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HIGHWAY WORKS

PART A – GENERAL PROVISIONS

ARTICLE 1 REFERENCE DOCUMENTS

1.1 Application of Ontario Provincial Standards for Roads and Public Works and MTO Technical Manuals

- (a) DB Co shall perform the Highway Works in accordance with Ontario Provincial Standards for Roads and Public Works and other applicable Reference Documents, including MTO Technical Manuals, subject to Clause 1.3 of Part A of this Schedule 15-2, Part 9 and with the following amendments to OPS and MTO Technical Manuals:
- (i) In the event OPS and MTO Technical Manual design and submission requirements, with respect to both temporary and permanent works, and quality requirements, are in conflict with this Project Agreement then this Project Agreement shall apply;
 - (ii) OPS and MTO Technical Manual requirements and specifications related to Equipment for performing the Highway Works do not apply; for greater clarity specified Equipment restrictions under the “Construction” Section do apply;
 - (iii) Sections and requirements of OPS and MTO Technical Manuals that are not applicable to this Project Agreement, such as payment terms, do not apply;
 - (iv) Any and all references to “approval by the Contract Administrator”, “submitted to the Contract Administrator”, or other such reference in OPS and MTO Technical Manuals, in terms of acceptance of Materials, permission to proceed, work methodology or end product, shall be construed as being the responsibility of DB Co (IQAF Project Manager as detailed in Schedule 11) to undertake all required reviews, confirm compliance with this Schedule 15-2 and make submissions to the City with the full acceptance and approval by the Engineers on their Design Team, unless otherwise requested by the City Representative in writing or as outlined in the Project Agreement;
 - (v) Any and all references in OPS and MTO Technical Manuals to submission of documentation to the Contract Administrator “for approval”, “for acceptance”, “to be submitted to”, or other qualifying phrase with similar connotation not identified in (iv) above, is to be construed as the City Representative retaining the right to object to the submission as set out in Schedule 10 – Review Procedure, if the submission is required to undergo the Review Procedure upon consultation with the City Representative;
 - (vi) Any and all references to the “Owner” or “Authority”, or other words or phrases with similar connotation in OPS and MTO Technical Manuals shall have the same meaning as the City Representative or its assigned authority, unless otherwise stated by the City Representative in writing;

- (vii) DB Co shall, when required to submit for approval by the City Representative samples of any products proposed by DB Co that are not included in the Designated Sources for Material List, submit such samples with supporting documentation to the City Representative in accordance with Schedule 10 – Review Procedure;
- (viii) DB Co may seek relief from any parts or portions of OPS and MTO Technical Manual, by articulating in writing the aspects that do not apply and demonstrate by clauses or sections in the Project Agreement how such aspects are not appropriate in the context of this Agreement, and submit this written request to the City Representative under the Review Procedure. For clarity, DB Co relief from any parts or portions of OPS and MTO Technical Manual requires the prior written approval of the City Representative; and,
- (ix) OPS and MTO Special Provisions refers to the current version at Commercial Close; only the Common and Provincial versions shall be used.

1.2 Reference Documents

- (a) Without limiting any other provision in the Project Agreement, the Reference Documents shall apply to the Highway Works as described in this Schedule 15-2, Part 9.

1.3 Order of Precedence

- (a) Unless otherwise expressly provided in this Schedule 15-2, Part 9, if there is any conflict between any of the provisions of the Project Agreement and any of the Reference Documents, the following shall apply in descending order of precedence:
 - (i) The provisions of the Project Agreement;
 - (ii) MTO Special Provisions
 - (iii) OPS; and,
 - (iv) Any other applicable Reference Documents.

1.4 Acceptable Products

- (a) DB Co shall use products and proprietary systems on the Highway Works which meet applicable Project Agreement requirements and shall be in accordance with the Designated Sources of Materials List. Without limiting Section 11.20 of the Project Agreement, the use of products that are not on the Designated Sources of Materials List requires the prior written approval of the City, in its sole discretion, and acceptance shall be subject to DB Co demonstrating in its submission sufficient knowledge, understanding and experience with the proposed product and proprietary system and acceptable performance for the proposed product and proprietary systems under conditions and applications similar to those existing for this Project.

1.5 Reference Concept

- (a) Any use by DB Co of any or all aspects of the Reference Concept or Preliminary Design Report in performing the Highway Works shall be entirely at DB Co's own risk. Use of the Preliminary Design Report as a basis for DB Co's design for any part of the Highway Works does not constitute City's acceptance of DB Co's design, unless use of the Preliminary Design Report is specifically required under the Project Agreement.

1.6 Definitions

- (a) Capitalized terms used in this Schedule 15-2, Part 9, including all Appendices hereto, are defined in the following and/or in Schedule 1 - Definitions and Interpretations of the Project Agreement and/or in Schedule 15-1 – Technical Terms and Reference Documents. In the event of conflict between terms defined in this Schedule 15-2, Part 9 and Schedule 15-1 and/or Schedule 1, the definitions in this Part 9 shall govern.

AASHTOWare means the enterprise AASHTOWare Pavement ME Design software suite designed by transportation professionals to help transportation professionals comply with AASHTO standards.

Acceptable Products means the products that meet the Project requirements as described in Clause 1.4 of Part A of Schedule 15-2, Part 9.

Accurate means the information provided is a true representation of an actual situation, accomplishment or occurrence.

Address or Addressed means the initiation of an activity that will reduce or remove a condition or Construction Defect.

Advance Notification refers to an **Advance Notification Sign**. It is a temporary sign (a version of a TC-64, 4'X 8', static sign) which message is temporal or time-oriented in nature. It aims to create awareness of a future work activity before the time (usually 7-14 days in advance) that it occurs in order to forewarn of future work activities liable to impact upon traffic operations and to effectively communicate the location, time, duration, extent and potential impact of the future work activity. It should provide information to motorists for route selection and travel planning.

Advance Warning refers to an **Advance Warning Sign**. It is a temporary sign (a version of a TC-64, 4'X 8', static sign) which message is situational or location-oriented in nature. It aims to create awareness of an ongoing work activity during the time that it occurs in order to warn of ongoing work activities that impact upon traffic operations, and therefore it needs to be located in advance of potential queues and to effectively communicate the location, time, duration, extent and potential impact of the ongoing work activity. It should provide information to motorists for route selection using a formal, signed detour route or an informal, un-signed alternative route.

Advanced Traffic Controller or ATC means an expandable, flexible, microprocessor-based traffic controller designed to run the owner's application software, which has been developed for the Intel x86 family of microprocessors, running QNX 6.3 real-time operating system.

Advanced Traffic Management System or ATMS means a system or series of systems that encompass a broad range of wireless and wire line communications-based information and electronics technologies integrated into the transportation system's infrastructure, and into vehicles themselves, to develop and improve transportation systems.

Arc Flash Study Report has the meaning given in Clause 6.3 of Part B of this Schedule 15-2, Part 9.

Ball Bank Indicator Report has the meaning given in Clause 2.3(b) of Part B of this Schedule 15-2, Part 9.

Barrier means physical barriers set along the road, including cable guide rail, steel beam guide rail, temporary and permanent concrete barriers, safety items such as energy-attenuating systems and crash cushions, box beams and anti-glare screens, which are intended to provide additional protection to motorists when vehicles leave the Roadway, that protect vehicle occupants from a more severe hazard and thereby reduce the degree of injury and damage.

Bearing means the superstructure support elements between the Bridge seats and the Bridge superstructure composed of steel, rubber or other materials and separated into two general categories as follows:

- (a) Fixed, allowing only rotational movements; and,
- (b) Expansion, allowing longitudinal as well as rotational movements, referring to drawings for specific Bridges.

Bikeways Design Manual means the Ontario Bikeways Planning and Design Guideline, as published by MTO.

Bluetooth Reader has the meaning given in Clause 11.3(f)(i) of Part B of this Schedule 15-2, Part 9.

Bluetooth Server has the meaning given in Clause 11.3(f)(ii) of Part B of this Schedule 15-2, Part 9.

Bluetooth Travel Time Monitoring Service has the meaning given in Clause 11.3(g)(i) of Part B of this Schedule 15-2, Part 9.

Borrow means earth or rock material acquired from outside of the right of way to complete the Works.

Bridge Deck means the structural element under the Deck wearing surface system that transfers loads from the Deck surface to the Bridge's superstructure or substructure components.

Bridge Deck Drainage means a system designed to remove water from the Deck as completely and quickly as possible and to discharge the runoff harmlessly.

Bridge Surface means the wearing surface used by vehicles, pedestrians, cyclists and others to travel over a Structure and includes curbs and gutters and approach slabs.

Bullnose means the location where the edge of a highway and the edge of ramp meet each other. Bullnose geometry is defined in the Geometric Design Standards for Ontario Highways (MTO) Figures FA-1 to FA-7.

Catch Basin means a drainage structure that collects stormwater surface runoff and transports it into a Culvert or storm sewer system. They may be located in paved areas or unpaved drainage ditches.

CCTV System/Subsystem means a video surveillance system/subsystem used to monitor Roadway conditions.

Certificate of Authorization has the meaning given in the Ontario *Professional Engineers Act*, R.R.O. 1990, c. P.28, as amended from time to time.

CHBDC means Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6.

Checking Team has the meaning given in Clause 4.2(b)(i) of Part B of Schedule 15-2, Part 9.

Chromaticity means the colour of the line by reference to Commission Internationale de l'Eclairage (CIE) chromaticity diagram to define the area within which the colour must fall, as measured in accordance with ASTM E-1347.

Clearance Certificate means a form that demonstrates registration with and the existence of an account in good standing with the Workplace Safety and Insurance Board of Ontario.

Closure means any partial or total closure, obstruction, blockage or other restriction or interference (howsoever arising) impeding the flow of traffic on or affecting the ability of the public to pass and re-pass over a traffic lane of whatever duration including, without limitation, any such partial or total closure, obstruction, blockage, restriction or interference:

- (a) That is effected by DB Co;
- (b) That is required for any works by a Governmental Authority or for any inspection, investigation or survey (whether carried out by DB Co, City, any other Governmental Authority or any other person);
- (c) That results from an Incident or a vehicle breakdown;
- (d) That is effected by an Emergency Service Provider;
- (e) That materially affects the ability of Highway users to use that traffic lane in a safe manner due to the build-up of snow, ice or water resulting from a failure to meet the requirements defined in the Output Specifications; or,
- (f) From any other natural event physically affecting the Roads.

For purposes of this definition, traffic congestion or slowing of the flow of traffic in a traffic lane or traffic lanes within the Roads will not by itself be considered to be a Closure (including where the same results from speed restrictions properly imposed from time to time as a direct result of adverse weather conditions or seasonal restrictions for the time being affecting the Roads, but excluding where the standard of construction and/or condition of the Roads has contributed to the need for such speed restrictions).

Closure Notification Number means a reference number provided by OTOC to identify Road Closures in respect of pre-approved Road Closures.

Communications System/Subsystem means the system or subsystem used to interconnect the various ATMS devices (VMS, CCTV, VDS, etc.) with the OTOC. It can be wireless and/or wire-line, as applicable.

COMPASS means the centralized software and hardware that controls and monitors remote ATMS devices and that is used to reduce travel delay and travel time uncertainty, to enhance safety, to improve incident response and to improve traffic flow.

Complete means that all required services and relevant information has been provided.

Concrete Barrier, Temporary and Permanent means pre-cast and cast-in-place concrete barrier walls in the median and edge of pavement; commonly installed in highway medians to separate traffic.

Context Sensitive Design or CSD means a series of concept design recommendation (Context Sensitive Design (CSD) to promote a consistent treatment of the major elements of the Queensway infrastructure such as Bridges, Retaining Walls, Noise Barriers, landscaping and architectural lighting.

Context Sensitive Design Concept has the meaning given in Appendix F of this Schedule 15-2, Part 9.

Continuous Illumination means a lighting system on an essentially straight and linear section of Roadway designed to provide a specific lighting level and uniformity of light over the traveled portion of the Roadway.

Council Resolution means a resolution passed by a municipal council under the *Municipal Act, 2001* (Ontario).

Counting Stations and Loops means a system consisting of electronic detecting and recording units installed at the side of the Roadway and connected to actuation devices, such as loop detectors, imbedded in the Roadway Pavement to measure traffic volumes, speeds and axle counts.

Crossing Road has the meaning given in Clause 4.1 of Part C of this Schedule 15-2, Part 9.

Culvert means a drainage structure designed to allow the passage of surface water, livestock or pedestrians under a roadway, railway or roadside entrance. For the purposes of these

Performance Requirements, culverts are less than three metre span and may be a concrete Culvert, corrugated steel Culvert (CSP), timber Culvert or plastic Culvert.

Data Room means the secure website established by City for the Project prior to the date of this Project Agreement containing or referring to materials, documents, information and data in respect of the Project.

Debris means objectionable items including damaged City/MTO inventory, sand, gravel, roadside garbage, litter, dead animals, unlawful signs, fallen trees, loose brush and fallen rocks.

Deck means the portion of an Bridge that supports the highway, from the top of the major structural members to the wearing surface, and is designed to distribute loads evenly across the Bridge.

Deck Area means the plan area of a bridge Deck: Total length (centre-line of bearing to centre-line of bearing x width (outside of barrier to outside of barrier).

Demolition, Removals, and Disposal Plan has the meaning given in Clause 12.1 of Part B of Schedule 15-2, Part 9.

Design Bulletins or Highway Design Bulletins or Bridge Office Memo's mean updated interim recommendations, directives and/or policies on select Highway design subjects.

Design Integration means a coordination process undertaken by DB Co to consider and ensure that all necessary disciplines (e.g. roadway, traffic, geotechnical/foundations, drainage, structural, environmental, etc.) that have an impact or may be impacted by a design have reviewed the design and have had their input incorporated and coordinated to ensure completeness of the design.

Design Life means the period of time specified by the Owner during which an asset is intended to remain in service.

Design Manager means the manager of the Design Team.

Design Safety Review means design safety reviews that are to be carried out in accordance with Article 10 of Part B of Schedule 15-2, Part 9.

Designated Construction Zone means one or more highway work zones located on or near the Roadway. A Designated Construction Zone must be designated through a Designation of Construction Zone and signed in order to have enforceable maximum speed limits.

Designated Sources of Materials List or DSM means materials and sources of materials that have been approved by MTO for use on an MTO construction contract.

Designation of Construction Zone means the Designation of Construction Zone Form PH-M-101, to be prepared and submitted by DB Co to MTO and through which an official of MTO may, by signing the Designation of Construction Zone Form, designate part of a King's Highway

as a Designated Construction Zone, thereby authorizing the posting of a lower regulatory rate of speed than is otherwise provided through the existing regulatory speed limit.

Detour Route means a route that takes traffic off of the regular route and, using existing or newly made temporary Roadways within the work zone, guides traffic around the work zone.

Ditch means an open drainage facility constructed to carry water to an outlet.

Diversions means traffic diversions by means of a lane shift or an on-site Detour Route.

Drainage and Stormwater Management Report has the meaning given in Clause 7.2 of Part B of this Schedule 15-2, Part 9.

Drop-off means the drop from the surface of the edge of asphalt pavement or concrete pavement to the gravel Shoulder as measured vertically from the underside of a 1.3 m rigid straight edge, placed on the asphalt pavement or concrete pavement and on the gravel Shoulder, to the deepest portion of the rut.

Durability means the percentage of marking remaining on the Roadway, as assessed in accordance with the MTO Durability Classification Guidelines.

EB means eastbound.

Electrical Safety Authority means the Electrical Safety Authority of Ontario.

Electrical System/Subsystem means the system composed of all infrastructure for electrical work relating to the Highway Works.

Emergency Repairs means any activity required to bring the Subsystem to full functionality in accordance with the specifications other than routine maintenance activities.

Enhanced Grading means the implementation of landscape berms to blend the extension with adjacent landscapes.

Engineer means a professional engineer licensed by the Professional Engineers of Ontario to practice in the Province of Ontario.

Engineer's Report means an Engineer's report containing the information specified in Section 8 of the *Drainage Act* (Ontario)

Environmental Approvals has the meaning given in Schedule 17 – Environmental Obligations.

Equipment means all machinery and equipment used for preparing, fabricating, conveying or erecting the Works and normally referred to as construction and maintenance machinery and equipment.

Explicit Safety Analysis has the meaning given in Clause 1.7 of Part B of this Schedule 15-2, Part 9.

Flasher Beacons means electrically operated warning devices that intermittently flash a red or amber light.

Flexible Pavement means Pavement consisting of asphalt concrete layers on supporting courses such as granular base and granular sub base, placed over the sub grade.

Floodplain Mapping means mapping approved by the Ministry of Natural Resources or local Conservation Authority that illustrates the limits of flooding associated with the Regulatory Storm.

Friction means the force that resists the relative motion between a vehicle tire and a pavement surface and is measured according to the MTO Friction Testing and Reporting Format, October 2009.

Friday Night has the meaning given in Clause 11.3(l)(iii) of Part B of Schedule 15-2, Part 9.

Full Closure means a Closure affecting all of the lanes in one or both travelling directions within the Roads.

Full Depth Paved Shoulder means Shoulder pavement depth that is designed to accommodate detour traffic for a period of one year minimum.

Full Illumination means a consistent lighting system covering a defined area such as an interchange or intersection, designed to provide a specific lighting level and uniformity of light over the traveled portion of the Roadway.

General Arrangement Drawing has the meaning given in Clause 4.4(b)(iii) of Part B of this Schedule 15-2, Part 9.

Geotechnical Report has the meaning given in Clause 5.11 of Part B of this Schedule 15-2, Part 9.

Granular Base means a set of requirements for dense graded aggregates intended for use as granular base within the Pavement structure, granular shouldering and backfill.

Granular Subbase means a set of requirements for well-graded aggregates intended for use as granular subbase within the Pavement structure and granular backfill. Granular B shall be Type II.

Granular Material means coarse-grained soils from which base and subbase aggregates can be produced.

Handrail means the rail mounted on top of the barrier or Parapet Wall, and all associated hardware to secure it to the wall.

Haul Route Plan has the meaning given in Clause 13.1 of Part B of this Schedule 15-2, Part 9.

Hazard(s) or Hazardous means a condition or Defect within the Highway Works causing an unsafe condition to the Highway users.

High Mast Lighting means illumination of a large area by means of a group of luminaires that are designed to be mounted in fixed orientation at the top of a high mast, generally 20 metres (65 feet) or higher.

Highway means a common and public thoroughfare any part of which is intended for or used by the general public for the passage of vehicles and includes the area between the lateral property lines thereof. This includes a street, bridge and any other structure incidental thereto and any part thereof.

Highway Emergency Traffic Plan has the meaning given in Clause 5.2(b) of Part C of Schedule 15-2, Part 9.

Highway Erosion and Sediment Control Plan has the meaning given in Clause 7.4 of Part B of this Schedule 15-2, Part 9.

Highway Lighting System means a system of luminaires, poles, sign luminaires, Underpass illumination, navigation lighting, cables, power supply equipment, control system and all associated materials required to provide illumination on a Highway or associated appurtenances.

Highway Traffic and Transit Management Communications Plan has the meaning given in Clause 5.2(g) of Part C of Schedule 15-2, Part 9.

Highway Traffic and Transit Management Plan or Highway TTMP means the plan to be prepared, submitted and implemented by DB Co in accordance with Clause 5 of Part C of Schedule 15-2, Part 9.

Highway Traffic Control Plan(s) or Highway TCP means the sub-plan or sub-plans of the Highway Traffic and Transit Management Plan prepared by the DB Co in accordance with Clause 5.2(a) of Part C of Schedule 15-2, Part 9.

Highway Traffic Incident Management Plan has the meaning given in Clause 5.2(c) of Part C of Schedule 15-2, Part 9.

Highway Traffic Management Implementation Plan or Highway TMIP means the sub-plan of the Highway Traffic and Transit Management Plan described in Clause 5.2(d) of Part C of Schedule 15-2, Part 9.

Highway Traffic Monitoring Plan has the meaning given in Clause 5.2(h) of Part C of Schedule 15-2, Part 9.

Highway Traffic Risk Assessment Plan means the sub-plan of the Highway Traffic and Transit Management Plan described in Clause 5.2(f) of Part C of Schedule 15-2, Part 9.

Highway Works Manager means the representative of the Lead Design Engineer on the Design Team.

Highway Works Traffic Management Communications Plan has the meaning given in Clause 1.13 of Part C of this Schedule 15-2, Part 9.

Holiday has the meaning given in Clause 1.4 of Part C of Schedule 15-2, Part 9.

Incident means events including traffic accidents, emergency situations, spills (Hazardous and non-Hazardous), flooding, Water Ponding, Highway deficiencies, Debris, and tree removal or other incidents off the ROW, which affect the Highway.

Incident Response Equipment (Freeway) means, at a minimum, a Crash Truck as defined in OTM Book 7 with operator and a vehicle with operator responding together with emergency response equipment including, but not limited to the following: a cutting torch, concrete saw, hand shovels, brooms, camera and film or digital camera, pick axe, chain saw, bolt cutters and other hand tools, emergency flares, cellular phone, sand or absorbent material for minor spills and traffic control equipment including cones, TC-54s and markers.

Incident Site means the location within the Highway Corridor Lands where an Incident has occurred and Response is required.

Independent Checking Team means a separate or independent design team of Professional Engineers engaged to conduct design checks, and are independent from the company of the design team performing the original design without any conflicts of interest.

Information Signage means signs that are used for directing motorists; identifying intersecting routes; identifying geographical locations and distances; and directing motorists to towns, cities, and other important destinations.

Integrated Management Plan has the meaning given in Schedule 11 - Integrated Management System.

Intelligent Transportation Systems or ITS has the same meaning as Advanced Traffic Management System.

Interconnection means a communication link between traffic signal controllers at adjacent intersections to optimize traffic flow by adjusting phasing and timing sequence in response to varying offset.

International Roughness Index or IRI means the measure of the Pavement smoothness based on the longitudinal profile of the Pavement surface as defined in the World Bank Paper 46.

Invasive Species or Invasive Exotics means plant species whose introduction or spread negatively impacts upon native biodiversity, the economy and/or society, including human health. Invasive plant species may out-compete desirable native plant species, destroy wildlife habitat and overtake landscape plantings and natural areas. Examples of invasive plant species include Phragmites, dog strangling vine, and giant hogweed.

Landscape Design Element(s) means an individual component which make up the designed landscape (i.e. stormwater management facility, visual screen, landscape berm).

Landscape Plan means design drawings, presentation graphics, specifications and narrative that cover all aspects of the landscape design to be prepared, submitted and implemented by DB Co in accordance with Article 9 of Part B of Schedule 15-2, Part 9.

Landscape Screening means a combination of one or more screening methods (sound barrier, vegetation, berming, fence), depending on the Site characteristics and safety and engineering requirements.

Lane Closure means any Closure affecting a lane or lanes (including ramps), but excludes a Full Closure.

Lead Design Engineer means the DB Co Party within the Design Team that is responsible for leading the overall design of the Highway Works.

LiDAR means Light Detection and Ranging.

Linear Highway Referencing System or LHRS means a link/node referencing system that is used to locate road sections and points on the Ontario Highway Network. Each Highway is divided into consecutive sections that have unique reference numbers assigned in ascending order. The starting point of any section is defined as the point where two Highways intersect, any other suitable points such as county/regional road intersections, structures and railway grade crossings and interchanges.

Light Trespass means the effects of light that strays from the intended purpose and becomes an annoyance, a nuisance, or a detriment to visual performance. As such, light trespass should always be considered negative, unlike spill light, which can have positive or negative attributes.

Lightweight Fill means a fill material with a unit weight less than conventional soil or rock fill. Examples include EPS (expanded polystyrene), blast furnace slag, cellular concrete, tire chips/shreds, saw dust/wood chips and expanded clay.

LLF means light loss factor.

Luminance means the luminous flux in a light ray emanating from a surface or falling on a surface in a given direction per unit of projected area of the surface viewed from that direction per unit of solid angle (reflective light) as measured in accordance with ASTM E-1347.

Made Aware means when DB Co has been advised by any party or upon detection.

Main Line means the freeway within the Highway Corridor Lands located:

- a. In a north-south direction that consists of the existing Highway 416 from south of Hunt Club Road to Highway 417, including all associated widened and improved infrastructure; and,
- b. In an east-west direction that consists of the existing Highway 417 from east of Maitland Avenue to west of Moodie Drive, including all associated widened and improved infrastructure.

Maintenance Operations means the activities performed to maintain the Highway in a safe and passable condition, to prolong the life of the asset, and other activities prescribed in Appendix G.

Material(s) means material and fixtures forming part of the infrastructure relating to Highway Works.

Ministry Directives means the official method of disseminating policy within the Ministry of Transportation Ontario.

Modular Expansion Joints means prefabricated deck joints consisting of multiple joint openings filled with seals.

MOE Notice of Approval has the meaning given in Schedule 17 – Environmental Obligations.

MOL means the Ministry of Labour (Ontario).

Moving of Utility has the meaning given in the Utility Relocation Guidelines (MTO), January 28, 2010.

MTO General Conditions of Contract means OPSS PROV 100.

MTOD means Ministry of Transportation Ontario Drawing.

MTO RAQS means the MTO Registry, Appraisal and Qualification System.

MTO Technical Manuals means manuals, guides, guidelines or standards published by MTO and listed in the Reference Documents.

Municipal Roadways means those Roads listed in Clause 4.1(a)(ii) of Part C of Schedule 15-2, Part 9.

NB means northbound.

Noise Barrier means a barrier designed to attenuate noise generated by vehicles traveling on a Highway.

Non-Structural Culvert means any Culvert that has a span of less than three metres.

NSSP means the Non Standard Special Provision, as published by MTO.

Office Space has the meaning given in Clause 6.1(a) of Part A of Schedule 15-2, Part 9.

Openness Ratio means the ratio of a Culvert's cross-sectional area divided by its length.

OPS means the Ontario Provincial Standards for Roads and Public Works.

OSIM means the Ontario Structure Inspection Manual, as published by MTO.

Other Affected Municipal Roadways means Roads affected by the Highway Works or Roads within the Highway Corridor Lands that are not Existing Provincial Highways, or Existing Municipal Roadways.

Ottawa Traffic Operations Centre (OTOC) means the MTO's traffic operations centre (TOC) for coordinated highway management systems. It is at this TOC that the data from the highway system is collected and processed, fused with other operational and control data, synthesized to produce "information", and distributed to stakeholders such as the media, other agencies, and the traveling public.

Overhead Sign Support Structure means a permanent structure with a Foundation used to support an over-head sign over a Roadway.

Overpass means a grade separated Structure carrying a Highway over a road, a Highway, a railway or a watercourse.

Parapet Wall means a barrier fastened to the edge of a Bridge Deck to prevent vehicles or other road users from running over the side of the Bridge.

Pavement means all structural elements or layers above the subgrade of a road, including granular driving surfaces and Shoulders.

Pavement Condition means the condition of the Pavement based on roughness and distresses.

Pavement Design Report has the meaning given in Clause 3.2 of Part B of this Schedule 15-2, Part 9.

Pavement Markings means directional dividing lines, lane lines, edge lines, transitional and continuity lines, interchange ramps and channelization lines, barrier lines, intersection markings, reserved facility markings and parking markings, including words, letters and symbols on Pavements, used to delineate vehicle operating limits on Highways conforming to the size and shape as specified in OTM Book 11.

Permanent Pavement Marking Plan has the meaning given in Clause 8.6(a) of Part B of Schedule 15-2, Part 9.

Permanent Signing Plan has the meaning given in Clause 8.4(e) of Part B of Schedule 15-2, Part 9.

Permanent Signing Table has the meaning given in Clause 8.4(e) of Part B of Schedule 15-2, Part 9.

Permitted Periods for Closures means the periods during which DB Co may implement Closures, Full Closures, Detour Routes, Lane Shifts and Diversions in respect of the various Roads, as set forth in Part C of Schedule 15-2, Part 9.

PIT Test Plan has the meaning given in Clause 11.3(m) of Part B of this Schedule 15-2, Part 9.

Poor Weather means any weather situation at any time of year, which requires DB Co to perform Maintenance Operations to Address the weather or the resulting impacts, including high winds and heavy rains.

Pothole means dents or hollow depressions in the Roadway surface.

Preliminary Design Report or PDR means the preliminary design report associated with [REDACTED], and any updates or any additional design to the above as shown on preliminary design drawings from the MTO designer. The PDR forms part of the Reference Concept.

Preliminary Lighting Design has the meaning given in Clause 6.4 of Part B of this Schedule 15-2, Part 9.

Priority Basis means completing the work in order of importance with respect to the public's safety.

Provincial Highways means those Highways listed in Clause 4.1(a)(i) of Part C of Schedule 15-2, Part 9.

Portable Variable Message Sign or PVMS means a Variable Message Sign that may be moved from place to place to provide drivers with information on conditions, usually work zone conditions, at the time and place where needed.

Preventative Maintenance means the proactive care and servicing by DB Co for the purpose of maintaining the New MTO Infrastructure and New Municipal Infrastructure in satisfactory operating condition by providing for systematic inspection, detection and correction of incipient failures either before they occur or before they develop into major Defects.

Professional Engineer means an engineer licensed by Professional Engineers Ontario to practice in the Province of Ontario.

Qualified Person or Qualified Personnel means staff having the licences, training and experience appropriate for the equipment or facilities they are working on.

Rapid Bridge Replacement (RBR) means replacement of the existing structure with an on-site constructed structure using SPMT's in the same location.

Registry, Appraisal and Qualifications System or RAQS means a system used by MTO for the registration, appraisal, and qualification of contractors and consultants for contracts with MTO.

Regulatory Sign means a sign that informs Highway users of traffic laws or regulations and indicates the legal requirements that would otherwise not be apparent, such as "stop" and "speed limit" signs.

Regulatory Storm means a design flow adopted by the Ministry of Natural Resources for floodplain management purposes. Figure 1 in the MTO Drainage Design Standards (January 2008) illustrates the three Flood Hazard Zones in Ontario. Depending on the zone, the

Regulatory Storm is either the 100-year flow or the greater of the 100-year design flow and the peak generated by the regional storm (Timmins Storm or Hurricane Hazel).

Response means the arrival of appropriate qualified staff and an appropriate amount of material and equipment to the Site of an Incident or situation requiring attention.

Restricted Period(s) means those periods of time, as set out in Part C of Schedule 15-2, Part 9, during any Construction Activity for an identified location within the work zone during which there are restrictions on DB Co's available traffic management measures.

Retained Soil System or RSS means a proprietary system that uses mechanical soil stabilization to retain horizontal loads in excess of 2 m in height for applications, such as true and false abutment structures, Retaining Walls and steep slopes, or to retain vertical loads for applications, such as embankments over soft ground.

Retaining Wall means a structure that holds back soils and is not a wingwall connected to a Bridge or Culvert.

Road Safety Audit means an audit carried out in accordance with Article 10 of Part B of Schedule 15-2, Part.

Road Safety Audit Certificate has the meaning given in Clause 10.8(a) of Part B of Schedule 15-2, Part 9.

Road Safety Audit Report has the meaning given in Clause 10.6(b) of Part B of this Schedule 15-2, Part 9.

Road Safety Audit Team means the team engaged by DB Co to undertake the Road Safety Audit.

Roads means, at any time, the Provincial Highways, Municipal Roadways, ramps and all other roads and Highways, including Shoulders, forming part of the Highway Works at that time.

Roadside means the area between the outside edge of the Shoulder rounding and the ROW limits and features within the Roadway that do not form an integral part of the driving surface, such as drainage features and guiderails.

Roadside Landscape(s) means geometrically strong plantings and structural elements that provide a green, aesthetic driving experience for users of Highway 417.

Roadway means that part of the Highway designed or intended for use by vehicular traffic and includes the Shoulders.

SB means southbound.

Select Subgrade Materials (SSM) means a set of requirements in accordance with OPSS 1010 for well-graded non-plastic aggregates used to replace poor subgrade materials and as swamp backfill.

Service Life means the period of time during which the structural component safely performs its design function without significant repairs, rehabilitation or replacement.

Shop Drawings means drawings that are prepared by DB Co and/or DB Co Parties based on the Construction Document Submittals for the detailing or further resolution of the assembly or execution aspects of the Highway Works.

Shoulder means that portion of the Roadway between the edge of the travelled surface and the top inside edge of the ditch or fill slope.

Side Clearance means that portion of the Roadway between the edge of the travelled surface and the edge of the adjacent curb or Barrier on a Structure.

Sign means, for the purposes of the Output Specifications, a lettered board, message or other display that includes all regulatory, warning, guide or informational, advisory, construction and maintenance, route markers and all special or other messages/displays under provincial jurisdiction as defined by MTO but excludes electronically controlled messages/displays, but includes the sign face overlay.

Significant and Complex Structures means Structures, including but not limited to the following:

- (a) Single span bridges of spans greater than 60 m;
- (b) Multi-span bridges of span(s) greater than 60 m or where the overall length of the bridge is more than 250 m;
- (c) Bridges which cannot be analysed by the Simplified Method of Analysis as CAN/CSA-S6-14 Clause 5.7 and that need to be analysed using refined methods of analysis as per CAN/CSA-S6-14 Clause 5.9 and Clause 5.10;
- (d) Curved bridges that exceeds the criteria of CAN/CSA-S6-14 A5.1.3.2 where dead and live loads twisting moments and associated effects of torsional and distortional warping need to be considered;
- (e) Bridges with complex boundary conditions, articulation and idealization;
- (f) Tunnels;
- (g) Bridges built in locations with complex Foundation conditions;

Sign Truss means a truss used as part of overhead static sign support structures.

Simplified Methods of Analysis means the method of analysis referred to as 'Simplified Methods of Analysis' in CAN/CSA-S6-14, Section 5.

SPMT's means Self-Propelled Modular Transporters.

Stage 1 Road Safety Audit means a Pre-Final Design Road Safety Audit as described in Clause 10.6(c)(i) of Part B of Schedule 15-2, Part 9.

Stage 2 Road Safety Audit means a Final Design Road Safety Audit as described in Clause 10.6(c)(ii) of Part B of Schedule 15-2, Part 9.

Stage 3a Road Safety Audit means a Temporary Traffic Control On-Site Road Safety Audit as described in Clause 10.6(c)(iii) of Part B of Schedule 15-2, Part 9.

Stage 3b Road Safety Audit means a Construction Road Safety Audit as described in Clause 10.6(c)(iv) of Part B of Schedule 15-2, Part 9.

Stage 4 Road Safety Audit means a Post Construction Road Safety Audit as described in Clause 10.6(c)(v) of Part B of Schedule 15-2, Part 9.

Structural Culvert means (i) a structure that forms an opening through soil with a span greater than or equal to 3 metres; (ii) Multi-cell culverts separated by a structural wall, with the total of the individual spans greater than or equal to 3 metres; and (iii) Multi-cell culverts separated by fill, the maximum fill spacing must be one times the minimum span of the individual cells, and the minimum individual cell span must be 2 metres. The total span is the total of the spans of the individual cells.

Structural Manual means the Structural Manual, as published by MTO.

Structure means any Bridge, Tunnel, Structural Culvert, Retaining Wall or Overhead Sign Support Structure.

Structure Rehabilitation means a modification, alteration or improvement to the existing condition of a Structure or Bridge subsystem that is designed to correct deficiencies for a particular design life or live load level.

Structure Survey Report has the meaning given in Clause 4.3(c) of Part B of this Schedule 15-2, Part 9.

Substructure means abutments, piers, their Foundations and protective works that form the Bridge substructure supporting the Superstructure above.

Subsystem means a grouping of like components with similar functionality and for the purposes of the Output Specifications, includes the following subsystems: CCTV, VMS, PVMS, VDS and communications. These are also referred to as Systems. These include structures (if applicable), electronic display elements (if applicable), controllers (if applicable), cabinets, electronic equipment and all other mechanisms and equipment.

Superpave means a hot mixed asphalt pavement technology designed and constructed in accordance with OPSS PROV 1151.

Superstructure means an upward extension of an existing Structure above a baseline.

System Integration Plan has the meaning given in Clause 11.3(m) of Part B of this Schedule 15-2, Part 9.

Temporary Pavement Marking Plan means the Pavement Marking plan to be prepared, submitted and implemented by DB Co in accordance with Clause 8.5(a) of Part B of Schedule 15-2, Part 9.

Temporary Signing Plan has the meaning given in Clause 8.3(c) of Part C of Schedule 15-2, Part 9.

Temporary Signing Table has the meaning given in Clause 8.3(c) of Part C of Schedule 15-2, Part 9.

Temporary Highway Works means Works that are performed to serve a specific temporary function in the execution of the Highway Works and in respect of which any resulting infrastructure is removed at such time when its temporary use is no longer required.

Temporary Works means Works that are performed to serve a specific temporary function in the execution of the Works and in respect of which any resulting infrastructure is removed at such time when its temporary use is no longer required.

Timely means that all required information is provided within the prescribed timeframe or, if not prescribed, a commercially reasonable timeframe.

Highway Traffic Advisory Temporary Signage Plan has the meaning given in Clause 5.2(e) of Part C of Schedule 15-2, Part 9.

Traffic Analysis Report has the meaning given in Clause 1.4 of Part B of Schedule 15-2, Part 9.

Traffic Control means the placement or erection of Signs, signals, Pavement Markings or other installations, and the use of flaggers and other personnel, for the purpose of regulating, warning or guiding traffic.

Traffic Control Device(s) or TCD is a term used to describe any person, Sign, signal, marking or device placed upon, over or adjacent to a roadway by or at the direction of a Relevant Authority or their designate, for the purpose of regulating, warning, guiding or informing a vehicle operator or pedestrian of an existing condition or hazard.

Traffic Control Supervisor or TCS means a person appointed by DB Co in accordance with Clause 5.3 (d) of Part C of Schedule 15-2, Part 9.

Traffic Engineer means the person appointed by DB Co in accordance with Clause 5.3 (c) of Part C of Schedule 15-2, Part 9.

Traffic Management Study has the meaning given in Clause 1.2(g) of Part C of this Schedule 15-2, Part 9.

Traffic Manager means the person appointed by DB Co in accordance with Clause 5.3 (b) of Part C of Schedule 15-2, Part 9.

Traffic Paint means a water-borne or organic solvent based paint specifically formulated for use in application of Pavement Markings.

Traffic Management Auditing has the meaning given in Schedule 11 – Integrated Management Systems.

Traffic Signal System means a system of traffic signal equipment, poles, traffic signal controllers, traffic signal actuation and interconnection equipment and all associated materials required to regulate vehicular and pedestrian traffic.

Underpass(es) means a grade separation (Bridge) in which the major road passes under an intersecting road or railway.

Variable Message Sign(s) or VMS means a system that includes sign structure, electronic display elements, sign case, photocell sensor, Variable Message Sign controller and all other mechanisms and equipment.

Vehicle Detector Stations/System/Subsystem or VDS means a system used to detect the presence of vehicles in one or more traffic lanes. Data is provided on speed, volume, occupancy and, frequently, classification of vehicles over timed intervals.

Warning Sign means a sign that indicates conditions on or adjacent to a Highway or street that are actually or potentially hazardous to traffic operations, such as a curve Sign.

Washout means the loss of aggregate, earth fill or any other type of soil from the edge of Pavement to the ROW limits.

Water Ponding means the collection of water on the travelled portion of the Highway.

WB means westbound.

Wildlife means animals such as fox, wolf or larger animals such as deer, elk, bear and moose and excludes smaller animals such as groundhogs, skunks, raccoons and domestic animals.

Winter Period means the period from December 1 in any calendar year, until April 14 the following calendar year, inclusive of these dates.

Winter Season Plan has the meaning given in Clause 1.14 of Part C of this Schedule 15-2, Part 9.

ARTICLE 2 DESIGN AND CONSTRUCTION

2.1 Responsibility for Design and Construction

- (a) DB Co shall be responsible for the design and construction of the Highway Works and all other Construction Activities, Highway DB Co Commissioning, and testing of the Highway Works, which shall be carried out in strict accordance with this Schedule 15-2, Part 9 and in such a manner as to comply with all applicable Project Agreement requirements.
- (b) DB Co shall implement a methodology to verify compliance of the construction with the Works Submittals. Tolerances for all work will be based on the requirements outlined in the Output Specifications. Changes made to the design during construction shall be dated, stamped and signed by the responsible Engineer from the Design Team and where applicable by a member of the Checking Team as per Clause 4.2 of Part B of this Schedule 15-2, Part 9 and submitted for review under Appendix B of Schedule 10 – Review Procedure.
- (c) DB Co shall ensure that the Construction Contractor has arrangements with the Design Team for the checking of the layout and verification of the specification, location, line grade and elevation of all as constructed works that is documented in the mark ups to As Built Drawings.
- (d) DB Co shall ensure that the materials incorporated into the Works meet the specified parameters. Materials that are not rejectable but do not meet the specified parameters may remain in place with a Construction Period Quality Failure applied in accordance with Schedule 21 and at the Construction Period Quality Failure Deduction detailed in Appendix I of this Schedule 15-2, Part 9.
- (e) DB Co shall ensure that at every stage of DB Co’s design, and for all design that is submitted to the City in accordance with Appendix B of Schedule 10 – Review Procedure, that all necessary Design Integration has been undertaken prior to submission for City review.
- (f) MTO has developed a series of concept design recommendations (Context Sensitive Design) to promote a consistent treatment of the major elements of the freeway infrastructure such as Bridges, Retaining Walls, Noise Barriers, landscaping and architectural lighting. DB Co shall implement the applicable MTO CSD recommendations as per the Reference Documents indicated in Schedule 15-2, Part 9, Appendix F. DB Co shall employ the services of a professional with demonstrated experience in the implementation of CSD’s as defined by FHWA. This individual shall be responsible to coordinate with the coordinating Engineers and the Design Team as necessary to ensure Design Integration requirements pertaining to CSD are met.
- (g) DB Co shall ensure that the Lead Design Engineer is engaged in all aspects of the development of the design and Design Integration through to Highway DB Co

Commissioning of the Project and acceptance and Highway DB Co Commissioning of the infrastructure. The Lead Design Engineer shall:

- (i) Have a Certificate of Authorization from the Professional Engineers Ontario;
- (ii) Be registered in the relevant Registry, Appraisal and Qualification System ("RAQS") certification for Highway Engineering (Multi-lane Arterial & Expressway - Major Reconstruction and/or Widening), Bridge Engineering (Design & Evaluation - Complex Structures (multi-span)) and other specialties as needed, and be directly and contractually responsible for coordinating the companies that are RAQS registered in other categories relevant to the Project including RAQS qualified individuals;
- (iii) Be represented on the Design Team by a lead individual, the Highway Works Manager, who is a Professional Engineer and possesses the qualifications specified in Schedule 9;
- (iv) Have the following minimum responsibilities:
 - A. Prepare and stamp engineering drawings and ensure stamping by the checking engineer for structural drawings;
 - B. Oversee the construction work as required to certify the work in the field is completed in accordance with the design;
 - C. Have adequate resources in the field with delegated responsibilities acting on behalf of the Lead Design Engineer to make certifications under the Professional Engineer's seal and signature, without qualification; and,
 - D. Review all As-built Drawings and Record Drawings, including shop drawings, and if there are material changes made between City's latest reviewed drawings with the As-built Drawings or Record Drawings, DB Co shall identify, justify, and provide supporting document through a revised submittal to City and describe how such material changes are compliant with the Project Agreement.
- (v) Appoint a coordinating Engineer(s). The coordinating Engineer role should be undertaken by different individuals, depending on the nature of work being undertaken, and the expertise required to carry out the responsibilities noted below. The coordinating Engineer shall:
 - A. Be satisfied that the Design Integration requirements have been met;
 - B. Communicate all Design Criteria to all respective disciplines;
 - C. Coordinate the various disciplines involved to ensure that the work as a whole substantially conforms to all applicable design and construction

- codes, guidelines, standards, and this Schedule 15-2 and the design performs as intended;
- D. Ensure that all documents within a particular engineering discipline are signed and sealed by the Professional Engineer taking responsibility for work within that discipline;
 - E. Become knowledgeable in any proprietary system, component or element that is not on the Designated Sources of Materials List or is being utilized for a purpose that differs from its original intended use as contemplated by DSM; ensure that such proprietary system, component or element is appropriately integrated; and ensure that the overall design will function as intended when that proprietary system, component or element is used;
 - F. Review all elements of a design that includes multiple disciplines, identify gaps and omissions in the design, and have those gaps and omissions rectified; and,
 - G. Apply a seal indicating that the work of the various disciplines has been coordinated.
- (h) DB Co shall prepare and submit for approval any necessary addenda to the MTO Design Criteria (as described in MTO Directive PHM-B-021) based on DB Co's design. The timing of these submissions is indicated in Schedule 10 – Review Procedure.
- (i) Where the new Confederation Line alignment and design requirements directly interface with the MTO's future Highway 417 widening as contemplated by the MTO's TESR, DB Co shall consider the interfaces and in particular the spacial constraints when protecting for the future MTO expansion. For certainty, where the Confederation Line infrastructure may preclude the MTO's future widening from both a design and constructability perspective, DB Co shall design and construct the New MTO Infrastructure within the Highway Corridor Lands as to eliminate the design and or construction conflict. DB Co shall provide the analysis of the interface between the LRT and future MTO infrastructure at PFDD, FDD and CDS of the Review Procedure, and where DB Co deems necessary to construct New MTO Infrastructure, DB Co shall submit to the City for MTO approval in accordance with Appendix B of Schedule 10 - Review Procedure.

