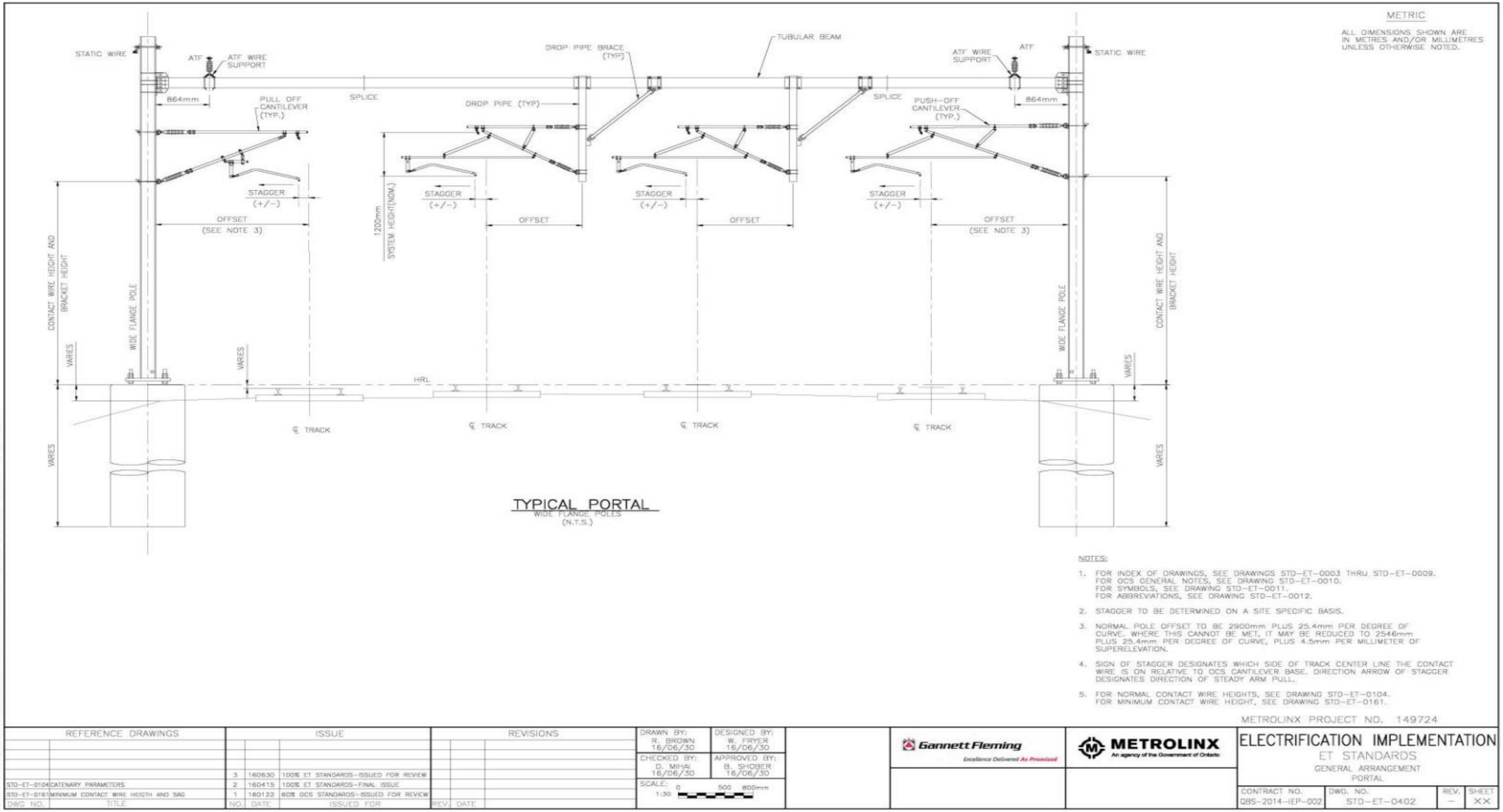


FIGURE 3-19 TYPICAL PORTAL STRUCTURE

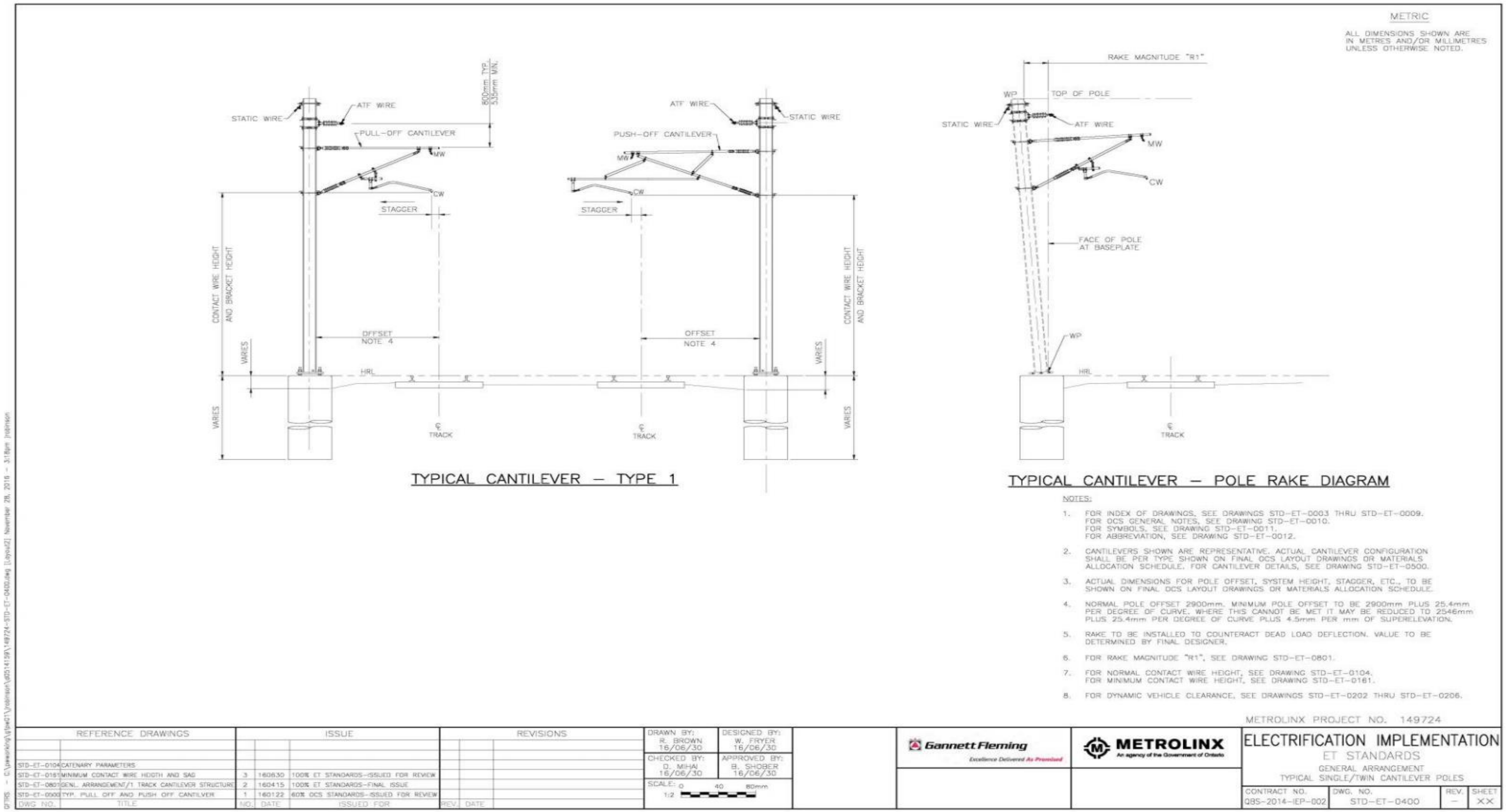


FIGURE 3-20 TYPICAL CANTILEVER STRUCTURE

3.10.2 Vegetation Clearing Zone

A Vegetation Clearing Zone is required in order to provide safe electrical clearances to any existing vegetation along the rail corridors. The Vegetation Clearing Zone entails vegetation removals within the area encompassed by the overhead contact system/2 X 25 kV feeders plus an additional 2 metre (m) offset area on either side of the OCS components or 2 X 25 kV feeders. As a result, the total clearing area is defined as 7m measured from the centerline of the outermost tracks to be electrified on either side of each rail corridor. The 7m zone is considered a maximum removal zone; during detailed design, the 7m zone may be reduced in certain areas where/if possible based on the final design.