2.2 Record Drawings and As Built Drawings

- (a) The Design Team shall track and document all changes from the IFC Drawings up to and including the preparation of the Record Drawings.
- (b) Design Team shall keep a record of the as-built condition and the reasons for any changes from the IFC documents including any necessary authorizations. Where the as-built condition deviates from the IFC documents but continues to meet the Output Specifications such that any changes fall within the design and specification tolerances and do not require engineering sign off by the responsible Engineer, the Design Team

shall ensure that drawings are marked up with the relevant information required to represent the as-built condition, highlighting the difference from the IFC documents. Before Highway DB Co Commissioning, the Design Team shall sign and seal the Record Drawings as required in Schedule 14 – Commissioning.

- (c) Where changes in the as-built condition mean that the constructed Highway Works would no longer meet the Output Specifications or would require further Design Data to demonstrate compliance with the Output Specification then the responsible Engineer shall revise the IFC documents and submit the Design Data as a Construction Document Submittal, in accordance to Appendix B of Schedule 10 – Review Procedure and shall be subject to the conditions of Clause 2.2 (a) and (b) in this Part A.

2.3 Post Construction Geospatial Data Collection

- (a) DB Co shall be responsible for the creation of geospatial data and inspection data as well as associated attribute information for each existing and newly installed drainage pipe within the limits of the Highway Works. Photographs shall be taken at every location. Inspections shall follow the MTO Eastern Region Culvert Condition Rating Guide as well as the MTO Drainage Asset Fields document.
- (b) The collection of geospatial data must be completed using a GPS device capable of achieving a horizontal positional accuracy of three metres or less. Coordinates shall record each invert and if necessary any bends or turns in the components alignment.
- (c) All spatial information must be coordinated horizontally to North American Datum 1983, using either the “NAD83 (Original)” or the “NAD83 (CSRS)” adjustment with a specified version, and supplied as 3-degree Modified Transverse Mercator (MTM) grid system co-ordinates.
- (d) All co-ordinate and attribute data shall be populated feature classes within a geodatabase suitable for integration into ESRI ArcGIS 10.4. An empty geodatabase set with all the necessary fields and domains will be provided by the City. There shall be a minimum of two feature classes delivered by DB Co:
 - (i) Culvert and Sewer Feature Class: This will be a line feature class with the asset attributes as defined below.
 - (ii) Culvert and Sewer Inspection Table: This is a table feature class with the specific information related to the inspection. Attributes are defined below.
- (e) Attribute Information:

DB Co shall collect attributes as defined below. Several of these will be supplied from the existing Eastern Region Drainage Inventory.

 - (i) Culvert and Sewer Feature Class:
 - A. Drainage Asset ID (DAID);

- B. Highway;
- C. Township;
- D. Location;
- E. Chainage;
- F. Pipe type;
- G. Pipe status;
- H. Material type;
- I. Pipe code;
- J. Diameter / span;
- K. Rise;
- L. Length;
- M. Cover depth;
- N. Construction year;
- O. Historic contracts (enter current contract);
- P. Inlet Structure ID (DAID of inlet CB/MH/DI, etc.);
- Q. Outlet Structure ID (DAID of outlet CB/MH/DI, etc.);
- R. Extensions (left, right, both, none);
- S. Notes;
- T. Upstream latitude;
- U. Upstream longitude;
- V. Downstream latitude;
- W. Downstream longitude;
- X. Source of spatial data;
- Y. Presence of animal grates;
- Z. Presence of end treatments; and

- AA. Presence of headwall / endwall / retaining wall.
- (ii) Inspection Table (Linked via DAID to Culvert and Sewer Feature Class):
 - A. Drainage Asset ID (DAID) – must match the DAID of pipe in the Culvert and Sewer Feature Class above;
 - B. Inspection date;
 - C. Evaluator (DB Co Party undertaking inspection)
 - D. Fish present at time of inspection;
 - E. Purpose of inspection (post-construction);
 - F. Barrel material rating;
 - G. Joint rating;
 - H. Shape rating;
 - I. Capacity rating;
 - J. Embankment rating;
 - K. Channel rating;
 - L. Roadway settling rating;
 - M. Scour/footings rating;
 - N. Head/endwall rating;
 - O. Recommended actions;
 - P. Beaver activity in area; and,
 - Q. Comments.
- (f) To ensure proper condition evaluation and worthwhile photos, GPS data collection and digital photos shall be completed with no ice / snow cover. A minimum of five digital photos of each location showing:
 - (i) The inlet and its surrounding environments;
 - (ii) The outlet and its surrounding environments;
 - (iii) Interior condition of the pipe from inlet end towards the middle;

- (iv) Interior condition of the pipe from outlet end towards the middle;
 - (v) Pavement condition directly above the pipe; and,
 - (vi) Any other pictures that help to demonstrate any unique aspects of the culvert.
- (g) All documents shall be placed into a digital folder with the following structure (a sample of the desired folder structure will be supplied by the City), and submitted to the City in accordance with Schedule 10 – Review Procedure:
- (i) Asset ID (e.g. CV-0417-001876).
 - A. Date of Inspection (e.g. 2018-09-18).

2.4 Shop Drawings

- (a) The Design Team shall review Shop Drawings and where no further comment is required shall treat Shop Drawings as IFC. Where the designer in the Design Team, who previously signed and sealed the drawings, is required to carry out further checking or design work in relation to the Shop Drawings the designer and a member of the Checking Team where applicable shall sign and seal the drawings and submit as Construction Document Submittal under Appendix B of Schedule 10 – Review Procedure.

2.5 Coordinate System

- (a) All Highway Works shall be designed and surveyed using the horizontal coordinate system MTM grid co-ordinate system, MTM Zone 9, NAD83 (original), metres, and the vertical datum CGVD28 – 1978 adjustment.
- (b) In addition to the project specific geodetic requirements, DB Co shall adhere to MTO survey requirements for New MTO Infrastructure and New Municipal Infrastructure which are as follows:
- (i) MTO Geodetic Reference System (“MTO CSRS GRS”):
 - A. Horizontal Datum: North American Datum of 1983, Canadian Spatial Reference System Version 6 (“NAD83 CSRSv6”), also referred to as “NAD83 epoch 2010.0”)
 - B. Vertical Datum: Canadian Geodetic Vertical Datum of 1928, 1978 adjustment (“CGVD28:78adj”); and,
 - C. Map projection: MTM, Zone 9.
 - (ii) MTO Geodetic Reference System (“MTO ORG GRS”):
 - A. Horizontal Datum: North American Datum of 1983, Original (“NAD83 Original”); and,

B. Vertical Datum: Canadian Geodetic Vertical Datum of 1928, 1978 adjustment (“CGVD28:78adj”).

(iii) Map projection: MTM, Zone 9.

2.6 Coordination with Ongoing Contracts

- (a) There will be adjacent Additional Works that will have impacts within the construction limits of the Highway Works and will require formal re-designation of the Designated Construction Zone limits. DB Co shall coordinate their Construction Activities with other construction work within and/or adjacent to the Highway Works to avoid performing work in the same Designated Construction Zone, or that may adversely affect operations of either party. DB Co is required to maintain a separate and distinct Designated Construction Zone for this Project at all times and shall ensure that separation by time, space or by physical barrier is maintained between the operations included in this Project and work within and/or adjacent to this Project by others. Any Designated Construction Zone adjustments made for the purpose of facilitating Lane Closures shall consider the requirements of OTM Book 7. No additional compensation shall be made for requirements associated with the adjustments to DB Co’s Designated Construction Zone.
- (b) DB Co is required to adjust all appropriate Project documentation to re-designate the Designated Construction Zone limits during the times when the adjacent projects require the use of DB Co’s Designated Construction Zone or part thereof. Revised Designated Construction Zone limits and Designation of Construction Zone shall be submitted to the City for approval in accordance with Schedule 10 – Review Procedure. DB Co shall not resume Construction Activities in any adjusted work zones until such time that the area has been re-established as the Designated Construction Zone for this Project.
- (c) DB Co shall identify on the Works Schedule and associated written narrative how the adjacent projects will be coordinated and staged with DB Co’s work.
- (d) DB Co shall coordinate with Third Party Contractors and Additional Contractors who may be performing Third Party Works or Additional Works which may connect, complement, interfere, or in any manner impact Highway Works. It is the responsibility of DB Co to work with these Third Party Contractors and Additional Contractors to fully coordinate interfaces and resolve any disputes or coordination problems that may arise, including, but not limited to, design and construction staging considerations. DB Co shall be responsible to be aware of and obtain information related to all Third Party Contractors and Additional Contractors and their projects.
- (e) For the purposes of establishing seniority of contractors with regards to coordination, DB Co shall retain seniority over Third Party Contractors or Additional Contractors whose works are initiated after the start of DB Co’s Construction Activities.
- (f) DB Co shall be aware of the following partial list of projects which may be undertaken within the Highway Corridor Lands prior to, concurrent with, or following Highway Works Construction Activities:

- (i) City of Ottawa Projects: Contact Senior Engineer, Infrastructure Projects, Design and Construction (Municipal) Branch (or the individual responsible for this function at the time). [REDACTED].
- (ii) MTO Contract 2017-4031. Contact MTO Contract Administrator (or the individual responsible for this function at the time). [REDACTED].
- (iii) GWP 4042-12-00 for ATMS work at the Highway 416 Hunt Club Road interchange. Contact MTO Planning and Design Office. [REDACTED].
- (iv) MTO projects: Contact MTO Planning and Design Office. [REDACTED].
- (v) [REDACTED] underground installation crossing Highway 417 at the Pinecrest Road interchange.
- (vi) [REDACTED] tower installation in the NW quadrant of the Woodroffe Avenue interchange.
- (vii) MTO planned electrical work on existing high mast poles in the vicinity of the Holly Acres Road interchange in 2019.
- (viii) GWP 4097-12-00, Crystal Beach Noise Barrier, Highway 417. Contact MTO Planning and Design Office. [REDACTED].

2.7 Graffiti Removal

- (a) Requirements shall be as per Appendix G to this Part 9.

2.8 Temporary Conditions and Access

- (a) Temporary conditions shall be removed/relocated prior to the Winter Period each year of construction. Refer to Clause 1.14 of Schedule 15-2, Part 9, Part C – Traffic Management and Construction Access.
- (b) DB Co shall adhere to the following:
 - (i) Maintain the security of all construction areas/routes with construction fence, including gates, to suit DB Co's operations;
 - (ii) All entrances into construction areas/routes shall be secured at all times outside of working hours;
 - (iii) Existing Utilities within the construction areas/routes are to be protected from any damage resulting from Construction Activities of or use of the construction staging area and/or construction access routes. It is DB Co's responsibility to locate and protect all Utilities within DB Co's construction areas and access routes;

- (iv) Removal of fencing/gates as necessary for deliveries and/or movement of equipment, preparation of access/egress for Closure events, shall be DB Co's responsibility;
- (v) All parking of DB Co vehicles, and storage of equipment and Materials shall be within the construction staging areas. At no time shall parking or storage of equipment and Materials be permitted on privately owned property if not required for on-going operations in the immediate area unless written permission from the property owner and the City has been provided; and,
- (vi) All areas where equipment is operated, Materials are stored and/or construction efforts have occurred shall be scarified as required prior to final site reinstatement.

2.9 Maintenance During Construction

- (a) Maintenance during construction shall be conducted by DB Co in accordance with Appendix G.

2.10 Checking

- (a) DB Co shall at its own cost and expense, engage a consultant to conduct activities as set forth in Clause 4.2 of Part B of this Schedule 15-2, Part 9 and in Appendix B of Schedule 10 – Review Procedure (the “Checking Team”).
- (b) The following expertise shall be included in the expertise of the Checking Team:
 - (i) Recognized expertise in:
 - A. The disciplines of highway, drainage, traffic, geotechnical, foundations, structural, electrical, ATMS engineering;
 - B. The analysis and design of all aspects of Significant and Complex Structures;
 - C. The use of state-of-the-art geotechnical, structural and soil-structure interaction modelling and software used for design and analysis of Foundations; and,
 - D. The review of designs to ensure compliance with all Applicable Law pertaining to the environment, and other environmental requirements.
 - (ii) Individuals who are registered or qualified to be registered as Professional Engineers in Ontario.
 - (iii) Be registered in the relevant Registry, Appraisal and Qualification System ("RAQS") certification for Highway Engineering (Multi-lane Arterial & Expressway - Major Reconstruction and/or Widening), Bridge Engineering

(Design & Evaluation - Complex Structures (multi-span)), and other specialties as needed.

2.11 Designated Construction Zone

- (a) Subject to Clause 2.6 of this Part A, DB Co shall be required to hold a Designated Construction Zone throughout the duration of Highway Works.

ARTICLE 3 NEW MUNICIPAL INFRASTRUCTURE

3.1 Responsibility for New Municipal Infrastructure

- (a) DB Co is responsible for the Highway Works including, the design and construction, Highway DB Co Commissioning and testing, and the New Municipal Infrastructure, as described in Schedule 15-2, Part 1, Article 19 - Description of Confederation Line West, Confederation Line East and Highway Works, which shall be carried out in strict accordance with this Schedule 15-2, Part 9 and all other applicable Project Agreement requirements.
- (b) The Highway Works, in connection with the New Municipal Infrastructure to be constructed by DB Co, shall incorporate the applicable design standards of the City of Ottawa.

3.2 Commissioning New Municipal Infrastructure

- (a) DB Co shall commission the New Municipal Infrastructure in accordance with Schedule 14 – Commissioning.

ARTICLE 4 UTILITIES

4.1 General Provisions for Utility Work on Provincial Highways

- (a) DB Co shall comply with Schedule 15-2, Part 2, Article 8 – Utility Infrastructure Design Criteria, as it pertains to Highway Works Utility Work, and additional requirements of this Schedule 15-2, Part 9, Part A, Article 4. This Article 4 shall take precedence if there are any conflicting requirements between the sections.
- (b) All submittals that pertain to Highway Works indicated in Schedule 15-2, Part 2, Article 8 - Utility Infrastructure Design Criteria, shall be provided under separate cover. DB Co shall submit separate Utility Infrastructure Relocation Plans specific to Highway Works, in accordance with Schedule 10 – Review Procedure.
- (c) DB Co shall comply with applicable MTO Standards.
- (d) DB Co shall apply for and obtain MTO Encroachment Permits in coordination with, and in favour of utility owners, where Utilities are required to be relocated, or newly located within the Highway Corridor Lands.
- (e) Refer to Schedule 15, Part 9, Part B, Clause 12.5 for requirements pertaining to the removal of existing Utilities.

4.2 Utility Design and Construction Requirements

- (a) DB Co shall not construct new maintenance holes, water valve box assemblies or locate valve chamber frame(s) and cover(s) on Highway 416 and 417 paved surfaces, including Shoulders, median or interchange ramps, except:
 - (i) Catchbasin maintenance holes dedicated to highway drainage shall be permitted on the median and outside Shoulders of the Highway.
- (b) For all Utilities, DB Co shall relocate outside of the median, Shoulders and paved surfaces of the Roadway (including Highway 417 and 416 Main Line and ramps), any existing maintenance holes, water valve box assemblies, valve chamber frame(s) and cover(s) where impacted by Construction Activities. Existing maintenance holes, water valve box assemblies, valve chamber frame(s) and cover(s) in the median Shoulder, outside Shoulder or median of the Highway that are not reconstructed shall be permitted to remain in the median Shoulder or outside Shoulder.
- (c) DB Co shall use trenchless methods where constructing new or relocating Utilities beneath the paved surfaces, Shoulders, or interchange ramps of Highway 416 and 417 that are otherwise only to be resurfaced. Open cut may be permitted for longitudinal installations beyond the outside Shoulder subject to adequate available space. Subject to other Utility placement requirements, as identified in this Article 4, open cut methods shall not be permitted within 3.0 m of the travelled portion of the Roadway, unless DB Co implements an engineered roadway protection system, and the excavation is separated by a Barrier.

- (d) New or relocated Utilities shall not be installed longitudinally along Highway 417 beneath paved surfaces, nor in front of the ditch line. Longitudinal utility plant shall be confined within 2.0 m of the ROW limits.
- (e) Utility plant shall not be located at a depth less than 1.2 m below the lowest portion of the Roadway cross-section for longitudinal underground installations.
- (f) New aerial pole crossings shall not be permitted over Highway 417 and Highway 416. New aerial crossings over Highway 416 and Highway 417 shall be permitted on towers. Existing pole crossings may remain if the poles are not impacted by the Highway Works and the Utility Work is limited to same place modifications on the existing poles.
- (g) DB Co shall not construct or relocate Utilities within new or existing MTO Bridge Structures, subject to the following exceptions:
 - (i) Lighting Utilities that provide lighting on or adjacent to the Bridge Structure shall be permitted; and,
 - (h) Existing Utilities that are not otherwise impacted or modified by Highway Works need not be relocated for the sole purpose of meeting the design standards contained in this Article 4.
 - (i) DB Co shall follow the MTO Eastern Region Utility Locates Protocol for the identification of MTO owned Utilities. Note that MTO owned Utilities are not covered under Ontario One Call.
 - (j) DB Co shall invite the MTO Electrical Coordinator and City of Ottawa Street Lighting to be present during the hydro service layouts by [REDACTED] to ensure that the account billing information with regards to Customer and Service Descriptions are set up appropriately. DB Co shall provide a minimum of five Business Days advanced notice to the City Representative prior to arranging the service layout meeting. DB Co shall also make arrangements as early as possible with [REDACTED] for service layouts and connections for the proposed power supply locations. Current contact information is as follows:

[REDACTED]
- (k) DB Co shall design and construct all Utility Infrastructure located on the Highway Corridor Lands to accommodate the ultimate build of the Highway 417 expansion as per Clause 5.1(b) of this Part A.

4.3 Trenchless Crossings

- (a) Trenchless crossing design shall be in accordance with CSA S250, the MTO Guidelines for Foundation Engineering – Tunnelling Specialty for Corridor Encroachment Permit Application, and Appendix H – Pipe Installation by Trenchless Methods, of this Schedule 15-2, Part 9.

- (b) DB Co shall provide rationale and justification for any new crossing of Highway 417 that is proposed, as an attachment to its Utility Infrastructure Relocation Plan submittals. The attachment shall demonstrate that DB Co has undertaken a review of Utility placement options, and that the option presented is technically preferred.
- (c) DB Co shall provide joint Utility crossings to minimize the number of crossings of Highway 417 and ramps, where possible.
- (d) Utilities crossing the Main Line shall be installed at a minimum depth of 5.0 m from the centreline of the Roadway surface. Utilities crossing ramps shall be installed at a minimum depth of 3.0 m from the centreline of the Roadway surface and 1.5 m below ramp ditch lines. DB Co shall increase these depths as needed to account for other considerations, including, but not limited to, superelevation and/or ditches, frost penetration, Utility work around requirements. This minimum depth does not apply to gravity systems if a shallower installation is required to tie into longitudinal systems. Crossings shall be as level as possible.
- (e) Perpendicular crossings of the Highway shall be offset a minimum of 20 m from any Bridge Structure. Longitudinal Utilities shall be offset a minimum of 10 m from the end of the approach slab of any Bridge Structure.
- (f) DB Co shall perform a minimum of two boreholes and shall include discussion in the Geotechnical Report for all proposed crossings equal to or greater than 300 mm in diameter. The Geotechnical Report shall indicate the preferred trenchless crossing method for each location and a settlement monitoring plan and shall be referenced in the Utility Infrastructure Relocation Plan.
 - (i) DB Co shall evaluate all reasonable alternatives for construction of trenchless crossings, including pipe jacking, pipe ramming, micro-tunneling, tunnel boring, and horizontal directional drilling.
- (g) The use of the pneumatic piercing method, including torpedoes or similar devices, is not permitted.
- (h) Open cuts of paved surfaces are not permitted to recover stuck drill bits.
- (i) Jacking pits or sending/receiving pits shall be located at the bottom of the ditch line or on the back slope, and shall not encroach onto the front slopes, the Shoulder or within 3.0 m of the travelled portion of the Roadway.
- (j) For watermains, casing pipes shall extend to 14 m past the edge of shoulder where feasible, or to the ROW limit at minimum.

4.4 Utility Relocation Process

- (a) DB Co shall engage each Utility Company whose facilities are impacted by Highway Works, and shall develop Utility Infrastructure Relocation Plans, which shall detail designs that meet the applicable standards of the Utility Company and applicable MTO

Standards. The Utility Relocation Plans shall be submitted in accordance with Schedule 10 – Review Procedure.

- (b) Separate Encroachment Permits from MTO are required for each Utility relocation.
- (c) For all Utility Work within DB Co’s responsibility for construction, DB Co shall prepare and submit applications for Encroachment Permits from MTO. For Utility Work within a third party Utility Company’s responsibility for construction, the Utility Company shall submit applications for Encroachment Permits from MTO. Encroachment Permits applications shall be submitted following return of the draft Final Design Development Submittal or Construction Document Submittal with “no comment” or “minor comments” assigned by the City. The MTO may instruct DB Co or Utility Companies to resubmit applications made prior to the Construction Document Submittal if it determines, at its sole discretion, that insufficient information is available on the Highway Works design to grant an Encroachment Permit prior to review of the Construction Document Submittal.
 - (i) Application for an MTO Encroachment Permit shall be done online through the following link (as may be updated in the future):

<https://www.hcms.mto.gov.on.ca/>
 - (ii) Once a complete application is submitted, DB Co shall allow 35 days for processing of an Encroachment Permit application.
- (d) Encroachment Permit applications shall contain the following minimum requirements, in addition to any other requirements contained in this Article 4:
 - (i) Key plan with scale of 1:100,000 (or as necessary for orientation).
 - (ii) Detail plan drawing including the following:
 - A. Level of detail and accuracy as per CSA S250;
 - B. Scale of 1:500;
 - C. GPS coordination;
 - D. Highway number, municipality, geographical township, lot, concession;
 - E. Scale, dimensions, north arrow, legend, date of plan preparation, name and address of designer or encroaching party;
 - F. Key plan depicting the location of work with GPS coordinates (to six decimal places);
 - G. Property and ROW limits;

- H. Highway infrastructure, including edge of pavement, shoulder, ditch line, centreline;
 - I. Location of poles and anchors (if applicable);
 - J. Existing Utilities, signs, sidewalks, drainage structures, entrances and other features;
 - K. Highway and Municipal Roadway names;
 - L. Proposed Utility plant, including details on type and size, and any associated infrastructure;
 - M. Proposed method of construction; and,
 - N. Dimensions and location of bore pits (if applicable).
- (iii) Relocation profile drawing including the following:
- A. Level of detail and accuracy as per CSA S250;
 - B. Cross-section of Roadway (if applicable), with scale of 1:500 (horizontal) and 1:50 (vertical);
 - C. Roadway width, ROW limits, depth and offset of Utility plant;
 - D. Dimension and location of bore pits;
 - E. Depth of cover at various locations; and,
 - F. Proposed casing, including material type, length, diameter.

ARTICLE 5 COMMITMENTS AND COMPLIANCE REQUIREMENTS

5.1 General Requirements

- (a) DB Co shall ensure that the design and construction of the Highway Works comply with Schedule 17 – Environmental Obligations of the Project Agreement, including all obligations and commitments arising from the Environmental Approvals.
- (b) DB Co’s design shall consider and protect for the future implementation of works contemplated within the limits of [REDACTED] by others, with minimal modification to the infrastructure constructed by DB Co

5.2 Additional Compliance Requirements

- (a) DB Co shall not convert Highway 417 lanes and ramps to transit only lanes or ramps, unless otherwise specified in this Schedule 15-2, Part 9.
- (b) DB Co shall accommodate access to the construction site following any request by the City or City Parties to carry out winter maintenance, traffic signal work as detailed in Part B, Clause 6.6, work relating to Encroachment Permits in the Highway Corridor Lands, Bridge inspections, or any similar activities.
- (c) DB Co is not permitted to engage in blasting as part of Highway Works within or immediately adjacent to the Highway Corridor Lands. For greater clarity, this restriction includes blasting of rock. The use of explosives shall not be permitted as part of Highway Works.
- (d) The ATMS power plant shall be protected and reinstated within the Highway Works and if required to ensure that the field equipment can operate continuously, DB Co shall design and construct temporary power facilities.

ARTICLE 6 REGISTRY, APPRAISAL, AND QUALIFICATION SYSTEM

6.1 General Requirements

- (a) In addition to the requirements of Section 11.4 of the Project Agreement, no later than 60 days after Financial Close, all engineering and contract administration pertaining to Highway Engineering (Multi-lane Arterial & Expressway - Major Reconstruction and/or Widening), Bridge Engineering (Design & Evaluation - Complex Structures (multi-span)) and other specialties as necessary shall be performed or reviewed by consultant(s) listed as “accepted” under the MTO electronic Registry, Appraisal and Qualifications System (MTO RAQS) for providing services meeting the applicable “specialities criteria” identified on RAQS.
- (b) Consultants performing engineering or review on Highway Works shall be approved in the relevant “high complexity”, “major”, or “complex” specialties where different levels are identified in the RAQS “specialities listing”.
- (c) Consultants performing quality assurance and oversight on Highway Works shall be approved in the “high complexity” category in the RAQS “specialities listing”.
- (d) The Construction Contractor(s) performing the Highway Works shall be appropriately registered under the MTO’s RAQS, and shall possess a Necessary Available Financial Rating of [REDACTED] and a Necessary Available Maximum Workload Rating of [REDACTED] (as such terms are applied in RAQS).

PART B – DESIGN AND CONSTRUCTION REQUIREMENTS

ARTICLE 1 LANING AND PHYSICAL LAYOUT

1.1 Order of Precedence

- (a) The geometric design for all Provincial Highways and Roads shall be designed in accordance with the criteria contained in this Article 1, and standards and manuals included in Reference Documents, and if there is any conflict between the criteria contained in this Article 1 and standards and manuals included in Reference Documents, the following shall apply in descending order of precedence:
- (i) The criteria contained in this Article 1;
 - (ii) MTO Special Provisions;
 - (iii) The applicable MTO Directives, MTO Policy Memorandums, and MTO Design Bulletins;
 - (iv) OPSS;
 - (v) MTO Contract Design, Estimating and Documentation (CDED) Manual;
 - (vi) Ontario Traffic Manual, MTO;
 - (vii) Highway Standards Bulletin HSB-DCSO-2016-05 Implementation of the Capacity Analysis Manual Memo, MTO;
 - (viii) Highway Capacity Manual, Transportation Research Board;
 - (ix) Accessibility for Ontarians with Disabilities Act (AODA) and Ontario Regulation 413/12;
 - (x) MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, June 2017;
 - (xi) Geometric Design Guide for Canadian Roads, TAC;
 - (xii) MTO Standard Drawings;
 - (xiii) OPSD;
 - (xiv) Roadside Safety Manual, MTO;
 - (xv) Bikeways Design Manual; and,
 - (xvi) The applicable standards of the City of Ottawa.

1.2 General Requirements

- (a) The Highway Works shall include the following:
 - (i) Modifications to interchanges and ramps at Pinecrest Road, Richmond Road, Holly Acres Road and Moodie Drive, including construction of a new eastbound and westbound Highway 417 on-ramps from Holly Acres Road;
 - (ii) Extension of Graham Creek Culvert and other new Structures to carry Roadways over the Guideway;
 - (iii) Roadside safety, drainage and illumination, utility relocations as required, Overhead Sign Support Structures, , landscaping and Context Sensitive Design;

1.3 Roadway Requirements

- (a) Freeway
 - (i) The area between the LRT and the WB Highway 417 east of Pinecrest Road to Queensway Station shall be treated as a median for the purpose of safety, as such DB Co shall provide an AASHTO Manual for Assessing Safety Hardware (MASH) TL-5 system in this location. The system shall be designed such that relocation is not required upon future widening of Highway 417 (by others). For further clarity, TL-5 system where required shall be entirely within the Lands except where the Confederation Line crosses the Highway Corridor Lands at the Highway 471/Pinecrest Road /Greenbank Road interchange. Refer to Clause 7.2 (m) of Part B – Design and Construction Requirements of this Part 9 for drainage requirements.
- (b) Freeway to Freeway Interchanges
 - (i) Highway 417 and Highway 416
 - A. DB Co shall ensure the fully directional interchange for the Highway 417 connection with Highway 416 is maintained to be operational at all times.
- (c) Crossing Roads and Interchanges
 - (i) Re-configured interchanges shall be designed and constructed at the following Crossing Roads. For site-specific improvements required to enhance pedestrian and cyclist connectivity at each interchange location refer to Schedule 15-2, Part 6 - Urban Design, Landscape Architecture and Connectivity Requirements, in addition to this Clause 1.3. Conceptual intersection minimum lane configuration diagrams are provided in Appendix E. All cross-sectional elements specified on all new grade separated shall be extended beyond the Structure as applicable to tie into existing infrastructure or New MTO Infrastructure, to maintain connectivity for all Roadway users, and to comply with applicable Reference Documents and Good Industry Practices.

- A. Highway 417 and Richmond Road / Holly Acres Road
- i. Note: Due to the orientation of Richmond Road relative to Highway 417 and previously adopted conventions, references to Richmond Road NB and EB may be used interchangeably, and references to Richmond Road SB and WB may be used interchangeably. Similarly, references to Holly Acres NB and WB may be used interchangeably, and references to Holly Acres SB and EB may be used interchangeably.
 - ii. Richmond Road North Side: DB Co shall modify the north ramp terminal and the Road and ramp layout as needed to accommodate the Works, and the design shall adhere to the following:
 1. Maintain the existing general layout of the Road and intersection between the Highway 417 / Richmond Underpass and Bayshore Drive.
 2. Extend the MUP to approx. 25 m west of the the E-N/S ramp terminal. A sidewalk (2.0 m width) shall be provided to connect the MUP to the southeast corner of the intersection. Include a MUP connection from the northwest corner of the Richmond/Bayshore intersection to Elstree Avenue. The MUP shall also connect to the existing road network on both sides of Richmond Road north of Bayshore Drive. DB Co's design shall include a future connection to a MUP (by others) at the northeast corner of the intersection. Connection of the MUP to Bayshore Station shall be in accordance with Schedule 15-2, Part 6 - Urban Design, Landscape Architecture and Connectivity Requirements.
 3. Crosswalks shall be provided at all intersection approaches that currently include a crosswalk. Separated bi-directional cross-rides shall be provided across the approach from the E-N/S ramp to the northeast corner of the intersection and across Richmond Road at the north approach to the northwest corner of the intersection. Existing crosswalks shall be maintained or replaced at all intersection approaches currently featuring a crosswalk. The crosswalks and cross-rides across the right turn channel from WB Richmond Road to WB Bayshore Drive shall be raised.
 4. Richmond Road EB at the approach to the E-N/S ramp terminal shall feature two left turn lanes and two through lanes. The through lanes shall each have a width of 3.5 m. The existing raised concrete median shall be retained. A

sidewalk shall be provided between the travelled lanes and the existing Parapet Wall of SN116110. The Parapet Wall shall be modified as needed to accommodate users of the Road and pedestrian facilities.

- iii. Holly Acres Road: DB Co shall modify the Road and ramp layout as needed to accommodate the Works, and the design shall adhere to the following:
1. Per Schedule 15-2, Part 7 - Traffic and Transit Management and Construction Access, and this Part 9, Part C, DB Co shall provide a new temporary EB bus-only on-ramp from Holly Acres Road to Highway 417. The new temporary OC Transpo bus only access on-ramp shall intersect Holly Acres Road at the intersection with the existing Highway 416 S/Highway 417 W – Holly Acres N/S ramp and shall utilize the existing speed change lane of the Richmond N-E ramp.
 2. DB Co shall provide an additional eastbound lane on the existing Highway 416 S/Highway 417 W – Holly Acres N/S ramp that shall terminate at a point 160 m west of Holly Acres Road. DB Co shall conduct a traffic analysis of the intersection with Holly Acres Road to determine the recommended eastbound lane configuration on the off-ramp at this intersection. This analysis shall consider that OC Transpo buses shall be able to make both the eastbound left turn and eastbound through movements at this intersection, in addition to the southbound left turn movement.
 3. DB Co shall convert the existing median southbound through lane into a southbound left turn lane, leading to the new Highway 417 N/S-E on-ramp.
 4. DB Co shall design and construct all the necessary temporary improvements on Holly Acres Road, associated intersection(s) and interchange ramp(s) as required to accommodate pedestrian and cyclist access, uninterrupted traffic and transit operations during staged construction, and temporary conditions to meet the requirements of Schedule 15-2, Part 7- Traffic and Transit Management and Construction Access and Schedule 15-2, Part 9, Part C.
 5. DB Co shall undertake a TIA study including a detailed intersection operations and level of service analysis considering vehicular and non-vehicular road users needs on all new and existing intersections and interchange ramps

on Holly Acres Road that are impacted or required as the result of Works. DB Co shall demonstrate that the traffic and transit operations and associated levels of service are acceptable and feasible using projected traffic volumes and expected transit operations for a 2031 horizon year, including pedestrian and cyclist movements.

- i. DB Co shall submit to the City the results of above-noted traffic analysis report and seek approval from the City in accordance with Schedule 10 – Review Procedure.
6. DB Co shall design and construct all the necessary permanent improvements on Holly Acres Road and associated interchange ramp(s) and intersection(s) impacted as the result of Works according to the requirements of Article 2 of this Part 9, Part B.
7. DB Co shall design and construct all the permanent improvements required at the intersection of the Holly Acres Road and the Transitway bus access at Bayshore Station to meet the requirements of the lane configuration diagram specified in Appendix E of this Part 9 and Schedule 15-2, Part 6 - Urban Design, Landscape Architecture and Connectivity Requirements and Article 9 of this Part 9, Part B.
 - i. DB Co shall design and construct separate crosswalk and bi-directional crossride facilities on the north, east and west legs of the intersection as per OTM Book 15 and Book 18 and the MTO Bikeways Design Manual.
 - ii. DB Co shall be responsible for the design and construction of all such improvements if DB Co's traffic and transit assessment, modelling and analysis determine that additional traffic lanes and improvements are required in addition to the information shown in Appendix E of this Part 9.
 - iii. All temporary and permanent improvements associated with the design and construction of these ramps noted above, within the limits of construction, shall meet the requirements of the City and MTO.

8. DB Co shall design and construct Pavements for any ramps affected by the Works, in accordance to the Pavement requirements of Article 3 of this Part 9, Part B, except where Pavements are prescribed in Article 3 of this Part 9, Part B DB Co shall not be required to design while DB Co shall be required to construct the Pavements as prescribed.
 9. DB Co shall design and construct the proposed improvements for the Holly Acres Drive/Bayshore access intersection, the Guideway Structure over Holly Acres Drive and the adjacent Highway 417 N/S-W ramp geometry, such that all necessary general traffic and bus traffic movements at this intersection can feasibly be accommodated to meet the requirements of the City. DB Co's design shall accommodate all necessary vehicular movements, including all through movements, the NB left and NB right turning movements and the WB movement of a transit vehicle departing from Bayshore Station and entering the above-noted Highway 417 N/S-W ramp.
 - i. DB Co shall design and construct the proposed Highway 417 N/S-W ramp south of the Track alignment, as well as accommodate the northbound left turn movement, per the requirements of this Article 6.
- B. Highway 417 and Pinecrest Road / Greenbank Road.
- i. DB Co shall design and construct interchange ramps and associated intersection modifications per the Design Criteria.
 - ii. SN015180: The lane configuration of the Pinecrest Road Bridge Structure (over the LRT alignment) shall include the following minimum requirements, and shall accommodate the lane configuration specified for the north ramp terminal. Design of this Structure shall be in accordance with Article 4 – Structural Design Criteria and Requirements, of Schedule 15-2, Part 2.
 1. Two NB lanes (3.5 m width) and an outside Side Clearance (1.0 m width);
 2. Two SB through lanes (3.5 m width), one SB right turn lane (3.5 m width) and an outside Side Clearance (1.0 m width);

3. Provide for a future bi-directional cycle track (3.6 m width) west of the SB lanes, separated from the SB lanes by a TL-4 crash Barrier wall (to be constructed by others);
 4. Sidewalks (2.0 m width) along the extreme east and west sides of the Structure; and;
 5. TL-4 Parapet Walls with railings (as applicable to accommodate users of the Road and pedestrian and cyclist facilities) along the outsides of the Structure;
 6. A raised concrete median, connecting between the intersection of Pinecrest Road and the Highway 417 E-N/S ramp and the existing median on the Highway 417 Underpass.
- iii. North Side: DB Co shall modify the north ramp terminal and ramp layout as needed to accommodate the Works, and the design shall adhere to the following:
1. DB Co shall design and construct a realigned N-W ramp such that the new ramp alignment intersects Pinecrest Road south of the Pinecrest Station layout, while maintaining the vertical and horizontal alignment requirements specified in this Schedule 15-2, Part 9. The infrastructure required to support the horizontal and vertical alignment shall be designed by DB Co to accommodate future up to a 500mm grade raise of Pinecrest Road as further detailed in Part B Clause 4.11 (a)(iii) without impacting the LRT Operations. DB Co shall demonstrate in the PFDD submission how this future grade raise and modification of NW ramp can be designed and constructed without impacting the LRT operation during the construction. DB Co shall repurpose the existing SB curb lane as the auxiliary right turn lane, and shall minimize the curb corner radius leading to the realigned N-W ramp to enhance pedestrian safety. The existing N-W on-ramp shall be closed, removed and regraded.
 2. DB Co shall retain the free flow configuration of the existing S-W loop on-ramp off of Greenbank Road.
- iv. A bus loop shall be constructed at the west leg of the north ramp terminal. The bus loop shall include two ingress and two egress lanes (one right turn and one left turn). A bus only left turn lane from NB Pinecrest to the bus loop shall be provided with capacity for one articulated bus. Buses shall also be able to access the bus

loop from SB Pinecrest Road. The bus loop shall be in accordance with the requirements of Schedule 15-2, Part 4 – Stations and Part 7 - Traffic and Transit Management and Construction Access.

1. DB Co shall provide three lanes in each direction on Pinecrest Road between the north ramp terminal and Queensview Drive.
 2. DB Co shall provide crosswalks on the east, west and north legs of the intersection.
 3. DB Co shall design and construct all necessary improvements required on the existing Highway 417 E-N/S ramp in order to accommodate the Confederation Line / E-N/S ramp grade separation. All the associated improvements required for the Highway 417 E-N/S including ramp and shoulder geometry, TL-5 barrier, vertical supports, overhead signs that are subject to relocation, and associated drainage elements as required, shall be designed and constructed at their ultimate location and configuration. DB Co's design of the above-noted improvements shall not preclude the efficient construction of MTO's planned Highway 417 widening so that if / when the Highway widening is implemented by others in the future, the above-noted improvements constructed by DB Co will require no modifications with the exception of ramp and taper transitions at tie-in locations, some relocation of gore points and bull nose treatments to meet MTO standards, as necessary.
- v. South Side: DB Co shall modify the south ramp terminal and ramp layout as needed to accommodate the Works, and the design shall adhere to the following:
1. The existing general purpose N-E rampo shall be retained. Upstream of the tie-in point wiuth the general purpose ramp, the existing N-E bus only ramp shall be closed, removed and regraded.
 2. Maintain the Ashley Street connection with the W-N/S off-ramp. The Ashley Street connection is to be temporarily closed in accordance with Schedule 15-2, Part 7 - Traffic and Transit Management and Construction Access. The existing lane configuration at the intersection with Greenbank Road shall be maintained, except where geometric adjustments are required.

3. In accordance with Schedule 15-2, Part 7 - Traffic and Transit Management and Construction Access, DB Co shall evaluate by undertaking traffic analysis to determine whether the provision of a third left turn lane on the W-N/S off ramp (reserved for buses only) would provide a travel time benefit to eastbound OC Transpo buses when they are on detour. If the traffic study finds this to be feasible and improves the transit service operation, DB Co shall modify the intersection so as to temporarily provide this third left turn lane with appropriate storage. This lane, if provided is to be removed as a Remaining Work, and the intersection restored to its pre-existing condition.