Vegetation clearing is required to:

- Minimize the risk of tree limbs falling on the track or overhead wires, thus potentially causing a conflict with the electrified system resulting in loss of service and revenue.
- Accommodate a mandatory clearance zone to ensure maintenance workers are safe when working in an electrified environment.

The project will comply with the European standard *EN50122-1:211+A1:2011 (E) Paragraph 5.2.6: Railway Applications - Fixed installations*. This European Standard specifies requirements for the protective provisions relating to electrical safety in fixed installations associated with alternating current (AC) traction systems and to any installations that can be endangered by the traction power supply system.

The 7m vegetation clearing zone is comprised of:

- 2.9 m clearance from the track to the OCS pole to ensure clearance of the train to the OCS pole
- 2.5 m vegetation clearance from the electrical components to the limits of the trees
- Up to 1.6 m to account for tree grow back (regrowth zone).

See Figure 3-21 for a typical tree removal drawing that demonstrates the required clearance zone for electrification infrastructure.

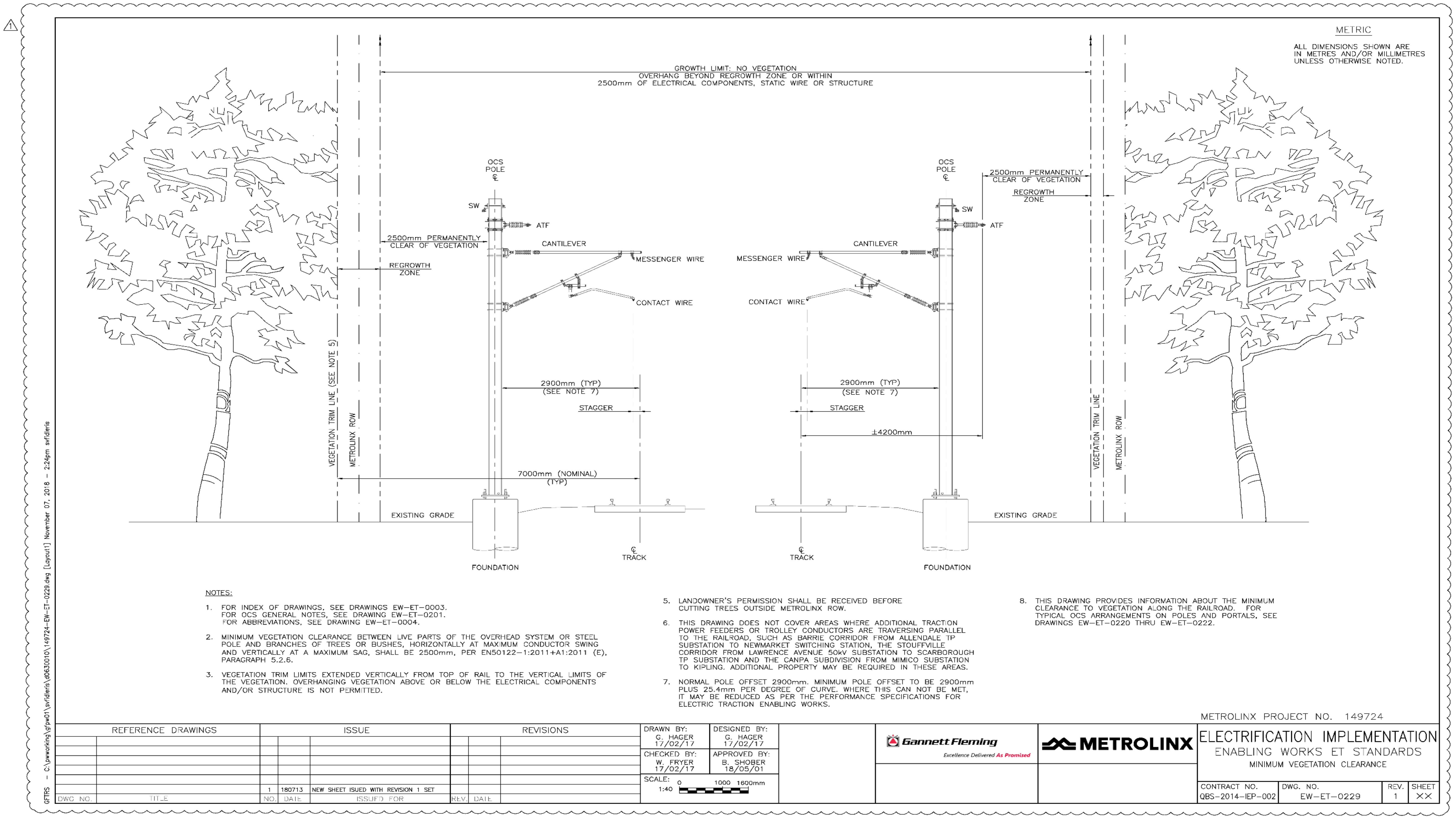


FIGURE 3-21 TYPICAL TREE REMOVAL ZONE DRAWING

3.10.3 Grounding and Bonding

To ensure safe touch-and-step potential is in accordance with permissible limits (as per applicable international electrical safety codes and standards including AREMA, CSA, EN and IEEE), a grounding and bonding system will be implemented as part of the Project.

Grounding and bonding systems serve two primary functions:

- Minimize touch voltage, step voltage and ground return currents caused by the electrified system to provide for the safety of passengers, operating personnel and other wayside public, and to provide protection from the risk of electrical shock.
- Provide the means to carry electric currents into the earth under normal and fault conditions without exceeding operating and equipment limits, or adversely affecting continuity of service.

The grounding and bonding system has been designed according to the applicable standards where applicable (i.e., IEEE Standards, Ontario Electrical Safety Code, CAN/CSA C22.1 Canadian Electrical Code, CAN/CSA C22.3–1 Overhead Systems, CAN/CSA C22.3-7 Underground Systems, EN 50122-1, AREMA Manual for Railway Engineering, Transmission System Code, etc.). Proper grounding and bonding systems will be engineered and installed throughout the entire electrified corridor to provide proper return circuits for the normal traction power currents and fault currents, with grounding connections.

The broad concepts surrounding “grounding” is to create a mechanism to allow current to flow from metallic objects that are not meant to carry current or otherwise become energized, to protect personnel from the hazards of electricity. This is accomplished by establishing a system of aerial and buried grounding conductors and ground rods with connections from the metallic object to the earth/ground to dissipate the energy. In some instances, copper cables are used to interconnect (or “bond”) the metallic object to another component that is part of the traction return system. The grounding electrodes will be contained within the right of way confines. The bonding material shall be capable of sustaining the short-circuit currents for up to the total switch-off (trip) time imposed on the system without thermal degradation or mechanical breakdown.

3.10.4 Bridge Modifications

The following section describes the types of bridge modifications that may be required to accommodate electrification along the Richmond Hill corridor. The structures present within the study limits for electrification of the Richmond Hill rail corridor are contained within Metrolinx’s Bala Subdivision and are presented in Table 3-3

3.10.4.1 OCS Attachments/Support Structures

To run OCS wires under overhead bridges without attachments, there must be enough clearance between the messenger wire/catenary and the lowest part of the bridge structure. Where enough clearance does not exist, attachments (e.g., tunnel arms) on the structure are required to support the OCS.

There are three options for installing OCS infrastructure on the Richmond Hill rail corridor structures to be electrified; including:

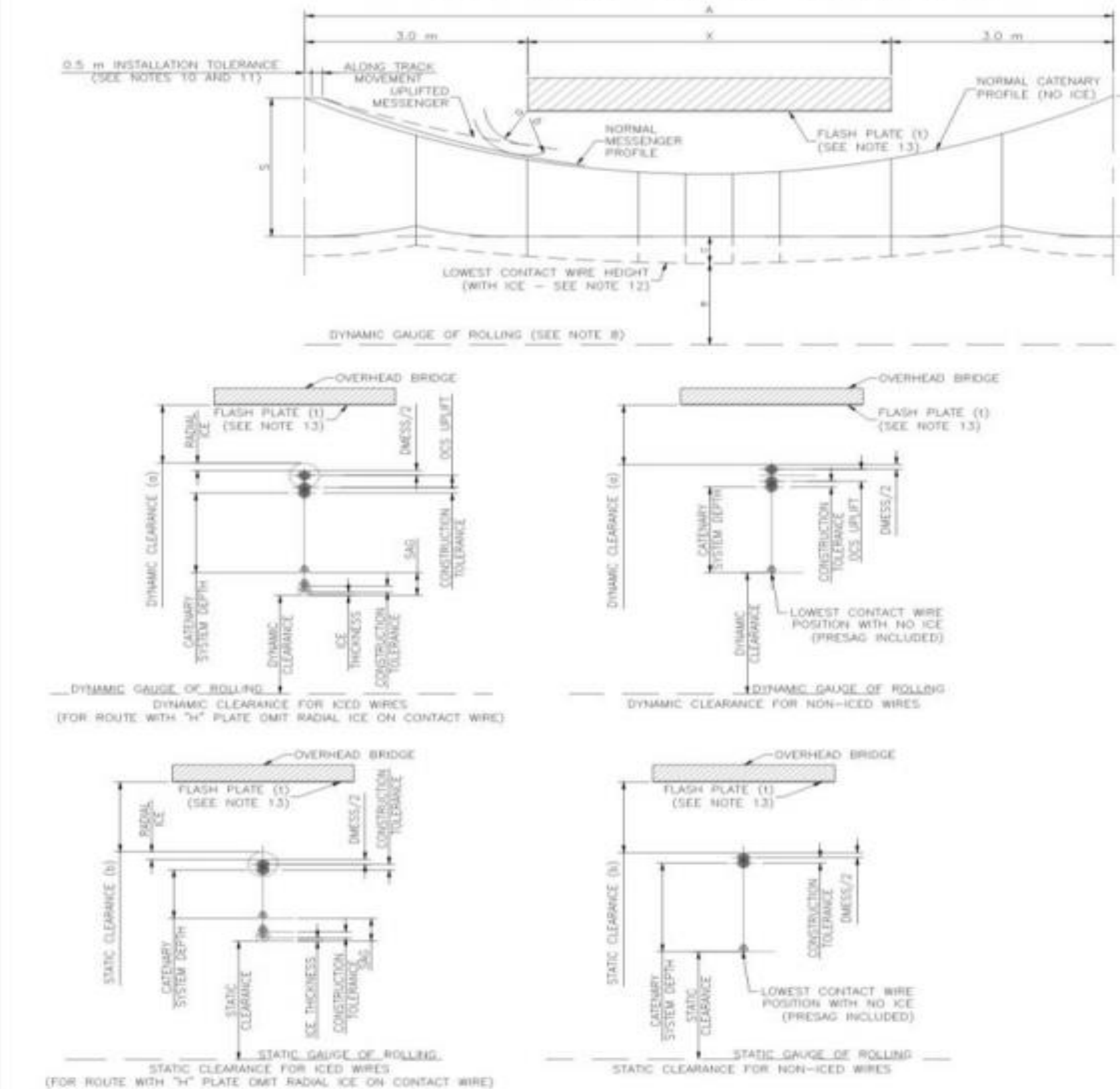
1. Wires ‘free run’ under the bridge with no modification required (see Figure 3-22)
2. Install attachments to support OCS wires running under the bridge (see Figure 3-23)
3. Attach to tunnel with tunnel arm(s) (see Figure 3-24)

As shown in Table 3-3, structural modifications corresponding to either Options #2 or #3 are required for all structures that are within the proposed electrification of the Richmond Hill rail corridor. The exact method of attaching the OCS to these structures will be confirmed during future project phases. There are no anticipated impacts to either the Prince Edward Viaduct or CP Belleville Rail Overpass.

TABLE 3-3 SUMMARY OF PROPOSED BRIDGE MODIFICATIONS – ELECTRIFICATION OF RICHMOND HILL CORRIDOR

Structure ID	Mile	Richmond Hill Study Area Segment	Municipality	Primary Name	Type of Structure	Wires Attached to Bridge?	Electrification Protection Barrier to be Added or Modified?
1	1.93	Segment 1	City of Toronto	Eastern Avenue (#264)	Bridge (Road)	Yes	Yes
2	1.95	Segment 1	City of Toronto	Don Valley Parkway Ramp (#263)	Bridge (Road)	Yes	Yes
3	1.98	Segment 1	City of Toronto	Queen Street East (#245)	Bridge (Road)	Yes	Yes
4	2.26	Segment 2	City of Toronto	Dundas Street East (#042)	Bridge (Road)	Yes	Yes
5	2.45	Segment 2	City of Toronto	Gerrard Street East (#244)	Bridge (Road)	Yes	Yes
6	2.67	Segment 3	City of Toronto	Riverdale Park Pedestrian Bridge (#041)	Bridge (Pedestrian)	Yes	Yes
7	2.70	Segment 3	City of Toronto	Don River	Bridge (Rail)	Yes	No
8	3.31	Segment 4	City of Toronto	Prince Edward Viaduct (Danforth Ave-Bloor St E)	Bridge (Road)	No	No
9	3.65	Segment 5	City of Toronto	DVP to Bayview Extension (#079)	Bridge (Road)	Yes	Yes
10	4.03	Segment 5	City of Toronto	CP Belleville Sub	Bridge (Rail)	No	No

FREE RUNNING CATENARY UNDER BRIDGE



METRIC

ALL DIMENSIONS SHOWN ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE NOTED.

A = SPAN LENGTH
S = SYSTEM HEIGHT AT SUPPORT
a = DYNAMIC ELECTRICAL CLEARANCE UNDER BRIDGE = 205mm MIN.
b = STATIC ELECTRICAL CLEARANCE UNDER BRIDGE = 270mm MIN.
c = SAG (DUE TO ICE) + PRE-SAG + ICE THICKNESS + INSTALLATION TOLERANCE
e = DYNAMIC CLEARANCE FROM DYNAMIC GAUGE TO CONTACT WIRE HEIGHT = 205mm MIN.
t = FLASH PLATE

ITEM	NORMAL MINIMUM		ABSOLUTE MINIMUM		NORMAL MINIMUM		ABSOLUTE MINIMUM		REMARKS
	DYNAMIC ICED	DYNAMIC NON-ICED	DYNAMIC ICED	DYNAMIC NON-ICED	STATIC ICED	STATIC NON-ICED	STATIC ICED	STATIC NON-ICED	
FLASH PLATE (mm)	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	FOR CONCRETE BRIDGES ONLY
ELECTRICAL CLEARANCE (mm)	205	205	155	155	270	270	205	205	–
RADIAL ICE ON MW (mm)	12.5	–	12.5	–	12.5	–	12.5	–	–
1/2 MW DIAMETER (mm)	8	8	8	8	8	8	8	8	
OCS UPLIFT (mm)	VARIES	VARIES	VARIES	VARIES	VARIES	VARIES	VARIES	VARIES	–
UPWARD CONSTRUCTION TOLERANCE (mm)	25	25	13	13	25	25	13	13	–
DOWNWARDS CONSTRUCTION TOLERANCE (mm)	25	25	13	13	25	25	13	13	–
RADIAL ICE ON CW (mm)	12.5	–	12.5	–	12.5	–	12.5	–	NOT INCLUDED FOR PLATE H ROUTES
ELECTRICAL CLEARANCE (mm)	205	205	155	155	270	270	205	205	–

NOTES

1. FOR INDEX OF DRAWINGS, SEE DRAWINGS STD-ET-0003 THRU STD-ET-0009. FOR OCS GENERAL NOTES, SEE DRAWING STD-ET-0010. FOR SYMBOLS, SEE DRAWING STD-ET-0011. FOR ABBREVIATIONS, SEE DRAWINGS STD-ET-0012 AND STD-ET-0013.
2. CALCULATIONS SHALL BE DONE WITH:
   - BARE MESSENGER AND CONTACT WIRES
   - ICED MESSENGER AND CONTACT WIRES
   - ICED MESSENGER AND BARE CONTACT WIRE (FOR PLATE H ONLY)
   - A PRE-SAG VALUE EQUAL TO 1/2000 OF THE SPAN LENGTH
   - FOR ICE CONDITION 12.5mm RADIAL ICE ON WIRES BELOW 0°C
   - A FULLY AUTO-TENSIONED CATENARY FROM -40°C TO 75°C
3. NORMAL TRACK MAINTENANCE ALLOWANCE 150mm.
4. INSTALLATION TOLERANCE: ±25mm FOR OCS WIRE HEIGHTS, ADJACENT TO OR UNDER BRIDGES, THIS MAY BE REDUCED TO 13mm WHERE ABSOLUTE MINIMUM CLEARANCE ARE REQUIRED.
5. FOR TYPICAL HANGER LENGTHS, SEE DRAWING STD-ET-0600.
6. THIS DRAWING IS APPLICABLE FOR FREE RUNNING CATENARY UNDER THE OVERHEAD BRIDGES AND FOR CASES WHERE TUNNEL ARM CAN BE USED.
7. IF FREE RUNNING IS NOT FEASIBLE REFER TO DRAWING STD-ET-0342 FOR RESILIENT ARM USE.
8. FOR DYNAMIC GAUGE SEE DRAWINGS STD-ET-0202 TO STD-ET-0206.
9. FOR CATENARY PARAMETERS, SEE DRAWING STD-ET-0104.
10. ALONG TRACK INSTALLATION TOLERANCE FOR STRUCTURE = 0.5m AT FIRST STRUCTURES ADJACENT TO THE BRIDGE.
11. ALONG TRACK INSTALLATION TOLERANCE FOR STRUCTURE = 1.0m AT STRUCTURES IN OPEN ROUTE.
12. ON ROUTES HOSTING FREIGHT CARS OF PLATE H, OPERATING ICE LOAD CASE WILL BE ASSUMED. (ICE ON MESSENGER WIRE ONLY). FOR ALL OTHER ROUTES, NON-OPERATING ICE WILL BE ASSUMED.
13. FLASH PLATES TO BE INSTALLED AT CONCRETE BRIDGES ONLY. ALLOWANCE FOR FLASH PLATE THICKNESS IS 12.7mm.