C. Highway 417 and Moodie Drive

- i. DB Co shall design and construct all the necessary temporary improvements on Moodie Drive, associated intersections and interchange ramps as required to accommodate the pedestrians' accesses, uninterrupted traffic, and transit operations during staged construction and temporary conditions and meet the requirements of Schedule 15-2, Part 7 – Traffic and Transit Management and Construction Access and Schedule 15-2, Part 9, Part C.
- ii. DB Co shall also design and construct the necessary permanent improvements on Moodie Drive, associated interchange ramps, and existing and new intersections that are impacted as the result of the Works in accordance with the Reference Documents and according to the applicable clauses of Article 2 of this Part 9, Part B.
- iii. DB Co shall design and construct all the necessary permanent improvements for the S-W and N-W ramp Overhead Structures over the Track alignment to meet the appropriate requirements of Article 4 – Structural Design Criteria and Requirements, of this Part 9, Part B. All temporary and permanent improvements associated with the design and construction of these ramps noted above, within the limits of construction, shall meet the requirements of the City and MTO.
 1. DB Co shall design and construct Pavements for any ramps affected by the Works, in accordance to the Pavement requirements of Article 3 of this Part 9, Part B. As a minimum requirement, DB Co shall resurface all ramps affected by the Works.
- iv. DB Co shall design and construct modifications to the free-flow bus access ramp from the NB lane of Moodie Drive to Moodie Station that accommodates a direct inbound bus traffic movement

to service the Transitway bus operations as required to tie into the proposed Moodie Station bus loop.

1. For any modifications or improvements to the bus access ramp noted above, DB Co shall protect and avoid any impacts to adjacent Structures, including but not limited to foundations, footings, piers or abutments.
- v. DB Co shall design and construct a sidewalk on the west side of Moodie Drive, as described in Schedule 15-2, Part 6 - Urban Design, Landscape Architecture and Connectivity Requirements and Article 9 of this Part 9, Part B.
1. DB Co shall repurpose the existing cross section on the Underpass Structure to provide the sidewalk, such that no widening of the Structure is required.
 2. DB Co shall relocate the existing guiderails, street lights and signage, as necessary north and south of the Structure in order to accommodate the above-noted sidewalk facility.
 3. DB Co shall maintain the existing SB lane widths for the two SB general traffic lanes and the SB on-road bicycle lane.
 4. DB Co shall locate the sidewalk west of the existing edge of roadway, south of the Structure, to maximize the storage length possible for the SB auxiliary traffic lane leading to the N-E ramp. The proposed ramp realignment geometry shall meet the Reference Documents.
 5. For the details of the proposed Bridge Structure requirements refer to Article 4 – Structural Design Criteria and Requirements of this Part 9, Part B.
- vi. For the design and construction of the Moodie MSF facilities associated with the Track Works, DB Co shall protect for and not preclude the necessary provisions for a future widening of the Highway 417 in the WB direction, west of Moodie Drive. The future Highway 417 widening in the WB direction shall account for an additional 3.75 m general traffic lane, a 3.0 m shoulder, roadside barriers and associated grading, drainage and signage requirements beyond the existing edge of outside lane, as minimum.

(d) Crossing Roads

- (i) Where pavement-level bike lanes are constructed adjacent to the curb, side inlet Catch Basins shall be used such that grates for Catch Basins / maintenance holes are not within the cyclist wheel paths.
 - (ii) In all locations where active transportation facilities are specified, DB Co shall provide adequate storage space for pedestrians and cyclists to safely maneuver within the network without obstructing other Roadway users, and shall abide by accessibility requirements at signalized intersections. The design of pedestrian and cycling facilities shall meet the requirements of OTM Book 15, OTM Book 18, and the MTO Bikeways Design Manual.
 - (iii) The Crossing Road Underpass Structures shall include the number of lanes specified in this Clause 1.3 of Part B.
- (e) Design vehicle requirements:
- (i) DB Co shall use the appropriate design vehicles to design the intersection layout geometry, and to accommodate the applicable sight distances and horizontal and vertical Road clearance requirements. WB-20.5 shall govern the design for all Roads within the scope of Highway Works.
 - (ii) All Roads that are a designated transit bus routes shall accommodate the turning movement requirements of the City's B-12 standard bus, articulated bus, double decker bus, and Para Transpo vehicles.
 - (iii) Clearance requirements for opposing left-turn design: In design of intersections with multiple left-turn lanes, especially where simultaneous opposing left turns exist, DB Co shall ensure that the design vehicle is appropriately selected. In the design of intersection layouts with double turn left lanes, the design shall accommodate the simultaneously turning manoeuvres of the WB 20.5 with a second Light Single Unit truck.
 - (iv) Minimum turning speed of a design vehicle shall not be assumed less than 15 km/hr.
 - (v) The design of OC Transpo bus turning paths shall satisfy the requirements of the OC Transpo - Transitway and Station Design Guidelines. Bus design turning speeds at intersection corners and curb returns shall not be less than 15 km/hr.
- (f) DB Co shall engage the City Representative to coordinate its layout and design of interchanges and Crossing Roads with future projects.
- (g) DB Co shall design and construct the Highway Works such that no maintenance holes are located within the travelled lanes of any Roads.
- (h) DB Co shall be responsible for ensuring proper surface drainage at all times. Surface drainage shall be properly controlled and directed to a suitable outlet without causing any disturbance or damage to existing infrastructure and structures. No flow of water shall be

directed across or over pavements except through approved pipes or properly constructed troughs. Run-off from un-stabilized areas shall be intercepted and diverted to a suitable outlet.

- (i) DB Co shall be responsible to manage water so that it is not injurious to public health or safety, to property or to any part of the Works completed or under construction.
- (j) DB Co shall submit roadway design drawings as part of its Design Development Submittals, in accordance with Schedule 10 – Review Procedure. Drawings shall depict elements of the Highway Works design, including but not limited to those listed below.
 - (i) Plan drawings
 - A. The proposed horizontal alignment including standard dimensioning of all horizontal alignment elements;
 - B. Locations of widening, reconstruction and paving;
 - C. Locations of structural elements, including Bridges, Retaining Walls, Noise Barriers, Culverts, sign structures, guiderail;
 - D. Location of all drainage elements including sewers, culverts and stormwater management ponds;
 - E. Location of Utility corridors;
 - F. Limits of grading; and,
 - G. Property limits.
 - (ii) Profile drawings
 - A. The proposed vertical profile including standard dimensioning for all vertical alignment elements;
 - B. Original ground line, ditching, sewers, top of pavement;
 - C. Location of structural elements, including Bridges, and Culverts;
 - D. Location of drainage elements including sewers, culverts, and stormwater management ponds; and,
 - E. Location of Utility crossings.
 - (iii) Typical cross-section drawings
 - (iv) Typical detail drawings

1.4 Traffic Engineering Requirements

- (a) Traffic engineering requirements for design of the Highway Works:
- (i) DB Co's design shall meet the traffic engineering requirements specified in this Clause 1.4.
 - (ii) MTO's Capacity Analysis Manual 2016 and MTO's Traffic Impact Assessment Guidelines (most current version) shall be applied to MTO's network unless otherwise noted. Synchro and SimTraffic (Version 10 or newer) suites shall be utilized, where appropriate, by DB Co for assessment of other roadway elements.
 - (iii) The Synchro parameters utilized by DB Co in undertaking the traffic analysis shall be as per the requirements laid out in Appendix C of the City of Ottawa's Transportation Impact Assessment Guidelines, and as per the MTO Traffic Impact Assessment Guidelines. The more conservative standard shall govern, except for Provincial Highway and ramp analysis, where the MTO Traffic Impact Assessment Guidelines shall apply.
 - (iv) The SimTraffic parameters utilized by DB Co in undertaking the analysis shall reflect actual local conditions. DB Co shall undertake field analysis in order to accurately identify the SimTraffic parameters. The performance measures from SimTraffic shall be obtained by:
 - A. Averaging 5 different speed values;
 - B. Seeding for 15 minutes followed by four 15 minutes recording intervals; and,
 - C. Applying peaking and anti-peaking (i.e. peaking is to be applied to the second 15 minute recording interval).
 - (v) DB Co shall undertake the necessary traffic engineering analysis to demonstrate that the geometric design and configuration of the ramp terminals shall accommodate the weekday AM and PM peak hour demand consistent with MTO and City of Ottawa performance standards. The analysis shall be undertaken as per the requirements of the City of Ottawa Multi-Modal Level of Service Guidelines, the MTO Capacity Analysis Manual 2016, and as per the MTO Traffic Impact Assessment Guidelines, The more conservative standard for vehicular traffic shall govern.
 - (vi) If the performance criteria in Clause 1.4(v) cannot be achieved through optimal geometric design or other improvements, DB Co shall submit a request to the City Representative to receive exemption on this performance criteria and acceptance of the intersection design, at the City's sole discretion.
 - (vii) DB Co shall undertake the necessary traffic engineering analysis consistent with appropriate MTO and City of Ottawa procedures to demonstrate that the

geometric design and configuration of weave sections shall accommodate the AM and PM peak hour traffic volumes at an acceptable level of performance. All modes of travel shall be considered in the analysis.

- (viii) If performance criteria in Clause 1.4(vii) cannot be achieved through optimal geometric design or other improvements, DB Co shall submit a request to the City to receive exemption on this performance criteria and acceptance of the intersections design, in the City's sole discretion.
 - (ix) DB Co shall submit a Traffic Analysis Report (the "Traffic Analysis Report") summarizing all traffic engineering analysis undertaken as per this Clause 1.4. The report shall demonstrate and identify required operational improvements of all affected Roads based on traffic analysis. The traffic engineering analysis shall identify and utilize projected volumes for 5, 10 and 20 year horizons for both morning and afternoon peak hours when analyzing any roadway configuration intended to be permanent. Traffic growth rates shall be determined from historical and current count data and future volumes shall be applied to the analysis of all Roads within the scope of Highway Works, including ramps, ramp terminal intersections and other intersections, and shall be included in the Traffic Analysis Report. Seasonal variations shall be addressed in the development of future traffic volumes. DB Co shall provide defensible recommendations for identified operational improvements in the report including a review and evaluation of any alternatives developed by DB Co. The Traffic Analysis Report shall be provided to the City Representative for review and acceptance a maximum of 16 weeks after Financial Close, prior to geometric design being further advanced, in accordance with Schedule 10 – Review Procedure.
 - (x) DB Co shall ensure that the Traffic Analysis Report summarizes in tabular form, parameters including but not limited to, overall intersection performance (V/C and LOS), individual movements V/C and LOS, movement delays and 95th percentile queue lengths. All modes of travel shall be considered in the analysis.
 - (xi) DB Co shall ensure that the Traffic Analysis Report shall include an appendix that includes all supporting documentation, modelling information, and calculations both in paper and electronic formats.
 - (xii) Traffic Signal Systems design and construction shall be as per Clause 6.6 of Part B of this Schedule 15-2, Part 9.
 - (xiii) DB Co shall design the intersection configuration, as a minimum, according to the layouts specified in Clause 1.3 of Part B of this Part 9, unless an alternative layout is analyzed by DB Co according to this Clause 1.4 and accepted by the City at its sole discretion.
- (b) Traffic engineering requirements during construction

- (i) DB Co shall meet the traffic engineering requirements specified in this section applicable to the construction period prior to Final Completion.
- (ii) Highway Capacity Manual 2016 methodology, and HSB-DCSO-2016-05 shall be utilized by DB Co, unless otherwise noted. Synchro and SimTraffic (Version 10 or newer) and/or Vissim transportation analysis software suites shall be utilized by DB Co for assessment.
- (iii) The Synchro and/or Vissim parameters utilized by DB Co in undertaking the analysis shall be as per the requirements laid out in Appendix C of the City of Ottawa's Transportation Impact Assessment Guidelines, and as per the MTO General Guidelines for the Preparation of Traffic Impact Studies. The more conservative standard shall govern, except for Provincial Highway and ramp analysis, where the MTO General Guidelines for the Preparation of Traffic Impact Studies shall apply.
- (iv) The default SimTraffic and/or Vissim parameters shall be utilized by DB Co in undertaking the analysis. DB Co shall undertake field analysis and appropriate Highway Capacity Manual analysis in order to alter the SimTraffic parameters to accurately reflect existing conditions. The performance measures from SimTraffic shall be obtained by:
 - A. Averaging five different speed values;
 - B. Seeding for 15 minutes followed by four 15 minutes recording intervals; and,
 - C. Applying peaking and anti-peaking (i.e. peaking is to be applied to the second 15 minute recording interval).
- (v) All traffic data used for analysis for traffic management purposes shall be based on the most current data and no older than two years. DB Co shall be responsible for obtaining or collecting all traffic data necessary for its traffic analysis, if traffic data less than two years old is not relevant to the traffic management analysis due to temporary conditions that existed at the time the data was collected. DB Co shall confirm with the City that the data is appropriate prior to conducting an analysis using said data.
- (vi) DB Co shall undertake an analysis of existing (pre-construction) traffic operations and establish current roadway/freeway performance including travel times/delays, vehicle queues, LOS and V/C and other parameters.
- (vii) DB Co shall undertake the necessary traffic engineering analysis to identify the impacts of all construction staging including closures and detours on all Provincial Highways, Municipal Roadways and Other Affected Municipal Roadways. The LOS analysis shall be undertaken as per the requirements of Chapter 6 of the City of Ottawa Multi-Modal Level of Service Guidelines, the

MTO Capacity Analysis Manual (2016), and as per the Highway Capacity Manual 2016. The more conservative standard shall govern.

- (viii) The performance of all Roads during each stage of construction shall be assessed and compared with existing (pre-construction) conditions. Existing pre-construction performance shall be maintained at all impacted intersections and freeway elements for weekday AM and PM peak hour demands.
- (ix) DB Co shall identify and provide necessary temporary improvements to achieve the pre-construction operational performance.
- (x) If intersection performance criteria cannot be achieved through adjusted signal timings, geometric improvements or other intersection improvements, DB Co shall submit a request to the City Representative to receive exemption on this performance criteria and acceptance intersection performance, in the City's sole discretion. The request for exemption shall include recommended mitigation to minimize the impacts to traffic.
- (xi) DB Co shall complete a detailed traffic engineering analysis and submit a Traffic Analysis Report for all works. DB Co shall review the study area and provide defensible recommendations.
- (xii) DB Co shall ensure that there is sufficient turn lane storage to accommodate temporary traffic conditions. DB Co shall provide additional storage as required.
- (xiii) DB Co shall ensure that within the Traffic Analysis Report, the intersection performance shall be summarized in tables which shall include overall V/C, movement V/C ratio, movement LOS, movement delay and 95th percentile queue lengths by movements, storage lengths (available and required storage lengths).
- (xiv) DB Co shall ensure that the Traffic Analysis Report includes an appendix with all supporting documentation, model data and calculations both in paper and electronic formats.

1.5 Structure Requirements

- (a) At locations where Highway 417 is proposed to cross over the Municipal Roadway, the Overpasses shall accommodate the ultimate cross-section of the Crossing Roads.
- (b) At locations where Highway 417 is proposed to cross under the Municipal Roadway, the Underpass shall accommodate the ultimate cross-section of Highway 417.
- (c) A minimum vertical clearance of 5.0 m shall be provided at all Underpasses. Laning for Crossing Roads shall be designed and constructed as per Clause 1.3 of this Part B. Appropriate horizontal clearance with the inclusion of the sidewalk and MUP, where indicated in the table, shall be provided.

- (d) For water crossings, Bridge Foundations shall be constructed as per Table 1.5b for the number of lanes required on Highway DB Co Commissioning. The Structure and Foundations shall be able to accommodate for future widening to the ultimate condition. DB Co shall provide any additional laning requirements such as acceleration, deceleration, or turning lanes, in its final design.

Table 1.5 b – Water Crossing Requirements ⁽¹⁾						
Creek	Location	Recommended Structure Type in PDR	Ultimate No. of Lanes on Structure (Through + Auxiliary)	No. of Through-Lanes required on Highway Substantial Completion	No. Auxiliary lanes required on Highway Substantial Completion	Notes
Graham Creek	Holly Acres N/S-E Ramp	Cast-in-place box Culvert	1	0	1	Extension and rehabilitation of existing Culvert

Notes:

- (1) Shoulder widths on freeway structures shall be consistent with the road section or as per the MTO Standard, whichever is greater. No reduction to Shoulder widths (Side Clearances) will be permitted for Structures greater than 50 m in length. On ramps, structures shall have Shoulders consistent with the ramp Shoulders. Shoulder widths on structures shall be adjusted to accommodate appropriate sight distances where applicable. Side Clearances on structures shall comply with the MTO Standards.

(e) Retaining Structures

- (i) DB Co shall confirm the location and shall design and construct retaining structures at and any locations where required to accommodate DB Co’s design.
- (ii) DB Co shall design and construct the retaining structures at the Pinecrest Road N-W ramp to accommodate a future grade raise by others as described in Part B, Clause 4.11 (a)(iii) of this Part 9.

(f) Noise Barrier Walls

- (i) At any locations identified in this Clause 1.5(f) where existing Noise Barrier is being replaced as part of Highway Works, DB Co shall install the new Noise Barrier walls at the same offset from the Roadway, unless an adjustment is required due to spatial constraints.
- (ii) Existing Noise Barriers that are removed by DB Co shall be replaced within seven days. In instances where Noise Barrier is not being replaced in the same location,

the requirement for replacement within seven days applies to the section of new Noise Barrier that provides equivalent noise mitigation.

- (iii) Noise Barriers shall be opaque except where otherwise noted in this Clause 1.5(f).
 - (iv) DB Co is advised that translucent window panels along the top 1.0 m of the Noise Barriers may be requested by residential property owners through the consultation process along all segments of the Highway where Noise Barrier is specified to be installed. DB Co shall incorporate the translucent panels if a request by the property owners is made and approved by MTO.
 - (v) Transparent Noise Barriers shall include black stripes to reduce the likelihood of bird collisions.
- (g) Other Structures
- (i) Subject to the requirements of this Schedule 15-2, Part 9 as they pertain to the applicable Highway ramps and Crossing Roads, the following Structures shall be designed in accordance with Schedule 15-2, Part 2, Article 4 – Structural Design Criteria and Requirements.
 - A. SN116420; and,
 - B. SN116430.

1.6 Fencing and Ramp Closure Gate Requirements

- (a) Fencing Requirements
- (i) Where New City Infrastructure, and New MTO Infrastructure conflicts with the existing chain link fence, and for further certainty the existing chain link fence located at the limits of the Highway Corridor Lands, a new continuous fencing fully securing Highway 417 shall be provided on the outermost boundaries of the Highway Corridor Lands. When in conflict, the existing chain link fencing shall be removed in order to complete the required widening, New City Infrastructure, and New MTO Infrastructure. New chain link fencing shall be reinstated along the limits removed for construction, with adjustments required in areas where there are changes in ROW limits.
 - (ii) Chain link security fencing shall be provided and shall be in accordance with OPSS 772, OPSD 972.130 and MTO Directive PHY B-209, with the following exceptions:
 - A. The tension top wire design shall be used for all chain link and antiglare screen installations.
 - B. Fencing gates shall be provided for maintenance purposes, such as structural maintenance. For example, for Structures over water crossings, a

minimum of two maintenance access gates shall be required, at least one on either side of the water course.

- C. The fencing shall be in accordance with the MTO Context Sensitive Design requirements as detailed in Appendix F of this Part 9.
 - (iii) Farm or rural fencing shall not be used for security fencing.
 - (iv) Temporary fencing shall be installed during construction as required to secure the highway and construction areas.
 - (v) Final fencing plan and design shall be submitted to the City Representative in accordance with Schedule 10 - Review Procedure a minimum of 90 days prior to installation.
- (b) Ramp Closure Gate Requirements
 - (i) DB Co shall install ramp closure gates at all new or reconstructed ramps entering Highway 417.
 - (ii) Ramp closure gates shall be designed in accordance with applicable MTOD-960 series 1 drawings.
 - (iii) Ramp gate location plan and design shall be submitted to the City Representative in accordance with Schedule 10 – Review Procedure a minimum of 90 days prior to installation.

1.7 Explicit Safety Analysis

- (a) DB Co shall perform an Explicit Safety Analysis (the “Explicit Safety Analysis”) on Hazards within the enhanced clear zone by calculating the potential future collision frequency, severity and societal costs, and also analyzing human factors, to determine if the Hazard should be relocated, shielded with Roadside Barrier, or otherwise safely mitigated in DB Co’s design.
- (b) DB Co shall review Highway and intersection safety elements within the Highway Works limits to identify, diagnose, and develop alternative countermeasures to be evaluated within the context of the project. A summary and recommendations of the review shall be provided.
- (c) DB Co’s Explicit Safety Analysis shall be conducted with safety as a paramount, and that cost saving shall not take precedence over safety.
- (d) DB Co’s analysis and calculation shall be carried out in accordance with the methodology from Appendix A of the 1996 AASHTO Roadside Design Guide, Reference Documents identified in this Schedule 15-2, Part 9, and in consultation with the City.

- (e) The Explicit Safety Analysis shall be carried out by Qualified Personnel who are highway or traffic engineering professionals with safety engineering training, and who have demonstrated experience and familiarity in carrying out such safety analyses (minimum 10 year experience).
- (f) DB Co shall conduct Explicit Safety Analysis early in its design, and shall submit an Explicit Safety Analysis Report in accordance with the Review Procedure as part of the Pre-Final Design Development Submittals. Updated analyses shall be submitted in subsequent submittals if the relevant design changes.
- (g) When the Explicit Safety Analysis is conducted to assess different safety improvement options, options that increase collision costs shall not be carried forward even if they have better benefit-cost ratios.
- (h) Notwithstanding the requirements in Clause 1.7(a) to (f) in this Part B, DB Co's design shall promote open, Barrier free Roadway, to achieve safety goals, and shall submit an Explicit Safety Analysis Report whenever a Hazard warrants Barrier protections.

1.8 MTO Underground Plant Layout

- (a) DB Co shall be responsible for the determination of the exact physical location and protection of all MTO underground plant including, but not limited to, electrical / Permanent Data Counting Stations ducts and cables, ATMS, storm sewers, subdrains, culverts, and all external agency underground utilities (i.e. gas, water etc.).
- (b) Requests for stake-out services by the MTO shall be co-ordinated through the City Representative. Locates shall be the responsibility of DB Co. DB Co shall be responsible for locates at all times, including during the Winter Period, within the Highway Works limits.
- (c) The MTO does not subscribe to the Ontario One Call System.

ARTICLE 2 HIGHWAY GEOMETRICS DESIGN CRITERIA

2.1 Order of Precedence

- (a) The geometric design for all Roads shall be in accordance with the criteria contained in this Article 2, and the standards and manuals included in Reference Documents, and if there is any conflict between the criteria contained in this Article 2 and standards and manuals included in the Reference Documents, the following shall apply in descending order of precedence:
- (i) The criteria contained in this Article 2;
 - (ii) MTO Special Provisions;
 - (iii) The applicable MTO Directives, MTO Policy Memorandums, and MTO Design Bulletins;
 - (iv) OPSS;
 - (v) MTO Contract Design, Estimating and Documentation (CDED) Manual;
 - (vi) Accessibility for Ontarians with Disabilities Act (AODA) and Ontario Regulation 413/12;
 - (vii) MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, June 2017;
 - (viii) Geometric Design Guide for Canadian Roads, TAC;
 - (ix) MTO Standard Drawings;
 - (x) OPSD;
 - (xi) Roadside Safety Manual, MTO; and,
 - (xii) The applicable standards of the City of Ottawa.

2.2 General Requirements

- (a) DB Co shall be responsible for all Roads within the Highway Works. In addition to the requirements in Clause 2.1(a) of Part B of this Schedule 15-2, Part 9, DB Co's design for the Roads shall be based on Good Industry Practices generally and in particular, with respect to good engineering practices, which shall consider safety and comfort of all Roadway users as paramount.
- (b) If DB Co is unable to meet any of the geometric Design Criteria contained in this Article 2, it shall propose to the City Design Criteria that comply with the Project Agreement, and applicable Reference Documents to the fullest extent possible. DB Co shall demonstrate that the proposed Design Criteria maximize the level of performance of the

Road, relative to the applicable MTO Standards. The Design Criteria proposed by DB Co are subject to acceptance by the City, at its sole discretion.

- (c) DB Co shall design the geometric elements of Highway Works according to the Design Criteria included in this Part 9. In all cases where a specific Design Criteria is not provided for a Road and/or interchange in this Article 2 of Part 9, DB Co shall undertake a detailed survey and review of the existing conditions, confirm the Road and/or interchange ramps geometric Design Criteria by referencing the existing conditions, appropriate standard and proposed Design Criteria, in order to address the necessary improvements as specified elsewhere in this Part 9. In all cases, DB Co shall consider safety and comfort of all Roadway users as paramount in development of geometric design.
 - (i) Notwithstanding the Design Criteria contained in this Article 2, under the circumstances whereby an existing interchange ramp, impacted by the Highway Works, does not meet current MTO Standards, DB Co shall design and construct the necessary ramp improvements to maximize radii, sight distances and speed change lane lengths used so that the impacted ramp will be upgraded to meet MTO Standards. Under circumstances where upgrading the ramps to standards is not feasible within the Lands available, DB Co shall demonstrate that its design has achieved the maximum level of performance relative to the standard as possible.
 - (ii) In all cases, geometric Design Criteria that correspond with DB Co's design for Highway Works that do not meet MTO Standards shall correspond to a value that is at minimum equivalent to existing conditions.
- (d) Granular foreslopes shall be designed never to be steeper than 4:1 on divided roads and 3:1 on undivided roads.
- (e) Shoulder widths shall be designed and constructed as noted in Clause 2.3 of this Part B.
- (f) In consideration of the Design Criteria contained in this Article 2 and the existing layout of Roads that are not reconstructed under Highway Works, DB Co shall design and construct transitions to tie into the adjacent road network. The design shall be based on Good Industry Practices and shall consider safety and comfort of all Roadway users as paramount.

2.3 Corridor Laning and Geometric Criteria

- (a) Freeway Geometrics
 - (i) General Requirements
 - A. In the case that the interchange ramp needs to be modified or new ramps required, DB Co shall design and construct the ramps to accommodate future highway widening such that in the future the ramps will require

minimal modifications to the extent possible. The following mainline geometric design can be referenced.

1. The geometric Design Criteria for the Highway 417 Main Line are summarized in Table 2.3a.

Table 2.3a – Highway 417 Main Line Geometric Design Criteria	
	Hwy 417 Main Line Widening
HIGHWAY CLASSIFICATION	UFD 120 ^(a)
MINIMUM STOPPING SIGHT DISTANCE (M)	120
EQUIVALENT MINIMUM ‘K’ FACTOR (M) (CREST/SAG)	120 / 60 ^(c)
MINIMUM RADIUS (M)	650
LANE PAVEMENT WIDTH (M)	4 x 3.50 ^(d)
SHOULDER WIDTH (M) (OUTSIDE/MEDIAN)	3.00 ^(e) / 2.50 ^(b)
SHOULDER ROUNDING (M)	1.0
MEDIAN WIDTH (M)	5.8 – 11.5 ^(b)
POSTED SPEED (KM/H)	100

Notes

- a) Existing alignment shall be retained.
- b) The median shoulder may vary to accommodate asymmetric tall wall barrier. The shoulder may be reduced to 2.25 m at overhead sign locations and to accommodate structure piers as determined by structural requirements. The WB median shoulder width beneath the Maitland Underpass Structure shall be improved by DB Co from the existing condition and shall meet the applicable shoulder width MTO Standards to the fullest extent possible.
- c) Alterations to the Highway 417 Main Line vertical alignment are not required for the sole purpose of correcting existing substandard alignments.
- d) Lane pavement width includes through lanes only. Any required interchange auxiliary lanes are in addition to this requirement.
- e) The Main Line outside Shoulder width also applies to continuous speed change lanes.

(ii) Roadside Safety

- A. Bridge abutments that are located at or outside the normal clear zone (10.0 m in the case of freeways) and have a slope not steeper than 2:1 in front of the abutment shall not require Roadside protection; provided, that the slope is free of obstacles, is traversable, and the approach grading is contoured to steer vehicles away from the abutment as detailed in Figure 2.7.3 of the MTO Structural Manual, where applicable.

(b) Crossing Roads with Interchanges Geometrics

(i) Specific Requirements

A. Geometric Design Criteria

- i. Tables 2.3b, 2.3c, 2.3d and 2.3e provide geometric Design Criteria for the interchange ramps.

	HOLLY ACRES EB ON-RAMP
EQUIVALENT MINIMUM "K" (M) (CREST/SAG)	
GRADES MAXIMUM (%)	
MINIMUM RADIUS (M)	
LANE PAVEMENT WIDTH (M)	
SHOULDER WIDTH (M) LEFT/RIGHT	
SHOULDER ROUNDING (M)	
MINIMUM SIGHT DISTANCE AT EXIT TERMINAL (M)	N/A
MINIMUM EXIT TERMINAL SPEED-CHANGE LANE LENGTH (M)	N/A
MINIMUM SIGHT DISTANCE AT ENTRANCE TERMINAL (M)	
MINIMUM ENTRANCE TERMINAL SPEED-CHANGE LANE LENGTH (M)	

Table 2.3c - On/Off Ramps at Highway 417 and Pinecrest / Greenbank						
		N-W ON-RAMP		S-W ON-RAMP		E-N/S OFF-RAMP
EQUIVALENT MINIMUM "K" (M) (CREST/SAG)						
MINIMUM RADIUS (M)				55		130 right 90 left ^(f)
LANE PAVEMENT WIDTH (M)		4.75		4.75		2 x 3.75
SHOULDER WIDTH (M) LEFT/RIGHT		1.0 / 2.5		1.0 / 2.5		1.0 / 2.5

Table 2.3c - On/Off Ramps at Highway 417 and Pinecrest / Greenbank						
SHOULDER ROUNDING (M)		1.0		1.0		1.0
MINIMUM SIGHT DISTANCE AT EXIT TERMINAL (M)		N/A		N/A		
MINIMUM EXIT TERMINAL SPEED-CHANGE LANE LENGTH (M)		N/A		N/A		535
MINIMUM SIGHT DISTANCE AT ENTRANCE TERMINAL (M)		N/A		370		N/A
MINIMUM ENTRANCE TERMINAL SPEED-CHANGE LANE LENGTH (M)		Continuous		345		N/A

Notes

- ii. DB Co shall complete a Ball Bank Indicator Report (the “Ball Bank Indicator Report”) for all ramps impacted by the Highway Works, to determine the posted advisory speed. The reports shall be submitted to the City for review and acceptance in accordance with Schedule 10 – Review Procedure. Advisory speed signs shall be posted prior to ramps being opened to traffic.
- iii. Table 2.3f provides the geometric Design Criteria for the Crossing Roads.

Table 2.3f – Interchange Crossing Road Geometric Design Criteria ^{(a)(b)(c)(d)}

	RICHMOND NB AND SB	HOLLY ACRES	PINECREST GREENBANK		
DESIGN SPEED (KM/H)	80	60 ^(d)	60		
EQUIVALENT MINIMUM 'K' FACTOR (M) (CREST/SAG)	N/A	N/A	11 / 18		
GRADES MAXIMUM (%)	N/A	N/A	N/A		
LANE PAVEMENT WIDTH (M)	See Notes	See Notes	See Notes		
SHOULDER WIDTH (M)	See Notes	See Notes	N/A		
SHOULDER ROUNDING (M)	N/A	N/A	N/A		
MEDIAN WIDTH (M)	See Notes	See Notes	See Notes		
ROW WIDTH (M)	N/A	N/A	N/A		
POSTED SPEED (KM/H)	60	60	50		
MISCELLANEOUS – SIDEWALK (M)	See Notes	See Notes	See Notes		

Notes

- a) Approach grades on intersection roads with ramp terminals shall not exceed 3.0%.
- b) The cross-sectional geometry of the Crossing Roads shall comply with Article 1 of Part B of this Schedule 15-2, Part 9.
- c) Full Depth Paved Shoulders shall be provided where Shoulders are required.
- d) Holly Acres posted speed shall be reduced to 60 km/h to increase safety and consistency between Richmond Road and the current 60 km/h zone just to the north.
- e) Alterations to the Richmond Road vertical alignment south of Holly Acres Road are not required for the sole purpose of correcting existing substandard alignments.
- f) Existing ramp alignment shall be retained downstream of the bullnose with modifications only to accommodate the widening of Highway 417, the West Works and specified modification to the ramp terminal.

ARTICLE 3 PAVEMENT DESIGN CRITERIA

3.1 Order of Precedence

- (a) DB Co shall design and construct Pavements in accordance with the criteria contained in this Article 3 and the following Reference Documents, and if there is any conflict between the criteria contained in this Article 3 and any Reference Document(s), the following shall apply in descending order of precedence for design and construction of Pavements:
- (i) The criteria contained in this Article 3;
 - (ii) MTO Special Provisions;
 - (iii) The applicable MTO Directives, MTO Policy Memorandums, and MTO Design Bulletins;
 - (iv) OPSS;
 - (v) MTO Contract Design, Estimating and Documentation (CDED) Manual;
 - (vi) DSM;
 - (vii) Procedures for Estimating Traffic Loads for Pavement Design, 1995, MTO;
 - (viii) MTO Materials Information Report MI-183 “Adaptation and Verification of AASHTO Pavement Design Parameters for Ontario Conditions”;
 - (ix) MTO Ontario’s Default Parameters for AASHTOWare Pavement ME Design Interim Report, 2014;
 - (x) 1993 AASHTO Guide for the Design of Pavement Structures;
 - (xi) Canadian Portland Cement Association – Thickness Design for Streets and Highways;
 - (xii) MTO Pavement Design and Rehabilitation Manual, Second Edition, 2013;
 - (xiii) Embankment Settlement Criteria for Design, July 2, 2010, MTO;
 - (xiv) Ontario Traffic Manual, MTO;
 - (xv) MTO Directive PHM-C-001 The Use of Surface Course Types on Provincial Highways;
 - (xvi) Manual for Condition Assessment of Flexible Pavements – Pavement Performance Monitoring using Automated Pavement Distress Data, November 2015, MTO;

- (xvii) The Formulations to Calculate Pavement Condition Indices, September 2009, MTO;
- (xviii) MTO Standard Drawings;
- (xix) OPSD;
- (xx) American Society for Testing and Materials (ASTM) Standards;
- (xxi) MTO Laboratory Testing Manual; and,
- (xxii) AASHTO Materials Specifications and Standards.

3.2 General Requirements

- (a) DB Co's Pavement structure design requirements for widened, milled or reconstructed components of the Highway Works are provided in this Article 3. The Highway Works paving scope is summarized below:
 - (i) Widened, reconstructed and realigned sections of all Roads within the scope of Highway Works shall be paved by DB Co.
 - (ii) Select ramps shall be reconstructed by DB Co to accommodate the Highway 417 widening.
 - (iii) Any other Roads that are widened, reconstructed or realigned under DB Co's design for Highway Works shall be paved by DB Co.
 - (iv) DB Co shall design all required transitions.
- (b) Acceptable Products
 - (i) All products used on the Highway Works shall meet applicable Project Agreement requirements and, where specified in this Schedule 15-2, Part 9, shall be in accordance with the Designated Sources of Materials List. Without limiting Section 11.20 of the Project Agreement, the use of products that are not on the Designated Sources of Materials List requires the prior written approval of the City, in its sole discretion, and acceptance shall be subject to DB Co demonstrating in its submission sufficient experience with the proposed product and acceptable performance for the proposed product under conditions and applications similar to those existing for this Project.
- (c) DB Co shall be responsible for the construction of all Pavements. A Pavement design has been developed and is detailed below. Without relieving DB Co of its responsibilities to achieve Design Integration, DB Co is required to adopt and incorporate all applicable aspects of the Pavement design specified in this Article 3 into its Highway Works design. DB Co shall design tie-ins (or adapt those detailed herein) to ensure compatibility between the Pavement design and DB Co's geometric design. If deviations to this

Pavement design are required by DB Co, it shall submit an alternative proposed Pavement design to the City in accordance with Schedule 10 – Review Procedure, accompanied by a narrative justifying why a deviation is necessary and how the proposed Pavement will perform relative to the Pavement design detailed herein. These aspects of DB Co’s Pavement design shall be subject to acceptance by the City, at its sole discretion.

- (i) Highway 417 widening, speed change lane widening and shoulder overbuilding:
 - A. Excavate from the existing speed change lane edge of pavement, within the asphalt, towards the shoulder.
 - B. Provide the following courses: 40 mm Superpave 12.5 FC2, 260 mm (50+70+70) Superpave 19, 150 mm Granular A, 550 mm Granular B Type II (150 mm on rock subgrades).
 - C. Provide a 50 mm deep by 300 mm wide longitudinal step joint in the upper binder course.
- (ii) Paved Shoulders on ramps and Municipal Roadways:
 - A. Fully paved Shoulders: DB Co shall design and construct fully paved Shoulders by extending the surface course, with the upper binder course extended across the full shoulder width (each side).
- (iii) For location specific Design Criteria for ramp and Municipal Roadway widening, realignment, and new construction, refer to Table 3.2a. Aspects of the paving scope not identified in Table 3.2a shall be in accordance with the general requirements outlined in this Article 3.

Table 3.2a – Pavement Design Criteria – Ramps and Crossroads				
RAMP	EXCAVATION REQUIREMENTS	PAVEMENT COURSES	BASE COURSES	JOINTING
MOODIE N-W RAMP (REALIGNMENT OR RECONSTRUCTION)	<ul style="list-style-type: none"> • Excavate from the existing edge of pavement 	<ul style="list-style-type: none"> • 40 mm Superpave 12.5 FC2 • 140 mm (70+70) Superpave 19.0 	<ul style="list-style-type: none"> • 150 mm Granular A • 450 mm Granular B Type II 	300 x 70 mm longitudinal step joint in upper binder course
MOODIE S-W RAMP (REALIGNMENT OR RECONSTRUCTION)	<ul style="list-style-type: none"> • Excavate from the existing edge of pavement 	<ul style="list-style-type: none"> • 40 mm Superpave 12.5 FC2 • 140 mm (70+70) Superpave 19.0 	<ul style="list-style-type: none"> • 150 mm Granular A • 450 mm Granular B Type II 	300 x 70 mm longitudinal step joint in upper binder course
HOLLY ACRES ENTRANCE RAMP (NEW CONSTRUCTION) (B)	<ul style="list-style-type: none"> • Excavate/fill to subgrade 	<ul style="list-style-type: none"> • 40 mm Superpave 12.5 FC2 	<ul style="list-style-type: none"> • 150 mm Granular A • 500 mm 	

		<ul style="list-style-type: none"> • 100 (50 + 50) mm Superpave 19.0 	Granular B Type II	
HOLLY ACRES S-W RAMP (REALIGNMENT OR RECONSTRUCTION)	<ul style="list-style-type: none"> • Excavate from the existing edge of pavement 	<ul style="list-style-type: none"> • 40 mm Superpave 12.5 FC2 • 140 mm (70+70) Superpave 19.0 	<ul style="list-style-type: none"> • 150 mm Granular A • 450 mm Granular B Type II 	300 x 70 mm longitudinal step joint in upper binder course
PINECREST/GREENBANK S-W RAMP (RECONSTRUCTION AS REQUIRED) ^(B)	<ul style="list-style-type: none"> • Remove existing asphalt full depth • For grade raises over existing pavement, provide Granular A to make up profile difference 	<ul style="list-style-type: none"> • 40 mm Superpave 12.5 FC2 • 140 (70 + 70) mm Superpave 19.0 	<ul style="list-style-type: none"> • 150 mm Granular A • 450 mm Granular B Type II 	<ul style="list-style-type: none"> • 300 x 70 mm longitudinal step joint in upper binder course
PINECREST/GREENBANK S-W RAMP (RESURFACING AS REQUIRED) ^(B)	<ul style="list-style-type: none"> • Cold mill 50 mm full width 	<ul style="list-style-type: none"> • 50 mm Superpave 12.5 FC2 		
PINECREST/GREENBANK N-W RAMP (RECONSTRUCTION) ^(B)	<ul style="list-style-type: none"> • Remove existing asphalt full depth • For grade raises over existing pavement, provide Granular A to make up profile difference 	<ul style="list-style-type: none"> • 40 mm Superpave 12.5 FC2 • 140 (70 + 70) mm Superpave 19.0 	<ul style="list-style-type: none"> • 150 mm Granular A • 450 mm Granular B Type II 	<ul style="list-style-type: none"> • 300 x 70 mm longitudinal step joint in upper binder course
PINECREST/GREENBANK E-N/S RAMP (RECONSTRUCTION AS REQUIRED) ^(B)	<ul style="list-style-type: none"> • Remove existing asphalt full depth • For grade raises over existing pavement, provide Granular A to make up profile difference 	<ul style="list-style-type: none"> • 40 mm Superpave 12.5 FC2 • 140 (70 + 70) mm Superpave 19.0 	<ul style="list-style-type: none"> • 150 mm Granular A • 450 mm Granular B Type II 	<ul style="list-style-type: none"> • 300 x 70 mm longitudinal step joint in upper binder course
PINECREST/GREENBANK E-N/S RAMP (RESURFACING AS REQUIRED) ^(B)	<ul style="list-style-type: none"> • Cold mill 50 mm full with 	<ul style="list-style-type: none"> • 50 mm Superpave 12.5 FC2 		
PINECREST/GREENBANK W-N/S RAMP (INCLUDING ASHLEY STREET FROM BULLNOSE TO GREENBANK) (RESURFACING) ^(B)	<ul style="list-style-type: none"> • Cold mill 90 mm full width 	<ul style="list-style-type: none"> • 40 mm Superpave 12.5 FC2 • 50 mm Superpave 19.0 		
HWY 417 FULLY PAVED OUTSIDE SHOULDERS (IF NOT OVERBUILT)		<ul style="list-style-type: none"> • 40 mm Superpave 12.5 FC2 • 50 mm Superpave 19.0 		
HWY 417 DETOURS AND SHOULDERS USED FOR CONSTRUCTION STAGING (NOT MORE THAN ONE CONSTRUCTION SEASON) (IF		<ul style="list-style-type: none"> • 40 mm Superpave 12.5 • 140 (70+70) mm Superpave 19.0 	<ul style="list-style-type: none"> • 150 mm Granular A • 450 mm Granular B Type II 	

REQUIRED)				
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Notes:

- A)
 - B) Paving of ramp shoulders shall be in accordance with Clause 3.2(c)(iii) of this Part B.
 - C) New pavement shall tie into existing pavement (constructed under MTO Contract 2017-4031) at Sta. 640+100 or further upstream.
- (iv) DB Co shall undertake the Pavement design and construction for all ramps (or portions thereof), within the scope of Highway Works, including those not otherwise noted in this Article 3, in accordance with the requirements of this Article 3. The design, performance, durability and life span of any Pavement shall be generally consistent with those of other Road segments with preliminary Pavement designs specified herein.
- (d) DB Co shall ensure that milling will not disturb the binder course or extend within 40 mm of waterproofing including, but not limited to, Overpass and Underpass Structures and approach slabs. DB Co shall clean any asphalt debris such that it is not left in the expansion joints or seals.
- (e) Upon review of DB Co’s geometric design, the City may, at its sole discretion, instruct DB Co to undertake its own design for any segment of Pavement. DB Co’s Pavement design would be in accordance with the requirements of this Article 3, including but not limited to the requirements of Clause 3.2(c).
- (f) DB Co shall ensure that design of new Pavement structures be in accordance with the “1993 AASHTO Guide for the design of Pavement Structures” and AASHTOWare Pavement ME Design software. The AASHTO 93 method will provide structural Pavement thickness design based on traffic volumes. DB Co shall use the ME Design method to assess the suitability of the chosen AASHTO Design for meeting Pavement performance parameters described elsewhere in this Part 9. DB Co shall select AASHTO Pavement Design parameters as described in the MTO Materials Information Report MI-183 “Adaptation and Verification of AASHTO Pavement Design Parameters for Ontario Conditions”. DB Co shall implement calibrated models for the AASHTOWare Pavement ME design software or default parameters for any non-calibrated models as described in MTO Ontario’s Default Parameters for AASHTOWare Pavement ME Design Interim Report, 2014. DB Co shall submit the use of alternate design methods and parameters in accordance with Schedule 10 – Review Procedure.
- (g) The soil boreholes advanced by DB Co shall be in accordance with the requirements of Ontario Regulation 903 (wells) and its amendments, made under the Ontario Water Resources Act (R.S.O 1990).
- (h) DB Co shall be responsible for designing all proposed slopes in cut and fill areas, including slope geometry, drainage treatments and erosion control measures for embankments and Ditches.