METROLINX PROJECT NO. 149724

REFERENCE DRAWINGS		ISSUE			REVISIONS	
STD-ET-0600	TYPICAL HANGER ASSEMBLIES	2	170217	100% ET STANDARDS-ISSUED FOR REVIEW		
		1	160506	75% ET STANDARDS-ISSUED FOR REVIEW		
DWG. NO.	TITLE	NO.	DATE	ISSUED FOR	REV.	DATE

DRAWN BY: R. BROWN 17/02/17
DESIGNED BY: D. MIHAI 17/02/17
CHECKED BY: W. FRYER 17/02/17
APPROVED BY: B. SHOBER 17/02/17
SCALE: 1:1

Gannett Fleming

METROLINX

ELECTRIFICATION IMPLEMENTATION
ET STANDARDS
FREE RUNNING CATENARY UNDER BRIDGE

CONTRACT NO. QBS-2014-IEP-002 | DWG. NO. STD-ET-0340 | REV. – | SHEET XX

FIGURE 3-22 TYPICAL FREE RUN CATENARY UNDER BRIDGE

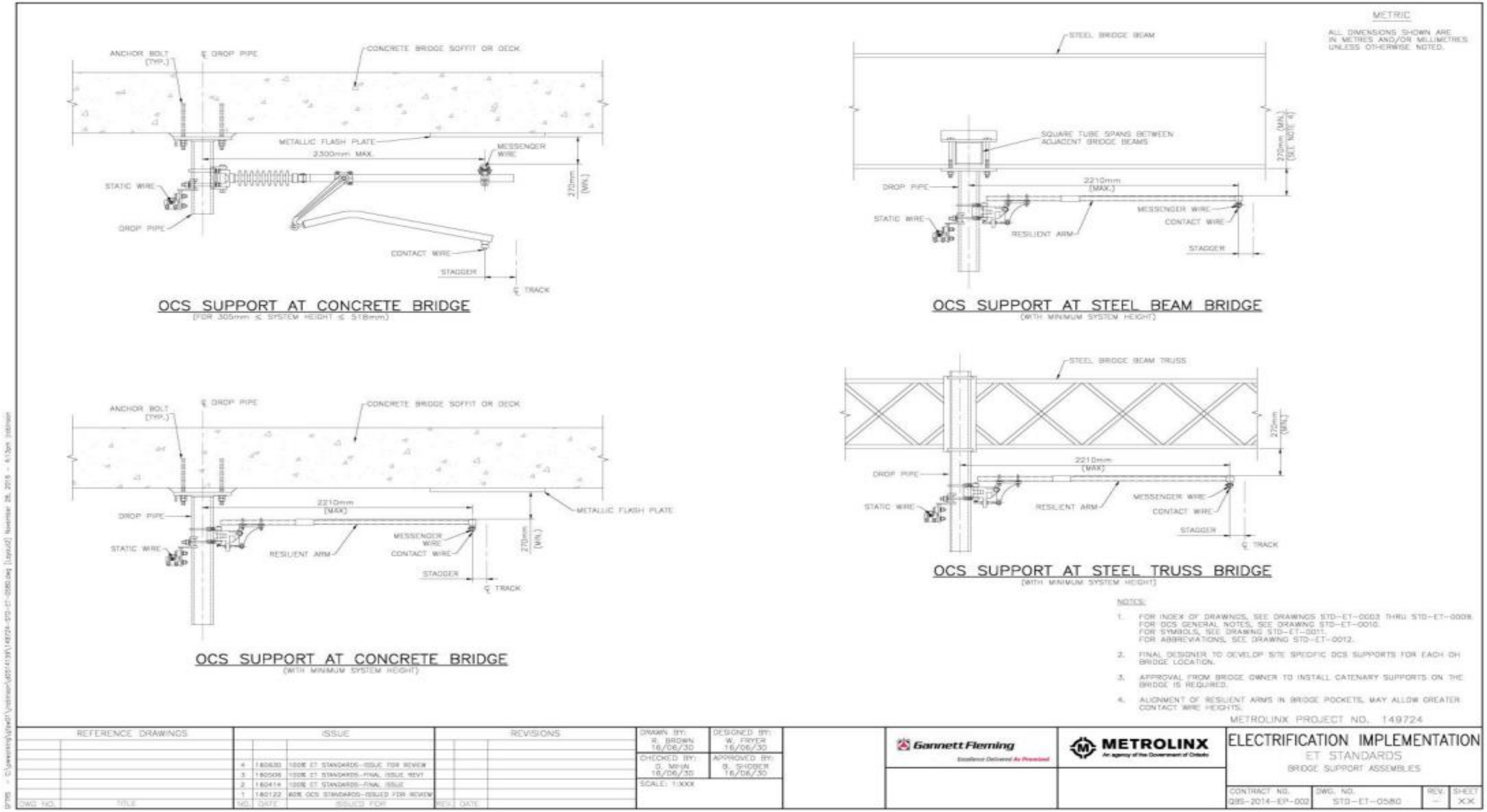


FIGURE 3-23 TYPICAL OCS BRIDGE ATTACHMENTS

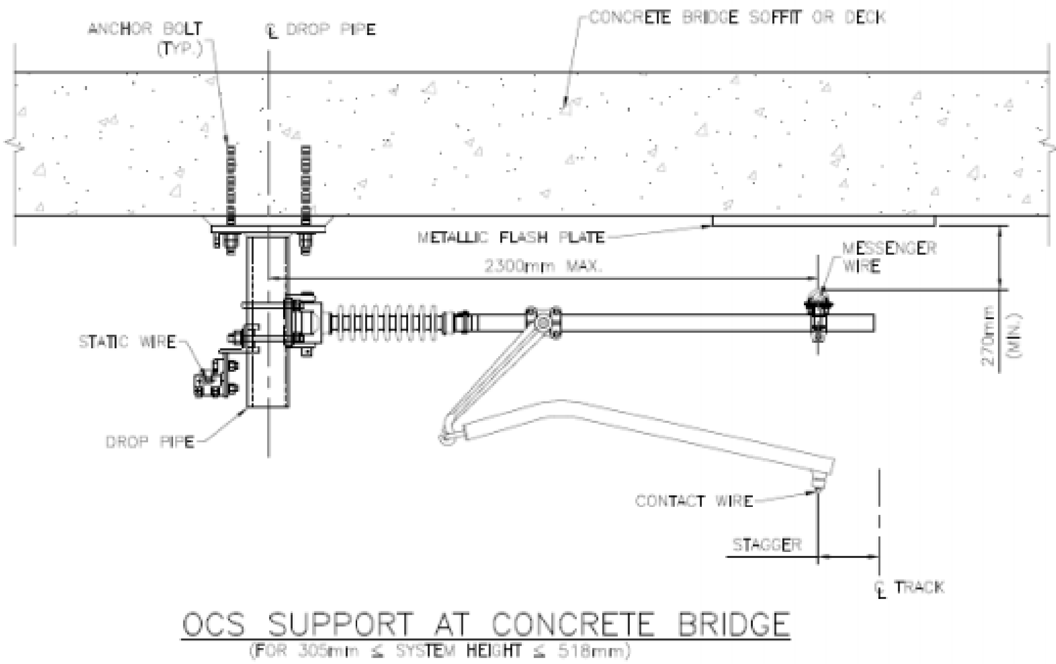


FIGURE 3-24 TYPICAL TUNNEL ARM ATTACHMENT

3.10.4.2 Minimum Clearance Requirements

A clearance plate defines the maximum height and width for railway vehicles to ensure safe passage through bridges, tunnels and other structures. Standard plates are used throughout North America so that train operators know what size equipment will safely pass on a given line. Minimum clearance requirements for the Richmond Hill rail corridor bridges within the limits of proposed electrification will be per Metrolinx's Electrification Enabling Works Standards, Drawings and Specifications, which have been designed to accommodate all rail users that utilize Metrolinx's Bala Subdivsion.