- (i) DB Co shall be responsible for effective subsurface drainage and frost protection, including the provision of subdrains or any other drainage treatments.
- (j) In areas where standard ditching is not feasible, nonstandard ditching shall be utilized to drain the pavement structure. In such cases, DB Co shall provide for the following:
 - (i) The subdrain shall be 150 mm diameter perforated pipe wrapped with geotextile and backfilled with SP 19 stone.
 - (ii) The geotextile shall be Class 1, non-woven with a minimum thickness of 1 mm.
 - (iii) The subdrain shall be placed under the Roadway Shoulder at the start of rounding and to a reasonable depth below the subgrade line.
- (k) A list of locations containing frost susceptible soils known to the Sponsor is provided below. These soils shall be treated as indicated if impacted by Highway Works. DB Co shall ensure positive drainage at each location. DB Co shall re-evaluate the frost susceptibility of the soils at these locations and the suitability of the treatment indicated. DB Co shall determine and use the most appropriate treatment as required such as excavating deeper, longer, and/or wider sections than indicated. DB Co shall not use less stringent treatment than indicated. DB Co shall be responsible to identify any additional locations containing frost susceptible soils, and shall design appropriate treatment.
 - (i) Station 18+990, 22.0 m Lt (WB): Excavate starting at the existing edge of pavement to a depth of 1.2 m between Station 18+825 and Station 19+075 per OPSD 205.060 Transverse Section With Ditch. Backfill with SSM.
- (l) DB Co shall be responsible for including type of backfill, bedding, and requirements for rock excavation for storm sewer design, if necessary.
- (m) Final travelled surfaces within the boundaries of the Highway Works following completion of the Highway Works shall meet the requirements specified in this Article 3.
- (n) DB Co shall ensure that any roads or sections of roads with unfinished pavement including, but not limited to, milled pavement or pavement without surface course that are opened to traffic, including but not limited to public or construction traffic, are designed to carry the expected traffic and to prevent water penetration. DB Co shall maintain and ensure all unfinished pavement opened to traffic are in compliance with the MTO Standards prior to final paving and that adequate surface friction is provided such as diamond grinding. Traffic shall not be on a Superpave 19.0 surface for more than one Winter Period. If construction staging operations result in pavement surfaces that cannot meet this restriction, Superpave 12.5 FC1 shall be substituted for Superpave 19.0 as the hot mix material for that surface. Steel plates shall not be used on the Provincial Highway or ramps as a travelled surface at any time. For milled pavement surfaces, DB Co shall follow the requirements of Part C – Traffic Management and Construction Access of this Part 9.

- (o) DB Co shall ensure that the Pavement surface course is in accordance with MTO's Directive PHM-C-001. This shall be applicable to all flexible Pavements including existing, rehabilitated and new sections of Pavement.
- (p) Pavement Design Report(s) (the "Pavement Design Report(s)") shall be prepared and submitted according to Schedule 10 – Review Procedure. The Pavement Design Report shall include the following minimum requirements:
 - (i) Results of a comprehensive pavement evaluation, field investigation, soils sampling and laboratory testing program;
 - (ii) Rationale for the design parameters selected in adopting or developing the Pavement design;
 - (iii) The methodology (i.e. AASHTO 93 method or AASHTOWare Pavement ME Design software) used for design of pavements, and how the selected layer thicknesses satisfy the minimum thickness based on the layer elastic analysis; and,
 - (iv) Geotechnical design recommendations for Pavements.
- (q) DB Co shall design and construct the Pavement thickness to be uniform throughout all traffic lanes.
- (r) DB Co shall resurface all locations (of permanent surface course asphalt) where scarring of pavement occurs due to the removal of Pavement Markings.
- (s) Pavement design for Shoulder shall comply with Long Combination Vehicle requirements as set out in Clause 2.2(d) of Part B of this Schedule 15-2, Part 9.
- (t) All Pavements that are outside of the Main Line and ramps shall meet City requirements.
- (u) The Design Life of all new flexible Pavement designed by DB Co shall be 40 years starting at the West Works Substantial Completion Date including intervene rehabilitation with initial Design Life of minimum 20 years.
- (v) Crossfall corrections shall be undertaken with Superpave 19.0 hot mix.
 - (i) Padding thickness less than 25 mm shall be placed with the binder course.
 - (ii) Padding thickness greater than 25 mm shall be placed in a separate lift.
 - (iii) The maximum lift thickness shall not exceed 70 mm.
- (w) The following pavement transitions shall be provided at tie-in locations:
 - (i) Highway Works limits: Partial depth remove 40 mm to key-in the new surface course flush with the existing pavement surface over a 15 m length.

- (ii) Highway 417 Ramps: Partial depth remove 40 mm to key-in new surface course flush with existing pavement surface over a 10 m length.
- (iii) Underpass Structures (Pinecrest/Greenbank Road, and Moodie Drive): Provide for a transverse butt joint in the binder course at the Highway Works limits. Partial depth remove 40 mm to key-in new surface course flush with existing pavement surface over a 5 m length per OPSS 313.07.07.03.
- (x) Widening of existing embankments shall be in accordance with OPSD 208.01.
- (y) All topsoil and other post primary consolidation settlement prone soil types shall be removed prior to constructing any embankments and widenings.
- (z) Transition points, where required, shall be carried out as per OPSD 205 series and in accordance to Clause 3.2(x) of this Part 9, Part B.
- (aa) A frost treatment depth of 1.8 m (from top of pavement) shall be utilized when designing frost tapers in accordance with OPSD 205 and OPSD 803 series.
- (bb) DB Co shall submit a list of all Special Provisions applicable to Highway Works Pavements with filled-in inputs in accordance with Schedule 10 – Review Procedure.

3.3 Pavement Structures

- (a) DB Co shall be solely responsible for selecting all Materials except as otherwise specified in this Article 3.
- (b) Granular Materials shall consist of OPSS 1010 Granular A for base course requirements and OPSS 1010 Granular B, Type II for subbase course requirements. All Granular Materials shall be in accordance with OPSS PROV 1010, April 2013. They shall be placed over the full width of the widened road, in accordance with the OPSD 200 series.
- (c) Performance graded PG 64-34 or 70-34 asphalt cement with an Ontario Traffic Category E shall be used for hot mix asphalt on Main Line and ramps. Performance graded PG 64-34 or 70-34 asphalt cement with an Ontario Traffic Category D shall be used for hot mix asphalt on Municipal Roadways.
 - (i) The Superpave 12.5 FC2 and Superpave 12.5 FC1 asphaltic concrete mix (Fine Grade mix specification under SP111F11 is required for 40 mm lift thickness) shall be designed for Traffic Category E.
 - (ii) The asphalt cement content for the Superpave 12.5 FC2 and Superpave 12.5 FC1 mixes shall be minimum 5.0%. The asphalt cement content for the Superpave 19 mix shall be minimum 4.7%.
- (d) Materials containing contaminants that may discharge into the environment and that could have an adverse effect on the natural environment (including air, land or water, and human plant or animal life) shall not be used. Granular Materials shall conform to the

- requirements of Ontario Provincial Standards Specifications OPSS PROV 1010 except that reclaimed hydraulic cement concrete shall not be used.
- (e) Asphaltic concrete shall conform to the requirements of OPSS PROV 1151 – Material Specification for Superpave and Stone Mastic Asphalt Mixtures.
 - (f) Grading and compaction shall conform to the requirements of OPSS PROV 206 – Construction Specification for Grading, and OPSS PROV 501 – Construction Specification for Compacting. Granular Base and Subbase shall be according to OPSS PROV 314.
 - (g) Drainage of the Pavement structure shall be constructed in accordance with the OPSD 300 series.

ARTICLE 4 STRUCTURAL DESIGN CRITERIA

4.1 Order of Precedence

- (a) The design and construction of Structures shall be in accordance with the criteria contained in this Article 4 and the following Reference Documents, and if there is any conflict between the criteria contained in this Article 4 and any Reference Document(s), the following shall apply in descending order of precedence for design and construction of Structures:
- (i) The criteria contained in this Article 4;
 - (ii) CAN/CSA-S6 Canadian Highway Bridge Design Code; including Exceptions to the Canadian Highway Bridge Design Code CAN/CSA-S6 for Ontario;
 - (iii) The applicable MTO Directives;
 - (iv) MTO Policy Memorandums;
 - (v) MTO Design Bulletins;
 - (vi) MTO Special Provisions;
 - (vii) MTO Standard Drawings;
 - (viii) OPSS;
 - (ix) OPSD;
 - (x) MTO Structural Manual;
 - (xi) MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads;
 - (xii) Geometric Design Guide for Canadian Roads (TAC);
 - (xiii) MTO Contract Design, Estimating and Documentation (CDED) Manual;
 - (xiv) Structure Rehabilitation Manual;
 - (xv) Structural Steel Coating Manual;
 - (xvi) Retrofitting of Existing Bridges with Joints to Semi-Integral Abutments, MTO;
 - (xvii) Ontario Structure Inspection Manual;
 - (xviii) Structural Financial Analysis Manual;
 - (xix) Roadside Safety Manual, MTO;

- (xx) Sign Support Manual;
- (xxi) NFPA502;
- (xxii) DSM; and,
- (xxiii) CSA and ASTM Standards.

4.2 General Requirements

(a) Structure Identification Number

- (i) Structure identification numbers as assigned by the City Representative shall be incorporated into the Structures in accordance with MTO standard practices. DB Co shall supply Bridge numeral forms and imprint identification numbers on Structures.

(b) Checking of Structural Design

- (i) DB Co shall engage a Checking Team, the qualifications of which are described in Clause 2.10 of Part A of this Schedule 15-2, Part 9, to perform design checks of Structures. The design checks shall be performed by a designer in the Checking Team that is independent of the Design Team.
- (ii) DB Co shall engage an Independent Checking Team responsible for certifying the design of Significant and Complex Structures in accordance with Attachment 1 of Schedule 10 – Review Procedure. The following expertise shall be included in the expertise of the Independent Checking Team:
 - A. Recognized expertise in the disciplines of geotechnical, foundation and structural engineering;
 - B. Recognized expertise in the analysis and design of all aspects of Significant and Complex Structures;
 - C. Recognized expertise in the review of designs to ensure compliance with all Applicable Law pertaining to the environment, and other environmental requirements; and,
- (iii) The Checking Team shall be responsible for:
 - A. Conducting design checks to ensure that the design of Structures meets performance expectations outlined in the Project Agreement and that such design is carried out according to accepted industry standards and MTO Standards;
 - B. Verifying that ‘use of engineering judgement’ is validated by appropriate experience. The independent check Engineer shall confirm, in each

- instance, that the use of the Simplified Methods of Analysis is applicable as per CAN/CSA-S6;
- C. Undertaking supplementary analyses to independently verify and confirm the appropriateness of design methodologies and assumptions used; and,
 - D. Identifying deficiencies in the design and analyses, and notifying DB Co and the City Representative of unresolved deficiencies.
- (iv) All structural drawings shall be signed and sealed by a member of the Checking Team and a member of the Design Team, in accordance with the requirements of this Project Agreement.
- (c) Existing and As-Built Structure LiDAR Scans
- (i) Work under this item includes the acquisition and processing of 3D point cloud data for all existing and new Structures constructed as part of Highway Works. Point cloud data shall be collected using a high density stationary terrestrial scanner for the following:
 - A. Existing Structures within the Highway Works limits (in situ prior to removal);
 - B. New fully constructed Bridge Structures on their temporary supports in the staging area (within three weeks prior to move); and,
 - C. New fully constructed Bridge Structures in design location (after move).
 - (ii) LiDAR system equipment shall be used to acquire all existing and as-built data. Scans shall be performed using a stationary terrestrial scanner capable of achieving requested point specifications in accordance with the following:
 - A. Point Spacing < 5.1mm
 - B. Point relative accuracy of < 5.1 mm
 - C. Absolute relative accuracy of < 10.1 mm
 - (iii) Scans should be of sufficient point density to accurately measure and analyze from the point cloud the following features:
 - A. Bridge girders, bearing seats, abutment walls, barrier walls and deck; and,
 - B. Visible cracking or deformation on the Structure components.
 - (iv) Terrestrial scans shall be conducted from a scanner mounted on a tripod or other stationary mount.

- (v) Scans shall be spatially located using established registration points or targets which meet absolute accuracy specification.
- (vi) Scan range shall not exceed 30 m.
- (vii) Scans shall be conducted in locations where shadowing and obstacle interference is eliminated or minimized.
- (viii) Scans shall be conducted during optimal environmental conditions to ensure high quality returns of data.
- (ix) Quality Control surveys shall be conducted to validate scan accuracy.
- (x) DB Co shall provide fully processed registered point cloud in LAS format version 1.4 to requested specifications for each Structure. Point cloud shall include positional, intensity and RGB data.
- (xi) DB Co shall provide Quality Control documents validating scan accuracy requirements are met.
- (xii) DB Co shall submit Structure Survey Reports to the City in accordance with Schedule 10 – Review Procedure. A separate survey report shall be submitted for each Structure scan and shall include:
 - A. Survey and scan details including field and office methodology; and,
 - B. A statement of certification, signed by a Professional Engineer or Land Surveyor registered in the province of Ontario, verifying the submitted deliverables are to requested accuracy tolerances and specifications.

4.3 Structures

- (a) This Article 4 includes the structural design and construction requirements for all new Structures and rehabilitation, widening, lengthening, strengthening and/or replacement of existing Structures, including but not limited to Bridges (which include Underpasses, Overpasses, railway grade separations, and Retaining Walls), Noise Barriers, single cell Culverts with spans equal to or greater than 3.0 m, multi-cell or twin Culverts with combined spans equal to or greater than 3.0 m, Overhead Sign Support Structures and mid-size VMS Signs and high mast pole footings.
- (b) For each Structure to be designed, or rehabilitated as detailed in Clause 4.10 of this Part B, DB Co shall submit to the City Representative individual Structure Survey Reports. The Structure Survey Reports shall be signed and sealed by structural Engineers who are members of the Design Team, and shall include the following minimum requirements.
 - (i) DB Co shall detail the construction, or rehabilitation methodology, identifying activities to be completed at each stage of construction.

- (ii) DB Co shall identify the standards and codes consulted in its design and shall detail how its design adheres to the requirements presented in this Schedule 15-2.
 - (iii) DB Co shall include a General Arrangement Drawing, which shall also be submitted in CAD format. The General Arrangement Drawings shall be prepared according to the MTO Structural Manual, and shall include the following additional minimum requirements (as applicable):
 - A. Embankment cone configuration;
 - B. Rehabilitation details;
 - C. Widening/lengthening requirements;
 - D. Identification of components to be removed or replaced;
 - E. Location and value of the minimum horizontal and vertical clearances;
 - F. Interface with existing Structure(s);
 - G. Interface with utilities;
 - H. Attached or supported utilities; and
 - I. Deep foundation type, size and design criteria.
 - (iv) DB Co shall include a future rehabilitation methodology for new Structures and supporting calculations/analysis that demonstrates that no temporary support would be required.
 - (v) Design drawings and calculations shall be appended to the Structure Survey Reports.
 - (vi) References to applicable section(s) of the Geotechnical Report shall be included.
 - (vii) For proprietary precast Culverts, the responsible Professional Engineer shall certify the design and construction of the precast Culverts.
 - (viii) DB Co shall include an evaluation of the capacity of the piles to satisfy a 75 year Service Life, considering the present condition and future corrosion losses. This section shall provide the methodology and results associated with the Foundation engineering assessments undertaken by DB Co in accordance with Clause 5.2 of this Part B.
- (c) Design Criteria
- (i) Design Loads

- A. Design loads shall be as specified in CAN/CSA-S6 and the MTO Structural Manual. The design of Overheads shall also consider loads due to system-wide elements such as electrification, signalization and communication equipment.
 - B. DB Co shall assume the design lanes as per CAN/CSA-S6 to extend across each Bridge deck between the two most exterior Barrier walls.
- (ii) Design and Service Life
- A. All new and rehabilitated Structures and components thereof in the Highway Works shall have a minimum Design Life of 75 year starting at the Highway Substantial Completion Date.
 - B. The Service Life of all main structural components of new Structures (including but not limited to Foundations, piers, abutments, Superstructures, Decks, wingwalls, Retaining Walls including wall components such as wall facings and anchorages) shall be 75 year starting at the Highway Substantial Completion Date.
 - C. The Service Life of all existing and rehabilitated substructure components (including but not limited to Foundations, pier and abutments) shall be 40 year starting at the Highway Substantial Completion Date.
 - D. Time dependent design calculations shall use a Service Life of 75 year.
- (iii) Clearances
- A. Horizontal and vertical clearances for new Overpass/Underpass Structures shall be provided and maintained in accordance the MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads.
 - B. New Overhead Structures and existing Overpass/Underpass Structures being modified to Overhead Structures that span the alignment shall meet the minimum horizontal clearance requirements for the Vehicle, in accordance with Clause 2.12 of Schedule 15-2, Part 2.
 - C. New Overhead Bridge Structures which span the alignment shall be designed to ensure they achieve a minimum vertical clearance of 4.5 m from the TOR to the underside of the Structure.
 - D. Existing Overpass/Underpass Bridge Structures being modified to Overhead structures shall achieve a minimum vertical clearance of 4.5 m from the TOR to the underside of the Structure.
- (iv) Aesthetics

- A. Bridges shall be designed in accordance with the Aesthetic Guidelines for Bridges using a “Level 1” classification, with the following clarifications:
 - i. Aesthetic improvements to the abutments and pier columns shall be per the MTO Context Sensitive Design requirements as detailed in Appendix F of this Part 9.
 - ii. The following Overhead Structures shall be designed using a “Level 3” classification:
 - i. Highway 417 Westbound Off-Ramp at Pinecrest Road (SN015160);
 - ii. Highway 417 Westbound On-Ramp at Pinecrest Road (SN015170);
 - iii. Pinecrest Road Bridge (SN015180);
 - iv. Highway 417 S-W On-Ramp at Moodie Drive (SN116370); and,
 - v. Highway 417 N-W On-Ramp at Moodie Drive (SN116330).
 - B. Retained Soil Systems shall be designed in accordance with the performance and appearance categories of Retained Soil Systems as defined in the MTO document “RSS Design Guidelines”.
 - C. Aesthetics for Retaining Walls, Noise Barriers, and other structural components shall be in accordance with Article 9 of Part B of this Schedule 15-2, Part 9 and the MTO Context Sensitive Design requirements as detailed in Appendix F of this Part 9.
- (v) Corrosion Protection
- A. DB Co shall provide corrosion protection according to CAN/CSA S6 and the Structural Manual. Where there are conflicts in the clearance requirements where premium reinforcement is to be used, Table 2.8.2 of the Structural Manual shall apply.
 - B. The grade for Superstructure members shall be 350 AT Category 3 for plate and 350 A Category 2 for rolled sections. Miscellaneous steelwork (including railings, Deck joints, restrainers bolts, anchor bolts, drains, embedment in concrete, fence) shall be hot-dipped galvanized in accordance with CAN/CSA-G164-M92. All non-structural steel shall be hot-dipped galvanized.

- C. GFRP is only to be used in Barrier walls on structures that meet the following criteria:
 - i. Is an Overpass Structure; and,
 - ii. Has an AADT of less than or equal to 2000.
 - D. Any reference to Grade I GFRP shall be deleted in its entirety, including anything listed in Reference Documents.
 - E. Stray current corrosion control for all Overheads shall be in accordance with Schedule 15-2, Part 3, Article 12 – Corrosion Control.
- (vi) Deck Wearing Surface Systems
- A. The Deck wearing surface systems are defined as the replaceable surfaces and waterproofing elements that protect the Bridge Decks, from abrasion and the ingress of water and chlorides.
 - B. Deck wearing surface systems shall be provided on all Bridges.
 - C. Deck wearing surface systems shall be designed to prohibit water penetration into the structural Deck over the Service Life of the Deck wearing surface system.
 - D. The wearing surface for all Bridge Decks shall consist of a hot applied rubberized asphalt waterproofing system with protection board and asphalt Pavement in accordance with OPSS PROV 914.
 - E. For Deck wearing surface systems where the Deck wearing surface cannot be rehabilitated without damaging the waterproofing elements, the Deck wearing surface and waterproofing and the drainage elements of the Deck wearing surface system shall have the same Service Life and shall be repaired as per OPSS PROV 914.
- (vii) Bridge Decks
- A. DB Co shall ensure that the Bridge Deck systems, including the interaction of Deck concrete, concrete cover, reinforcement, Deck wearing surface system, joints and Deck drainage details, are such that the Bridge Decks meet the Service Life requirements of Highway Works.
 - B. Cantilevered Structures or steel grated systems are prohibited for new repurposed Underpass Bridges.
 - C. Parapet Walls shall be integral with the Bridge Deck.
- (viii) Bridge Deck Joints

- A. Bridge Decks shall be designed to minimize the occurrence of joints.
 - B. Integral and semi-integral abutments shall make provision for movement at the interface between the approach slab and the approach Road Pavement construction.
 - C. All components of Modular Expansion Joints shall be designed such that they can be individually replaced without damaging the joints.
 - D. In-span and mid-span expansion joints shall not be used.
 - E. Where Deck sections flare to accommodate more or fewer lanes, expansion joints shall be carried across the full width of the Deck.
- (ix) Deck Drainage
- A. Bridge Deck Drainage shall be designed in accordance with the Highway Drainage Design Standards. A Deck drainage discharge system consisting of downpipes shall be provided where the discharge cannot meet the conditions of Structural Manual, Clause 9.2.1. Runoff water from the Road surface of Bridges shall be discharged in accordance with the drainage and environmental requirements of Highway Works.
- (x) Approach Slabs
- A. Approach slabs shall be provided at all Bridge abutments and shall be designed to mitigate anticipated settlements.
 - B. Sleeper slabs shall be considered as defined in MTO Structure Manual.
- (xi) Slope Protection
- A. Concrete slope protection in accordance with MTO Structure Manual shall be provided on the sloped embankments in front of the abutments under all Bridges.
- (xii) Piers
- A. Pier design protection shall be in compliance with the [REDACTED].
- (xiii) Water Ingress
- A. Water ingress into or onto the Substructure or abutment wall backfill from the Superstructure above shall be prevented.
- (xiv) Barriers
- B. Structures shall be provided with Barriers as required by CAN/CSA-S6.

- (xv) Bearings
 - A. Sufficient space shall be allowed at the Bearings for inspection, maintenance, and replacement of the Bearings including provisions for jacking.
 - B. Bearings shall be restrained from unintended movement.
 - C. Elastomeric plain and steel laminated Bearings shall be tested according to OPSS PROV 1202, as amended by Special Provision 922F01.
- (xvi) Pre-stressed and Post-tensioned Concrete
 - A. Un-bonded pre-stressing cables are not permitted except at the ends of pre-stressed girders. Un-bonded post-tensioned cables are not permitted.
- (xvii) Hydraulic Design
 - A. DB Co shall undertake all hydrology/hydraulic analyses and design for Structures. This shall include all hydrotechnical modeling, analyses, and design to ensure that all Foundations, adjacent facilities, Utilities, and water course banks are protected from scour.
 - B. DB Co shall identify, design, and construct all scour protection, erosion control, and stabilization necessary to prevent damage to Structures, Roads, or property affected by the Highway Works.
- (xviii) Steel Girder Bridges
 - A. Steel girders are not permitted for the Superstructure of the Highway 417 Bridges.
- (xix) Precast Deck Panels
 - A. Full depth and partial depth Deck panels may only be considered for use at the following Structure locations:
 - i. Pinecrest Road Structure (SN015180);
 - ii. Holly Acres Road Bridge (SN115230);
 - iii. Moodie Drive Bridge (SN116350);
 - iv. Highway 417 Westbound Off-Ramp at Pinecrest Road (SN015160);
 - v. Highway 417 Westbound On-Ramp at Pinecrest Road (SN015170);

- vi. Highway 417 S-W On-Ramp at Moodie Drive (SN116370); and,
 - vii. Highway 417 N-W On-Ramp at Moodie Drive (SN116330).
- (xx) Traffic Staging for Future Bridge Deck Rehabilitation
- A. Bridges shall be designed and detailed such that they can be rehabilitated without major disruption to traffic.
 - B. DB Co shall demonstrate that rehabilitation can be carried out with no more than one lane in each direction being taken out of service.
- (xxi) Provision for Illumination, Electrical, and ATMS
- A. The Bridges shall include the embedded conduit, lighting pole anchorage, pole bases and junction boxes meeting MTO or the local municipal lighting standards as required. DB Co shall coordinate the lighting design with the local municipality.
 - B. The Bridges shall include provisions for ducting, conduits and PVC junction boxes to accommodate future Underpass illumination where required by the Electrical Design Manual.
 - C. Ducting, conduits and junction boxes on Bridge Decks are only permitted in the Barrier walls. A maximum of two ducts per Barrier wall are permitted.
 - D. Surface mounted conduits are only permitted on existing Structures in accordance with the MTO Structural Manual Division 2, Section 16.3.1 where no additional widening or new Barrier walls are being constructed. Conduits shall be embedded for all new Structures or widened portion of Structures. If there is insufficient space to embed all conduits in new and existing Structures, the conduits shall be provided underground.
- (xxii) Structures listed below shall be classified as follows for the purpose of assigning an Importance Category under the CAN/CSA-S6:
- A. Overpasses: Major Route Bridges
 - B. Underpasses and Overheads: Other Bridges
- (xxiii) Concrete materials shall be in accordance with OPSS PROV 1350 and concrete construction shall be in accordance with OPSS PROV 904.
- (xxiv) Collision Protection
- A. Piers supporting new and existing Bridges over the alignment and with a clear distance of less than 6m from the centerline of a Track shall be of

heavy construction or shall be protected by a reinforced concrete crash wall.

- i. Crash walls shall have a minimum height of 1200mm above the top of rail. The crash wall shall be at least 600mm thick and at least 3.5m long. When two or more columns compose a pier, the crash wall shall connect the columns and extend at least 900mm beyond the outermost columns parallel to the Track. The crash wall shall be anchored to the footings and columns, if applicable, with adequate reinforcing steel and shall extend to at least 1200mm below the lowest surrounding grade.
- ii. Piers shall be considered of heavy construction if they have a cross-sectional area equal to or greater than that required for the crash wall and the larger of its dimensions is parallel to the Track.

(xxv) The OCS foundation and structural design shall include, but not be limited to, consideration of wind, ice accretion, wire tensioning forces, upward force to the contact wire or contact rail, and the effect of wire break. The OCS foundation shall be designed in conjunction with the requirements in Schedule 15-2, Part 3, Clause 14.4.

4.4 New Retaining Walls

- (a) See Article 5 – Geotechnical/Foundation Design Criteria of Part B of this Schedule 15-2, Part 9 for additional requirements for Retaining Walls.

4.5 Sign, Traffic Signal and Lighting Structures

- (a) DB Co shall design, fabricate and install Structures for Signs, traffic signals, and lighting in accordance with CAN/CSA-S6 and applicable Reference Documents.
- (b) Camera support structures shall have a maximum sway of 25 mm at 65 km/h wind speed.
- (c) Sign support Structures shall be designed according to MTO Sign Support Manual.

4.6 Noise Barriers

- (a) Noise Barriers shall be designed and constructed in accordance with CAN/CSA-S6, SP 760F01 and Design Criteria specified in this Section. Noise Barrier aesthetics requirements are governed by Article 9 of Part B of this Schedule 15-2, Part 9 and the MTO Context Sensitive Design requirements as detailed in Appendix F of this Part 9.

4.7 Culverts

- (a) Culverts shall be designed to ensure accessibility for inspection and maintenance. For clarity, accessibility includes accessibility for personnel to enter a Culvert to conduct inspection and maintenance activities.

- (b) Wire mesh shall not be substituted as reinforcement for new Culverts or extension of existing Culverts.

4.8 Openness Ratio

- (a) For the smaller watercourse crossings, a minimum height of 1.2 m and a minimum Openness Ratio of 0.05 shall be provided for the Culverts in order to facilitate movement of small and medium sized mammals.
- (b) The Openness Ratio for the above shall be based on the structural dimensions relative to dry ground/structural surface/platform beside the watercourse that can be traversed by wildlife during the 2 year flood flow level. Culvert dimensions shall be confirmed during the design stage in Coordination with DB Co's terrestrial specialist.

4.9 Structural Widening and Rehabilitation

- (a) DB Co shall perform structural widening and rehabilitation as part of the Highway Works such that all Structures meet and/or exceed the recommendations set out in the Project Agreement.
- (b) A general outline of the rehabilitation and widening work to be done for the key Structures is given below:

- (ii) Graham Creek Culvert (Site 3-537/C), Lat:45.345120, Long: 075.813220

- A. DB Co's comprehensive rehabilitation and extension of Graham Creek Culvert shall accommodate a new Highway 417 on-ramp and include repairs of deteriorated concrete on exposed surfaces of the existing Culvert barrel. The Culvert extension will be a cast-in-place box Culvert with the same hydraulic opening as the existing box Culvert and will utilize environmental protection measures and temporary flow passage system during construction. The Culvert extension shall be doveled into the existing Structure. The top slab of the Culvert extension is to be waterproofed and the waterproofing shall extend 1 m onto the existing Culvert such that the construction joint between the new and existing Culverts is covered. DB Co shall perform concrete repairs on all delaminated and spalled areas on all exposed concrete surfaces on the existing Culvert barrel and outlet header walls and wingwalls.
- B. The culvert extension shall have a minimum Design Life of 75 years starting at the Highway Substantial Completion Date. The rehabilitated components of the existing culvert shall have a minimum Service Life of 25 years starting at the Highway Substantial Completion Date.

- (iii) Stillwater Creek Culvert at LMSF (SN 110180)

- A. DB Co shall review the limits of this existing Culvert, which crosses Highway 417 at the site of the proposed LMSF. Any extensions required

for this Structure shall be designed and constructed by DB Co. Guideway structures crossing Stillwater Creek shall exhibit at minimum the light filtering characteristics of an open deck Bridge Structure. Culverts of any type are not acceptable.

4.10 Description of New Overhead Structures

- (a) DB Co shall design and construct the following overhead structures as part of the Highway Works.
- (i) Highway 417 Westbound Off-Ramp at Pinecrest Road (SN015160)
 - A. Design and construct a new Overhead Bridge to carry the Westbound Off-Ramp at Pinecrest Road over the alignment. The new Bridge shall accommodate the following:
 - iii. The proposed Off-Ramp roadway cross section in accordance with Schedule 15-2, Part 9, Clause 1.3 on the Structure; and,
 - iv. EB and WB alignment, including Emergency walkways, under the Structure.
 - (ii) Highway 417 Westbound On-Ramp at Pinecrest Road (SN015170)
 - A. Design and construct a new Overhead Bridge to carry the Westbound On-Ramp at Pinecrest Road over the alignment. The new Bridge shall accommodate the following:
 - i. The proposed On-Ramp roadway cross section in accordance with Schedule 15-2, Part 9, Clause 1.3 on the Structure; and,
 - ii. EB and WB alignment, including Emergency walkways, under the Structure.
 - (iii) Pinecrest Road Structure (SN015180)
 - A. Design and construct a new Overhead structure to carry Pinecrest Road over the alignment. The new Structure shall accommodate the following:
 - i. The proposed Pinecrest Road roadway cross section in accordance with Schedule 15-2, Part 9, Clause 1.3 on the Structure; and,
 - ii. The EB and WB alignment, including Emergency walkways.
 - iii. The design of the Structure shall protect for and accommodate a future grade raise of up to 500 mm at the adjacent Pinecrest Road Highway 417 bridge location.

1. Buried structures, abutments and retaining walls shall, as a minimum, be designed to support an additional 500mm of granular material above the structure.
 2. Bridge girders and bridge deck shall be detailed to accommodate future lifting and reuse as part of the future elevated Pinecrest Road Structure (SN015180). Integral bridges shall not be used at this location. This lifting and reuse, along with modifications to the abutments and retaining walls, will have to be completed concurrently during a rapid bridge replacement of the Pinecrest Road Highway 417 bridge location. DB Co shall demonstrate in the PFDD submission how this future grade raise and modification of the bridge can be designed and constructed without impacting the LRT operation during the construction.
 3. Foundation design loading shall include appropriate allowances for the future elevated Pinecrest Road Structure (SN015180).
- B. Design of the Structure shall be coordinated with the design of Pinecrest Station. Refer to Schedule 15-2, Part 4, Article 3 – Station Specific Architectural Design Criteria.
- C. Provide pedestrian access to Pinecrest Station in accordance with the requirements in Schedule 15-2, Part 6, Article 4 – Site Specific Desired Outcomes.
- D. Construction of the new Structure shall be staged in accordance with the requirements of Schedule 15-2, Part 7, Article 2 – Existing Municipal Roadways.
- (iv) Highway 417 S-W On-Ramp at Moodie Drive (SN116370)
- A. Design and construct a new Overhead Bridge to carry Highway 417 S-W On-Ramp at Moodie Drive over the alignment. The new Bridge shall accommodate the following:
- i. The proposed On-Ramp cross-section in accordance with Clause 6.19 of Schedule 15-2 Part 2 on the Structure.
 - ii. The proposed EB and WB LRT alignment including an Emergency walkway and an allowance for a future MUP on the north side of the alignment under the Structure.
- (v) Highway 417 N-W On-Ramp at Moodie Drive (SN116330)

- A. Design and construct a new Overhead Bridge to carry Highway 417 N-W On-Ramp at Moodie Drive over the alignment. The new Bridge shall accommodate the following:
 - i. The proposed On-Ramp cross-section in accordance with Clause 6.19 of Schedule 15-2 Part 2 on the Structure.
 - ii. The proposed EB and WB LRT alignment including Emergency walkway and an allowance for a future MUP on the north side of the alignment under the Structure.

- (vi) Holly Acres Road Bridge (SN115230)
 - A. Design and construct a new Overhead Bridge to carry the alignment over Holly Acres Road. The new Bridge shall accommodate the following:
 - i. The proposed EB and WB alignments, including an Emergency walkway on the Structure.
 - ii. The proposed Holly Acres Road roadway cross section in accordance with Clause 6.19 of Schedule 15-2, Part 2, pedestrian facilities and Transitway access to the Highway 417 on-ramp under the Structure.

- (vii) Moodie Drive Bridge (SN116350)
 - A. Design and construct a new Overhead Bridge to carry Moodie Drive over the proposed alignment. The new Bridge shall accommodate the following:
 - i. The proposed Moodie Drive cross-section in accordance with Clause 6.19 of Schedule 15-2, Part 2 on the Structure.
 - ii. The proposed EB and WB alignment including an Emergency walkway and an allowance for a future MUP on the north side of the alignment under the Structure.

 - B. The proposed Moodie Drive overpass shall have a raised concrete sidewalk on the West side of the Moodie Drive, in accordance with Article 6 - Roadways, Bus Terminals and Lay-Bys, of Schedule 15-2, Part 2.

 - C. Install Bridge Structure fencing in accordance with Schedule 15-2, Part 6, Article 2 – Design Criteria.

ARTICLE 5 GEOTECHNICAL/FOUNDATION DESIGN CRITERIA

5.1 Order of Precedence

- (a) DB Co's design and construction of all Foundation work shall be in accordance with the criteria contained in this Article 5 and the Reference Documents identified below. If there is any conflict between the criteria contained in this Article 5 and any the Reference Documents below, the following shall apply in descending order of precedence:
- (i) The criteria contained in this Article 5;
 - (ii) MTO Special Provisions;
 - (iii) The applicable MTO Directives, MTO Policy Memorandums, and MTO Design Bulletins;
 - (iv) OPSS;
 - (v) MTO Contract Design, Estimating and Documentation (CDED) Manual;
 - (vi) Guidelines for Foundation Engineering – Tunneling Specialty for Corridor Encroachment Permit Application;
 - (vii) MTO Laboratory Testing Manual, February 2016;
 - (viii) RSS Design Guidelines, MTO, September 2008;
 - (ix) Embankment Settlement Criteria for Design, July 2, 2010, MTO;
 - (x) MTO Guidelines for Rock Fill Settlement and Rock Fill Quantity Estimates, September 2010;
 - (xi) MTO Sign Support Manual, April 2015;
 - (xii) MTO Guidelines for the Design of High Mast Pole Foundations, 4th Edition, May 2004;
 - (xiii) Integral Abutment Guidelines and Semi-Integral Abutment Guidelines, MTO;
 - (xiv) MTO Standard Drawings;
 - (xv) OPSD;
 - (xvi) DSM;
 - (xvii) CHBDC, for Highway applications;
 - (xviii) Canadian Foundation Engineering Manual;

- (xix) Guideline for Professional Engineers Providing Geotechnical Engineering Services, published by Professional Engineers of Ontario;
- (xx) ASTM Standards; and,
- (xxi) Geotechnical Resistance Factors – Highway 417 Widening and Rehabilitation, Thurber Engineering, June 28, 2017.

5.2 Subsurface Investigations and Testing Prior to Construction

- (a) DB Co shall, notwithstanding the requirements specified in this Clause 5.2 of Part B of Schedule 15-2, Part 9, be responsible for undertaking sufficient additional subsurface investigations to permit the detail design and construction of Highway Works. Results of investigations shall be provided to the City for information purposes promptly upon receipt of same and shall include a Geocres number for the MTO Foundation Database.
- (b) Boreholes shall extend to refusal or to a competent stratum that will provide sufficient axial resistance or bearing resistance for the design of structure foundations or sufficient bearing resistance to settlements and/or instability for the design of embankment to meet the design requirements.
- (c) For Temporary Protection System and Temporary Cofferdam, boreholes shall be extended to depth to provide sufficient tip resistance, lateral resistance and resistance to basal heave.
- (d) Refusal is defined by material for which the resistance measured by the Standard Penetration Test (SPT) exceeds 100 blows per 0.3 m of penetration.
- (e) Where possible, explorations shall be located to minimize disruption to traffic, environmentally sensitive areas and not to interfere with private property.
- (f) For re-use of existing Foundation, a minimum of one borehole is required at each final Bridge pier and abutment location, advancing to a minimum of 3 m below refusal. If bedrock is encountered, the borehole shall be cored for a minimum depth of 3 m. Additional boreholes, sufficient in number to permit the detail design and construction of Structure Foundations shall be carried out as required and, shall also be located as needed at such locations and at retaining Structure locations, within Bridge approaches, and in cut/fill sections.
- (g) For design of new or replacement Foundation, a minimum of two boreholes are required at each Foundation element advancing to a minimum of 3 m below refusal. If bedrock is encountered, a minimum of 50% of explorations shall be cored for a minimum depth of 3 m.
- (h) A minimum of one borehole within 20 m of the abutment shall be advanced at each Bridge approach location. The borehole shall be advanced to 3 m into a competent stratum.

- (i) A minimum of two boreholes shall be advanced at each Structural Culvert, one at the inlet and one at the outlet location. For greater clarity, at locations where separate Structural Culverts are designed along the same waterway, such as under each carriageway, each of those Structural Culverts requires a minimum of two boreholes. If bedrock is encountered, bedrock shall be cored for a minimum depth of 3 m.
- (j) Minimum borehole spacing along retaining wall shall not exceed 50 m and one borehole at each end of the retaining structure shall be drilled. The boreholes shall be advanced to 3 m into a competent stratum.
- (k) A minimum of one borehole shall be advanced for each Overhead Sign Support Structure Foundation and for each High Mast Lighting Foundation. The borehole shall be advanced to 3 m into a competent stratum. If bedrock is encountered, the rock shall be cored for a minimum depth of 3 m.
- (l) Minimum borehole requirements for the drainage crossing installation by trenchless method are:
 - (i) One borehole at each end (entry and exit portal);
 - (ii) A minimum of one borehole shall be placed between the embankment crest and the ends of the culvert (or sewer);
 - (iii) Borehole spacing along the tunnel alignment shall not exceed 50 m;
 - (iv) All boreholes shall be located outside but within 2 m of the drainage crossing's alignment;
 - (v) Boreholes shall be advanced to a depth of triple the drainage crossing diameter below invert; and,
 - (vi) If bedrock is encountered, bedrock shall be cored for a minimum depth of 3 m below the invert of the drainage crossing.
- (m) Minimum borehole spacing along the alignment of Noise Barrier shall not exceed 50 m. The borehole shall be advanced 3 m below competent stratum. If bedrock is encountered, the rock shall be cored for a minimum depth of 3 m.
- (n) Boreholes shall be advanced at 50 m spacing in high fill and deep cut sections when fill height and cut depths exceed 4.5 m. The boreholes shall be advanced 3 m into a competent stratum or 10 m below the base of the fill or 6 m below the base of the cut, whichever is less. If bedrock is encountered coring is not required.
- (o) All field and laboratory testing shall be carried out in accordance with applicable MTO Standards.
- (p) Field testing locations shall be consistent with the Coordinate system identified in Part A of this Schedule 15-2, Part 9.

- (q) All aspects of implementation of geotechnical test holes (including, but not limited to, planning, licensing, construction, maintenance, abandonment, and reporting) shall be in accordance with Ontario Regulation 903 (Wells) and its amendments made under the Ontario Water Resources Act (R.S.O. 1990).
- (r) Fieldwork shall be carried out in accordance with the OHSA and MTO Occupational Health and Safety Field Guide for Engineering Functions.

5.3 Structure and Utility Protection

- (a) DB Co shall be responsible for the protection of all structures and Utilities that may be affected by the Project Operations and the repair of any structures and Utilities damaged by the Project Operations. DB Co shall follow and satisfy the requirements identified in Part 2, Article 9 – Protection of Existing Adjacent Structures.