3.10.4.3 Electrification Protection Barriers (EPB)

The purpose of an electrification protection barrier (EPB) is to protect pedestrians and infrastructure users within the public right-of-way on overhead bridges from direct contact with adjacent live parts of the OCS. In addition, these barriers protect against damage to the OCS passing under bridges by providing an obstacle to debris that may be thrown onto the railway from overhead. Figure 3-25, Figure 3-26 and Figure 3-27 depict typical bridge barriers.

The length of the protection barrier will extend a minimum of approximately 3m laterally beyond the live parts of the overhead contact system, on either side the bridge. The barriers will be made of solid-faced material and will be a minimum height of approximately 2m (barriers of greater heights may be required in areas where vandalism is prevalent). High voltage signage will also be provided as an additional safety measure. Metallic elements of the protection barriers will be grounded and bonded to the static wire in minimum two locations, as previously described.

FIGURE 3-25 EXAMPLE OF A BRIDGE BARRIER IN A NON-VISUALLY SENSITIVE LOCATION

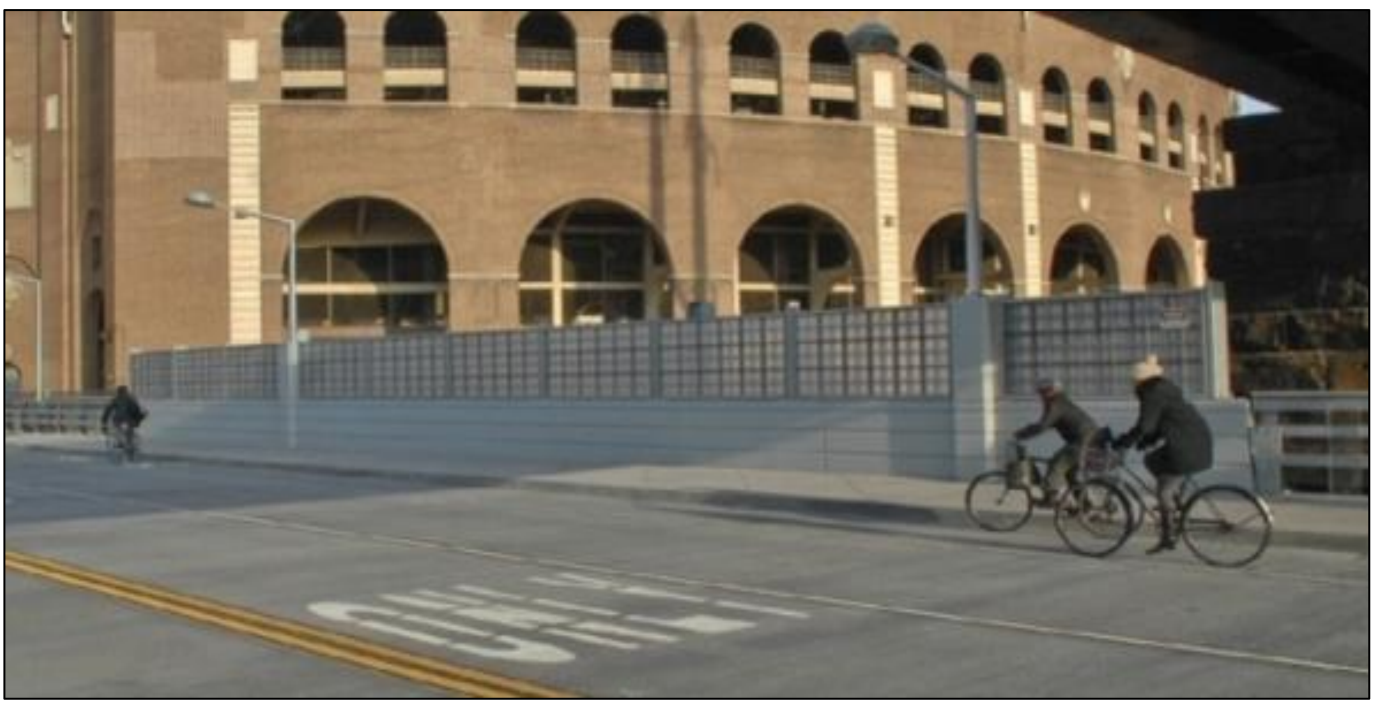


FIGURE 3-26 EXAMPLE OF A BRIDGE BARRIER IN A VISUALLY SENSITIVE LOCATION

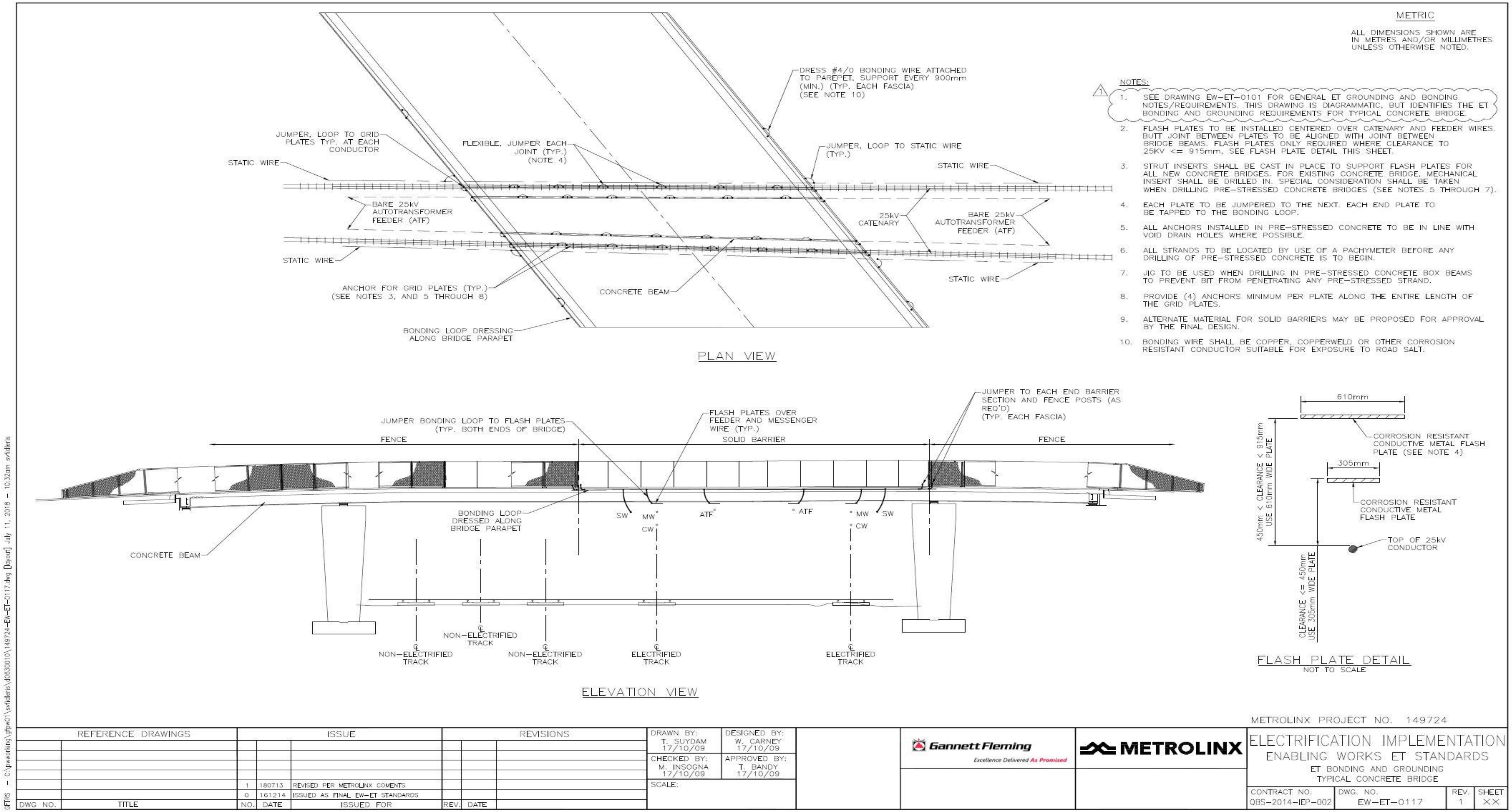


FIGURE 3-27 TYPICAL BRIDGE BARRIER DRAWING

3.11 Property Requirements

The following section provides a summary of the potential property impacts (i.e., potential property acquisitions/easements/etc.) identified to date based on the available conceptual designs for the proposed infrastructure. It should be noted that properties with negligible encroachments were not listed, as it is anticipated that reasonable engineering solutions can be established at detailed design to address/avoid property impacts wherever feasible. Table 3-4 summarizes the potential property impacts by rail corridor and the mapping contained in **Appendix A1** illustrates the locations of potentially affected properties.

Property requirements will be further reviewed and refined during detailed design. If required, Metrolinx will proceed with property acquisition as follows:

- Based on the GO Rail Network Electrification detailed design, locations where temporary/permanent easements/property acquisition are required will be confirmed;
- Metrolinx will obtain all easements/property acquisitions from public/private property owners that are required to implement the project in accordance with Metrolinx's approved property acquisition process.

TABLE 3-4 SUMMARY OF PROPERTY REQUIREMENTS – NEW TRACKS, STATION PLATFORMS, RETAINING WALLS, AND LAYOVER/STORAGE YARD FACILITIES

Corridor	Mileage	Proposed Infrastructure	Area Required (Ha)	Property Owner	Mapping Figure # (Appendix A-1)	Type of Property Impact
Property Requirement for New Tracks, Platforms, and Retaining Walls						
Barrie	61.80 - 62.30	• New track	0.043	Private	BR-14	Agreement - Partial Acquisition
Barrie	61.80 - 62.30	• New track	0.024	Private	BR-14	Agreement - Partial Acquisition
Barrie	61.80 - 62.30	• New track	0.034	Private	BR-14	Agreement – Partial Acquisition
Barrie	61.80 - 62.30	• New track	0.028	Private	BR-14	Agreement - Partial Acquisition
Barrie	61.80 - 62.80	• New track	0.216	Private	BR-14 and BR-15	Agreement - Partial Acquisition
Kitchener	11.20 - 11.80	• New track	0.046	Private	KT-5	Agreement - Partial Acquisition
Kitchener	11.20 - 11.80	• New track	0.145	Private	KT-5	Agreement - Partial Acquisition
Lakeshore East	10.65 - 10.78	• New third track - Thickson Road Bridge expansion • Retaining Wall at Thickson Road	0.016	Public	LSE-2	Agreement - Partial Acquisition
Lakeshore East	10.70 – 11.20	• New third track - Thickson Road Bridge expansion • Retaining Wall at Thickson Road	0.005	Public	LSE-2	Agreement - Partial Acquisition
Lakeshore East	10.70 – 11.20	• New third track - Thickson Road Bridge expansion • Retaining Wall at Thickson Road	0.000	Public	LSE-2	Agreement - Partial Acquisition
Lakeshore East	10.70 – 11.20	• New track northside of new platform • New third track	0.020	Private	LSE-3	Agreement - Partial Acquisition
Lakeshore East	11.20 - 11.70	• New Platform at Oshawa GO Station • Retaining Wall at Oshawa GO	0.014	Private	LSE-4	Agreement - Partial Acquisition
Lakeshore West	8.10 - 8.60	• Track upgrade	0.001	Private	LSW-1	Agreement - Partial Acquisition
Stouffville	51.00 - 50.60	• New Platform at Unionville GO Station • New track east side of new platform	0.054	Public	ST-1	Agreement - Partial Acquisition
Stouffville	46.30 - 45.80	• New Platform at Mount Joy GO Station • New passing track for new platform	0.099	Public	ST-3	Agreement - Partial Acquisition
Stouffville	46.30 - 45.80	• New Platform at Mount Joy GO Station • New passing track for new platform	0.025	Public	ST-3	Agreement - Partial Acquisition
Stouffville	46.30 - 45.80	• New Platform at Mount Joy GO Station • New passing track for new platform	0.102	Public	ST-3	Agreement - Partial Acquisition
Stouffville	45.80 - 45.30	• New Platform at Mount Joy GO Station • New passing track for new platform	0.020	Public	ST-4	Agreement - Partial Acquisition
Stouffville	45.80 - 45.30	• New Platform at Mount Joy GO Station • New passing track for new platform	0.096	Public	ST-4	Agreement - Partial Acquisition
Property Requirements for New Layover/Storage Yard Facilities						
Don Valley Layover	3.10 - 3.60	• Don Valley Layover (along Don Branch)	0.109	Public	RH-4	Agreement – Partial Acquisition
Don Valley Layover	3.10 - 4.10	• Don Valley Layover (along Don Branch) • Retaining Walls at Don Valley Layover	1.130	Public	RH-4 and RH-5	Agreement – Partial Acquisition and Easement
Unionville Storage Yard	51.00 – 50.00	• Unionville Storage Yard	0.301	Private	ST-1	Agreement – Partial Acquisition
Unionville Storage Yard	51.00 - 50.00	• Unionville Storage Yard	0.782	Private	ST-1 and ST-2	Agreement - Partial Acquisition

Corridor	Mileage	Proposed Infrastructure	Area Required (Ha)	Property Owner	Mapping Figure # (Appendix A-1)	Type of Property Impact
Unionville Storage Yard	50.60 - 50.00	• Unionville Storage Yard	0.063	Private	ST-2	Agreement - Partial Acquisition
Unionville Storage Yard	50.60 - 50.00	• Unionville Storage Yard	0.062	Public	ST-2	Agreement - Partial Acquisition
Walkers Line Layover	29.00 - 29.50	• Walkers Line Layover	0.992	Private	LSW-5	Agreement – Fee Simple Acquisition
Walkers Line Layover	29.00 - 29.50	• Walkers Line Layover	0.300	Private	LSW-5	Agreement – Permanent Easement
Walkers Line Layover	29.00 - 29.50	• Walkers Line Layover	0.278	Private	LSW-5	Agreement – Permanent Easement

3.12 Operations and Maintenance

3.12.1 Operation and Maintenance of Track Infrastructure

Railway networks are complex electric and mechanical systems comprised of hundreds of components that require regular maintenance. Track maintenance plays a crucial role on safe and reliable operations of rail systems. Regular inspection and maintenance activities include replacement of ties and other track components; lubricating and adjusting switches; tightening loose track components; redistributing ballast to maintain track geometry; and managing/controlling unwanted vegetation to prevent safety hazards (fire hazards, restricted visibility, contacting wires, fouling ballast and impeding track inspection).

Figure 3-28 depicts the main track components as listed below:

- Continuous Welded Rail (CWR) refers to steel lengths that are welded together;
- Ties to support the rails;
- Track ballast refers to the stones beneath railway track.
- Switches and turnouts to divert trains from one track to another
- Set of points to move switches and crossings.