5.4 Foundation Design and Construction

- (a) Foundation engineering design shall be carried out in accordance with the most recent edition of the CHBDC and Canadian Foundation Engineering Manual, as applicable, and the Reference Documents in Clause 5.1 of Part B of this Schedule 15-2, Part 9.
- (b) Foundations for the integral abutments shall be designed in accordance with Integral Abutment Guidelines, MTO.
- (c) Foundations for High Mast Lighting shall be designed in accordance with the latest edition of the CHBDC, Canadian Foundation Engineering Manual and Guidelines for the Design of High Mast Pole Foundations.
- (d) Foundations for sign support structures shall be designed in accordance with the latest edition of the CHBDC, Canadian Foundation Engineering Manual and MTO Sign Support Manual,
- (e) Foundation design and construction shall consider existing Utilities or buildings. Excessive settlement that can compromise the performance and serviceability of existing Utilities or buildings shall be prevented.
- (f) DB Co shall carry out a detailed site specific seismic Hazard assessment for Sites where the subsoil has been screened and flagged as potentially liquefiable. Detailed seismic Hazard assessment shall be performed per CHBDC using a rigorous dynamic Site response analysis.
- (g) Physical and mechanical properties and erodibility of Soil/Rock shall be provided to the Drainage/Hydrology Engineer for scour analysis. The Geotechnical Engineer shall review the Drainage/Hydrology Report and confirm that the proposed countermeasures for scour protection are sufficient to ensure the performance of the Structure Foundations.

5.5 Permanent Retaining Walls/Structures

- (a) Reinforced soil slopes shall be considered as Retaining Walls in accordance with the “RSS Design Guidelines, MTO”, CHBDC and Canadian Foundation Engineering Manual.
- (b) Both the proprietary retained soil system and conventional retaining structures shall be designed for durability and shall satisfy sliding, bearing resistance, overturning and global stability with appropriate factors of safety, in accordance with CHBDC and Canadian Foundation Engineering Manual, and RSS Design Guidelines, MTO. The internal stability of the proprietary retained soil system shall also be checked.
- (c) Proprietary Retained Soil Systems not prequalified on the DSM shall be approved by the MTO RSS Committee on a project specific basis. DB Co shall allow six weeks for each iteration of review.
- (d) Proprietary Retained Soil Systems, if used, shall be designed and constructed in accordance with the “RSS Design Guidelines, MTO” and applicable Special Provisions. Walls required to retain Bridge embankments adjacent to Bridge Foundations are considered abutment walls. RSS walls shall not be used as True Abutments where True Abutments are defined by “RSS Design Guidelines, MTO”.
- (e) Gabion baskets shall not be utilized as retaining structures within the MTO ROW.
- (f) Design of all permanent retaining structures and Barriers shall allow for full-depth replacement of Pavements.
- (g) Design of all permanent retaining structures shall eliminate pressures generated by frost action.
- (h) At each side where construction of a Retained Soil System is considered, DB Co shall engage a Geotechnical Engineer to evaluate the suitability of the site for use of the Retained Soil System that satisfies the intended purposes and to consider the anticipated ground movement or settlement and global stability. Based on the findings of this evaluation, DB Co shall provide design details of the ground improvement method, to accelerate the consolidation settlement and limit the secondary compression and/or to strengthen the existing soils.

5.6 Permanent Cut and Fill Slopes

- (a) Permanent cut and fill slopes shall be designed to:
 - (i) Be compliant with the CHBDC;
 - (ii) Provide an applicable factor of safety against global slope failure according to the Canadian Foundation Engineering Manual;
 - (iii) Be protected against surficial erosion and shallow surface failures;

- (iv) Control discharge of surface water and subsurface seepage;
 - (v) Allow for regular maintenance of the slope surface;
 - (vi) Satisfy short-term stability during construction using appropriate undrained strength parameters;
 - (vii) Satisfy long-term stability using effective strength parameters; and,
 - (viii) Satisfy embankment settlement performance requirements as specified in the Embankment Settlement Criteria for Design (MTO).
- (b) An applicable factor of safety shall be used for slopes adjacent to, abutting, or surrounding Bridge abutments that considers the risk and consequences of slope failure adjacent to the Bridge.
- (c) In accordance with OPSD 202.010, independent of stability analyses, for embankment earth fills equal to or greater than 8 m in height, fill slopes shall incorporate horizontal benches for surficial stability at maximum 8 m intervals. For rock fills equal to or greater than 10 m in height, rock fill slopes shall incorporate horizontal benches at maximum 10 m intervals. Slopes shall be constructed in accordance with OPSS PROV 206 and OPSS PROV 804.
- (d) Horizontal benches shall be provided for surficial stability for cut slopes higher than 6 m and shall be provided at maximum 6 m intervals.
- (e) Permanent cut and fill slopes shall be designed and constructed to avoid tension cracks, toe bulging, slumping, or sloughing of embankment or cut slope.

5.7 Temporary Slopes and Retaining Structures

- (a) The performance of each Temporary Works shall be sufficient for its expected Service Life. All Temporary Highway Works must comply with the OHS/A, MOL requirements and the applicable construction projects regulation thereunder current at the time of excavation and the additional criteria identified below:
- (i) Temporary retaining structures shall be designed and constructed to meet OPSS PROV 539 Construction Specification for Protection Systems and this Article 5.

5.8 Earthwork and Geo-Environmental

- (a) Earthwork shall be constructed to meet the applicable requirements of OPSS PROV 501 Construction Specification for Compaction, and as modified by SP 105S22, OPSS PROV 401 Construction Specification for Trenching, Backfilling, and Compacting, OPSS PROV 206 Construction Specification for Grading, OPSS PROV 212 Construction Specification for Earth Borrow, and OPSS PROV 1010 Aggregates – Base, Subbase, Selected Subgrade and Backfill Material.

- (b) All Lightweight Fills shall be adequately protected from wheel load, groundwater, road salts, weather, fire, flotation under flood conditions, and fuel spills.
- (c) Geo-Environmental requirements are specified in Schedule 17, Part 4 – Contamination and Excavated Material Management.

5.9 Instrumentation and Monitoring

- (a) DB Co shall develop and submit plans and procedures to the City for instrumentation and monitoring at least three months prior to commencement of monitoring of the Highway Works.
- (b) DB Co shall determine and install geotechnical instrumentation in the key and critical areas described as follows where special attention or continued monitoring is required before, during, and after Highway Works construction to check the safety of the work; assess the effects of construction on the surrounding ground and existing facilities including Structure abutments and footings; identify likely causes and distribution of ground movements; evaluate design assumptions and refine estimates of future performance; and check compliance with performance specifications. As needed, the monitoring shall address, frequency and duration of monitoring for construction-induced noise and vibration, groundwater elevation and pressure, loads and strains in the ground, on adjacent facilities and structures, and vertical and horizontal movements including displacement and strains for fill embankments and Ground Movements adjacent to deep excavations, temporary retaining structures (including piles, struts and tiebacks), permanent retaining structures, Utilities Infrastructure, hydro towers, Roadways and pathways, existing buildings, Bridges or other Structures that shall remain in service on temporary and permanent works. DB Co shall be responsible for designing and implementing the program, obtaining baseline survey data, organizing, evaluating and preserving the data, submitting it to the City for information, and undertaking corrective actions if and as needed.
- (c) Design of the geotechnical instrumentation and monitoring program shall be under the direct supervision of a Professional Engineer.
- (d) Staff for the design and implementation of the geotechnical instrumentation and monitoring program shall include personnel who have verifiable design and construction experience with similar programs.
- (e) DB Co shall decommission and dispose of all geotechnical, hydrogeological, and/or geo-environmental instrumentation installed by DB Co or MTO for the purposes of this Project, at the end of construction or after the instrumentation is no longer required for Project activities. DB Co shall decommission and dispose of any existing geotechnical, hydrogeological, and/or geo-environmental instrumentation, that is documented in the Background Information or that may not be documented and otherwise encountered by DB Co during construction, used for monitoring/not used for monitoring, on, in, or under the Lands. DB Co shall obtain acceptance from the City prior to decommissioning and disposal of any existing geotechnical, hydrogeological, and/or geo-environmental

instrumentation, that is documented in the Background Information or that may not be documented and otherwise encountered by DB Co during construction, used for monitoring/not used for monitoring, on, in, or under the temporary Lands as defined in Schedule 20 - Lands. DB Co shall provide decommissioning records to the City.

- (f) GIMP: DB Co shall prepare a comprehensive GIMP and submit to the City for review in accordance with Schedule 10 - Review Procedure. The GIMP shall be applicable for the duration of construction, testing, and Commissioning. As a minimum, the GIMP shall include the following:
- (i) A DMP for monitoring the impacts on Existing Adjacent Structures including in areas where the underlying soil is clay, dewatering of the excavation could lead to impacts on Existing Adjacent Structures, and excavations are across existing Roadway Structures. The DMP shall be a GIS-based and web-based system using a secure internet connection capable of receiving and visualizing near real time monitoring data. The DMP shall be used to create and send alarm reports/notifications and create monitoring reports including batch reports if Response Levels defined by DB Co and indicated in Schedule 15-2, Part 2, Article 9 – Protection of Existing Adjacent Structures, are exceeded. DB Co shall provide access credentials to the City for simultaneous users for the DMP. DB Co shall set up the DMP such that the City is immediately notified of exceedances.
 - (ii) For Existing Adjacent Structures located in areas where underlying clay soil is not present, dewatering for the excavation would not impact Existing Adjacent Structures, and excavations are not across existing Roadway Structures, conventional survey monitoring using benchmarks may be used..
 - (iii) All instruments including existing instruments turned over to DB Co by the City or MTO and instruments to be installed by DB Co.
 - (iv) Typical installation details and location of additional instruments.
 - (v) Schedule for installation, taking baseline readings, frequency and duration of monitoring for each phase of construction.
 - (vi) Construction-induced noise and vibration control and monitoring plan.
 - (vii) The plan and schedule for decommissioning and disposing of all additional instruments installed by DB Co as well as all existing instruments turned over to DB Co. DB Co shall notify the City of the intention to decommission instruments.
 - (viii) All Response Levels (refer to Part 2, Article 9 – Protection of Existing Adjacent Structures), as specified and defined by DB Co.
 - (ix) A Response Action Plan, which shall consist of methods and means to respond to various Review and Alert Level scenarios as outlined in Part 2, Article 9 – Protection of Existing Adjacent Structures, based on types of geotechnical instruments that indicate Review and Alert Levels. DB Co shall inform the City of

subsequent response actions in accordance with the Response Action Plan. At a minimum, a Response Action Plan shall include the following:

- A. Names, telephone numbers, and locations of persons responsible for implementation of contingency plans.
 - B. Materials and equipment required to implement contingency plans.
 - C. Location on Site of all required materials and equipment to implement contingency plans.
 - D. Step-by-step procedure for performing works involved in implementation of the contingency plans.
 - E. Specific actions related to the Alert Level values for all instruments, including means of reducing or eliminating movements and rates of movements.
 - F. Inspection of affected facilities, structures and utilities and performance of acceptable corrective and restorative measures.
 - G. Clear identification of objectives of contingency plans and methods to measure plan success.
- (x) All measures and specific instrumentation and monitoring requirements to protect Existing Adjacent Structures in accordance with Part 2, Article 9 – Protection of Existing Adjacent Structures.
- (xi) All measures and specific instrumentation and monitoring requirements for protecting heritage buildings, if any, identified in the Project Assessment Study Environmental Project Report and relevant updated revisions which are within the Project ZOI as defined in Part 2, Article 9 – Protection of Existing Adjacent Structures.
- (xii) For all Underground Structures, DB Co shall supply, install, maintain, and monitor for the duration of construction, testing, and Commissioning a system of instruments that will indicate the pressures and deformations imparted to the permanent Structures. The instrumentation shall include:
- A. Two arrays of pressure cells with one array on each long side of the Station. Each array shall consist of three cells installed at three different elevations (top, middle and bottom levels along the vertical side walls and away from end walls). Pressure cells shall be installed behind the water proofing system on the overburden side, including soil and rock, prior to start of concrete pouring for the walls.
 - B. Install a minimum of three equally spaced surface settlement monitoring points on both sides of the excavation along a line perpendicular to the

excavation, with the first monitoring point located at the edge of the excavation, the second monitoring point located at the farthest point no further away than the limits of the Project ZOI outlined in Part 2, Article 9 – Protection of Existing Adjacent Structures, and the third monitoring point located equally between the first and second monitoring points. These lines of monitoring points shall be spaced a maximum of every 30 m running parallel to the excavation.

- C. Install In-Place-Inclinometers on both sides of the excavation spaced a maximum of 50 m running parallel to the alignment. Inclinometers to be placed a maximum allowable distance of 1 m from the edge of excavation.
 - D. Install piezometers on both sides of the excavation spaced a maximum of every 50 m. DB Co to locate and monitor piezometers to ensure the groundwater drawdown restrictions of Clause 5.10 of this Part 9, Part B are followed.
 - E. All the above instruments shall be connected to permanent data loggers.
 - F. All of the above instruments shall have a minimum daily reading frequency when located less than or equal to 30 m from the edge of excavation and a weekly reading frequency (a minimum of once per week) when located greater than 30 m from the edge of excavation.
 - G. DB Co shall submit an updated monitoring report in electronic format, in accordance with requirements of Schedule 10 – Review Procedure every week.
- (g) Stable benchmarks shall be established along the length of the alignment. Coordinates and elevations shall be established at least three months prior to monitoring with repeat baseline survey readings taken during this time. The number of reference benchmarks established shall be sufficient to provide adequate sight distances to permit monitoring as specified in this Article 5. Benchmark coordinates and elevations shall thereafter be resurveyed annually. Data shall be submitted to the City for information.
- (h) Measurements of differential settlements between abutments and abutment approaches must be taken at the end of years 1 and 2 of the Highway Warranty Period. Measurement data shall be provided to the City.
- (i) Immediately following paving, elevations at the centreline of each lane shall be measured at all Bridge abutments and at distances of 20 m, 50 m, 75 m, and 100 m from the abutments.
- (j) DB Co shall validate and demonstrate the effectiveness of ground improvement when it is carried out to mitigate seismic Hazards, by appropriate insitu and laboratory testing.

- (k) DB Co shall carry out settlement monitoring for the drainage crossings installed by subsurface methods and shall satisfy the requirements of the Tunneling Guidelines including adherence to Review and Alert Level protocol.
- (l) Provide a demonstration of the features of the instrumentation DMP to the City prior to the start of construction and afterwards as modifications are made to the website.
- (m) Meet with the City as needed to discuss instrumentation levels and necessary actions to protect EAS.
- (n) Replace damaged or malfunctioning instrumentation. The City may order a temporary work stoppage in areas where there is insufficient working instruments to ensure the protection of EAS.
- (o) Accommodate the City in inspecting the installation of geotechnical instrumentation, related hardware, and in verifying the proper functioning of the instrumentation monitoring system including, but not limited to the collection, transmission, storage, backup, and reduction of data.
- (p) DB Co shall indicate locations where, due to contractual interfaces or changes in the extent of the Project ZOI outlined in Part 2, Article 9 – Protection of Existing Adjacent Structures, re-baselining of instrumentation readings shall be conducted.

5.10 Groundwater Control – Dewatering/Unwatering

- (a) For the purposes of this Clause 5.10, unwatering is defined as the removal of water that has accumulated in an excavation and is an element of groundwater control. Groundwater control is defined as dewatering/unwatering and/or aquifer depressurization.
- (b) DB Co shall develop and submit plans and procedures for groundwater control (including effluent discharge), in accordance with Schedule 10 – Review Procedure. The plans and procedure shall include, but not be limited to the following items:
 - (i) Detailed shop drawings of the entire dewatering system(s) that bear the seal and signature of a Professional Engineer, and include, but not be limited to, details, and calculations of proposed type of dewatering system(s), showing arrangement, location, and depths of components of system including details of screens and filter media, complete description of equipment and materials to be used, procedure to be followed, standby equipment, standby power supply, and proposed location(s) of points of discharge of water and abandonment of dewatering system(s), a description of any permits and approvals that pertain to the groundwater control activities;
 - (ii) A discharge plan that includes: discharge location(s) including methods; procedures and equipment to convey water to discharge locations; location and dimensions of treatment equipment; procedures for water testing; water quality laboratory analyses procedures, test results or analyses, and water treatment

methods; location and construction details of monitoring observation wells, and a description of any permits and approvals that pertain to the discharge activities.

- (c) DB Co shall apply for Permits, Licences and Approvals, including PTTW and/or Environmental Activity and Sector Registry, and discharge permits (e.g., Municipal, conservation authority and/or ECA).
- (d) Design, construction, and operation of groundwater control measures shall not induce detrimental short- and/or long-term movements of surrounding Structures, infrastructure and ground surface. Evaluation of detrimental movements shall follow provisions included in Part 2, Article 9 – Protection of Existing Adjacent Structures.
- (e) DB Co shall develop plans and procedures for groundwater control (including effluent discharge), establish monitoring requirements, and perform a hydrogeological impact assessment and associated risk assessment and submit to the City. This process shall consider all required project Permits and Approvals. DB Co shall ensure that any groundwater control, effluent discharge, and subsequent effects during construction or during the Design Life shall have no adverse impact on the following features within the Project ZOI: properties, adjacent Structures, infrastructure, active groundwater supply wells, and environmental features. Specifically, the following potential impacts shall be managed/mitigated such that they are not/do not become adverse:
 - (i) Groundwater drawdown effects including impacts on the quantity and quality of groundwater available for groundwater dependent ecosystems and existing groundwater users;
 - (ii) Groundwater drawdown effects which may cause settlement of existing Structures or Utilities within the Project ZOI as required in Part 2, Article 9 – Protection of Existing Adjacent Structures; and,
 - (iii) Appropriate quantity and quality of dewatering effluent with respect to the receiver (e.g., municipal sewer, natural environment, off-site receiver, etc.), in accordance with all applicable Project permits and approvals.
- (f) Any activity within RVCA regulated area shall be performed in agreement with the applicable requirements and regulations and will require RVCA review and approval.
- (g) DB Co shall design, install, operate, monitor, maintain, and decommission (as required) the project-specific groundwater control systems, as necessary to meet Project requirements and shall continue proper discharging of effluent according to the relevant City's Sewers Use By-law, as well as any other applicable regulatory (e.g., conservation authority and MOECC) approvals without any interruption or negative impact on existing Structures. It shall be the sole responsibility of DB Co to verify the condition of the groundwater control systems and operate them as required.
- (h) DB Co shall submit, on a quarterly basis, the data obtained from all instrumentation utilized for monitoring including hydrogeological and geotechnical instrumentation to the City for review in accordance with Schedule 10 – Review Procedure.

- (i) DB Co shall conduct all monitoring required by the obtained permits and approvals (including daily pumping volumes).
- (j) DB Co shall submit the monitoring results to the applicable agencies as stated in the obtained permits and approvals.
- (k) DB Co shall respond to/address any complaints received that are potentially related to groundwater control activities.
- (l) Dewatering shall be carried out in accordance with OPSS PROV 517 and SSP 517F01.
- (m) Extraction of groundwater for the purposes of construction dewatering and/or depressurization is subject to the following provincial regulatory requirements:
 - (i) Environmental Protection Act (R.S.O. 1990) and Ontario Regulation 63/16 thereunder that requires registration on the Environmental Activity and Sector Registry (EASR) for extracting greater than a total of 50,000 litres per day but no more than 400,000 litres per day (cumulative from all sumps, wells, well points, educators, etc.).
 - (ii) Ontario Water Resources Act (R.S.O. 1990) and the Water Taking regulation thereunder that requires a Permit to Take Water (PTTW), Category 3, for extracting more than a total of 400,000 litres per day (cumulative from all sumps, wells, well points, educators, etc.).
 - (iii) DB Co shall obtain any required PTTW or complete EASR registration as applicable, for construction dewatering or groundwater pressure reduction activities. Refer to Part B, Clause 7.4 of this Part 9.
- (n) Discharge of water extracted during dewatering and/or groundwater pressure control activities shall be completed by DB Co in compliance with all applicable federal, provincial, and municipal requirements for water quality and flow rates. DB Co shall obtain any required Permits or Authorizations, as applicable, for the discharge of water extracted for construction dewatering and/or groundwater pressure reduction activities.

5.11 Submission Requirements

- (a) DB Co shall prepare a comprehensive Geotechnical Report (the “Geotechnical Report”) for Highway Works that covers existing geotechnical information and known site conditions, new investigations performed for the Project, geotechnical engineering analysis, geotechnical design assumptions and design parameters (and the basis for these) and geotechnical design recommendations for all Structures. The report shall be submitted in accordance with Schedule 10 – Review Procedure, and shall include, as a minimum, the following items:
 - (i) A summary of any additional work and subsurface investigations that have been completed by DB Co, including drafted drill summary logs in a format acceptable to the City;

- (ii) Final recommendations for Foundation systems, allowable loads and estimates of total and differential settlements at 2, 5, 10, 20, 40 and 75 years following construction;
- (iii) Geotechnical design recommendations for retaining structures;
- (iv) Design of trenchless crossings;
- (v) Design of high fill embankments, including fill stages and consolidation period between each fill stage;
- (vi) Design details to time-rate-of-settlement control measures such as prefabricated vertical drains, lightweight fills, and preload/surcharge;
- (vii) Estimates of total and differential settlement of embankments and roadways at 2, 5, 10, 20, 40 and 75 years following construction;
- (viii) A settlement monitoring and instrumentation plan along with details of instrumentation to be installed, monitoring requirements, and instrumentation reading threshold values at which construction is halted or resumed;
- (ix) Requirements for ground improvement measures necessary to meet the static and seismic performance requirements for Foundations, cut and fill slopes, embankments and retaining structures;
- (x) An assessment of the stability of approach embankments, road embankments, cut slopes and fill slopes under static and seismic loading conditions and the ability of these to meet the seismic performance requirements;
- (xi) Reduced size (11" x 17") drawings showing the road alignment in plan and profile with drill hole locations shown on the plan and simplified summary logs shown on the profile (design notes are to be shown along the bottom of the drawings);
- (xii) A final geotechnical progress report for the Structures with reduced size (11" x 17") drawings showing the general arrangements for Structures, including Bridge, pedestrian bridge, Culvert, Retaining Wall, and Overhead Sign Support Structure in plan and profile, with drill locations shown in plan and simplified summary logs shown in profile (with Overhead Sign Support exempt from the simplified summary log requirement); and
- (xiii) Geotechnical design recommendations for stormwater management ponds, including identification of subsurface conditions, borehole data, and inclusion of stratigraphic information.

ARTICLE 6 ELECTRICAL, SIGNALS AND LIGHTING DESIGN CRITERIA

6.1 Order of Precedence

- (a) DB Co's design for all electrical, lighting, and Traffic Signal Systems shall be in accordance with the criteria contained in this Article 6 and the following Reference Documents, and if there is any conflict between criteria contained in this Article 6 and any of the Reference Documents, the following shall apply in descending order of precedence:
- (i) The criteria contained in this Article 6;
 - (ii) MTO Special Provisions;
 - (iii) The applicable MTO Directives, MTO Policy Memorandums, and MTO Design Bulletins;
 - (iv) OPSS;
 - (v) MTO Contract Design, Estimating and Documentation (CDED) Manual;
 - (vi) Ontario Electrical Safety Code, Electrical Safety Authority;
 - (vii) MTO – Electrical Engineering Bulletin;
 - (viii) Electrical Engineering Manual, MTO;
 - (ix) Roundabout Lighting Policy;
 - (x) Illumination Warrant Policies PLNG –B-05 & PLNG – B- 06;
 - (xi) MTO accepted luminaire Photometric list;
 - (xii) Policy for spill light beyond MTO Right-of-way and for Light Trespass onto the MTO Right-of-way, (September 2007);
 - (xiii) MTO Electrical Engineering Bulletin 2018-01;
 - (xiv) AODA and Ontario Regulation 413/12;
 - (xv) Ontario Traffic Manual, MTO;
 - (xvi) Traffic Signal Bulletin 2009-01;
 - (xvii) Roadside Safety Manual, MTO;
 - (xviii) MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, June 2017;

- (xix) Geometric Design Guide for Canadian Roads (TAC);
- (xx) MTO Standard Drawing;
- (xxi) OPSD;
- (xxii) DSM;
- (xxiii) NCHRP Report 498: Illumination Guidelines For Highway Nighttime Work;
and,
- (xxiv) The applicable standards of the City of Ottawa.

6.2 General Requirements

- (a) There are existing chambers such as maintenance holes and handholes within the Highway Works limits that may be utilized as part of Highway Works. DB Co is advised that some of the chambers may require cleaning prior to using/entering the chambers. Cleaning shall include, but not be limited to, pumping water, mud and sludge that may have accumulated within and legally disposing of removed materials.
- (b) Maintenance holes and handholes metallic components shall be bonded and grounded per item specific requirements. There are existing chambers utilized by Highway Works, and some such chambers may require bonding connectors accordingly. Subsection 609.07.07 of OPSS 609 is amended by the addition of the following:
 - (i) Ground wires passing through new or existing electrical chambers, the ground wire shall be connected to the chamber's ground lugs (attached to ladder and/or frame and cover) with an appropriate ground wire connector. Where chambers found without bonded lugs, issue shall be raised with the City. At all locations where a new or existing ground electrode is present in the electrical chamber and/or enclosure, the ground wire shall be connected to the ground electrode with an appropriate ground wire connector.

6.3 Power Distribution

- (a) When the work in this Article 6 requires communication and Coordination with Utility Companies, the requirements of Article 4 of Part A of this Schedule 15-2, Part 9 and Section 11.30 of the Project Agreement shall be followed.
- (b) The power distribution system shall provide power to the Highway Works including illumination, ATMS, traffic signal control systems, and all other systems and components that require electrical power.
- (c) DB Co shall undertake all Coordination with power Utility Companies for all required servicing and shall provide a list of all electrical loads to the power Utility Companies, as required. DB Co shall coordinate preparation and submittal of service applications on behalf of the City.

- (d) DB Co shall provide power installations and connections to all components of the Highway Works that require electrical power and shall be metered.
- (e) DB Co shall provide an Arc Flash Study Report (the “Arc Flash Study Report”), including a coordination study and short circuit study, and warning labels for arc flash Hazard for all power supply equipment.

6.4 Lighting

- (a) All permanent lighting poles shall be base mounted with underground ducts and wiring.
- (b) Lighting shall meet the MTO Context Sensitive Design requirements as detailed in Appendix F of this Part 9.
- (c) All permanent Roadway lighting Design Criteria shall meet the appropriate standard for the Roadway classification and shall comply with MTO Directives and MTO Standards. DB Co shall use LED luminaires for all high mast, conventional, and underpass illumination design. Luminaires shall be selected from the most current MTO Accepted Photometric List. Rotatable high mast luminaires shall be used for all high mast illumination design. DB Co shall be responsible to verify product availability. DB Co shall use a manufacturer that provides IES files with independent lab tests.
- (d) DB Co shall provide a Preliminary Lighting Design (the “Preliminary Lighting Design”) consisting of:
 - (i) Assessment of existing Highway Lighting System within Highway Works limits.
- (e) DB Co shall provide, at a minimum, the following illumination:
 - (i) Upgrade of the existing illumination (not requiring removal) to current standard LED luminaires and reinstate illumination impacted by Highway Works:
 - A. Greenbank Road/Pinecrest Road interchange and impacted ramps;
 - B. New power supply at Greenbank Road/Pinecrest Road to feed interchange (if required);
 - (ii) Ensure adequate illumination for new Holly Acres N/S-E on-ramp.
- (f) DB Co shall provide municipal lighting to City of Ottawa standards and shall coordinate and liaise design and installation with the City in accordance with Schedule 15-2, Part 2, Clause 6.16, on the following Crossing Roads. In each case, DB Co’s lighting design shall include provisions for lighting on the Underpass Structures (i.e. pole bases on the Deck and associated ductwork).
 - (i) Pinecrest Road/Greenbank Road;

- (g) DB Co shall determine the need for and provide any additional illumination within the Highway Works, interchanges, Crossing Roads and adjacent Highways including Underpasses.
- (h) All permanent Roadway illumination Design Criteria shall meet the appropriate standard for the Roadway classification and shall comply with MTO Directives. All lighting calculations shall be carried out utilizing MTO approved software. Illumination Design Criteria shall be met within the Highway Works limits.
- (i) Where the Highway lighting system is specified to be a full High Mast Lighting system, in-fill conventional lighting shall not be permitted.
- (j) The lighting design shall accommodate more than one high mast luminaire manufacturer (i.e. the selection of high mast pole placements shall accommodate alternate luminaires, both of which must satisfy the MTO's lighting criteria).
- (k) DB Co shall replace high mast luminaire support components to install additional luminaires. Mixing of new and old luminaires on a high mast pole is not permitted. Modification of existing high mast luminaire support components is not permitted. All high mast poles that are taken down shall have their raising and lowering devices and luminaire support assemblies replaced.
- (l) DB Co shall not modify existing high mast pole footings.
- (m) DB Co shall relocate or replace associated underground lighting power cables and wiring, conduit, and maintenance holes. Permanent underground cable splices are not permitted. Disruptions to electrical cables will require the installation of new continuous cables.
- (n) All high mast poles that are taken down shall be inspected to ensure that their condition is suitable for reinstallation, if damaged or found to be not suitable for reinstallation, new high mast poles shall be installed.
- (o) Only external raising/lowering drives shall be used for high mast poles. A minimum of two drills shall be provided for each type of raising/lowering device. Granular maintenance access shall be provided for each high mast pole.
- (p) DB Co shall provide a minimum of one spare conduit for each under pavement crossing. Hand holes shall be minimum 600 x 600 mm.
- (q) DB Co shall coordinate all under pavement crossing operations with the installation of Noise Barriers, retaining walls and Barrier walls adjacent to the auguring pits for the subsurface installation of ducts and steel encasements.
- (r) Electrical ducts behind concrete barrier on the outside Shoulders shall be offset a minimum of 1.2 m.
- (s) The following total light loss factor (LLF) shall be used when completing lighting calculations: Total LLF of 0.70 for LED conventional, total LLF of 0.74 for LED high

mast, and total LLF of 0.55 for LED underpass. When completing lighting calculations for trespass levels, total LLF of 1.0 shall be used.

6.5 Temporary Lighting during Construction

- (a) All existing lighting shall be maintained in operational order during performance of the Highway Works until such time as replacement temporary or permanent lighting is energized.
- (b) DB Co shall review the need for temporary lighting for each construction stage and provide lighting where required.
- (c) Temporary illumination shall be provided for the Roads to accommodate traffic Detour Routes and Diversions in accordance with the OPSS 106 and Electrical Engineering Manual (MTO).
- (d) All temporary Roadway illumination Design Criteria shall meet the appropriate standard for the Roadway classification and shall comply with MTO Directives. All lighting calculations shall be carried out utilizing MTO approved software. Illumination Design Criteria shall be met within the Highway Works limits.

6.6 Traffic Signals

- (a) Traffic signals shall be constructed at the following locations:
 - (i) Holly Acres Road at Highway 417 N/S-E and N/S-W on-ramps;
 - (ii) Richmond Road at Bayshore Drive/Highway 417 E-N/S ramp (as required);
 - (iii) Pinecrest Road at Highway 417 north ramp terminal;
 - (iv) Greenbank Road/Iris Street at Highway 417 south ramp terminal;
 - (v) Holly Acres Road at Highway 417 N/S-W on-ramp;
- (b) General Requirements
 - (i) DB Co shall coordinate the design, approvals and construction requirements for temporary and permanent traffic signals with the City.
 - (ii) In accordance with the requirements of this Schedule 15-2, Part 9, DB Co shall be responsible for all aspects of the design of the signalized intersections listed in this Clause 6.6, with the following exception:
 - A. Upon review and approval of DB Co's geometric design of each signalized intersection, the City shall design traffic signals (including below and above ground plant) in accordance with AODA and Ontario Regulation 413/12 and applicable MTO guidelines. Where the location

selected for a traffic signal pole is not suitable for a pole foundation as per City of Ottawa Standard Detail Drawings (e.g., where the pole is designed to go on top of pre-existing utilities), DB Co shall be responsible for the design of the non-standard foundation, in addition to the construction requirement.

- (iii) For temporary and permanent traffic signals, DB Co shall prepare PHM-125 drawings, and shall coordinate review and approval by MTO prior to commencing construction.
- (iv) Interconnection shall be provided only where the signal is part of an existing municipal Interconnection network.
- (v) DB Co shall be responsible for providing communication to the traffic signals in coordination with the City.
- (vi) DB Co shall be responsible for liaising with the City and providing emergency pre-emption upon consultation with these municipalities and emergency services.
- (vii) Following the receipt of completed traffic signal designs from the City, DB Co shall contact the City's designated traffic control signal contact person at least 30 calendar days in advance to arrange for a mutually acceptable date and time to have City forces available to perform the installation, relocation, modification, and connection of the traffic control signal.
- (viii) DB Co shall complete the related civil Works at least 14 calendar days prior to the date when City forces are available in order for appropriate inspections to occur. Prior to the crew arriving on Site, DB Co shall provide adequate space and time for the Works to be completed.
- (ix) The City or a City Party shall have an inspection role during the construction and activation of the permanent and temporary traffic signals for both the above and below ground work. The City shall also be present for all traffic signal activations and deactivations of any traffic signal system, permanent or temporary within the Highway Works limits.
- (x) Access to the Traffic Signal controller cabinets:
 - A. The traffic signal controller cabinets will be locked at all times by the City. DB Co shall maintain access at all times to the traffic signal controller cabinet for all work inside the cabinet including for routine maintenance and/or emergency repair for the City of Ottawa Traffic Signal Department.
 - B. Should DB Co require access to the traffic signal controller cabinet, they shall request access from the City Representative.

- C. DB Co shall have both IMSA Traffic Signal Level II (Bench & Field) & Traffic Signal Level III (Bench & Field) certification in order to perform work inside of the traffic signal controller cabinet.
 - D. A representative from the City of Ottawa Traffic Signal Department shall be allowed to inspect any work being done inside the traffic signal controller cabinet including for routine maintenance and/or emergency repair.
- (c) MTO Permanent Traffic Signals
- (i) For permanent new traffic and transit signal facilities, or new permanent configurations at existing signalized intersections, the City shall supply and install all above ground traffic signal equipment as required by the governing road authority including but not limited to controller, poles, pedestrian and traffic signal heads with push buttons, audible displays, etc. The City shall supply, install and make all required terminations for the traffic signal wiring. The City shall provide all equipment and labour associated with the installation of permanent above-ground traffic signal infrastructure.
 - (ii) DB Co shall coordinate with the City the design of electrical power feeds for all alterations to existing traffic signals, and new traffic signals; the cost of obtaining new electrical power feeds shall be a City responsibility.
 - (iii) DB Co shall construct all permanent underground traffic infrastructure, including the supply and construction of concrete encased ducts, direct buried ducts, pole foundations, maintenance holes, maintenance hole frames & covers, vehicle loop detection and concrete pads.
 - (iv) All traffic signal poles shall be base mounted poles with underground ducts and wiring.
 - (v) The traffic signal controller unit shall be provided by the City.
 - (vi) The City shall design and implement signal timing plans to accommodate traffic at Highway Substantial Completion.
 - (vii) DB Co shall be responsible for obtaining all traffic data that may be required for analysis and signal timing design purposes. Traffic data shall be no older than two years.
 - (viii) All traffic signal controllers shall be equipped with uninterruptable power supplies and emergency pre-emption, based on municipal standard.
 - (ix) DB Co shall coordinate type of Detection with the City Representative.
- (d) Municipal Traffic Signals

- (i) DB Co shall be responsible for liaising and Coordinating with the City of Ottawa with regard to all modifications that may be required at municipal traffic signals both during and after Highway Substantial Completion of the Highway Works. Proposed modifications shall be supported by traffic engineering analysis.
- (e) MTO PHM-125 Legal Drawings
 - (i) DB Co shall prepare and submit temporary PHM-125 legal drawings to the City Representative in accordance with Schedule 10 – Review Procedure and to MTO for review and approval following return of the Construction Document Submittal, and a minimum of 15 Business Days prior to implementation of each stage of construction where physical changes occur (i.e., geometric changes, signals hardware modification, etc.).
 - (ii) DB Co shall prepare and submit permanent PHM-125 legal drawings to the City Representative in accordance with Schedule 10 – Review Procedure and to MTO for review and approval following return of the Construction Document Submittal, and a minimum of 90 Business Days prior to implementation.
 - (iii) All permanent and temporary MTO PHM-125 legal drawings on an MTO PHM-125 drawing template for the permanent and temporary traffic control signals must be approved by the MTO prior to the construction of the signal or implementation of physical changes.
 - (iv) All permanent and temporary PHM-125 drawings shall identify all Regulatory Signs that impact operations.
 - (v) DB Co shall use and submit the current MTO PHM-125 drawing check list.
 - (vi) DB Co shall obtain the existing PHM-125 drawings from the City and shall update them based on the final conditions.
- (f) MTO Temporary Traffic Signals during Construction
 - (i) For temporary traffic and transit signals, or temporary modifications to existing signalized intersections, the City shall supply and install all above ground traffic signal equipment as required by the governing road authority including but not limited to controller, poles (with the exception of wood poles), pedestrian and traffic signal heads with push buttons, audible signals, etc. The City shall also supply and install and make all required terminations for the traffic signal wiring. The City shall provide all equipment and labour associated with the installation of temporary above-ground traffic signal infrastructure.
 - (ii) DB Co shall coordinate with the City the design of electrical power feeds for all temporary traffic signals or temporary modifications to existing signalized intersections; the cost of obtaining new electrical power feeds shall be a City responsibility.

- (iii) DB Co shall construct all temporary underground traffic infrastructure, including the supply and construction of concrete encase ducts, direct buried ducts, pole foundations, maintenance holes, maintenance hole frames & covers, vehicle loop detection and concrete pads. DB Co shall undertake all above ground infrastructure Work, including but not limited to installation, removals and reinstatement of wood poles, double span and anchors, along with any required underground civil Works including conduit, foundations, manholes/hand holes, frames & covers etc., as required to accommodate the staged construction of Work, with the exception of traffic signal equipment as described above, which shall remain the responsibility of the City.
 - (iv) All existing traffic signals shall be maintained in operational order during performance of the Highway Works until such time as replacement temporary or permanent traffic signal is energized.
 - (v) DB Co shall determine the need for temporary traffic signals to facilitate construction staging and provide where required including auxiliary heads, Advance Warning Signing, advance Flasher Beacons and down lights.
 - (vi) The City shall design and implement temporary signal timings during the Highway Works.
 - (vii) Integration with existing permanent traffic signals and temporary traffic signals is to be provided where needed.
 - (viii) The City shall operate and maintain the temporary traffic signals.
 - (ix) The City shall design and construct the traffic signal controllers.
 - (x) Where a temporary signal infrastructure requires the use of wood poles and/or span wire, the City shall be responsible for the design of signal head placement only. DB Co shall design the location of the wood poles, guy wires, and span wires based on the City’s signal head placement.
- (g) Notification Requirements and Timelines
- (i) DB Co shall provide advanced notification in relation to traffic signal work to the City, in accordance with Table 6.5a. In any instances where the timelines of Table 6.5a may conflict with review periods specified elsewhere within this Schedule 15-2, Part 9, the longer duration shall apply.

Table 6.5a – Traffic Signal Notification Requirements					
Item	Description	Notification (Calendar Days)	Prior to	Information to be supplied to City	Information to be supplied to DB Co

1	Design	30	Desired receipt of signal design	1:250 CADD for the intersection, including pavement markings on all approaches	City provides traffic signal design within 30 calendar days
2	Commencement of civil works (prerequisite – signal design completed)	30	construction of civil works	Date when works are to begin, schedule of work	None
3	Electrical work involving the City (prerequisite – signal design completed)	30	construction of civil works	Meeting date regarding electrical works, schedule of work	Contact names and telephone numbers of relevant staff
4	Scheduling of installation date by City forces (prerequisite – signal design completed)	30	Desired signal installation date	Desired installation date by City forces	Scheduled date for installation to be provided to DB Co within eight calendar days of the notification. Scheduled date shall be within 10 calendar days of DB Co's request
5	City Inspection of civil work completed by DB Co (pre-requisite – signal installation date)	14	Scheduled signal installation date	Confirmation of work being completed	Confirmation that the work was completed to City satisfaction, within 7 calendar days of DB Co's notification

	scheduled)				that work was completed
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6.7 Counting Stations and Loops

(a) DB Co shall identify the actual locations of Counting Stations and Loops (traffic data collection stations) along the Highway 417 and ramps. DB Co shall provide Counting Station and Loops at the locations identified below.

(i) Traffic count Counting Stations and Loops:

- A. Greenbank W-N/S ramp (if existing plant is impacted by DB Co design);
- B. Pinecrest N-W ramp;
- C. Pinecrest E-N/S ramp;
- D. Holly Acres N/S-W ramp;
- E. Moodie S-W ramp;
- F. Moodie N-W ramp; and
- G. Pinecrest S-W ramp (if existing plant is impacted by DB Co design).

(ii) Permanent data collection Counting Stations and Loops (approx. locations):

(b) Counting Stations and Loops shall be installed within the milled surface or binder course of the Roadway.

6.8 Embedded Work in Structure

(a) DB Co shall provide embedded work in new and rehabilitated structures.

(b) DB Co shall provide new conventional pole bases throughout the core Continuous Illuminations.

ARTICLE 7 DRAINAGE AND EROSION CONTROL DESIGN CRITERIA

7.1 Order of Precedence

- (a) DB Co's Drainage design and construction shall be in accordance with the criteria contained in this Article 7 and the following Reference Documents and, if there is any conflict between the criteria contained in this Article 7 and any of the Reference Documents, the following shall apply in descending order of precedence:
- (i) The criteria contained in this Article 7;
 - (ii) Federal and Provincial Codes, Acts, and Regulations;
 - A. Fisheries Act (Canada)
 - B. CHBDC
 - C. MTO Special Provisions
 - D. MTO Standard Drawings
 - E. MTO Drainage Directives
 - F. Ontario Water Resources Act
 - G. Drainage Act (Ontario)
 - H. Ontario Building Code
 - (iii) MTO Publications;
 - A. The applicable MTO Directives, MTO Policy Memorandums, and MTO Design Bulletins
 - B. MTO Highway Drainage Design Standards
 - C. MTO Drainage Management Manual
 - D. MTO Special Provisions
 - E. MTO Standard Drawings
 - F. MTO Drainage Directives
 - G. MTO Intensity-Duration-Frequency Curves
 - H. MTO Contract Design, Estimating and Documentation (CDED) Manual

- I. MTO Gravity Pipe Design Guidelines for Circular Culverts and Storm Sewers
- J. MTO Environmental Guide for Erosion and Sediment Control During Construction of Highway Projects
- K. MTO Evaluation of Drainage Management Software
- L. Guide for Preparing Hydrology Reports for Water Crossings (MTO)
- (iv) OPS;
- (v) MOECC Publications;
 - A. MOECC Stormwater Management Planning and Design Manual
 - B. MOECC Stormwater Pollution Prevention Handbook
 - C. Environmental Activity and Sector Registry information <https://www.ontario.ca/page/environmental-activity-and-sector-registry>
 - D. Permit To Take Water Manual
- (vi) Conservation Authority Publications;
 - A. Conservation Authority Subwatersheds Studies and Criteria (RVCA)
 - B. RVCA: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (Ontario Regulation 174/06)
 - C. TRCA/CVC: Low Impact Development Stormwater Management Planning and Design Guideline
 - D. CVC: Low Impact Development Construction Guide
- (vii) City of Ottawa Sewer Design Guidelines, including Technical Bulletins; and,
- (viii) Environment Canada Stormwater Best Management Practice Handbook: Construction.