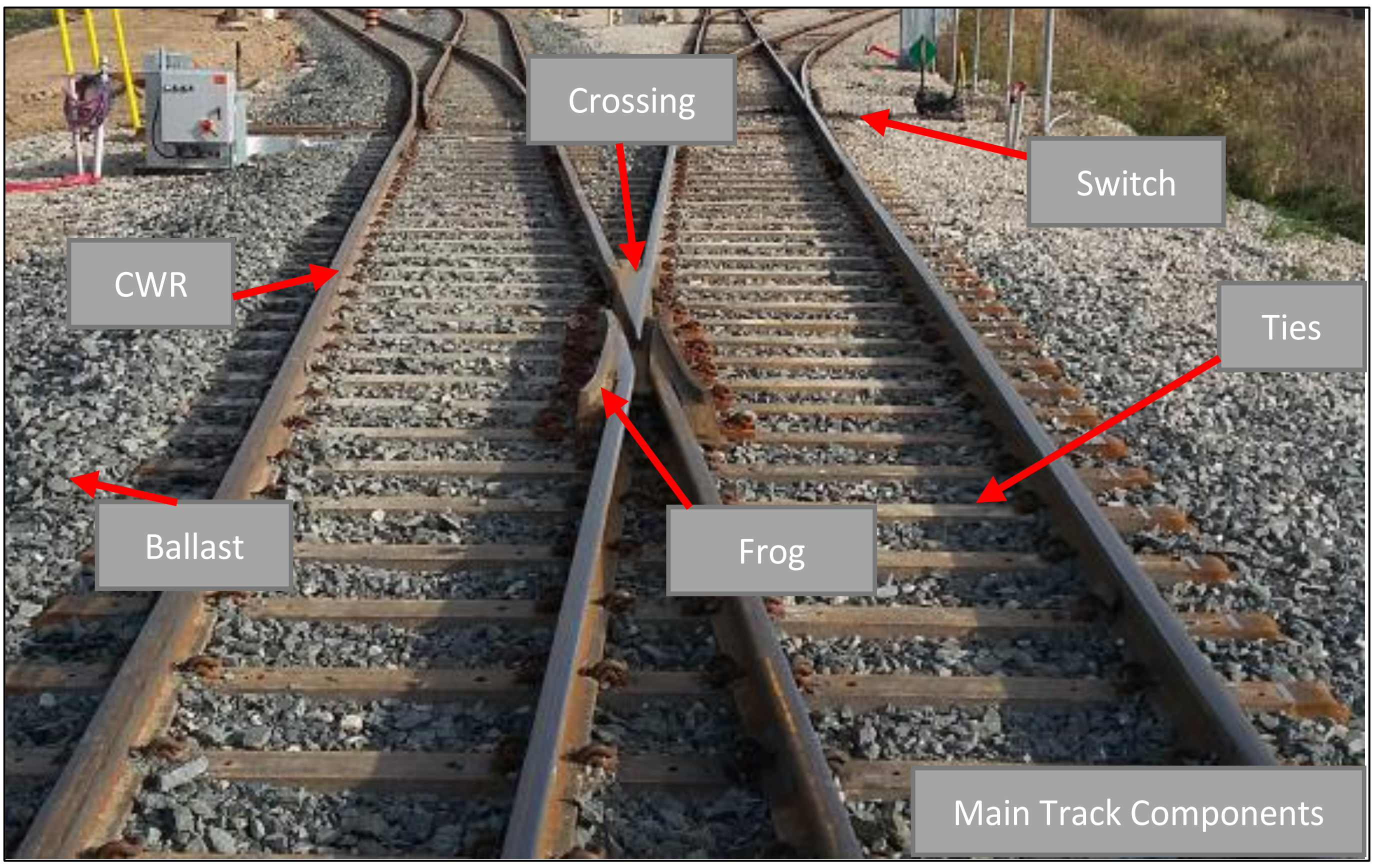


FIGURE 3-28 RAIL TRACK COMPONENTS

3.12.2 Operation and Maintenance – Retaining Walls

Retaining walls are subject to periodical inspection, as detailed in the Ontario Structure Inspection Manual. Inspections determine how retaining walls deteriorate over time from surrounding elements, such as rain/wind/snow/ice, shifting/settling of the ground beneath, exposure to de-icing salts, vegetation growth, etc. Inspection reports typically include information about the retaining wall location, length, load, description of materials, abutments, and general condition of the structure. The inspection report then details recommendations for rehabilitation works, if required. If applicable, action will be taken to ensure rehabilitation of the retaining wall meets current standards to support the applicable load.

3.12.3 Operation and Maintenance – GO Station Platforms

Regular maintenance is needed at GO Station Platforms to ensure safe access for GO train passengers. This may include visual inspections to identify obvious defects or damage to the platform, general cleaning (e.g., disposal of garbage), and use of de-icing/snow removal equipment in the winter months.

Inspections determine how platforms deteriorate over time from surrounding elements, such as rain/wind/snow/ice, exposure to de-icing salts, etc. Remedial actions will be taken as necessary to ensure platforms remain safe for GO passengers following inspections.

3.12.4 Operation and Maintenance of New Layover Facilities and Storage Yard Facility

Layover and storage yard sites will require regular maintenance to support ongoing operations. Typical maintenance activities include snow and ice clearing, regular vegetation management and, in the case of layover facilities, service maintenance. Service maintenance refers to activities that support the daily operation of Metrolinx's rolling rail stock, such as general cleaning, toilet dumping, and refilling potable water, etc.

3.12.4.1 Walkers Line Layover Facility

The following types of maintenance activities will be carried out at the Walkers Line Layover:

- Light Repairs - This involves quick, small-scale repairs, such as replacing light bulbs, seat cushion change outs, windows and other small replaceable units. These repairs can be performed when the trainset is parked anywhere at the Layover Facility and do not require special facilities.
- Daily Inspections - general visual inspections to identify any obvious defect or damage to equipment prior to trains entering revenue service. These types of inspections usually take less than an hour to complete per trainset.
- Cleaning, servicing and temperature control of rolling stock.
- Sanitary flushing and replenishment of washroom supplies. This includes emptying sanitary tanks from rolling stock into temporary storage facilities. Temporary storage facilities will be pumped out at regular intervals.
- Maintenance of the layover facility will include cleaning of interior and exterior surfaces, as well as preventive and corrective (repairs) actions to onset deterioration of the infrastructure.

3.12.4.2 Unionville Storage Yard

The following activities will be carried out at the Unionville Storage Yard:

- Daily Inspections - general visual inspections to identify any obvious defect or damage to equipment prior to trainsets entering revenue service. These types of usually take less than an hour to complete per trainset.
- Cleaning, servicing and temperature control of rolling stock.

3.12.4.3 Don Valley Layover Facility

The following types of maintenance activities will be carried out at the Don Valley Layover:

- Daily Inspections - general visual inspections to identify any obvious defect or damage to equipment prior to trainsets entering revenue service. These types of inspections usually take less than an hour to complete per trainset.
- Cleaning, servicing and temperature control of rolling stock.
- Sanitary flushing and replenishment of washroom supplies. This includes emptying sanitary tanks from rolling stock into temporary storage facilities. Temporary storage facilities will be pumped out at regular intervals.
- Maintenance of the layover facility will include cleaning of interior and exterior surfaces, as well as preventive and corrective (repairs) actions to onset deterioration of the infrastructure.

3.12.5 Operation and Maintenance of Thickson Road Bridge Expansion

Bridges are subject to periodical inspection, as detailed in the Ontario Structure Inspection Manual. Inspections determine deterioration over time from surrounding elements, such as rain/wind/snow/ice, exposure to de-icing salts, vegetation growth, etc. Inspection reports typically include information about the bridge location, length, load, description of materials, abutments, and general condition of the structure. The inspection report then details recommendations for rehabilitation works, if required. If applicable, action will be taken to ensure rehabilitation of the bridge meets current standards to support the applicable load.

3.12.6 Operation and Maintenance of Electrified Richmond Hill Corridor (up to Mile 4.4)

3.12.6.1 Track Patrol Inspection

An important factor in the maintenance of the OCS is an early warning system based on regular inspection that allows faults to be detected and rectified as part of the planned routine maintenance rather than as an emergency. These inspections can be carried out either via visual inspections involving follow-up reporting, or visual inspection with remedial site work. The preferred frequency of track patrol is at four weekly intervals during the first year after commissioning on each section of the electrified line.

3.12.6.2 Routine Maintenance

Initial operation of the OCS after commissioning requires high level performance monitoring and inspection. Following this initial effort, routine maintenance will be completed as a repetitive, periodic overhaul and reconditioning of the OCS to maintain its reliability After approximately two years of operation, an effective and economic schedule will be established for activities such as protective greasing, examination and cleaning of insulators, contact wire height and stagger checking, contact wire wear checks, etc.

3.12.6.3 Planned Maintenance

Planned maintenance refers to performing detailed inspections in accordance with maintenance procedures related to the OCS. Planned maintenance will include the periodicity of inspection maintenance, the work to be carried out for major OCS maintenance, and the certification to ensure maintenance work has been carried out appropriately with full reporting records.

3.12.6.4 Vegetation Management

Vegetation management will consist of a vegetation trimming program that will consist of two parts. The first phase will cut back trees and other vegetation within the vegetation clearance zone to a maximum of 7 meters from the center of the outer most track. The second phase will be a reoccurring maintenance phase that will involve trimming branches that may grow back into the vegetation clearance zone over time. The frequency between vegetation trimming activities will depend on the rate that the vegetation grows back and the allowable space within Metrolinx rail ROW. Vegetation trimming is accomplished using trucks and equipment such as woodchippers that will work from within the track area.

3.13 Construction Activities

The following section provides an overview of the types of typical construction methods/activities that will be utilized to build the proposed infrastructure.

3.13.1 Construction Management Plans

Construction Management Plans will be developed and implemented as part of the detailed design phase of the project and will take into consideration applicable legislation as appropriate. Construction Management Plan(s) will be made available to local municipalities and conservation authorities prior to implementation.

3.13.2 Construction Staging Areas

A construction staging and laydown area is used for the storage and assembly of construction equipment, materials, and other supplies (see Figure 3-29 for a visual example of a typical construction staking and laydown area). These areas are typically located near or at the construction site. Metrolinx considers construction staging and laydown areas as part of:

- *Temporary Access Lands* that are included in the Project Study Area and are selected, investigated, and evaluated by Metrolinx as part of the study (it should be noted that the locations of construction staging areas were not identified at the conceptual design phase of the New Tack & Facilities Project and will therefore need to be identified during detailed design. Consultation with Municipalities and other affected third-party stakeholder will be undertaken as appropriate with respect to the locations of any proposed construction staging areas); or
- *Optional Lands* that are outside of the Project Study Area and are proposed by a private enterprise bidding to work or working on the study (a Project Co/Contractor). If selected, Metrolinx or a Project Co conducts appropriate environmental investigations/study and evaluation. If suitable, these lands are leased and/or acquired by Metrolinx.