7.2 General Criteria

- (a) DB Co shall develop and implement a drainage strategy in accordance with the Reference Documents listed above, in consultation with applicable Stakeholders, and prepare a Drainage and Stormwater Management Report (the “Drainage and Stormwater Management Report”) to comply with the criteria and design parameters as outlined in this Project Agreement.

- (b) The Drainage and Stormwater Management Report shall present the drainage and stormwater management strategy taking into consideration all upstream and downstream impacts. The report shall describe the required measures to meet City of Ottawa, MOECC, and RVCA requirements for the management of stormwater runoff. The report shall identify hydrologic reference points downstream of Highway 417, and demonstrate how post development discharge shall be controlled to pre-development (existing) peak flow rates.
- (c) The Drainage and Stormwater Management Report shall be submitted within 120 days following Financial Close in accordance with Schedule 10 – Review Procedure.
- (d) DB Co shall secure all permits and approvals, where necessary for the implementation of the Drainage and SWM systems for the Project, and shall be responsible for preparing and submitting all necessary drawings and supporting documentation associated with obtaining those permits and approvals in accordance with Schedule 10 – Review Procedure.
- (e) DB Co shall be responsible for all costs associated with obtaining the required permits and approvals, and those associated with providing the Drainage and SWM systems.
- (f) DB Co shall obtain sewer discharge permits and approvals in accordance with the City, MOECC, and RVCA requirements. Sewer discharge permits and approvals shall be obtained a minimum of two weeks prior to the anticipated discharge date.
- (g) DB Co shall obtain all PTTWs and/or Environmental Activity and Sector Registry (EASR) registrations, in accordance with current MOECC requirements, for the Works.
- (h) All drainage from new or widened ramps and roadways shall be captured and managed within the Highway 417 or City ROW, as applicable, with SWMPs that provide water quality protection that meets MOECC’s ‘Enhanced’ standard before discharging to outlet locations.
- (i) All additions or modifications to existing sewers and related appurtenances will require municipal approval and shall conform to the requirements of the City.
- (j) All proposed changes to existing crossings of watercourses shall be analyzed to determine the impact of the proposed design on flood levels. The available Floodplain Mapping for all existing crossings shall be obtained from the RVCA. Existing Floodplain Mapping shall be updated with the proposed design.
- (k) DB Co shall assess the drainage impacts of the Highway 417 runoff where such runoff directly interfaces with the LRT trench. DB Co shall modify or replace the existing drainage system within Highway 417 to the extents required to accommodate the Highway Works, while protecting the LRT trench from infiltration, seepage, and flooding due to the existing Highway 417 runoff. Notwithstanding, any such drainage system provided by DB Co shall not preclude the future Highway 417 widening plan to install a closed drainage system.

- (l) Highway drainage is to discharge to existing outlets unless otherwise approved by the City at its sole discretion. Upstream of these outlets, the Highway 417 storm sewer system shall be a standalone gravity system and shall not be integrated with the municipal system or New Municipal Infrastructure.
 - (i) DB Co shall adjust, modify, or replace the drainage features along the south side of the Guideway to the existing rural ditch drainage system that may be impacted by construction of the West Works and/or TL-5 adjacent to the Guideway, as described in Clause 1.3 (a) of Part B – Design and Construction Requirements of this Part 9.
 - (ii) If DB Co’s drainage design includes new or modified outlet locations, DB Co shall demonstrate to the City through hydrologic/hydraulic modeling that the cumulative impacts of the Highway Works will not increase peak flow rates or the peak hydraulic grade line of the City storm sewer for all rain events up to the 100-Year Storm. This analysis shall be submitted in accordance with Schedule 10 – Review Procedure. This analysis shall be presented in the Drainage and Stormwater Management Report. The available outlet constraints shall be obtained from the City.
- (m) The new storm sewer system shall be designed to accommodate a 1 in 10 year return period storm.
- (n) Storm sewers shall have longitudinal slopes of 0.3% or greater, to avoid constructability issues.
- (o) Post-construction discharge shall be controlled to pre-construction (existing) peak flow rates. Where capacity is insufficient for pre-construction peak flows, DB Co shall design the drainage system to control peak flows to within existing capacity.
- (p) DB Co shall ensure that the Roadway is adequately drained to meet MTO Standards during all stages of construction.
- (q) For any Municipal Roadway affected by the Highway Works, DB Co shall:
 - (i) Include insulation for sewers that have less than the minimum standard cover;
 - (ii) Design the drainage system to leave at least one lane free of water in each direction for emergency vehicle traffic during the 1:100 year return period event;
 - (iii) Ensure that existing maintenance hole top sections, frames, and covers are upgraded to current standards including water tight covers on sanitary manholes in ponding areas;
 - (iv) Conduct pre and post construction video inspection of existing sewers to remain as part of DB Co’s design; and,

- (v) Assess adjacent properties for surface drainage impacts as a result of the Highway Works, and ensure no adverse impacts as a result of the design.

7.3 Highway Drainage Criteria

- (a) The design and construction of all Provincial Highway drainage features shall meet or exceed the requirements of MTO Highway Drainage Design Standards, 2008. Project specific criteria are listed below.
 - (i) The minor system associated with the new Roadways shall be designed to capture and convey the 10-year storm event. Major system (overland) flows are to be directed to an outlet with sufficient capacity. In the case where no outlet is available, major system flows are to be conveyed to storage areas within the Highway 417 ROW.
 - (ii) Watercourse crossings with upstream drainage areas that exceed the limit established by the RVCA, the crossing shall be designed to convey the Regulatory Storm, defined as the 100-year design storm event, without any increase in water surface elevations outside of the Highway 417 ROW.
 - (iii) All watercourse crossings shall be designed to convey the 50-year storm for the span less than 6.0 m and the 100-year storm event for the total span more than 6.0 m (MTO HDDS WC-1, 2008) with a minimum 1.0 m freeboard from the water surface elevation to the edge of pavement, without requiring a change to the existing Roadway profile.
 - (iv) All watercourse crossings shall be designed as per the criteria set out in Schedule 17 – Environmental Obligations.
 - (v) All discharge to municipal storm sewers shall be in accordance with City of Ottawa Sewer Design Guidelines.
 - (vi) Following construction, DB Co shall prepare a CCTV assessment of all storm sewers forming part of the Highway Works drainage system as per OPSS 409. The CCTV footage shall be submitted to the City in accordance with Schedule 10 – Review Procedure.
 - (vii) There shall be no flow spread onto travelled lanes.

7.4 Stormwater Management Criteria

- (a) DB Co shall implement a stormwater management design:
 - (i) That provides “*Enhanced*” quality treatment to all Highway Works runoff (as described in Chapter 3 “Environmental Design Criteria” of the “Stormwater Management Planning and Design Manual”, MOECC), including mitigation of thermal impacts on cold water streams;

- (ii) That addresses the downstream impacts on conveyance and erosion for all watercourse crossings; and
 - (iii) That includes necessary mitigation measures in compliance with requirements of the RVCA.
- (b) With reference to Schedule 17 – Environmental Obligations, DB Co shall maintain base flows in all watercourses during construction.
- (c) In-watercourse works will only be conducted during appropriate construction windows as set by the RVCA and DFO. DB Co shall prepare a Highway Erosion and Sediment Control Plan (the “Highway Erosion and Sediment Control Plan”), as a component plan of the Environmental Management Plan described in Schedule 17 – Environmental Obligations, and submitted to the City Representative, in accordance with Schedule 10 – Review Procedure, 30 days prior to the commencement of any Highway Works Construction Activities. This plan shall:
 - (i) Meet all requirements in this Article 7;
 - (ii) Meet all requirements of the Schedule 17 – Environmental Obligations;
 - (iii) Be developed in accordance with the MTO Environmental Guide for Erosion and Sediment Control during Construction of Highway Projects;
 - (iv) Include a contingency plan in the event the erosion and sediment control measures fail;
 - (v) Detail the temporary works during construction as described in the MTO Highway Drainage Design Standards TW-1 and TW-2 (2008);
 - (vi) Include provisions for maintaining the site, providing adequate over-winter protection and controlling erosion on all exposed earth surfaces and temporary fill embankments until conditions permit application of the final specified seed and cover; and,
 - (vii) Include the following, at a minimum:
 - A. Work area requirements, including equipment access, operation and storage, and material supply, utilization and storage;
 - B. Surface drainage from outside, through or around the work;
 - C. Areas of disturbed soil and soil stockpiles;
 - D. Means of access to erosion and sediment control measures requiring maintenance;
 - E. Protection of completed portions of the work; and,

- F. All vegetated cover not specified for removal shall be preserved in order to minimize erosion and sedimentation.
- (d) Watercourses shall not be diverted, intercepted or blocked unless specifically approved by the RVCA.
 - (e) Temporary erosion and sediment control measures shall be maintained and kept in place until all work has been completed. Temporary control measures shall be removed at the completion of the work provided that permanent erosion control measures, have been established.
 - (f) DB Co shall inspect erosion and sediment control measures within 24 hours after a significant rainfall event.
 - (g) Unless otherwise specified, the time interval between commencement and completion of any Construction Activity that disturbs earth surfaces shall be a maximum of 45 calendar days. Commencement of such work shall be considered to have occurred when the original stabilizing ground cover has been removed, including grubbing, or has been covered with fill material. Completion of such work shall be considered to have occurred when the specified cover material (seed and mulch, seed and erosion control blanket, sod, riprap, etc.) has been applied.
 - (h) Where interceptor ditches or subsurface drains are specified, they shall be constructed before commencement of any related cut or fill.
 - (i) Run-off from construction materials and any stockpiles shall be contained and discharged so as to prevent entry of sediment to watercourses.
 - (j) Where dewatering is required or where culverts are cleaned by hydraulic means, effluent shall be discharged so as to prevent discharge of sediment to watercourses.
 - (k) Erosion and sedimentation control measures shall not be placed in watercourses unless specifically approved by the RVCA and the City.
 - (l) A 200 m stand-by supply of prefabricated silt fence barrier, in addition to silt fence barrier which may be specified elsewhere, shall be maintained at any site where Construction Activities are underway prior to commencement of grading operations and throughout the duration of the Highway Works.
 - (m) Oil-grit separators shall not be permitted to treat MTO Highway 417 runoff.

7.5 Numerical Computational Procedures and Models

- (a) All numerical computation procedures shall comply with the principles outlined in the MTO Drainage Management Manual (1997). Computer models used shall comply with the computer model selection criteria identified in the MTO Drainage Management Manual (1997).

- (b) Rational method will be limited to areas less than 40 ha.
- (c) For areas greater than 40 ha and for the purpose of designing stormwater facilities, an MTO approved computer model shall be utilized.
- (d) Modelling output files shall be included in the deliverables. Final deliverable shall include the hydrologic and hydraulic digital model files.

7.6 Deliverables

- (a) In addition to those listed elsewhere in this Article 7, the following deliverables shall be submitted in accordance with Schedule 10 – Review Procedure:
 - (i) If applicable, stormwater management facility design drawings showing details of inlet and outlet structures, pipe sizes, pond layout plan and section, with details of overflow weir, outlet structure, access road, and elevations. For water within the pond, surface elevations shall be shown for permanent pool, 25 mm event, 100-year events on the pond section view;
 - (ii) Where existing Floodplain Mapping exists, updated floodplain drawings showing changes to 100-year storm event water level delineation;
 - (iii) Details of water course realignments such as:
 - A. Proposed plan and profiles
 - B. Erosion protection and environmental rehabilitation design
 - C. Fluvial Geomorphological report as per RVCA
 - (iv) Proposed storm sewer design sheets;
 - (v) Design drawings showing the proposed drainage conveyance system (swales, storm sewers, culverts, ditches, ditch inlets, spillways). These drawings will include summary tables of all components of the drainage conveyance system, such as structures ID's (for Catch Basins and manholes), structure inverts, Ditch slopes, typical Ditch cross-sections and Ditch elevations.

ARTICLE 8 SIGNING AND PAVEMENT MARKING DESIGN CRITERIA

8.1 Order of Precedence

- (a) Signing and Pavement Marking shall be designed, applied and installed in accordance with the criteria contained in this Article 8 and the following Reference Documents, and if there is any conflict between the criteria contained in this Article 8 and any of the Reference Documents, the following shall apply in descending order of precedence:
- (i) The criteria contained in this Article 8;
 - (ii) MTO Special Provisions;
 - (iii) The applicable MTO Directives, MTO Policy Memorandums, and MTO Design Bulletins;
 - (iv) OPSS;
 - (v) MTO Contract Design, Estimating and Documentation (CDED) Manual;
 - (vi) Ontario Traffic Manual, MTO;
 - (vii) Highways Standards Bulletin Memorandum 2014-04 – Guidelines for Reducing Speed Limits in Construction Workzones;
 - (viii) Highways Standards Bulletin HSB-DSCO-2017-01 Permanent Ground Mounted Sign Support Systems – Small and Intermediate Sign Assemblies;
 - (ix) HSBM #2011-01, Fluorescent Orange Temporary Pavement Markings, MTO Highway Standards Branch Provincial Engineering Memorandum;
 - (x) DSM;
 - (xi) Temporary Conditions Traffic Management: Advanced Notification, Advanced Warning, and Alternate Route Signing Manual (April 2001), MTO Central Region Traffic Office;
 - (xii) Portable Variable Message Signs (PVMS) Best Practices Manual, May 2009, MTO;
 - (xiii) Ramp Closure Gate Sign Installation Drawing, December 2009, MTO;
 - (xiv) Sign Sheeting Memorandum for Ground Mounted Regulatory Warning, and Temporary Condition Signs, October 4, 2013, MTO;
 - (xv) Sign Support Manual, MTO;
 - (xvi) MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, June 2017;

- (xvii) Geometric Design Guide for Canadian Roads, TAC;
- (xviii) MTO Standard Drawings;
- (xix) OPSD;
- (xx) King's Highway Guide Signing Policy Manual, MTO;
- (xxi) Manual of Uniform Traffic Control Devices; and,
- (xxii) OPP Aircraft Enforcement Area Policy, MTO.

8.2 Materials

- (a) Except as noted in Clause 8.3(g) and Clause 8.4(n) of Part B of this Schedule 15-2, Part 9, DB Co shall supply all Signing and Pavement Markings Materials specified in the Reference Documents noted in Clause 8.1 of Part B of this Schedule 15-2, Part 9.

8.3 Temporary Signing

- (a) DB Co shall be responsible for the design, supply, installation, relocation, reinstatement, maintenance, and removal of all temporary Signs and Pavement Markings, including Regulatory, Warning, guide, advisory and directional Signs with the exception of temporary advance and turn (non-standard) ground-mounted Signs which will be designed and fabricated by MTO and supplied to DB Co for installation.
- (b) DB Co shall provide signing requirements for all temporary conditions, including Advance Notification, Advance Warning and Alternative Route signing, all as defined in the MTO Central Region Temporary Conditions Traffic Management: Advanced Notification, Advanced Warning, and Alternate Route Signing Manual and the Ontario Traffic Manual. All temporary signing shall be in accordance with the Ontario Traffic Manual, and MTO standards. The location, size and type of each Sign shall be indicated on the Highway Traffic Control Plans.
- (c) DB Co shall prepare a Temporary Signing Plan (the "Temporary Signing Plan") and a Temporary Signing Table (the "Temporary Signing Table"). The Temporary Signing Plan shall depict the location of all Signs, and shall include staging drawings, which indicate the timing for installation and removal of temporary signage. The Temporary Signing Table shall include, but, not be limited to information detailing Sign location (station of final location, removal location and on which side of the road to be installed in relation to the direction of travel), height to bottom of Sign, lateral offset to post #1, support type with dimensions, alpha-numeric Sign code with dimensions, timing for installation and removal, and the message/description.
- (d) Temporary Signs shall be in French and English or bilingual and MTO Standards and guidelines shall be used.

- (e) The Temporary Signing Plan shall be combined into one drawing at a scale of 1:1000 with the Temporary Pavement Marking Plan.
- (f) The Temporary Signing Plan and Temporary Signing Table shall be submitted to the City Representative for review and acceptance in accordance with Schedule 10 – Review Procedure, and a minimum of 60 days prior to implementation of the plan.
- (g) MTO, through the City, will prepare and supply the temporary advance and turn ground-mounted Sign designs (guide Signs only) to DB Co, and will supply these fabricated Signs to DB Co for the locations where overhead Signs will be removed for a period greater than short duration (per DB Co’s Temporary Signing Plan). When the temporary ground-mounted Sign locations have been confirmed, MTO will create the Sign design details to include in DB Co’s design. MTO, through the City, must provide these Sign design details and fabricated boards for MTO's jurisdiction. Sign boards shall be fabricated and supplied by MTO's Provincial Sign Shop. MTO's Provincial Sign Shop will not accept Sign designs from DB Co. DB Co will not be charged for signs from MTO’s Provincial Sign Shop. The Signs ordered through the MTO Provincial Sign Shop will be delivered to a location identified by DB Co. The list of temporary Signs and shop drawings shall be submitted by DB Co to the City a minimum of 12 weeks prior to the pickup date.

8.4 Permanent Signing

- (a) DB Co shall provide Main Line overhead signing at the locations, and in accordance with the requirements identified in Table 8.4a. The exact locations of the signs shall be determined by DB Co in accordance with its final design. In all cases DB Co shall provide new Overhead Sign Support Structures and footings, and install new sign boards (supplied by MTO), subject to Clause 8.4(b).

Table 8.4a – Highway 417 Main Line Overhead Signing	
Station (approx.)	Notes
WB Upstream of Pinecrest E-N/S Ramp	- Exact location station to be determined by DB Co as per OTM
WB Upstream of Pinecrest E-N/S Ramp	- Exact location station to be determined by DB Co as per OTM

- (b) Where it is indicated in Table 8.4a that DB Co may salvage a component of an existing Overhead Sign Support Structure, or use existing footings, DB Co may do so, only if it verifies that these options are feasible, meet current MTO Standards, and are compatible with its final design. DB Co shall be responsible to provide new Overhead Sign Support Structures or footings in all instances where existing infrastructure cannot be re-used.
- (c) DB Co shall engage a structural Engineer to verify and certify that the sign boards provided by MTO are compatible with the Overhead Sign Support Structures designed by DB Co prior to installation. In any instances where DB Co proposes to salvage an existing Overhead Sign Support Structure (or component thereof), an Engineer shall

inspect and certify whether the entire Structure is suitable for re-use. If as a result of the inspection, DB Co determines that the Structure cannot be salvaged, DB Co shall be responsible to provide a new Overhead Sign Support Structure.

- (d) For all other locations within the Highway Corridor Lands, DB Co shall determine all required permanent ground-mounted and overhead signing, in accordance with the Reference Documents noted in Clause 8.1 of Part B of this Schedule 15-2, Part 9. DB Co shall contact the City to confirm, in writing, the official Municipal Roadway names as well as '911' signing requirements. If the information received indicates a road name change, DB Co shall obtain the municipal bylaw, Council Resolution or written direction in this regard and provide a copy to the City Representative for their records. The location, size, and type of each Sign shall be indicated on the Highway Traffic Control Plan.
- (i) DB Co shall install signage to identify Emergency Detour Routes (as defined in OTM Book 8) established by the City and MTO. DB Co shall confirm the routes with the City. Sign locations shall be established in consultation with the City.
- (ii) DB Co shall install a new overhead tri-chord sign structure on the Pinecrest E-N/S ramp if the existing structure is impacted by the Highway Works design.
- (e) DB Co shall prepare a Permanent Signing Plan (the "Permanent Signing Plan") and a Permanent Signing Table (the "Permanent Signing Table"). The Permanent Signing Plan shall depict the location of all Signs, and shall include staging drawings, which indicate the timing for installation of permanent signage. The plan shall also include Overhead Sign section drawings depicting the position of sign boards on Overhead Sign structures overtop of travelled lanes. The Permanent Signing Table shall include, but not be limited to, information detailing Sign location (station of final location, removal location and on which side of the road to be installed in relation to the direction of travel), height to bottom of Sign, lateral offset to post #1, support type with dimensions, alpha-numeric Sign code with dimensions, timing for installation, and the message/description.
- (f) The Permanent Signing Plan shall be combined into drawings at a scale of 1:1000 with the Permanent Pavement Marking Plan.
- (g) Permanent Signs shall be in French and English or bilingual and MTO Standards and guidelines shall be used.
- (h) DB Co shall design and supply all Overhead Sign support Structures, ground-mounted Sign break-away steel supports and associated Sign footings. Sign support Structures shall conform to the MTO Context Sensitive Design requirements as detailed in Appendix F to this Part 9.
- (i) The Permanent Signing Plan (combined with the Permanent Pavement Marking Plan), Permanent Signing Table, Sign details and shop drawings for all support structures and footings shall be submitted to the City Representative for review and acceptance in

accordance with Schedule 10 – Review Procedure, and a minimum of 60 days prior to the implementation of the plan.

- (j) DB Co shall include in the Permanent Signing Plan any changes to existing Signs.
- (k) All overhead Signs shall be provided on a separate structure. Overhead Sign boards may be mounted on existing support structures where applicable. In general, DB Co shall construct Sign support Structures per the following criteria:
 - (i) Main Line static Signs shall be provided on a tri-chord or cantilever structure; and,
 - (ii) Static lane designation Signs on ramps may be provided on a tri-chord, cantilever or monotube structure.
- (l) MTO through the City will supply all fabricated sign boards for all overhead and ground-mounted extruded Signs and non-standard Signs. Sign layouts will be provided by the City to DB Co for the design of Sign structures. DB Co shall replace existing with any new Sign boards that are supplied by MTO.
- (m) All permanent ground-mounted and overhead Sign boards shall be ordered through MTO Provincial Sign Shop and such Signs shall be supplied by the City. DB Co shall submit a list of Signs required to the City Representative for each year of construction. The list of Signs shall contain the quantity and details of the Signs, and the date for pick-up by DB Co. DB Co shall also submit to the City Representative structural shop drawings for all Sign support structures. The list of Signs and shop drawings shall be submitted a minimum of 12 weeks prior to the pickup date. The Signs ordered through the MTO Provincial Sign Shop will be delivered to a location identified by DB Co. DB Co shall within five Business Days of pickup, confirm in writing to the City Representative that all the ordered signs were received in accordance with the list of required signs. Any Signs damaged following delivery will be required to be replaced at DB Co expense.
- (n) Static Sign Structure Locations:
 - (i) DB Co shall install Sign structures in accordance with the Reference Documents noted in Clause 8.1 of Part B of this Schedule 15-2, Part 9.

8.5 Pavement, Hazard and Delineation Markings (Temporary)

- (a) DB Co shall provide all temporary Pavement Markings (including temporary Roadway Pavement Markings) in accordance with the Reference Documents noted in Clause 8.1 of Part B of this Schedule 15-2, Part 9. DB Co shall prepare a Temporary Pavement Marking Plan (the “Temporary Pavement Marking Plan”), which shall be submitted to the City Representative in accordance with Schedule 10 – Review Procedure, a minimum of 30 days prior to the implementation of the plan. The Temporary Pavement Marking Plan shall include scale drawings of the proposed Pavement Marking layout.

- (b) All temporary Pavement Markings shall have a minimum of two applications of Traffic Paint. Glass beads shall be applied for reflectivity and shall conform to the requirements of OPSS 710 and OPSS 1750.
- (c) DB Co shall paint or reinstate this same day any Pavement Markings that are removed that day.

8.6 Pavement, Hazard and Delineation Markings (Permanent)

- (a) DB Co shall provide all permanent Pavement Markings in accordance with the Reference Documents noted in Clause 8.1 of Part B of this Schedule 15-2, Part 9. DB Co shall prepare a Permanent Pavement Marking Plan (the “Permanent Pavement Marking Plan”), which shall be submitted to the City Representative in accordance with the requirements of the Review Procedure, a minimum of 60 days prior to implementation of the plan.
- (b) All painted permanent Pavement Markings shall have a minimum of two applications. Glass beads shall be applied for reflectivity and shall conform to the requirements of OPSS 710 and OPSS 1750.
- (c) All permanent Pavement Markings on Main Line and interchange ramps shall be durable type.
- (d) DB Co shall paint or reinstate this same day any Pavement Markings that are removed that day.

8.7 Ramp Closure Gates

- (a) Ramp closure gate signage shall be in accordance with the Reference Documents noted in Clause 8.1 of Part B of this Schedule 15-2, Part 9.

ARTICLE 9 LANDSCAPE ARCHITECTURE AND ECOLOGICAL RESTORATION

9.1 Order of Precedence

- (a) DB Co's landscape architecture and ecological restoration shall be in accordance with the criteria contained in this Article 9 and the following Reference Documents, and if there is any conflict between the criteria contained in this Article 9 and any Reference Document(s), the following shall apply in descending order of precedence:
- (i) The criteria contained in this Article 9;
 - (ii) MTO Special Provisions;
 - (iii) The applicable MTO Directives, MTO Policy Memorandums, and MTO Design Bulletins;
 - (iv) OPSS;
 - (v) MTO Contract Design, Estimating and Documentation (CDED) Manual;
 - (vi) MTO Standard Drawings; and,
 - (vii) OPSD.

9.2 General Requirements

- (a) DB Co's landscape architecture and ecological restoration requirements for Highway Works shall be in accordance with Schedule 15-2, Part 6 – Urban Design, Landscape Architecture and Connectivity Requirements.
- (b) DB Co shall adhere to MTO Context Sensitive Design requirements as detailed in Appendix F of this Part 9.
- (c) DB Co shall submit plan drawings depicting proposed tree removals and mitigations within the Highway Corridor Lands in accordance with Schedule 10 – Review Procedure, within 60 days following Financial Close.

ARTICLE 10 ROAD SAFETY REVIEW AND AUDIT

10.1 Order of Precedence

- (a) DB Co shall have independent Design Safety Review and Road Safety Audits completed in accordance with the criteria set out in this Article 10 and the following Reference Documents, and if there is any conflict between the criteria contained in this Article 10 and any of the Reference Documents, the following shall apply in descending order of precedence:
- (i) The criteria contained in this Article 10;
 - (ii) MTO Special Provisions;
 - (iii) The applicable MTO Directives, MTO Policy Memorandums, and MTO Design Bulletins;
 - (iv) OPSS;
 - (v) MTO Contract Design, Estimating and Documentation (CDED) Manual;
 - (vi) Roadside Safety Manual, MTO;
 - (vii) MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, June 2017;
 - (viii) Geometric Design Guide for Canadian Roads, TAC;
 - (ix) The Canadian Road Safety Audit Guide, TAC;
 - (x) MTO Standard Drawings;
 - (xi) OPSD;
 - (xii) Ontario Traffic Manual, MTO;
 - (xiii) King's Highway Guide Signing Policy Manual, MTO;
 - (xiv) MTO General Conditions of Contract;
 - (xv) MTO Contract Design, Estimating and Documentation Manual;
 - (xvi) NCHRP Report 280 Work Zone Practices – Table 3: GENERAL GUIDELINES ON VEHICLE CAPACITY THROUGH WORK ZONES;
 - (xvii) Electrical Engineering Manual, MTO;
 - (xviii) Bikeways Design Manual;

- (xix) Ontario Bikeways Planning & Design Guidelines, MTO;
- (xx) Policy – Municipal Work on MTO Traffic Signals, September 2008; and,
- (xxi) MTO Policy – Roadway Lighting on Municipal Crossroads, October 24, 2003.

10.2 Road Safety Audit Team

- (a) The Road Safety Audit Team shall perform the Road Safety Audit and shall consist of a team of auditors, with a minimum of three Qualified Personnel, who are independent of the Construction Contractor, and shall meet the following minimum criteria:
 - (i) Be Engineers trained in the area of road and public safety, with over 20 years of engineering experience and demonstrated record or resume working in the road safety field and undertaking formal road safety audits with criteria similar to the Road Safety Audits in this Project, with references from government agency;
 - (ii) Possess demonstrated experience in undertaking safety reviews and experience with TAC's Canadian Road Safety Audit Guide, and Canadian and Ontario Roadside safety standards;
 - (iii) Possess demonstrated experience in road safety, traffic engineering, geometric design, and demonstrated expertise with human factors in design and safety reviews or audits;
 - (iv) Have participated in at least two recent road safety audits with criteria similar to the Road Safety Audits in this Project, where such previous participation was on projects delivered using design build or public private partnership methods; and,
 - (v) Possess demonstrated professional independence in undertaking Road Safety Audit in this Project.

10.3 General Requirements

- (a) Road Safety Audits shall include the Road Safety Audit processes as identified in the Canadian Road Safety Audit Guide, and shall for clarity include human factor considerations.
- (b) The Road Safety Audit Team's individuals' qualifications, experience, and knowledge, and letters of reference from the relevant Governmental Authority where prior audits were performed, shall be provided to the City Representative 60 days in advance of any safety audit work and be accepted by the City in accordance with the Review Procedure prior to any safety review or audit work being initiated.
- (c) The Road Safety Audit Team's individuals shall not be an employee of any of the companies on DB Co's team and, other than being paid for services rendered to DB Co in their capacity as Road Safety Auditor, the team shall be fully independent and at arm's length from any company participating on DB Co's team.

- (d) All Road Safety Audits and safety reviews shall include a human factors expert experienced in road and Highway design and construction, who shall provide input and review of the safety and operation of the work from a human factors perspective.
- (e) Any “as constructed” element that does not conform to the design, does not meet the required safety standards, or deemed not to meet a reasonable level of safety by the Safety Auditor, shall be corrected by DB Co immediately. The rectification recommendations shall to be prepared by an individual with the requisite skill and training in the area of the work, stamped and sealed by the Engineer and the solution shall be acceptable to the Road Safety Audit Team and to the City.
- (f) DB Co shall be responsible for any existing or proposed Site conditions found not to meet a reasonable level of safety, and shall rectify the condition immediately, or otherwise construct temporary works to Address the safety concern until repairs are made.

10.4 DB Co’s Responsibility

- (a) DB Co shall undertake Road Safety Audit and Road Design Safety Reviews as per the requirements of this Article 10 of Part B of Schedule 15-2, Part 9 on all temporary and permanent elements of the Highway Works.
- (b) DB Co shall be responsible for:
 - (i) Scheduling, initiating, allowing access to the applicable Site and managing the Road Safety Audit and Design Safety Review process at the appropriate times during the course of the Highway Works;
 - (ii) Providing all necessary design drawings and supporting documentation for the Road Safety Audit Team to conduct the Road Safety Audit and Design Safety Review;
 - (iii) Ensuring that the Design Safety Review and Road Safety Audit is conducted in accordance with Good Industry Practice;
 - (iv) Receiving and reviewing the Road Safety Audit Team’s report with the City Representative;
 - (v) Responding to the Design Safety Review and Road Safety Audit Report including presenting alternatives to Address deficiencies;
 - (vi) Implementing required re-design as a result of the corrective suggestions described in (v) above in an expeditious and Timely manner;
 - (vii) Updating changes on the required design drawings; and,
 - (viii) Providing all draft and final documentation related to the Design Safety Review and Road Safety Audit to the City Representative.

- (c) All costs associated with the Design Safety Review and Road Safety Audit, including any re-design and increased costs to the Highway Works that result from the Design Safety Review and Road Safety Audit, shall be borne by DB Co.
- (d) After each Design Safety Review and Road Safety Audit, except as otherwise expressly agreed in writing by the City Representative, DB Co shall address all recommendations made by the Road Safety Audit Team.

10.5 Design Safety Review

- (a) At the outset of the Highway Works and no later than 60 days after Commercial Close, an initial Design Safety Review shall be undertaken to assess all design elements proposed by DB Co or required in the Output Specifications that may have any bearing on public, maintenance or operational safety from the point of view of any user within the Highway Works. The initial Design Safety Review shall precede the design activity and the subsequent design shall accommodate any required recommendation or resolution of this initial Design Safety Review.
- (b) Design Safety Reviews shall be undertaken on an ongoing basis through the stages and duration of all designs and all to be constructed temporary and permanent elements that may have any bearing on public, maintenance or operational safety from the point of view of any users within the Highway Works.
- (c) Design Safety Reviews shall review, identify and resolve any safety concerns prior to design such that the design can be modified in a Timely manner to Address the safety concerns for permanent and temporary works within the Highway Works. DB Co shall plan, schedule and execute the review, together with providing a report that Addresses any safety concerns and the recommendation or resolution of each Design Safety Review.

10.6 Road Safety Audit Process

- (a) The Road Safety Audit process shall be carried out in accordance with the Canadian Road Safety Audit Guide (TAC). References to “review” or “response” from the owner agency, or other qualifying phrase with similar connotation, shall be construed as the responsibility of DB Co in accordance with the requirements in this Article 10.
- (b) The Road Safety Audit Team shall prepare a report (the “Road Safety Audit Report”) to document the audit findings. Road Safety Audit Reports shall be submitted to the Design Team for the stages identified in Clause 10.6(c) below. The Road Safety Audit Reports shall clearly identify safety Hazards that need to be Addressed by DB Co along with recommendations for remediation. DB Co shall respond to the identified Hazards and recommendations with remediation counter-measures or provide to the City Representative for approval, appropriate reasons why the safety issue may not be Addressed as recommended in the reports. Under any circumstances, DB Co’s response and remediation countermeasures shall Address the safety issue to the satisfaction of the Road Safety Audit Team.

- (c) The Road Safety Audit Reports shall be provided to the City Representative in accordance with Schedule 10 – Review Procedure for review at the stages identified below:
- (i) Stage 1: Pre-Final Design Road Safety Audit
- A. Stage 1 Road Safety Audit shall be conducted immediately before submission of the Pre-Final Design Development Submittals in accordance with Schedule 10 – Review Procedure, and Section 11.1 of the Project Agreement. The audit shall undertake a detailed review of the Pre-Final Design Development Submittals to identify any potential safety-related enhancements that might have an impact on the New MTO Infrastructure or New Municipal Infrastructure, including Crossing Roads and local roads. Issues considered shall include but not be limited to:
- i. Design consistency;
 - ii. Site conditions and visibility;
 - iii. Drivers’ work load and perceived road information;
 - iv. Vehicular traffic speed management and associated safety risk factors;
 - v. Traffic control devices
 - vi. Human factors;
 - vii. Horizontal and vertical alignment;
 - viii. Cross section design;
 - ix. Interchange/intersection configuration;
 - x. Access location;
 - xi. Sight distance including, but not limited, to stopping sight distance and turning sight distance, sight distances to Traffic Control Devices, Bullnoses, etc.;
 - xii. Operation of public transit;
 - xiii. Operational and maintenance safety;
 - xiv. Traffic operations;
 - xv. Environmental factors;
 - xvi. Clearances to Roadside objects;

- xvii. Safety Barriers; and,
 - xviii. Provision for vulnerable road and all multimodal ROW users.
- (ii) Stage 2: Final Design Road Safety Audit
- A. Stage 2 Road Safety Audit shall be conducted immediately before submission of the Final Design Development Submittals in accordance with Schedule 10 – Review Procedure, and Section 11.1 of the Project Agreement. The audit shall undertake a detailed review of the completed Final Design Development Submittals to identify any potential safety-related enhancements that might have an impact on the operational safety of the New MTO Infrastructure or New Municipal Infrastructure, including Crossing Roads and local roads. Issues considered shall include, but not be limited to:
- i. Signing and Pavement Markings;
 - ii. All interface with adjacent design disciplines;
 - iii. Traffic signal configuration;
 - iv. Intersection details;
 - v. Drainage and storm water management elements;
 - vi. Lighting;
 - vii. Fencing;
 - viii. Clearances to Roadside objects;
 - ix. Safety Barriers;
 - x. Surface standards including treatments and structures;
 - xi. Traffic Control Devices;
 - xii. Landscaping, streetscape and road furniture;
 - xiii. Provision for vulnerable road and all multimodal ROW users;
 - xiv. Accommodation of design vehicles;
 - xv. Emergency response requirements;
 - xvi. Road maintenance;
 - xvii. Traffic staging plan; and,

- xviii. Any other Stage 1 Road Safety Audit results affected by the Final Design Development.
- (iii) Stage 3a: Temporary Traffic Control On-Site Road Safety Audit
- A. Stage 3a Road Safety Audits shall be conducted on the applicable Site before implementation of temporary Traffic Control set-ups that meet one or more of the following criteria:
- i. Two or more individual temporary work zones in close proximity to each other such that one would influence the traffic operation of the other. The spacing between the termination area of one work zone and the Advance Warning area of the next work zone for which one temporary Traffic Control set-up influences the traffic operations of the next temporary Traffic Control set-up is 2.0 km or less.
 - ii. Temporary staging are required within the existing Highway 417 and the duration of temporary Traffic Control set-ups is five calendar days or more. The set-up does not necessarily have to be in place for the entire time but can be one of a number of repeating set-ups that are active at different times.
 - iii. The duration of temporary Traffic Control set-ups is 10 calendar days or more on roads other than those identified above. The set-up does not necessarily have to be in place for the entire time but can be one of a number of repeating set-ups that are active at different times.
- (iv) Stage 3b: Construction Road Safety Audit
- A. Stage 3b Road Safety Audits shall be conducted on the applicable Site during construction. These audits shall examine the field conditions of the work under construction and assess any circumstances that may have a bearing on public safety from the point of view of any user and public areas that are within the Highway Works, or are modified and constructed as a part of the Highway Works. The audits shall meet the following criteria:
- i. Two of the Stage 3b Road Safety Audits shall be undertaken annually within the high construction season, between June and September (i.e. two audits to be performed annually between June and September) and one in the winter, annually between December and February. Only one of the audits shall be preplanned with DB Co, while the others shall be performed unannounced.
- (v) Stage 4: Post-Construction Road Safety Audit

- A. Prior to opening any portions of the Highway Works and Crossing Roads and local roads for traffic operation, a Stage 4 Road Safety Audit shall be carried out. The audit shall investigate and identify potential safety enhancements that may reduce the frequency and/or the severity of collisions. The Road Safety Audit Team shall also check for safety deficiencies that result from using particular combinations of design elements not previously detected or any synergistic effects of using minimum Design Criteria for multiple design elements that may compromise users' safety;
- B. Stage 4 Road Safety Audits shall take place prior to and as a condition of the issuance of the Highway Construction Certificate (Completion); and,
- C. For the purposes of completing a Stage 4 Road Safety Audit required pursuant to paragraphs A and B above, the Road Safety Audit Team must fully examine the Highway Works by:
 - i. Meeting with DB Co to review any issues relating to the Highway Works, in particular design changes that may affect the safety of the New MTO Infrastructure or New Municipal Infrastructure, including all Crossing Roads and local roads;
 - ii. Checking to ensure that safety issues identified in the Stage 2 Road Safety Audit are Addressed and the resulting design changes do not create further safety issues;
 - iii. Reviewing any design changes that occurred during the relevant Highway Works to ensure they do not create safety issues; and,
 - iv. Conducting field reviews of such Highway Works, under both daytime and night time conditions.

10.7 City Requested Safety Audit

- (a) Road Safety Audits shall be undertaken by the Road Safety Audit Team at any time upon City request, in addition to the audits required in Clause 10.6 of this Part B. Such request may be for any Site condition, design element, design concern or constructed element of work that is of concern to the City. The City written request will outline the safety concern and the issue required to be investigated and Addressed by DB Co.
- (b) DB Co shall be responsible to demonstrate that the design and proposed constructed Highway Works meets a reasonable level of safety for all users. DB Co shall provide supporting research or engineering rationale and analysis for the design decisions, and for the support of the proposed design and constructed Highway Works that are subject to investigation.

- (c) DB Co shall Address the concerns and/or modify the proposed design and construction works accordingly and provide all available technical information to the Road Safety Audit Team for consideration.
- (d) The Road Safety Audit Team will render an opinion with the safety issue, and DB Co shall Address the safety issue to the satisfaction of the Road Safety Audit Team and City. The disposition and rectification of the safety concern is DB Co's full responsibility and obligation based on full and due consideration of input from the City and the Safety Audit Team.

10.8 Certificates

- (a) DB Co shall submit to the City Representative a certificate (a "Road Safety Audit Certificate") in the form attached as Appendix A - Form of Road Safety Audit Certificates to this Schedule 15-2, Part 9 in respect of the Stage 1, Stage 2 and Stage 4 Road Safety Audits respectively. Each Road Safety Audit Certificate shall be signed by the Design Manager, the Road Safety Audit Team, the Construction Contractor, and the DB Co Representative.
- (b) The Stage 4 Road Safety Audit Certificate shall be provided to the Independent Certifier and the Highway Substantial Completion Certificate shall not be issued unless a Stage 4 Road Safety Audit Certificate has been submitted and signed by the Design Manager, the Road Safety Audit Team, the Construction Contractor and DB Co's Representative.

10.9 Random Audits

- (a) The City and/or MTO retains the right to perform any additional independent audits on any part of design and construction Works at any time.

ARTICLE 11 DEMOLITION, REMOVALS AND DISPOSAL

12.1 General Requirements

- (a) DB Co's demolition, disassembly, removals and disposal of infrastructure and other buildings, improvements and amenities from the Site prior to Highway Substantial Completion shall be carried out in accordance with this Article 12, Schedule 17 – Environmental Obligations, and shall satisfy all Applicable Law and requirements of Governmental Authorities, Railway Companies and Utility Companies.
- (b) DB Co shall prepare and submit a Demolition, Removals, and Disposal Plan (the “Demolition, Removals, and Disposal Plan”) to the City Representative in accordance with Schedule 10 – Review Procedure a minimum of 60 days in advance of implementation of the plan.
- (c) The Demolitions, Removals, and Disposal Plan shall include, at a minimum, the following:
 - (i) Overall plan and schedule for demolition, removals and disposal within the Highway Works;
 - (ii) Procedures for demolition, removals and disposal of any special structures or Infrastructure;
 - (iii) Waste management and recycling plans and procedures;
 - (iv) Identification and definition of contaminated material, including contaminated soils, and any other dangerous or deleterious material, and DB Co's plan in managing them; and,
 - (v) DB Co's steps in complying with all Applicable Law, including the OHS Act, Schedule 17 – Environmental Obligations, and the requirements in this Article 12.

12.2 Demolition

- (a) Demolition in accordance with this Article 12 shall be completed before DB Co submits a Notice to City in respect of West Final Completion, pursuant to Section 25.14 of the Project Agreement, with the following clarification:
 - (i) DB Co shall provide access to salvage works and shall comply with other environmental works as identified in Schedule 17 – Environmental Obligations prior to demolition of a structure.
- (b) Demolition shall include backfilling all excavations, grading and site stabilization/erosion control of demolition site upon completion of the demolition work.
- (c) Demolition of Structures shall be carried out as necessary to avoid effects on the Main Line or other Roads, or as specified elsewhere in the Project Agreement.

- (d) Portions of existing roads that are not retained as part of the New MTO Infrastructure or New Municipal Infrastructure, including any abandoned roads and driveways, shall be removed and restored to match conditions of adjacent, undisturbed areas in a clean and tidy condition, and in accordance with this Article 12. Re-vegetation shall be in accordance with DB Co's Final Vegetation Restoration Plan as required in Schedule 17.
- (e) Provisions must be made by DB Co to minimize the creation of dust generated during any demolition activities in accordance with the requirements of Schedule 17 – Environmental Obligations and in compliance with the air quality mitigation plan.
- (f) DB Co shall comply with noise and vibration requirements of Schedule 17 – Environmental Obligations.
- (g) Conduct demolition operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- (h) DB Co shall install temporary security fencing around any excavations, should the site remain open overnight and during those times DB Co is not on site.
- (i) DB Co shall be responsible to make the area secure if any contaminated soil and deleterious material are encountered. DB Co shall install fencing if necessary.
- (j) Excavations are to be backfilled and levelled with clean fill and graded to promote positive drainage (i.e., no ponding).
- (k) DB Co shall not use explosives in any demolition operations.
- (l) A Designated Substances Survey report has been prepared for Structures that have been identified for replacement or rehabilitation. Refer to Schedule 17 – Environmental Obligations.

12.3 Waste Management

- (a) DB Co shall train applicable DB Co Parties and ensure all suppliers are trained on proper waste management procedures, as appropriate for the Highway Works.
- (b) DB Co shall, prior to Highway Substantial Completion, remove from the Site and dispose of all Materials and installations not incorporated in the Highway Works. Such removal and disposal shall include any abandoned vehicles, equipment, or waste material.
- (c) DB Co shall recycle construction waste to the maximum extent possible and, at a minimum, in accordance with Good Industry Practice.
- (d) All contaminated or dangerous material, including, but not limited to, elements of Infrastructure and buildings to be removed from the Site that contain designated substances and excess excavated material containing contaminants, shall be disposed of in accordance with the regulations of relevant Governmental Authorities.

- (e) Burning of waste is not permitted.

12.4 Removal of Existing Electrical Equipment

- (a) DB Co shall, prior to Highway Substantial Completion, remove from the Site and dispose of all existing electrical equipment, including underground boxes, Foundations and wiring, not incorporated into the Highway Works.

12.5 Removal of Existing Utilities

- (a) DB Co shall:
- (i) Obtain approvals from Utility Companies, as required, prior to the start of demolition/removal work;
 - (ii) Grout or remove from the Highway Corridor Lands and dispose of, in its entirety, all Utility structures that are abandoned through the Project, situated beneath permanent travelled lanes or where it may otherwise affect the New MTO Infrastructure, subject to the additional requirements below;
 - A. Any facilities that contain hazardous material shall be removed.
 - (iii) Where required, cut, flush, and cap any municipal sewer lines in accordance with the requirements of the applicable municipality; and,
 - (iv) Ensure that prior to demolitions/removals, all Utilities are appropriately disconnected and all Utility meters and Utility rentals are returned to the appropriate Utility Company.

ARTICLE 12 CONSTRUCTION HAUL ROUTE

13.1 General Requirements

- (a) DB Co shall be responsible for the cleaning and maintenance of any and all haul roads used to complete the Highway Works to the satisfaction of the City or the local municipality. Haul routes shall be kept clean and free of construction dust and Debris.
- (b) Road conditions shall be inventoried and photographed by DB Co before construction and after.
- (c) Road condition shall be restored to original or better condition than prior to construction and to the satisfaction of the City or the local municipality.
- (d) DB Co shall determine the haul route and applicable load restrictions after consultation with the City and applicable local municipalities, and shall comply with their requirements. Haul routes shall comply with the City's by-laws for goods movement and use of truck routes.
- (e) DB Co shall be required to submit a construction Haul Route Plan (the "Haul Route Plan") a minimum of 90 days prior to start of any construction activities, in accordance with Schedule 10 – Review Procedure. The Haul Route Plan shall be reviewed by the City under the Review Procedure. The Haul Route Plan shall include the inventoried road conditions and photographs taken by DB Co before construction.
- (f) The Haul Route Plan shall include, at a minimum, the following:
 - (i) Existing condition of Municipal Roadways that will be used as haul routes;
 - (ii) A schematic of the general construction haul routes undertaken in each of the municipalities at or immediately adjacent to the Highway Works;
 - (iii) A description of the construction equipment or vehicles, including type and quantities, as applicable that will be traveling on the identified haul routes.
 - (iv) DB Co's plan and approach to cleaning and maintaining municipal haul roads as per requirements in this Article.

PART C
TRAFFIC MANAGEMENT AND CONSTRUCTION ACCESS

ARTICLE 1 GENERAL TRAFFIC MANAGEMENT REQUIREMENTS

1.1 Order of Precedence

- (a) DB Co's Traffic Management Plan and Traffic Control operations shall comply with the criteria contained in this Part C, and all standards, regulations, policies, Applicable Law, guidelines or practices applicable to the Project, including but not limited to each of the following Reference Documents. In the event of a conflict between the criteria and any of the Reference Documents, the following shall apply in descending order of precedence:
- (i) The criteria contained in this Part C;
 - (ii) MTO Special Provisions;
 - (iii) The applicable MTO Directives, MTO Policy Memorandums, and MTO Design Bulletins;
 - (iv) OPSS;
 - (v) MTO Contract Design, Estimating and Documentation (CDED) Manual;
 - (vi) Ontario Traffic Manuals;
 - (vii) MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, June 2017;
 - (viii) Urban Supplement to the Geometric Design Guidelines for Canadian Roadways, TAC;
 - (ix) Geometric Design Guide for Canadian Roads, TAC;
 - (x) Roadside Safety Manual, MTO;
 - (xi) MTO Standard Drawings;
 - (xii) OPSD;
 - (xiii) Fluorescent Orange Temporary Pavement Markings Policy #2011-11;
 - (xiv) MTO Policy 2011-02 – Full Road Closures;
 - (xv) Manual of Uniform Traffic Control Devices;
 - (xvi) Sign Sheeting Memorandum, February 21, 2008, MTO;

- (xvii) NCHRP Report 280 Work Zone Practices - Table 3: General Guidelines on Vehicle Capacity Through Work Zones;
- (xviii) Electrical Engineering Manual, MTO;
- (xix) Policy – Municipal Work on MTO Traffic Signals, September 2008;
- (xx) MTO Policy – Roadway Lighting on Municipal Crossroads, October 24, 2003;
- (xxi) Portable Variable Message Signs – Best Practices Manual, MTO;
- (xxii) Bikeways Design Manual; and,
- (xxiii) Guidelines for Reducing Speed Limits in Construction Work Zones.

1.2 General Requirements

- (a) DB Co shall manage the traffic and transit impacts of the Project and shall develop a Highway Traffic and Transit Management Plan (TTMP) for the Highway Works to meet the requirements of this Part C. DB Co shall manage and coordinate the Highway TTMP developed under this Part C with DB Co's requirement to manage and develop the TTMP required for the Confederation Line Extension Works as prescribed in Schedule 15-2, Part 7 – Traffic and Transit Management and Construction Access. The management and development of the Highway TTMP shall complement the requirements of the other respective TTMP and for further certainty neither the Highway TTMP nor the TTMP shall diminish the other nor the requirements prescribed in this Part 9 and Schedule 15-2, Part 7 – Traffic and Transit Management and Construction Access.
 - (i) The Highway TTMP shall be applicable to the Highway Works Construction Activities only.
- (b) DB Co shall coordinate the Permitted Periods for Closures and shall work collaboratively with adjacent MTO Contract 2017-4031 and the ATMS work at the Highway 416 / Hunt Club Road interchange, as outlined in Clause 2.6 of Part A. The Highway TTMP shall include how DB Co will manage this coordination. DB Co may reasonably be required to plan the Works with recognition of periodic Closures required by MTO Contract 2017-4031, which shall be given priority. DB Co shall expect to temporarily revise Designated Construction Zone limits to accommodate these Closures, when necessary. Designated Construction Zone revision shall allow Closures necessitated by DB Co and MTO Contract 2017-4031 to maintain compliance with OTM Book 7. Coordination requirements with other work are further detailed in Clause 2.5 of Part A of this Schedule 15-2, Part 9.
- (c) The Permitted Periods for Closures outlined in this Part C shall be the basis for the development of the Highway TTMP. Variations to the applicable Permitted Periods for Closures, at specific locations, may be permitted for such specific locations, but only if substantiated through a plan by DB Co that addresses, at a minimum, traffic

- requirements, analyses and Stakeholder consultation, where applicable, and such plan is submitted to the City for approval in accordance with Schedule 10 – Review Procedure.
- (d) DB Co shall work collaboratively and diligently, in a reasonable manner with the City and OC Transpo, Stakeholders, MTO, EMS organizations and other City service providers and Governmental Authorities so that transit service is maintained during construction in terms of travel time and frequency.
 - (e) Construction shall be scheduled so that the duration and extent of the proposed Highway Works and traffic control measures minimize the impact to all modes of transportation and adjacent land owners, and shall not prohibit any part of the traveling public access prior to receiving the required authorization to do so.
 - (f) All traffic data used for analysis for traffic management purposes shall be based on the most current data, no older than two years. The information to be collected shall include, but not be limited to, typical hourly traffic volumes in each direction for a 24 hour period for each season, considering all modes of travel on all Roads, bus Facilities, bike facilities and pedestrian facilities which will be affected by the Project, including any potential Detour Routes. DB Co shall be responsible for obtaining or collecting all traffic data necessary for its traffic analysis; the data shall reflect typical conditions of the roadway. DB Co shall confirm with the City that the data is appropriate prior to conducting an analysis using said data.
 - (g) DB Co shall undertake a Traffic Management Study (the “Traffic Management Study”), where road capacity is reduced, to determine the impact of the construction on possible diverted traffic and to determine appropriate mitigation measures. The Traffic Management Study shall extend along the entire extent of projected impacts and address all modes of transportation including adjacent corridors impacted by the construction. The study shall include DB Co’s forecast for, but not limited to, routes, diverted traffic volumes, speeds and travel times, for all modes of travel on all routes subject to the study. The Traffic Management Study shall be submitted as a part of the Highway TTMP document in accordance with Schedule 10 – Review Procedure.
 - (h) The OTM supersedes all reference in this Schedule 15-2, Part 9 to the MTO MUTCD. The supply and placement of all necessary temporary TCDs shall be performed under the sole direction of DB Co and in accordance with DB Co’s submitted/reviewed Highway TTMP and associated Highway TCP, prior to commencing any construction, on or adjacent to any Provincial Highways, Municipal Roadways or Other Affected Municipal Roadways. The Highway TCP shall be developed in accordance with guidelines established by the most recent version of the OTM, the OHSa and this Part C which details the required contents and submission of the Highway TTMP and associated Highway TCPs.
 - (i) Vehicular and pedestrian/cyclist traffic control within the Highway Works limits shall remain the sole responsibility of DB Co. The City delegate this authority to DB Co in accordance with the submitted/reviewed Highway TTMP. Notwithstanding the foregoing,

- DB Co shall, at its own expense, remove any equipment or Material, which in the City's opinion, constitute a Hazard to traffic, pedestrians and cyclists.
- (j) DB Co shall be fully and solely responsible to ensure the development and implementation of a submitted/reviewed Highway TTMP as required in this Part C. The Highway TTMP and its sub-plans, and all required TCDs shall be designed/installed, monitored, operated/maintained and removed, utilizing only competent persons and workers as defined under the OHSA. DB Co shall be responsible for coordination of this work with the City.
 - (k) DB Co shall not store any equipment or materials on a provincial or municipal road or the Roadway shoulders, the Transitway, Park and Rides, or boulevards, unless the storage areas are identified in the Highway TCP and appropriate TCDs have been implemented to protect the equipment or materials. The City shall review and approve any storage of equipment and/or materials within the Highway Corridor Lands. Construction shall be scheduled so that the duration and extent of the proposed Highway Works and traffic control measures minimize the impact on the traveling public. DB Co shall remove all dirt and Debris from all paved or concrete surfaces outside of the staging area at the close of each workday, and are responsible for any repairs or maintenance associated with the construction activity, to City and MTO Standards.
 - (l) Implementation and removal of any Closure, Full Closures, Detour Routes, Lane Shifts, and Diversions and/or other changes in traffic patterns shall not be permitted outside of the applicable Permitted Periods for Closures as defined in this Part C and elsewhere in this Project Agreement.
 - (m) The City Representative may, acting in a reasonable manner, temporarily adjust the applicable Permitted Periods for Closures in circumstances considered appropriate by the City including but not limited to, Holidays, as further addressed in Clause 1.4 of this Part C – Holidays and Special Events and Clause 4.4 of this Part C – Permitted Times for Lane and Ramp Closures.
 - (n) The City Representative may direct DB Co, on seven Business Days advance notice, to eliminate or modify any or all Closures and restore free-flow traffic for a 24-hour period on the day of any planned event other than a Holiday, as per this Part C.
 - (o) The City Representative may direct DB Co, on short notice (within 48 hours), to remove any or all Closures and restore or maximize Road cross-section including Shoulders and maintain existing traffic flow, where practical for any unplanned / emergency events.
 - (p) DB Co shall temporarily cease any relevant Construction Activities that are affecting traffic and make all the necessary travel lanes available to traffic as quickly as possible if the City Representative or DB Co Traffic Control Supervisor determines that vehicular queues related to Closure, Full Closures, Detour Routes, Lane Shifts and/or Diversions are excessive. For example, where vehicular queues at intersections or interchanges extend onto the Main Line.

- (q) If DB Co's Traffic Control Supervisor or the City Representative determine that there are significant unexpected and/ or unmitigated traffic safety or operational issues related to Closure, Full Closures, Detour Routes, Lane Shifts and/or Diversions, DB Co shall temporarily cease any relevant Construction Activities that are affecting traffic and take necessary steps to Address the safety and operational issues.
- (r) Any proposed DB Co initiated Closure, Full Closures, Detour Routes, Lane Shifts, and Diversions, not included in DB Co's accepted Highway TCP, shall be submitted to the City in an updated Highway TCP in accordance with Schedule 10 – Review Procedure. DB Co shall not proceed with implementation of the Closure, Full Closure, Detour Route, Lane Shift or Diversion without a Highway TCP accepted by the City. DB Co shall not commence any work on Highway Corridor Lands without an applicable current accepted Highway TCP.
- (s) Multiple work zones that impact each other along Provincial Highways, Municipal Roadways, and Other Affected Municipal Roadways or routes between them, such that traffic encounters multiple disruptions and/or discontinuity in the lane geometries, shall not be permitted.
- (t) Notwithstanding any Closures or Full Closures, DB Co shall maintain access to all adjacent properties through Detours or otherwise.
- (u) Access to/from work zones along existing Provincial Highways and Roads shall not be permitted outside of the applicable Permitted Periods for Closures.
- (v) Access to/from work zones on the Provincial Highways during applicable Permitted Periods for Closures shall only be permitted with a Closure of the adjacent lane to provide vehicle acceleration / deceleration.
- (w) Construction vehicles/equipment shall only use accesses to/from work zones in the same direction of traffic thereby diverging/merging with the flow of traffic. A minimum distance of 1,000 m shall be maintained between construction egress and access locations. If this minimum spacing cannot be accommodated due to spatial constraints, DB Co shall propose an alternate configuration through the Highway TTMP. The City reserves the right to close any access to/from any work zones that it deems to be unsafe or which constitutes a Hazard to the public.
- (x) DB Co shall ensure that an open excavation adjacent to a lane carrying traffic will not be present except where a Barrier designed to restrain errant vehicles is located between the traffic and the excavation.
- (y) DB Co shall ensure that Materials and / or equipment is not stored within 10 m of the traveled portion of any Roadway unless protected by a Barrier. Notwithstanding compliance by DB Co with the foregoing, DB Co shall, at its own expense, remove Materials and construction vehicles and equipment which, in the opinion of the City Representative, constitute a traffic Hazard, or obstruction to maintenance operations.

- (z) DB Co shall be responsible for identifying to the City in advance all Roads being utilized for haul routes. DB Co shall be responsible for the cleaning and maintenance of haul routes. Requirements pertaining to haul routes are identified in Article 13 of Part B of this Schedule 15-2, Part 9.
- (aa) The City shall be granted access to the work zones to install portable cameras or other devices required for monitoring, audit, public communication, data collection or other purposes.
- (bb) All TC-54s used by DB Co shall be equipped with two sets of rubber tire ballast rings. DB Co shall remove all TC 54s from Roads, within the limits of the Highway Works, immediately after the conclusion of any traffic control requiring their use.
- (cc) DB Co shall be responsible for providing, installing and maintaining all TCDs and protective devices identified in the approved Highway TTMP.

1.3 Accommodation of Transit Services

- (a) DB Co shall be responsible for liaising and coordinating with all applicable municipal transit agencies for any modifications to bus routes and/or bus stops that may be required due to Closures, Full Closures, Detour Routes, Lane Shifts and Diversions and/or other changes in traffic patterns.
- (b) DB Co shall maintain access for transit customers at all adjacent existing Transitway and transit facilities, bus lanes and Transit Priority Lanes and non Transitway routes through detours or otherwise as detailed elsewhere in Schedule 15-2, Part 7 - Traffic and Transit Management and Construction Access, and elsewhere in the Project Agreement, unless exceptions have been approved.
- (c) DB Co shall provide the City and OC Transpo at least 35 calendar days' notice to coordinate adjustments required to their facilities as a result of construction. Access by buses, pedestrians and cyclists to all existing bus stops located within the work zone shall be maintained at all times, except where otherwise stated in Schedule 15-2, Part 7 - Traffic and Transit Management and Construction Access or elsewhere in this Project Agreement or agreed upon by the City and OC Transpo.
- (d) Proposed modifications to bus routes and/or bus stops shall be submitted in accordance with Schedule 10 – Review Procedure.

1.4 Holidays and Special Events

- (a) DB Co shall comply with the following requirements when scheduling hours of work or DB Co initiated Closures during the Holidays identified in Tables 1-1.1 and 1-1.2 (the "Holidays"):
 - (i) DB Co shall not commence the implementation of any Closures on any of the Holidays, after 12:00 on Fridays or a day proceeding a Holiday weekend, and

before 12:00 on a day following a Holiday or on the first Business Day following a Holiday weekend.

- (ii) Closures required for the installation of the Pedestrian Bridge at Queensview Station shall be permitted on Holiday weekends, except the weekends of Canada Day and Thanksgiving, subject to DB Co's receipt of approval from the City according to Article 4 of this Part C.

TABLE 1-1.1 – ONTARIO STATUTORY HOLIDAYS

New Year’s Day	Civic Holiday
Family Day	Labour Day
Good Friday	Thanksgiving Day
Victoria Day	Christmas Day
Canada Day	Boxing Day

TABLE 1-1.2 – OTHER HOLIDAYS

Easter Monday	Remembrance Day
St. Jean Baptiste	

- (b) DB Co shall minimize traffic disruptions on Provincial Highways, Municipal Roadways, and Other Affected Municipal Roadways during special events. DB Co shall be responsible for obtaining a listing of planned special events on an as required basis from the City of Ottawa Events Central Office, the Traffic Management Special Events office, and the NCC, recognizing that the special events calendar is updated by the City and the NCC on a regular basis.

1.5 Detour Route, Lane Shift, Diversion, Closure and Construction Requirements

(a) General

- (i) DB Co shall not implement any Closure, Detour Route, Lane Shift or Diversion without an applicable current accepted Highway TTMP and Highway TTMP sub-plans.
- (ii) DB Co shall pave all Detour Routes, Lane Shifts and Diversions and have appropriate Pavement Markings and Signs placed in accordance with the OTM, MTO Standards, policies, guidelines and best practices.
- (iii) DB Co shall be responsible for all Pavement Markings and non-regulatory signage on all Detour Route, except as identified in Clause 8.3 of Part B of this Schedule 15-2, Part 9, in preparation for the detour and during detour operations.
- (iv) DB Co shall ensure that the Pavement structure and condition of any new, existing or temporary Road, bus lanes, cycling facility and pedestrian facility used for all Detour Routes, Lane Shifts and Diversion is designed and constructed for its intended purpose in accordance with the requirements set out in Schedule 15-2,

Part 9, Part B, Clause 3.3, and does not adversely impact the safety and intended function of such Detour Routes, Lane Shifts and Diversions for all road users of the facilities.

- (v) DB Co shall schedule Construction Activities such that no milled surface shall remain for more than 10 calendar days, or over Holidays and adjoining Weekend Periods. Each milled surface shall have a uniform texture, not be raveled, and not allow standing water on the surface.
- (vi) DB Co shall prepare an engineered design for each Detour Route, Lane Shift and Diversion that shall conform to the design requirements in the Reference Documents. Detour Routes shall be designed to the same design speed of the existing Road. Where a Diversion design speed for a Crossing Road cannot match the existing design speed within the proposed ROW limits, a reduced design speed corresponding to the posted speed shall be submitted to the City Representative for acceptance in accordance with Schedule 10 – Review Procedure.
- (vii) DB Co shall provide Detour Routes, Lane Shifts and Diversions with drainage facilities to prevent standing water and flow of water across the Roads, bus lanes, cycling and pedestrian facilities.
- (viii) Implementation and removal of any Closures, Full Closures, Detour Routes, Lane Shifts and Diversions and/or other changes in traffic patterns shall not be permitted outside of the applicable Permitted Periods for Closures.
- (ix) Lane Closure duration shall be limited to the time required to execute the necessary Construction Activities. DB Co shall not close a lane for purposes other than actual Construction Activities, such as, but not limited to, Material and equipment storage, and staff parking, unless approved by the City.
- (x) Detour Routes, Lane Shifts and Diversion requirements and any modifications thereto, shall be submitted in accordance with Schedule 10 – Review Procedure. The submittal shall in addition include modifications to the various Highway TTMP sub-plans as applicable.
- (xi) All Highway Works related Closures associated with traffic of any kind shall be the responsibility of DB Co, as well as any associated requirements for traffic control (such as but not limited to signage, line painting, TCD, Barriers, flag persons, point duty police, etc.). Closures and their ancillary requirements shall be submitted as part of the submittals in accordance with Schedule 10 – Review Procedure.
- (xii) DB Co shall prepare and submit Record Drawings to the City in accordance with the requirements of Schedule 15-2, Part 1, Article 16 – Record Drawings, and Schedule 15-2, Part 9, Part A, Clause 2.2, where new traffic signals, temporary traffic signals or modifications are being made to existing traffic signals, within 30 calendar days of signal activation.

- (xiii) DB Co shall have independent Road Safety Audits and Road Design Safety Reviews completed for any temporary or permanent Road, or Road detour, in accordance with the criteria set out in Article 6 - Roadways, Bus Terminals and Lay-Bys, of Schedule 15-2, Part 2 and Article 10 of Part B of this Part 9.
- (b) Traffic Control Devices
- (i) DB Co shall supply, install and maintain DSM approved PVMS as required to supplement the Highway TCP and shall use the same to provide advance notification and advance warning of traffic pattern changes. Sign locations and messages shall be as shown in the Highway TCP which shall be submitted to the City in accordance with Schedule 10 – Review Procedure two weeks prior to being displayed. The City retains the right to require DB Co to provide additional PVMS in support of the Highway TCP.
 - (ii) DB Co shall provide PVMS(s) to provide advance notification and advance warning of Incidents as deemed necessary by the Highway Emergency Traffic Plan. Sign messages and the duration that the PVMS is deployed and displayed shall be submitted to the City for acceptance prior to being implemented, and the Highway TCP shall be updated to record the messages which were used.
 - (iii) PVMS signs shall meet the following requirements:
 - A. Be capable of displaying a sequence of up to six panels;
 - B. Each display panel shall be capable of displaying up to three lines;
 - C. Accommodate up to 12 characters on each line of text; and,
 - D. Messages shall be legible from 50 m to 300 m.
 - (iv) DB Co shall utilize standard MTO and bilingual messages on all PVMS Signs and message boards (one Sign per approach) with translations accepted by the City.
 - (v) DB Co shall provide TC-64 Signs or PVMS for all re-occurring Lane Closures, Full Closures, detours and Diversions. Additional PVMS may be used as an option in lieu of the TC-64 Signs. PVMS are required for all Full Closures.
- (c) Temporary Barrier Requirements
- (i) DB Co shall supply and install temporary Barriers based on the requirements of the OTM, OHSA and the Roadside Safety Manual.
 - (ii) DB Co shall show the temporary Barriers in the Highway TCP which shall be submitted in accordance with Schedule 10 – Review Procedure.
 - (iii) Temporary Barriers used for Closures, Full Closures, Detour Routes, Lane Shifts and Diversions, shall meet the OPS standards and have appropriate flare offsets,

end treatments and crash cushions. Temporary Barriers shall have reflectors installed. DB Co shall make adequate provision for drainage and removal of snow, ice and Debris where temporary Barriers are used.

- (iv) DB Co shall install anti-glare screens, on or adjacent to Barriers, in order to avoid driver distraction and headlight glare in locations adjacent to Municipal Roadways and Other Affected Municipal Roadways where Equipment is actively working. DB Co shall submit the documentation and product samples proposed for anti-glare screens in accordance with Schedule 10 – Review Procedure.
- (d) Daily Backfilling to Subgrade Level
- (i) At locations where temporary Concrete Barrier is present, excavation for the roadworks, placement of Granular Materials, and any other operation which will result in an excavation shall only be completed to within 1.0 m of the backface of the Barriers when the Barriers are positioned in their temporary configuration, in accordance with MTO Design and Contracts Standards Policy #2017-04. The remainder of the excavation, Granular Materials and asphalt pavement shall be completed by shifting the Barrier and implementing a lane Closure in accordance with the timing constraints specified elsewhere in this Part C. The Barrier shall then be returned to its un-shifted position.
 - (ii) DB Co shall ensure that prior to completion of work each day, areas that are excavated below a subgrade level are backfilled to the subgrade level in accordance with methods specified elsewhere within the Project Agreement.
 - (iii) DB Co shall ensure measures are taken against undermining of the adjacent Pavement structure at open excavations throughout the contract limits, where traffic is protected by temporary Concrete Barrier. This shall be done by backfilling with the specified Material up to profile grade within 2 m of the back of Barrier prior to ceasing operations each weekend.
- (e) Guide Rail Construction Operations
- (i) DB Co shall ensure that the existing guide rail system or an approved Barrier System shall remain in place at all times or the removed guide rail is replaced with the new guide rail or an approved Barrier System within the same working day at all locations with an existing guiderail or Barrier System.
- (f) Ramp and Side Street Closures
- (i) DB Co shall provide notice of one-time ramp and side street Closures consistent with requirements detailed elsewhere.
 - (ii) Ramp and Side Street Closures – Short Duration
 - A. DB Co shall comply with conditions covered elsewhere in the Project Agreement for all nightly Closures of ramps and/or Lane Closures on side

streets. Ramps shall only be closed if work is directly located on the ramp or on Highway 417 or side street at the ramp junction, or if Closure is required to implement other lane Closures in accordance with OTM Book 7. Short-term ramp Closures are restricted to one ramp at a time per interchange per direction.

(iii) Ramp and Side Street Closures – Long Duration

- A. DB Co shall only close ramps if work is directly located on the ramp, or on the Highway or side street at the ramp junction, if Closure is required to implement other Lane Closures in accordance with OTM Book 7, with the exception of the Long Duration temporary closure of the Richmond Road N-E ramp.

RAMP / SIDE STREET	DURATION
Moodie Drive S-W ramp	Permitted to be closed for a single construction season to facilitate the construction of the grade separation between the S-W ramp and the LRT alignment, with associated lane reductions/traffic management measures on Moodie Drive
Richmond Road N-E ramp	This ramp shall be closed temporarily from the commencement of the Transitway Segment W-7 detour/opening of the temporary Holly Acres N/S-E transit only ramp until Revenue Service of the Confederation Line West Extension is achieved.

(f) Existing Roadway Illumination

- (i) DB Co shall ensure all existing Roadway illumination remains fully operational during the hours of darkness until such time as a temporary and/or permanent Highway Lighting System is installed and operational during hours of darkness. For instances where the Roadway is closed to traffic to accommodate construction, the existing Roadway illumination may be turned off within the limits of the road Closure only. Any temporary and/or permanent Highway Lighting System must have equivalent lighting levels to the existing lighting levels.

(h) Underpass Illumination

- (i) DB Co shall ensure that existing Underpass illumination is fully operational at all times during the hours of darkness until such time as the temporary or permanent Underpass lighting is installed and operational during the hours of darkness. Any temporary and/or permanent Highway Lighting System must have equivalent lighting levels to the existing lighting levels.

- (i) Electrical Coordination
 - (i) DB Co shall coordinate the installation of guiderail with the location of any electrical work (permanent, temporary and existing) within the Highway Works limits.
- (j) Signage
 - (i) DB Co shall be responsible for the design, supply, installation, relocation, maintenance and removal of all temporary signage, including Warning Signs, guide, advisory and directional Signs in accordance with this Part C and Clause 8.3 of Part B of Schedule 15-2, Part 9.
 - (ii) All temporary signage shall be in accordance with the City of Ottawa, OTM and MTO Standards. DB Co shall provide signage requirements for all temporary conditions as per MTO's Temporary Conditions Traffic Management Manual dated April 2001, throughout the Highway Works. The location, size and type of each Sign shall be indicated on the Highway TCP.
 - (iii) DB Co shall supply and install bilingual Signs, with translations accepted by the City.
 - (iv) DB Co shall prepare and submit as part of the Highway TTMP sub-plans a Temporary Signing Plan and a Temporary Signing Table in accordance with Clause 8.3 of Part B of Schedule 15-2, Part 9.
 - (v) DB Co shall be responsible to install and remove all necessary construction signage for any proposed Detour Routes. DB Co shall notify the City a minimum of 14 calendar days in advance of the requirement for the detour.
 - (vi) Project Information Signage will be provided by the City. DB Co shall install project Information Signage at locations designated by the City.
- (k) Temporary Lighting During Construction
 - (i) DB Co shall be responsible for all temporary street light relocation.
 - (ii) All existing lighting in each staging phase shall be maintained in operational order to applicable standards during construction on the relevant construction phase until such time as replacement temporary or permanent lighting is energized.
 - (iii) DB Co shall provide temporary illumination as per Clause 6.5 of Part B of this Schedule 15-2, Part 9.
- (l) Pavement Drop-Offs
 - (i) DB Co shall perform all Construction Activities so as to minimize any Drop-offs (abrupt changes in Road elevation) left exposed to traffic, pedestrians and cyclists

during non-working hours. Drop-offs left exposed to traffic, pedestrians and cyclists during non-working hours shall be delineated as follows:

- A. Drop-offs up to 40 mm may remain exposed with appropriate TCDs alerting motorists of the condition. However, no drop-offs shall be allowed between adjacent lanes of traffic;
 - B. Drop-offs greater than 40 mm that are in the Road or Shoulder shall be delineated with appropriate TCDs and further delineated as described in Clause 1.5(c) of this Part C;
 - C. Ramping shall be provided for vehicular traffic at a slope of 10:1 if the elevation difference, where unavoidable, is more than 40mm for longitudinal edge drops.
 - i. The provisions for temporary ramping shall also meet the requirements of OPSS PROV 313.
 - ii. DB Co shall ensure that adequate and positive drainage is maintained along and across the Roadway at all times and during all construction stages.
 - D. All transverse edge drops located on roads utilized by traffic and transit shall be ramped at a slope of 120:1.
- (ii) All areas of excavation near areas of traffic and their proposed safety measures shall be shown in the Highway TCP.
 - (iii) All Highway Works shall meet AODA requirements at all times.
- (m) Temporary Pavement Markings, symbols and devices
- (i) DB Co shall be responsible for the execution of all temporary Pavement Markings and symbols in accordance with this Part C, and Clause 8.5 of Part B of Schedule 15-2, Part 9.
 - (ii) DB Co shall be responsible for the application, maintenance and removal of all Temporary Pavement Markings, symbols, Road pavement markers, channelizing devices, barricades, reflective devices, etc., in accordance with the OTM, and all of which shall be specified and detailed in the Highway TCP which shall be submitted to the City in accordance with Schedule 10 – Review Procedure. Only permanent Pavement Markings shall be applied to the final Pavement surface.
 - (iii) DB Co shall eradicate all redundant Temporary or Permanent Pavement Markings that are not required for the intended traffic pattern using DSM listed equipment.
 - A. Eradication of Pavement Markings shall be in accordance with the CDED Manual, such that removal of Pavement Markings, when necessary, shall

- be by means of asphalt grinding, sandblasting, soda blasting, water blasting or some other form of mechanical removal and not by the use of black paint.
- B. DB Co shall resurface all locations where scarring of Pavement occurs due to the removal of Pavement Markings for construction staging. Resurfacing requirement applies to all locations where more than one Lane Shift or diversion occurs. DB Co shall provide full width paving throughout the limits of the scarring prior to the application of permanent Pavement Markings.
- (iv) Temporary Pavement Markings Materials shall be in accordance with OPSS 710, and shall be specified and detailed in the Highway TCP.
- (v) DB Co shall apply all Temporary Pavement Markings in accordance with OPSS 710 and the accepted Signing and Pavement Markings drawings and the Closure, Detour Route, Lane Shift and Diversion drawings as submitted to the City in accordance with Schedule 10 – Review Procedure.
- (vi) Fluorescent Orange Temporary Pavement Markings shall be used on all Provincial Highways where there are changes in alignment to accommodate construction staging.
- (n) Speed limits and safe passage through work zones
- (i) The City reserves the right to determine speed limits through the work zones. Unless specified in this Part C or agreed to in writing by the City, the existing regulatory speed limits shall be maintained.
- (ii) DB Co shall review the need for short- or long-term speed reduction for all staging in accordance with the Reference Documents. Proposed speed reduction shall be submitted to the City Representative through the Designation of Construction Zone forms. Proposed posted speed reductions on Provincial Highways below 80 km/h will not be accepted.
- (iii) Speed limits on all Provincial Highways, Municipal Roadways, and Other Affected Municipal Roadways shall remain unchanged outside of Designated Construction Zones. DB Co shall prepare the necessary Designation of Construction Zone forms, (PH-M-101), which shall be submitted to the City Representative for approval in accordance with Schedule 10 – Review Procedure. The City Representative will submit the forms to MTO for approval.
- (iv) Construction Activities shall be carried out in such a manner as to maximize safety and minimize disruption to Highway traffic.
- (v) Outside the Winter Period, lane widths of no less than 3.5 m and lateral offsets between the travelled lane and temporary Barriers of no less than 0.5 m must be maintained at all times during Construction Activities.

- (vi) During the Winter Period, lane widths shall be as per Clause 1.14.
- (vii) Floodlighting used to illuminate areas of the Highway Works during Construction Activities, shall be included in the Highway TCP and shall be adjusted so as to not interfere with the vision of drivers on the affected or opposing lane and also so as to not be directed towards residences or businesses near the work zone.
- (o) Maintenance of Closures, Detour Routes, Diversions, Lane Shifts, pathways and sidewalks
 - (i) DB Co shall keep existing Roads open to traffic, and DB Co shall be responsible for providing a road through the Designated Construction Zone for the duration of the Highway Works, whether along an existing Road, including the road under construction, or on Detours, Diversions or Lane Shifts.
 - (ii) DB Co shall maintain and repair Closures, Detour Routes, Diversions, Lane Shifts, pathways and sidewalks and their appurtenances, which are built as permanent infrastructure, as per the maintenance provisions set out in this Part C for temporary infrastructure.
 - (iii) DB Co shall be responsible for all aspects of maintenance and repair for all temporary Closures, Detour Routes, Diversions, Lane Shifts, pathways and sidewalks and their appurtenances throughout their duration of use.
 - (iv) DB Co shall execute the maintenance on temporary infrastructure, throughout its duration of use:
 - A. In accordance with Applicable Law and Good Industry Practice;
 - B. In accordance with the accepted Highway TTMP;
 - C. To ensure that the condition of the DB Co temporary infrastructure is sufficient to meet the design, construction and operational requirements for the intended use; and,
 - D. In coordination with the City, so as to permit the City to operate City infrastructure, while minimizing any adverse impact on third parties.
 - (v) Prior to putting part of temporary or permanent transportation infrastructure into service, DB Co shall convene a meeting with the City in order to coordinate maintenance activities at the interface between existing City or MTO infrastructure and the DB Co temporary or permanent infrastructure. DB Co shall take minutes of the meeting and, distribute the documented proceedings and conclusions to the participants.
 - (vi) On the first Monday after Thanksgiving Day each year, DB Co shall convene a meeting with the City to discuss “winter readiness”, so that all parties know their respective roles prior to a sudden onset of winter weather. DB Co shall take

minutes of the meeting and distribute the documented proceedings and conclusions to the participants.

- A. MTO shall be responsible for winter maintenance (snow plowing, winter sanding, snow clearing) on Provincial Highways and Crossing Road ramps, excluding existing Transitway lanes and ramps. No Lane Closures will be permitted if any precipitation is anticipated during the requested Lane Closure period.
- B. DB Co shall be responsible for the winter maintenance of any construction Roads or accesses to construction sites.

1.6 Accommodation of Pedestrians and Cyclists During Construction

- (a) DB Co shall not close or relocate any Pedestrian Walkway or cycle track without a Highway TTMP that has been accepted by the City. The Highway TTMP and sub-plans shall identify any Pedestrian Walkway or cycle track Closure, relocation and alternate route in accordance with Schedule 10 – Review Procedure, complete with a detailed explanation of why the Pedestrian Walkway or cycle track is required to be closed or relocated and the signs which shall be installed as a part of the Closure or relocation.

1.7 Working within Vicinity of a Traffic Control Signal

- (a) DB Co shall notify and be responsible for all costs associated with Ottawa Police Services (OPS) being on duty to control traffic, when DB Co is required to work within 200 m of a traffic control signal. Advanced notice of 48 hours shall be provided to OPS. No traffic control person shall be permitted to direct traffic in this area, nor may they direct traffic from more than one direction at any time. DB Co shall notify the City of this situation prior to OPS contact.

1.8 Temporary Traffic Control Signals

- (a) DB Co shall design and construct temporary Traffic Signal Systems in accordance with Clause 6.6 of Part B of this Schedule 15-2, Part 9.
- (b) Where there are active ongoing Construction Activities and DB Co personnel are present within an intersection where there are existing traffic control signals to be temporarily modified, or new temporary traffic control signals to be installed, DB Co shall be responsible to arrange for OPS paid-duty officers to provide point duty within an intersection while the City modifies or installs the traffic control signals.
- (c) At an intersection where as part of Highway Works, existing traffic control signals are to be modified temporarily, or temporary traffic control signals are to be installed, and only City forces will be working at the intersection, the City shall arrange for the OPS services and DB Co shall be responsible for the costs.

1.9 Traffic Engineering Requirements During Construction

- (a) DB Co shall meet the traffic engineering requirements outlined in Clause 1.4 of Part B of this Schedule 15-2, Part 9.
- (b) If DB Co demonstrates through detailed traffic analysis that pre-construction performance cannot be achieved through optimized signal timing, geometric improvements or other intersection improvements, DB Co shall submit a request to the City in accordance with Schedule 10 – Review Procedure to receive exemption on this performance and acceptance of the intersection design during construction in City’s sole discretion.

1.10 Record Keeping of Traffic Control Devices/Collisions

- (a) DB Co shall maintain Accurate records of the traffic controls which are in place within temporary infrastructure that is in service.
- (b) DB Co shall maintain an Accurate daily record of the inspection of the traffic accommodations, and provide copies of the information to the City immediately upon request. The daily record shall include the following:
 - (i) A twice daily video (hand held, dash-cam, etc.) in both or all directions as applicable, such that all portions of the Highway Works are recorded in sufficient detail to accurately see and distinguish/read all of the TCDs in place on Site;
 - (ii) Condition and placement including changes, additions and removals of all TCDs;
 - (iii) Confirmation of compliance with the Highway TTMP and its sub-plans;
 - (iv) All traffic collisions;
 - (v) The dates, times and content of all messages on all PVMS; and,
 - (vi) The date and time of Lane Closures;

1.11 Traffic Monitoring During Construction

- (a) DB Co shall undertake traffic monitoring in accordance with its Highway Traffic Monitoring Plan, as defined in Clause 5.2(h) of this Part C.

1.12 Communications

- (a) DB Co shall ensure that all communications and stakeholder engagements in relation to the Highway TTMP are in accordance with Schedule 18 – Communications and Stakeholder Engagement Obligations and as further detailed in this Clause 1.12 of Part C.
- (b) DB Co shall be responsible for providing road Closure and detour information to the City for the purposes of public notification.

- (c) DB Co shall schedule and attend Highway TTMP meetings and workshops with the City in order to obtain Highway TTMP approvals and with key Stakeholders prior to implementation. The frequency of the meetings will vary at the City's discretion. DB Co shall record and distribute minutes for these meetings to the City within five Business Days of the meeting, including but not limited to attendance sheets, agenda, record copy of material presented, comments received, issues raised, and the follow up action proposed by DB Co to resolve each issue. Resolution of the issues shall be raised and recorded by DB Co at the regularly scheduled Highway TTMP meetings.
- (d) DB Co shall attend any public meetings that are held prior to detour implementation, and shall be responsible for Addressing issues raised at the public meetings in the forum of the technical Highway TTMP meetings.
- (e) DB Co shall provide the City with a process as part of the Communication and Stakeholder Engagement Plan detailed in Schedule 18 – Communications and Stakeholder Engagement Obligations, and a contact person to whom the City can rely on to respond to any stakeholder relations obligations pertaining to traffic management. Issues and the resolutions thereto shall be raised and recorded by DB Co at the regularly scheduled Traffic Management Committee meetings.
- (f) DB Co shall assist the City and attend stakeholder events and stakeholder outreach meetings in relation to the Highway TTMP in accordance with Schedule 18, Part 4 – Communications and Stakeholder Engagement Activities. At these events and meetings, DB Co shall explain in terms easily communicated to the public, the process of how the specific segment of the Project will be built, with a focus on an overview of the proposed traffic Closures and detours/alternate routes for pedestrians, cyclists and vehicles, and how the related traffic/transit management staging is proposed to be carried out.
- (g) DB Co shall provide design illustrations, display boards and narratives to the City for the traffic related information such as traffic volumes, traffic detours/alternate routes, traffic Emergency/contingency plans, collision data, truck routes, construction traffic routes, etc. All material provided shall be dated and include a contact name and contact coordinates (DB Co & City jointly). All materials shall be provided in quantity for distribution in both hard copy and electronically, in both official languages.
- (h) DB Co shall provide Timely e-mail distribution regarding traffic/transit updates, including major cycling route impacts.
- (i) DB CO shall provide to the City, content for weekly traffic/transit information/forecast updates, for release to the City's website and the MTO website.
- (j) DB Co shall provide content for the City's quarterly technical briefing to Committee and/or Council.
- (k) DB Co shall provide Timely content for social media updates to the City for release on the City's social media accounts so as to inform followers as to quick updates about on-the-ground traffic control implementation.