FIGURE 3-29 EXAMPLE STAGING AND LAYDOWN AREA

Metrolinx understands the importance of addressing and mitigating construction impacts and is developing an approach to managing construction staging and laydown areas. The approach will include implementation of best practices that will help minimize environmental impacts without unduly affecting surrounding communities and the environment. Construction Staging Plan(s) will be made available to local municipalities and conservation authorities prior to implementation.

3.13.3 Installation of Track Infrastructure and New Switches

New tracks and switches require excavation, backfilling and compaction prior to installation. Excavation is required to accommodate service utilities and to ensure that appropriate bearing material and drainage provisions are installed to minimize settlement and facilitate proper drainage runoff. Following excavation, appropriate backfill material such as graded Granular A and Granular B material will be compacted in specific lift sizes and at specific depths to form the sub-ballast and sub-grade layers before ballast stone is placed. The ballast stone rests beneath the track switches and rails.

Tracks and switches are comprised of concrete or timber ties and rails, fastened by rail anchors. The rail anchors prevent the track from crawling (moving) and are supported by a steel rail brace.

It is anticipated that the following equipment will be required for installation of track infrastructure and new switches:

- Backhoe, front end loader
- Hi-rail excavator (345CAT or equivalent)
- Hi-rail crane (10T or equivalent)
- Ballast cars (on track)
- Flatbed
- Hi-rail boom truck
- Speed swing loader
- Production/switch tamper (Mark IV or equivalent)
- Dynamic ballast stabilizer
- Ballast regulator
- Hi-rail pickup trucks
- Back-up power/uninterrupted power supply

3.13.4 Installation of Retaining Walls

It is expected that grading for track installation and retaining walls works will be completed together. Subject to further assessment during detailed design, it is anticipated that earth removed from cut sections will be reused in the construction of fill sections. Any excess soils will be transported and disposed of in accordance with applicable laws. The construction of track will generally occur after the fill aspects of grading are completed.

3.13.5 Construction of GO Station Platforms

The following elements are included within the construction of a new GO Station platform:

- Demolition and site preparation
- Grading and drainage work
- Platform paving and construction of concrete curbs
- Installation of tunnels, ramps, stairs, elevator shafts and elevators
- Construction of canopies and shelters
- Installation of site lighting (potentially high-mast lighting), communication systems, and ancillary features such as CCTV, fare handling units, etc.
- Installation of a standby generator or UPS
- Construction of walkways and sidewalks
- Potential adjustments to parking areas if affected by construction of other platform elements
- Installation of wayfinding and signage
- Utility modifications, as required
- HVAC systems for mini-hubs and radiant heating for shelters
- Building modifications for mechanical pumps or heat tracing systems
- Fibre optic cable installation

3.13.6 Construction of New Layover Facilities and Storage Yard Facilities

Initial steps during the construction of a layover facility are site clearing and ground improvements. There may be instances where installation of culverts and retaining walls is required, and grading must occur.

Utility modifications or extensions will be completed soon after that will require excavation and coordination with multiple service providers and municipalities. Potentially affected utilities include power/hydro, telecommunications, storm and sanitary sewers, gas, watermains, and, in the case of the proposed Don Valley layover, potentially an oil pipeline. This work will require shoring, particularly in the vicinity of operational rail tracks. In general, it is preferred that discharge be directed into municipal sanitary sewers.

The above work could potentially require extensive demolition on brownfield sites, as well as excavation of up to 2 metres below ground surface, depending on the utilities to be installed. Excavated materials will be hauled for landfill disposal depending on the quality of the materials, and in consideration of any hazardous material disposal requirements. A dewatering system may be required for certain construction activities to remove water beneath the excavation levels.

Each layover facility will require significant electrical work to install either a sub-station or new transformer to provide power to the site, which includes significant grounding work. Electrical power will feed low voltage systems, separate from electrification power requirements, including lighting and all communication devices such as cameras and public address systems. For layovers that are not electrified, wayside power will be installed, which are high-voltage systems.

The layover facilities will require construction of access roads using hot mix asphalt and emulsified bitumen, complete with concrete curb and sidewalks. Drainage work will also be required in addition to track construction, as previously described. Road construction includes a subgrade, subbase and base course, all of which require extensive use of aggregate and compaction effort. A nuclear gauge is typically used to measure compaction levels.

Office and maintenance buildings are included in several proposed layovers, which are typically structural steel buildings. They require construction of concrete foundations and will be serviced by power, fire suppression water, domestic water, telecommunications and gas. Buildings will also be equipped with HVAC units. Some facilities will require a septic tank and an electrical substation. Pole bases will also be installed for the OCS system to accommodate electrification.

Other features of a typical layover include:

- Fencing and gates
- Exterior lighting
- Roadways and walkways
- Parking areas
- Waste management areas
- Stormwater management facilities
- Sanitary field
- Transformer and power distribution systems
- Back-up power/uninterrupted power supply (UPS)
- Telecommunications and security/CCTV
- Restroom facilities
- Mobile standing storage

It is anticipated that the following equipment will be required for layover facility construction:

- Excavator
- Backhoe
- Grader
- Tower cranes
- Loaders
- Paver
- Compactor
- Dump trucks
- Bulldozer
- Pumps
- Generators
- Lighting equipment
- Boom trucks

3.13.7 Construction of Thickson Road Bridge Expansion

It is anticipated that the following typical construction activities and equipment will be required to complete the expansion of the Thickson Road Bridge:

- Pile-driving machine for installing the H-Piles
- Caisson machine for temporary shoring
- Excavators/bulldozers for excavation
- Dump trucks for soil removal
- Concrete pumps for pouring concrete
- Compactors for soil compaction before installing concrete elements or paving the road
- Pavement machine for pouring asphalt and paving the roadway below the bridge
- Cranes for lifting different construction elements in the site

3.13.8 Electrification of Richmond Hill Corridor - Installation of Overhead Contact System

The primary construction activities associated with OCS construction and installation are described as follows:

3.13.8.1 OCS Foundation Installation

The OCS foundation sizes are dependent on the type of OCS structure to be installed (i.e., portal, cantilever), however typical sizes are estimated to be as follows be: 36” (900mm) diameter (single track cantilever), 42” (1050mm) diameter (two track cantilever), 42” (1050mm) diameter (portal structure<24 meters wide), 48” (1200mm) (portal structure >24 meters wide). Excavation will be required to install OCS foundations at an approximate depth of 5m.

3.13.8.2 Install OCS Support Structures

Once foundations have been established, OCS support structures will be installed. For both portal and cantilevers, the structures are pre-assembled and ready to lift using a rail crane. For cantilevers, brackets can be installed on the poles before sending to the site, whereas portals are more complex to install, as they require access to all lines (similar to a signal bridge).

3.13.8.3 Install OCS Wiring

The installation of OCS wiring involves running the contact and messenger wires together under tension along the corridor. This is typically completed using a four vehicle wiring unit, where the base vehicle dispenses wire, the second vehicle with working platform is equipped to allow messenger to be installed onto cantilever, the third vehicle with working platform is equipped to allow contact wire to be installed, and a fourth vehicle installs hangers.

3.13.8.4 Installation of Grounding and Bonding of the OCS

Grounding and bonding within the rail ROW is required for OCS support structure locations. The construction of grounding and bonding elements will occur concurrently with OCS structure foundation installation and OCS wiring installation, since each OCS structure will be individually grounded and interconnected through the static wire.

3.13.9 Electrification of Richmond Hill Corridor - Bridge Modifications

OCS attachments to bridge structures (road over rail), will be done via railcar with a raising working platform from track level to install attachments to the bottom of the bridge structure.

With regard to installation of grounding grids/flash plates, this may be done via railcar by raising the working platform from track level to attach the flash plates to the bottom of the overhead structure.

With regard to construction of electrification bridge protection barriers, this will be completed on top of the bridge structure, in the same manner as other bridge related civil construction works. It is noted that temporary road (traffic lanes may be reduced) and/or pedestrian walkway closures may be required during construction of the protection barriers; full road closures were not anticipated to be required for this work at the time of writing this report. - Construction Management & Traffic Management Plans will be developed in consultation with the City of Toronto, as appropriate

3.13.10 OCS Testing and Commissioning

After the overhead contact system (OCS) is installed and all adjustments made, test runs with the electric locomotives shall be made. The Contractor shall make all corrections, as determined necessary by such test runs. The OCS shall then be energized and tested for sectionalization. Any defects in the OCS revealed by these energization tests shall be corrected by the contractor, prior to commissioning the overhead contact system.