- (l) DB Co's Director of Communications and Stakeholder Engagement shall be the spokesperson whom the City will contact to Address all Project related complaints pertaining to traffic/transit management issues which are reported to the City, unless an alternate spokesperson has been agreed to by the City. The spokesperson shall provide pertinent and Timely information to the City in response to the complaint.
- (m) DB Co shall be advised that in the weeks leading up to and on the weekend of the Queensview Pedestrian Bridge installation, there will be requests from media, interest groups and City and MTO staff to gain access to the site. DB Co shall co-ordinate these requests and identify to these non-construction personnel the requirements they must meet to allow them to access the site (proper clothing, footwear, hard hat, etc.). DB Co shall provide any and all training to allow the non-construction personnel access to the site to meet DB Co's requirements as the constructor.

1.13 Highway Works Traffic Management Communications Plan

- (a) DB Co shall, no later than 180 days before commencement of Construction Activities for Highway Works, submit a plan (the "Highway Works Traffic Management Communications Plan") for review by the City pursuant to Schedule 10 – Review Procedure.
- (b) Project Co shall implement the Highway Works Traffic Management Communications Plan for the period covering commencement of Highway Works Construction Activities on the Highway Corridor until Highway Works Final Completion. The Highway Works Traffic Management Communications Plan will clearly describe how DB Co will communicate to all Stakeholders on matters relating to traffic flow, including, specifically, how it will provide Timely notice of construction related delays, Closures, Full Closures, Detour Routes, Lane Shifts, Diversions, and Incidents.
- (c) For the installation of the Pedestrian Bridge at Queensview Station (in accordance with the requirements of Schedule 15-2, Part 9), DB Co shall include and employ the following communication tactics in its Highway Works Traffic Management Communications Plan:
 - (i) Advertising in City of Ottawa and surrounding municipalities local newspapers;
 - (ii) Providing content for social media and project websites;
 - (iii) Leading Stakeholder consultation meetings as required, commencing a minimum of 90 days prior to weekend Closures;
 - (iv) Drafting and issuing media releases, as required; and,
 - (v) Notification to and coordinating with the City Representative, MTO Compass Traffic Operations Centre and MTO Road Work Scheduling and Coordination Unit.
- (d) The Highway Works Traffic Management Communications Plan must include communication and outreach tactics to ensure all Stakeholders are properly notified and

provided with the appropriate information. For purposes of this Clause 1.13, Stakeholders include, but are not limited to the following:

- (i) Stakeholders (as defined in Schedule 1 – Definition and Interpretation of the Project Agreement);
- (ii) Emergency services: Police, Fire and Ambulance;
- (iii) City of Ottawa;
- (iv) OC Transpo;
- (v) School boards;
- (vi) Any and all affected transit commissions;
- (vii) Vulnerable road users such as pedestrians, cyclists and special interest groups (consider disabled/ODA requirements);
- (viii) Municipal and provincial elected officials;
- (ix) Large traffic generators, such as major employers, commercial/retail establishments, businesses, entertainment venues, places of worship, etc.;
- (x) Industries/shippers;
- (xi) Ontario Trucking Association;
- (xii) Motorists and professional drivers; and
- (xiii) General public.

1.14 Winter Period

- (a) DB Co shall perform all Maintenance Operations during the Winter Period except for snow, ice, and frost control as defined in Appendix G.
- (b) DB Co shall submit to the City for review a Winter Season Plan for each year by the first Monday in October each year in accordance with Schedule 10 – Review Procedure (the “Winter Season Plan”). The plan shall detail any and all Construction Activities to continue during the Winter Period, as well as any changes to the current Highway TTMP during the Winter Period, including the signing and Pavement Marking changes, and document the Shoulder widths available for snow storage during the Winter Period.
- (c) All permanent Highway 417 and Municipal Roadway lanes, Shoulders, Pavement Markings, Signs, Structures and interchange ramps that were in place prior to the start of construction, or their reconstructed counterparts, shall be paved, and/or reinstated prior to the Winter Period. All lanes (Provincial Highway and other Roads) and interchange

ramps shall be opened to traffic and shall remain unrestricted at all times to public traffic during the Winter Period.

- (d) DB Co shall complete all of the following work, prior to the Winter Period, in areas where the Highway Works was initiated in the same year:
- (i) Partial depth Pavement removal and paving operations (to the top of the upper binder course) on all Road lanes, including Shoulders, Structures and ramps;
 - (ii) Construction of all drainage courses, Culverts and storm sewers/Catch Basin grates (temporary and/or permanent) to elevations and provision of positive drainage of the Roadway, sub-base, Ditches and ROW in any areas where the existing road/median Ditches or drainage system has been altered from its pre-contract state;
 - (iii) Installation of new Barriers or temporary Barriers, with appropriate end treatments, in locations where existing roadside Barriers have been removed;
 - (iv) Installation of all erosion and sedimentation control measures as required;
 - (v) Completion of all permanent and/or Temporary Pavement Markings, Pavement Marking obliterating and installation of all guiderail systems;
 - (vi) If construction related Signs and supports are required during the winter, they shall not be placed on any asphalt surface or within two metres from the edge of pavement, so as to ensure winter plowing shall not be impeded;
 - (vii) DB Co's equipment and Material shall be removed from within the Highway Works limits consistent with the Winter Season Plan;
 - (viii) All Temporary Flexible Guide Posts shall be removed prior to the Winter Period;
 - (ix) All median construction access locations shall be closed off using temporary Concrete Barrier in accordance with DB Co's Winter Season Plan, deflected at 40:1;
 - (x) Temporary Pavement Markings shall be painted and receive a second application of paint each calendar year if they will be left in place during the Winter Period;
 - (xi) The removal of Temporary Pavement Markings that are not part of DB Co's Winter Season Plan and were placed for work during the construction season shall be completed using approved methods;
 - (xii) All new guiderail systems installed prior to the Winter Period shall be installed to the grades required for the final top of Pavement elevation; and,

- (xiii) Shoulder widths/offsets to Barriers shall be provided on Highway 417 on the right side and the left hand side of the lanes (in the direction of traffic) during the Winter Period; according to the following:
 - A. For the right hand side, DB Co shall provide a minimum 2.5 m Side Clearance. Where the right edge of Pavement is at the final location, DB Co shall maximize the offset but provide no less than the offset provided during construction. All Shoulders are to be paved and the concrete Barriers are to be installed on Pavement.
 - B. For the left hand side, DB Co shall maintain the existing offset during widening construction and shall provide a minimum 1.0 m Side Clearance during median construction. All Shoulders are to be paved and the concrete Barriers are to be installed on Pavement.
- (e) If the Highway Works on any Crossing Road is not completed in one season, then DB Co shall provide a paved surface with width consistent with the existing and/or to be constructed geometry, and with sidewalks as identified elsewhere in this Part 9 prior to the Winter Period.
- (f) All frames and covers of catch basins, maintenance holes and valve chambers located in the travelled portion of the Roadway shall be set flush with the pavement at the time of the Winter Period as required. All depressed curbs for entrances, cross-walks, curb ramps, uneven longitudinal/transverse joints, etc. shall be ramped with hot mix asphalt before the start of the Winter Period.
- (g) DB Co shall be responsible for preparing the Site each spring including, but not limited to:
 - (i) Re-instatement of all necessary construction related Signs;
 - (ii) Re-instatement to the design cross-fall all granular Shoulders on the contract, including any Material that is required; and,
 - (iii) Carrying out a detailed inspection of the binder course, identification of any deficiencies, and carrying out repairs as required to the satisfaction of the City.
- (h) Winter Period requirements, as contained in this Clause 1.14 of Part C, shall not relieve DB Co of any other requirements of the Project Agreement. All hot mix paving work performed by DB Co to meet Winter Period requirements, that do not meet the full requirements as specified elsewhere, shall be considered temporary paving and DB Co shall be responsible for the placement and subsequent removal of the temporary Pavement.
- (i) DB Co's Works Schedule shall at all times reflect the Winter Period requirements as defined in Clause 1.14 of this Part C.

ARTICLE 2 EXISTING MUNICIPAL ROADWAYS

2.1 General Requirements – Municipal Roadways

- (a) DB Co shall not perform any Highway Works on Municipal Roadways (Crossing Roads) or Other Affected Municipal Roadways during the following Peak Periods unless noted as an exception in this Part C:
 - (i) Monday to Friday inclusive: 06:30 to 09:30 and 15:00 to 18:30.
- (b) DB Co shall be permitted to partially close portions of Municipal Roadways due to Construction Activities while always maintaining local traffic access. There shall be at least one lane per direction (or two lanes per direction for segments with three existing lanes in each direction) and sufficient lane widths to accommodate bus travel. Exceptions to the principle of maintaining two lanes per direction in segments with three existing lanes per direction shall be defined by DB Co and presented to the City as part of the Highway Traffic Control Plans for acceptance.
- (c) DB Co shall schedule intersection disruptions during Off Peak Periods, Night Periods or Weekend Periods only. During those periods, there shall be at least one lane of traffic per street permitted at all times. Flagging shall be required if a single lane of traffic is in operation during Construction Activities. No active Construction Activities shall be performed in an intersection during Peak Periods.
- (d) DB Co shall develop a sequencing plan to minimize the length of the Municipal Roadway that is closed at any one time and include as part of the Highway Traffic Control Plans.

2.2 Conditions of Highway Works on Municipal Roadways

- (a) DB Co shall provide at least 35 Business Days advance notice in the form of an e-mail to the City Representative for all Closures, detours and Diversions.
- (b) DB Co shall only be permitted to close any existing Municipal Roadway for the purposes of carrying out Highway Works after all other safe and reasonable methods of construction have been investigated by DB Co and deemed not to be feasible or practicable.
- (c) DB Co shall maintain two-way traffic at successive intersections on either side of a closed intersection at times of the Closure.
- (d) DB Co shall maintain a pedestrian sidewalk on each Crossing Road in accordance with City design standards at all times during the construction. DB Co shall be responsible for all design, approvals, construction and Maintenance of the sidewalk for the duration of the Detour.
- (e) DB Co shall not use accesses to/from work zones, Shoulder Closures, and the loading and unloading of materials and construction vehicles/equipment to/from the travelled portion

of existing Municipal Roadways during Peak Periods on any weekday. Exceptions to this shall be made for the delivery of concrete.

- (f) DB Co shall accommodate all turning movements at intersections at all times, unless specified elsewhere in this Schedule 15-2, Part 9. This includes all protected auxiliary turn lanes.
- (g) DB Co shall make all travel lanes available during non-work times unless Construction Activities have rendered them temporarily unsuitable for traffic use, or unless a Closure was approved by the City.

2.3 Permits from the City of Ottawa

- (a) Road Cut Permit
 - (i) DB Co shall obtain a Road Cut Permit prior to the start of Highway Works on any Municipal Roadway or Other Affected Municipal Roadway. The requirements of the Road Cut Permit are outlined in City of Ottawa By-Law — Road Activity By-Law No. 2003-445.
 - (ii) When an application for a Road Cut Permit is made for Highway Works or any portion thereof, DB Co shall ensure that it contains a reference therein, that the application pertains to the Project. Furthermore, DB Co shall include in their application, the Highway TCP sub-plan as submitted to and accepted by the City in accordance with Schedule 10 – Review Procedure. If as a result of the Road Cut Permit approval process the Highway TCP is revised, DB Co shall submit the revised Highway TCP to the City in accordance with Schedule 10 – Review Procedure for re-acceptance, and, shall update and resubmit the Highway TCP sub-plans to reflect the changes found in the approved Road Cut Permit version of the Highway TCP.
- (b) Road Close Permit
 - (i) DB Co is required to obtain Road Close Permits prior to closing Municipal Roadways or Other Affected Municipal Roadways as specified elsewhere. DB Co shall submit to the City the road Closure request forms no later than four weeks prior to each Closure event.
 - (ii) DB Co shall ensure that an application for Road Close Permit contains a reference to the Project and shall include in their application, the Highway TCP sub-plan as submitted to and accepted by the City in accordance with Schedule 10 – Review Procedure. If as a result of the Road Close Permit approval process the Highway TCP is revised, DB Co shall submit the revised Highway TCP to the City in accordance with Schedule 10 – Review Procedure for re-acceptance. It shall include the updated Highway TCP and sub-plans to reflect the changes found in the approved Road Close Permit version of the Highway TCP.
- (c) Private Approach Permit Application

- (i) DB Co shall obtain a Private Approach Permit for any construction site access from Municipal Roadways or Other Affected Municipal Roadways.
 - (ii) DB Co shall ensure that an application for a Private Approach Permit contains a reference to the Project and shall include in their application, the relevant portion of the Highway TTMP as submitted to and accepted by the City in accordance with Schedule 10 – Review Procedure. If as a result of the Private Approach Permit approval process the Highway TTMP is revised, DB Co shall submit the revised Highway TTMP to the City in accordance with Schedule 10 – Review Procedure, for re-acceptance. It shall include the updated Highway TTMP and sub-plans to reflect the changes found in the approved Private Approach Permit version of the Highway TTMP.
- (d) OC Transpo Permits
- (i) DB Co shall not carry out any work on bus-only lanes, the Transitway, or any bus facilities, without completing the Transitway Access Permits and receiving approval from the City and OC Transpo.
 - (ii) When an application for an OC Transpo Permit is made for the Project or any portion thereof, DB Co shall ensure that an application for an OC Transpo Permit contains a reference to the Project and shall include in their application, the Highway TCP as submitted to and accepted by the City in accordance with Schedule 10 – Review Procedure. If as a result of the OC Transpo approval process the Highway TCP is revised, the DB Co shall submit the revised Highway TCP to City in accordance with Schedule 10 – Review Procedure for re-acceptance, and, shall update and resubmit the Highway TTMP and sub-plans to reflect the changes found in the approved OC Transpo version of the Highway TCP.
 - A. DB Co shall ensure that the Highway TCP is approved by the City at least 14 calendar days prior to any detour or Construction Activity that has operational impacts on transit service. If the action is an extended detour or requires a shelter relocation, notification shall be provided as otherwise specified in Schedule 15-2, Part 7 - Traffic and Transit Management and Construction Access.
 - B. The submission of a Highway TCP does not constitute advance notice, which does not include timelines for potential revisions to the Highway TCP.
- (e) Noise Bylaw Exemption
- (i) DB Co shall apply and obtain an exemption to the City Noise Bylaw if required for evening/night work.

2.4 Crossing Roads

- (a) Crossing Roads are defined as the following Municipal Roadways within the MTO ROW:
 - (i) Holly Acres Road
 - (ii) Richmond Road
 - (iii) Pinecrest Road/Greenbank Road

- (b) The following constraints shall be followed within the Crossing Roads corridor:
 - (i) DB Co shall maintain access across Highway 417 on Crossing Roads at all times for vehicles, transit services, emergency services, pedestrians and cyclists. All existing travel lanes on Crossing Roads shall be maintained at all times during the Peak Periods throughout construction.
 - (ii) DB Co shall maintain uninterrupted access to all Highway 417 ramps at all times, except for MTO authorized ramp Closures obtained in accordance with the provisions of this Part C.
 - (iii) Notice of the scheduled dates of the Full Closure for the installation of the Pedestrian Bridge at Queensview Station shall be identified to the City a minimum 35 Business Days in advance of the each of the scheduled Closures for approval. The Closure dates shall not be scheduled during events identified in Clause 4.2 of this Part C.

ARTICLE 3 WEST TRANSITWAY SEGMENT W-6, W-7 AND W-8

3.1 West Transitway Segment W-6 – Queensway Station to Pinecrest Station

- (a) The traffic management for this West Transitway Segment is covered by Clause 3.11 of Schedule 15-2, Part 7 - Traffic and Transit Management and Construction Access.
- (b) Any modification or realignment to the existing dedicated bus lanes on Highway 417 that would remove the barrier separating buses from general purpose lanes requires an approved Ontario Regulation prior to implementation. If such a modification is proposed by DB Co, it shall supply scale drawings of the proposed configuration in AutoCAD and PDF format to the City Representative for submission to MTO. The proposal may be approved or rejected by the Relevant Authority at its sole discretion. If approved, DB Co shall coordinate with the City and MTO to implement the Ontario Regulation, and shall notify the City once the Ontario Regulation is no longer required. DB Co is advised that approval of an Ontario Regulation may take in excess of six months.

3.2 West Transitway Segment W-7 – Pinecrest Station to Bayshore Station

- (a) The traffic management for this West Transitway Segment is covered by Clause 3.12 of Schedule 15-2, Part 7 Traffic and Transit Management and Construction Access.
- (b) This detour involves the design and construction of a temporary N/S-E bus-only ramp at Holly Acres Road and the temporary closure of the Richmond Road N-E ramp, as described in Schedule 15-2, Part 7 - Traffic and Transit Management and Construction Access, and this Schedule 15-2, Part 9 Part B. The Holly Acres Road N/S-E bus-only ramp shall open and the Richmond Road N-E ramp shall close upon the commencement of the W-7 BRT Detour; the closure of the Holly Acres Road N/S-E bus-only ramp and the re-opening of the Richmond Road N-E ramp shall occur following Revenue Service of the Confederation Line West Extension and shall be considered Remaining Works.

3.3 West Transitway Segments W-8 and W-9 – Bayshore Station to Moodie Station

- (a) The traffic management for this West Transitway Segment is covered by Clause 3.13 of Schedule 15-2, Part 7 - Traffic and Transit Management and Construction Access.
- (b) This detour involves the design and construction of a fourth lane on the Highway 416 S/Highway 417 W – Holly Acres N/S ramp, as described in this Schedule 15-2, Part 9, Part B.

ARTICLE 4 EXISTING PROVINCIAL HIGHWAYS AND MUNICIPAL ROADWAYS WITHIN MTO ROW

4.1 General Requirements

- (a) The requirements in this Article 4 are applicable to the following Roads:
 - (i) Existing Provincial Highway 417 and Highway 416 including all interchange ramps; and,
 - (ii) Existing Municipal Roadways connecting or spanning over Highway 417 within MTO's designated jurisdiction, ("Crossing Roads") including but not limited to:
 - A. Holly Acres Road;
 - B. Richmond Road;
 - C. Pinecrest Road / Greenbank Road;
- (b) DB Co shall not proceed with any Construction Activities on Provincial Highways without an accepted Highway TTMP and Highway TTMP sub-plans applicable to said Construction Activities.
- (c) DB Co shall ensure that there is coordination between the Stage 2 LRT TTMP and the Highway TTMP, as per Article 5 – Implementation Constraints, of Schedule 15-2, Part 1.
- (d) DB Co shall use PVMS for all Closures, Detour Routes and Diversions including ramps and Crossing Roads. PVMS shall be placed at strategic upstream locations to allow motorists the opportunity to divert prior to reaching the Closure, Detour Route or diversion location. The PVMS location shall be submitted to and approved by the City in accordance with Schedule 10 – Review Procedure.
- (e) PVMS placed in support of Highway Works shall be controlled by the OTOC.
- (f) PVMS shall be equipped with modems active on the MTO communications network to allow OTOC to operate. DB Co shall be responsible for modem procurement and activation from the modem supplier at least two weeks prior to requiring the Signs. DB Co shall be responsible for all fees associated with the procurement of the modem including but not limited to activation of service, modem rental and monthly data communication fees.
- (g) DB Co shall provide at least 35 calendar days advance notice to the City for all Closures, Detour Routes, and Diversions.
- (h) Transit facilities on Highway 417 (West Transitway) and interchanges shall remain in service until after West Substantial Completion, and upon notice by the City.

- (i) DB Co failure to abide by the requirements set out in this Article 4 shall result in shutdown of the relevant Works until the requirements have been met.
- (j) DB Co shall maintain a minimum of three through lanes in each direction on Highway 417 at all times, except during Permitted Periods for Closures.

4.2 Restrictions on Construction Operations

- (a) DB Co shall not use construction access/egress, Shoulder Closures or load and unload materials and construction equipment onto and from the traveled portion of Highway 417, Highway 416 and Highway 417/416 interchange ramps on days identified under Clause 1.4 of this Part C, or outside of the Permitted Periods for Closures as detailed in this Part 9.
- (b) Construction operations shall not be carried out during the four hours preceding or three hours after any scheduled events at the [REDACTED]. DB Co shall obtain the schedule of events from the [REDACTED] and schedule work accordingly.
 - (i) Events with fewer than 10,000 attendees, or “all-day” events that do not have a specific peak traffic demand period associated with them are exempted from this requirement.
- (c) Construction operations shall not be carried out during the two hours preceding or two hours after any [REDACTED], or other major events at [REDACTED], as identified by the City. DB Co shall obtain the schedule of [REDACTED] and schedule work accordingly.

4.3 Delivery and Trucking

- (a) DB Co shall plan and schedule the routes of vehicles transporting all Materials to, from or within the Site, so that vehicular movements are accomplished with minimum interference and interruptions to traffic according to the requirements of this Part C, including but not limited to Clauses 4.2, 4.4 and 4.9. This will necessitate vehicles to “slip-off” or “slip-on” in the direction of traffic, in order to merge with and thereby avoid crossing traffic lanes.
- (b) Access to and from the Provincial Highway ROW shall be restricted to ramps at the interchanges unless otherwise provided for in the Project Agreement.
- (c) Median cross-overs shall not be used except where single axle vehicles are entering a passing lane that is closed to traffic.
- (d) DB Co shall obtain the City Representatives’ prior acceptance for the location of any "slip-off" or "slip-ons" through review of the Highway TTMP. The City Representatives reserve the right to alter, reject or close same as considered necessary. DB Co shall notify suppliers of Materials and equipment of the above requirements.

4.4 Permitted Times for Lane and Ramp Closures

- (a) Lane Closures and ramp Closures for construction will only be allowed during the following times, subject to the additional restrictions covered under Clause 1.4 of this Part C – Holidays and Special Events. Any Closures proposed by DB Co outside of the times indicated in this Part C are subject to review and approval by the City in accordance with Schedule 10 – Review Procedure. All Sunday Closures proposed by DB Co are subject to review and approval by the City. Applications for extended Closures by DB Co shall be submitted to the City for approval, supported by traffic analysis. The City may reject applications for Closures at its discretion.
- (b) Weekend Lane Closures
 - (i) All weekend Lane Closures shall be subject to the following conditions:
 - A. DB Co shall adhere to all traffic timing restrictions identified elsewhere in the Project Agreement, including Holiday Restrictions and Canadian Tire Centre Events and Ottawa Redblacks games.
 - B. The exact weekend Lane Closure dates shall be subject to approval by the City.
 - C. DB Co shall notify the stakeholders and ESP of the Closure(s), as specified elsewhere in the Project Agreement.
- (c) Permitted Lane Closure periods for Provincial Highways are included in Table 4-4.1. Permitted Crossing Road Closure periods for Provincial Highways are included in Table 4-4.2. Permitted ramp Closure periods for Provincial Highways are included in Table 4-4.3.

Table 4-4.1 – Section Description: Existing Highway 417 and 416

Closure	Monday or a Day Following a Holiday	Tuesday to Wednesday Except on Days Following and Preceding Holidays	Thursday to Friday or a Day Preceding a Holiday	Saturday	Sunday**
One Lane Closure/ Shoulder Closure (Highway 417 EB)	00:00 – 05:00 10:00 – 14:30 21:00 – 23:59	00:00 – 05:00 10:00 – 14:30 21:00 – 23:59	00:00 – 05:00 10:00 – 14:30 (Thurs) 10:00 – 14:00	00:00 – 10:00 22:00 – 23:59	00:00 – 10:00 21:00 – 23:59

			(Fri) 22:00 – 23:59		
One Lane Closure/ Shoulder Closure (Highway 417 WB and Highway 416)	00:00 – 06:00 10:00 – 14:30 21:00 – 23:59	00:00 – 06:00 10:00 – 14:30 21:00 – 23:59	00:00 – 05:00 10:00 – 14:30 (Thurs) 10:00 – 14:00 (Fri) 22:00 – 23:59	00:00 – 10:00 22:00 – 23:59	00:00 – 10:00 21:00 – 23:59
Two Lane Closure (Highway 417 EB) ***	00:00 – 05:00 22:00 – 23:59	00:00 – 05:00 22:00 – 23:59	00:00 – 05:00 23:00 – 23:59	00:00 – 08:00 23:00 – 23:59	00:00 – 08:00 22:00 – 23:59
Two Lane Closure (Highway 417 WB and Highway 416) ***	00:00 – 06:00 22:00 – 23:59	00:00 – 06:00 22:00 – 23:59	00:00 – 06:00 23:00 – 23:59	00:00 – 08:00 23:00 – 23:59	00:00 – 08:00 22:00 – 23:59
Three Lane or Full Closure *	Not Permitted	Not Permitted	Not Permitted	Not Permitted	Not Permitted

* Applications for Full Closures are subject to acceptance by the City, as further detailed in Clause 4.4(f) of Part C of this Schedule 15-2, Part 9.

** All Sunday Closures are subject to acceptance by the City.

*** Apply to sections of Provincial Highways with three or more through lanes only.

Table 4-4.2 – Section Description: Crossing Roads

Closure	Monday or a Day Following a Holiday	Tuesday to Wednesday Except on Days Following and	Thursday to Friday or a Day Preceding a Holiday	Saturday	Sunday**
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		Preceding Holidays			
Richmond Road (1 lane per direction)	20:00 - 23:59 00:00 - 06:00	20:00 - 23:59 00:00 - 06:00	20:00 - 23:59 00:00 - 06:00	20:00 - 23:59 00:00 - 10:00	20:00 - 23:59 00:00 - 10:00
Pinecrest/ Greenbank Road (1 lane per direction)	20:00 - 23:59 00:00 - 06:00	20:00 - 23:59 00:00 - 06:00	20:00 - 23:59 00:00 - 06:00	20:00 - 23:59 00:00 - 10:00	20:00 - 23:59 00:00 - 10:00
Woodroffe Avenue (1 lane per direction)	20:00 - 23:59 00:00 - 06:00	20:00 - 23:59 00:00 - 06:00	20:00 - 23:59 00:00 - 06:00	20:00 - 23:59 00:00 - 10:00	20:00 - 23:59 00:00 - 10:00
Maitland Avenue (1 lane per direction)	20:00 - 23:59 00:00 - 06:00	20:00 - 23:59 00:00 - 06:00	20:00 - 23:59 00:00 - 06:00	20:00 - 23:59 00:00 - 10:00	20:00 - 23:59 00:00 - 10:00
Two Lane or Full Closure *	Not Permitted	Not Permitted	Not Permitted	Not Permitted	Not Permitted

* Applications for Full Closures are subject to acceptance by the City, as further detailed in Clause 4.4(f) of Part C of this Schedule 15-2, Part 9.

** All Sunday Closures are subject to acceptance by the City.

Table 4-4.3 –Ramp Description: All Ramps Highway 417 416

Closure	Monday or a Day Following a Holiday	Tuesday to Wednesday Except on Days Following and Preceding Holidays	Thursday to Friday or a Day Preceding a Holiday	Saturday	Sunday**
One Lane Closure ***/ ***	00:00 - 06:00 10:00 - 14:30	00:00 - 06:00 10:00 - 14:30	00:00 - 06:00 10:00 - 14:30	00:00 - 10:00 23:00 - 23:59	00:00 - 10:00 22:00 - 23:59

Shoulder Closure	22:00 – 23:59	22:00 – 23:59	(Thurs) 10:00 – 14:00 (Fri) 23:00 – 23:59		
Full Closure *	00:00 – 05:00 23:00 – 23:59	00:00 – 05:00 23:00 – 23:59	00:00 – 05:00 23:00 – 23:59	00:00 – 05:00 23:00 – 23:59	00:00 – 05:00 23:00 – 23:59

* Applications for Full Closures are subject to acceptance by the City, as further detailed in Clause 4.4(f) of Part C of this Schedule 15-2, Part 9. No two successive on and/or off ramps shall be closed at the same time.

** All Sunday Closures are subject to acceptance by the City.

*** Apply to two lane ramps only. For single lane ramp Closures, “Full Closure” restrictions apply.

- (d) Full Closure of the ramps at the Highway 417 and Highway 416 interchange shall not be permitted.
- (e) DB Co shall use PVMS for all Closures, Detour Routes and Diversions including ramps and Crossing Roads. For Full Closure of off-ramps DB Co may utilize existing MTO permanent VMS in place of PVMS, subject to approval of the City Representative.
- (f) Applications for all Full Closures are subject to acceptance by the City Representative in accordance with Schedule 10 – Review Procedure. Full Closures may be permitted on a site-specific basis for work such as overhead Sign installation/modification and hydro wire installation/modification between 01:00 and 04:00 and be restricted to 15 consecutive minutes per any one hour period or until the end of the traffic queue passes. DB Co may also apply for an extended Full Closure period between 23:00 and 05:00. Approval for extended Full Closure period is at the sole discretion of the City Representative. Applicable Police Services must be employed to assist all Full Closures and PVMS signage is required. DB Co shall provide supporting rationale, including but not limited to a traffic analysis, as part of an application for any Full Closure, at the request of the City Representative.

4.5 Lane Closures and Full Closures for Queensview Pedestrian Bridge

- (a) DB Co shall be permitted to fully close all lanes of Highway 417 between Pinecrest Road / Greenbank Road and Woodroffe Avenue on a weekend for 17 consecutive hours, from 18:00 hours on the Saturday until 11:00 hours on the Sunday.
- (b) Lane reductions on Highway 417 associated with the full closure shall be permitted to commence at 16:00 hours on the Saturday

- (c) During the full closure period noted above, the following Highway 417 ramps shall be exempt from the restrictions of Clause 4.4 of this Part 9, Part C:
- (i) Pinecrest Road at Highway 417 E-N/S ramp;
 - (ii) Greenbank Road at Highway 417 S-E ramp;
 - (iii) Greenbank Road at Highway 417 N-E ramp;
 - (iv) Woodroffe Avenue at Highway 417 W-N/S ramp; and,
 - (v) Woodroffe Avenue at Highway 417 N/S-W ramp.
- (d) DB Co shall provide advanced notice to the City and MTO as early as possible, or a minimum of 35 Business Days in advance of the scheduled closure. The dates scheduled by DB Co shall be subject to approval by the City and MTO. These closure dates shall not be scheduled during events identified in Clause 4.2 of this Part 9, Part C.

4.6 Early and Late Opening of Lanes and Ramps

- (a) Construction Period Quality Failures deductions shall be applied as detailed in Schedule 21, Part B - Construction Period Failures.

4.7 Closure Notification

- (a) DB Co shall perform the following prior to lane and/or Shoulder Closures:
- (i) Inform the City Representative of any Closure one week prior to the start date of the Closure;
 - (ii) Inform the City Representative of any Closure lasting more than one week at least two weeks prior to the start date of the Closure;
 - (iii) Inform the City Representative and OTOC of Emergency Closures as soon as any details are known;
 - (iv) Obtain a Closure Notification Number from the MTO Representative for each Closure;
 - (v) Submit to the OTOC a completed ROW Form (MTO);
 - (vi) Inform the City Representative and OTOC of any Closure that is being cancelled subsequent to (i) and (ii) above;
 - (vii) Notify the OTOC by phone ([REDACTED]) immediately prior to the set-up of any Closure stating the Closure Notification Number and details of the Closure;

- (viii) Notify the OTOC immediately of any changes to the Closure or anticipated problems that may delay the opening time, stating the Closure Notification Number and details of the changes to and/or problems with the Closure; and,
- (ix) Notify the OTOC immediately upon removing the Closure stating the Closure Notification Number and details of the Closure.

4.8 Lane and Ramp Closures by OPP Officers (Paid Duty)

- (a) DB Co shall incorporate OPP assistance into all lane and ramp Closures. DB Co shall be responsible to arrange for the OPP-assisted Lane Closures.

4.9 Construction on or Adjacent to Highway 417 and Highway 416

- (a) The supply and placement of all traffic control required by the MTO shall be performed by DB Co in accordance with the Ontario Traffic Manual Book 7, latest edition (and enhancements to staging and traffic control where it cannot be achieved), where construction is being performed on or adjacent to Highway 417 and 416 or its ramps. This requirement is in addition to the MTO's requirement for deployment of PVMS.
- (b) DB Co shall follow the requirements of the City's Special Provision – General D-001, in addition to MTO requirements for construction on or adjacent to Highway 417 and 416.
- (c) Traffic Signal Construction Start-Up Meeting
 - (i) DB Co shall arrange a start-up meeting to confirm the protocol for the traffic signals at all affected intersections. The meeting shall also be used to confirm communication protocols with the MTO, DB Co, and the City of Ottawa Traffic Operations for dealing with traffic signal timing changes if required during construction. DB Co shall create a contact list and distribute it to all parties involved for any non-routine and/or emergency repairs to the traffic signals.
 - (ii) DB Co shall invite MTO Regional Traffic Office, MTO Electrical Coordinator, and City of Ottawa Traffic Operations to attend this meeting.
- (d) Advanced Notice of Work
 - (i) DB Co shall provide a minimum of 30 Business Days advance notice to the City of all Highway Works that may impact the traffic signals, unless a signal design is required, in which case DB Co shall abide by the requirements set out in Schedule 15-2, Part 9, Part B, Article 6.
- (e) Access to the Traffic Signal Controller Cabinets
 - (i) For any Emergency Works at any of the impacted traffic control signals, DB Co shall coordinate with the City of Ottawa Traffic Operations:

City of Ottawa
Transportation Services Department
Program Manager, Signal Installation and Field Program (or the individual responsible for this function)

4.10 Transitway Detours

- (a) As specified elsewhere in this Project Agreement, a Transitway detour will be required when the Western Transitway is taken out of service during this Project as part of the West Works. The following requirements shall apply to DB Co's Highway TTMP, and the submission in accordance with Schedule 10 – Review Procedure:
 - (i) DB Co shall be responsible for the design and coordination of the Highway 417 transit detour segments to the satisfaction and acceptance of the City.
- (b) DB Co shall not implement any new dedicated bus lanes on Highway 417.
- (c) Per Schedule 15-2, Part 9, Part B Clause 1.3 and Schedule 15-2, Part 7, Clause 3.12, DB Co shall add a third eastbound left turn lane (for transit only) to the W-N/S ramp at Greenbank, if such an added lane is found to provide a travel time benefit to eastbound buses while they are on detour. This lane, if built, shall be removed as part of the Remaining Works.
- (d) Per Schedule 15-2, Part 9, Part B Clause 1.3 and Schedule 15-2, Part 7, Clause 3.12, DB Co shall design and construct a temporary bus-only N/S-E on ramp from Holly Acres to Highway 417, in conjunction with the long term temporary closure of the Richmond Road N-E ramp. The temporary N/S-E on ramp at Holly Acres shall be closed and the Richmond Road N-E ramp shall be reopened as Remaining Works.

4.11 MTO Encroachment Permits

- (a) DB Co shall obtain MTO Encroachment Permits prior to working within the Highway 417 and Highway 416 ROW or on any Roads adjacent to Highway 417 within MTO's designated jurisdiction. DB Co shall provide the City with copies of the approved MTO Encroachment Permits immediately upon receipt of same.

4.12 Moodie Drive and Interchange Ramps Traffic Conditions

- (a) The following constraints shall be followed within the Moodie Drive corridor:
 - (i) DB Co shall ensure all northbound lanes on Moodie Drive are open and available for vehicles, transit services, Emergency services, pedestrians, cyclists during the following times:
 - A. weekdays between 6:00 and 9:30 hrs.

- (ii) DB Co shall ensure all southbound lanes on Moodie Drive are open and available for vehicles, transit services, Emergency services, pedestrians, cyclists during the following times:
 - A. weekdays between 15:00 and 18:30 hrs.
- (iii) DB Co shall ensure that a minimum of one lane in each direction on Moodie Drive shall remain open at all times, in addition to any auxiliary lanes at intersections
- (iv) Uninterrupted access to and from all Highway 417 ramps shall be maintained at all times, except for MTO authorized ramp closure times obtained in accordance with the provisions of this Part 9.
 - A. DB Co shall be permitted to close the S-W ramp for the purposes of constructing the grade separation for the Confederation Line for a period not exceeding one construction season. This closure shall require public notification in accordance with Article 5 of Schedule 15-2, Part 7 - Traffic and Transit Management and Construction Access, and shall be supported by a traffic analysis. Detour signage shall be provided as required.
- (v) The conditions in items (i) and (ii) above permit that DB Co use a three-lane cross section, with a center lane that changes direction. Should it not be possible to achieve this staging concept while remaining compliant with OTM Book 7, DB Co shall use decking to maintain a four-lane cross section.

ARTICLE 5 HIGHWAY TRAFFIC AND TRANSIT MANAGEMENT PLAN

5.1 General Requirements

- (a) DB Co shall submit a separate Highway TTMP for the Highway Works.
- (b) DB Co shall submit an initial Highway TTMP to the City in accordance with Schedule 10 – Review Procedure no later than 60 calendar days following Financial Close, and at least 45 calendar days in advance of the start of any Construction Activity, and in accordance with the requirements of this Part C. Following the acceptance of the initial Highway TTMP by the City, DB Co shall submit all subsequent proposed changes to the Highway TTMP to the City Representatives in accordance with Schedule 10 – Review Procedure. As a minimum, the initial Highway TTMP shall be updated and submitted on an annual basis in accordance with Schedule 10 – Review Procedure. The Highway TTMP shall not be considered complete for the purpose of initiating Construction Activities until all comments (as described in Article 4 of Schedule 10 – Review Procedure) have been resolved and addressed by DB Co.
- (c) The Highway TTMP shall outline how public traffic, transit, pedestrians, and cyclists as well as the traffic generated by Construction Activities, is to be managed. It shall include all aspects of traffic management as set out in this Part C, as well as any traffic management related matters which may arise as a result of the execution of any aspect of the Highway Works. The Highway TTMP shall include a Traffic Management Study, as per the requirements of Clause 1.2 of this Part C.
- (d) The Highway TTMP and all updates thereto shall be consistent with and comply with all of the requirements set forth in this Part C and all other relevant provisions of this Project Agreement (including reference and interface with DB Co Traffic Management Auditing as described in Schedule 11 – Integrated Management Systems), the OTM, and City of Ottawa and MTO Standards, Operation Policies, Procedures and Guidelines.
- (e) Each submission of the Highway TTMP or Highway TTMP sub-plans shall be stamped by DB Co’s designated Traffic Engineer, and signed off by DB Co’s designated Traffic Manager, both of whom shall be as identified in Clause 5.3 – DB Co Responsibilities of this Part C.
- (f) The Highway TTMP and all updates thereto shall include a traffic schedule which shall be adapted from the Project Schedule. The traffic schedule shall show start and finish dates for all the information pertinent to traffic management for the Highway Works, such as but not limited to, detours and Diversions, and relevant submissions.
- (g) The Highway TTMP shall show proof of constructability in terms of schedule (traffic schedule versus Project Schedule), and, in terms of onsite Construction Activities and physical work area requirements versus spatial accommodations for Highway TTMP and Highway TTMP sub-plan traffic management requirements.
- (h) DB Co’s Highway TTMP shall consider all direct and indirect impacts relating to the construction that pertain to the existing operations of the City and the street network

- within, and include impacts on all road users, pedestrians, cyclists, transit vehicles, and private vehicles of all types.
- (i) DB Co's Highway TTMP shall reference and interface with DB Co's Traffic Management Auditing as described in Schedule 11 – Integrated Management System, DB Co's Highway Emergency Traffic Plan as described in this Part C, the OTM, and City of Ottawa and MTO Standards, Operation Policy and Procedures.
 - (j) DB Co's updates to the Highway TTMP shall be prepared and submitted in accordance with Schedule 10 – Review Procedure for any and all Project activities which may result in changes to the traffic management strategies set out in the Highway TTMP. The initial Highway TTMP shall be updated and submitted on an annual basis in accordance with Schedule 10 – Review Procedure
 - (k) DB Co shall not conduct any Construction Activity that affects traffic without a signed and sealed Highway TTMP that is current to the activities on Site, and has been accepted by the City.
 - (l) DB Co's Highway TTMP shall comply with the definitions and guidelines provided in the OTM and City of Ottawa and MTO Standards, Operation Policy, Procedures and Guidelines.
 - (m) DB Co shall prepare detailed Highway TCPs complete with traffic control layout drawings and fully integrated with the approved Project Schedule, outlining the provision of all forms of traffic control required throughout the duration of the Project. The plans shall be consistent with the Highway TTMP and submitted in accordance with Schedule 10 – Review Procedure.
 - (n) DB Co shall prepare drawings that address stage-specific activities and requirements for each stage of the Highway Works that affects traffic. These drawings shall accompany the Highway TTMP submissions in accordance with Schedule 10 – Review Procedure.
 - (o) The Highway TTMP shall provide detailed drawings for project-related designated truck access and egress points, the applicable haul and heavy vehicle routes through the City and applicable staging areas. The drawings shall be consistent with the Highway TTMP and submitted in accordance with Schedule 10 – Review Procedure. As a minimum the designated truck route drawings shall be updated and submitted on a quarterly basis in accordance with Schedule 10 – Review Procedure. The City may, at its discretion, require that DB Co's site, where contiguous with an active construction site, be utilized for haul and heavy vehicle routes in order to reach the City's truck route network in a manner acceptable to the City.
 - (p) DB Co shall be responsible for providing, installing and maintaining all TCDs and protective devices identified in the approved Highway TTMP.
 - (q) The following Highway TTMP sub-plans for DB Co's Highway TTMP are required and shall be submitted in accordance with Schedule 10 – Review Procedure. The Highway TTMP sub-plans shall be:

- (i) Highway Traffic Control Plan;
- (ii) Highway Emergency Traffic Plan;
- (iii) Highway Traffic Incident Management Plan;
- (iv) Highway Traffic Management Implementation Plan;
- (v) Highway Traffic Advisory Temporary Signage Plan;
- (vi) Highway Traffic Risk Assessment Plan;
- (vii) Highway Traffic and Transit Management Communications Plan; and,
- (viii) Highway Traffic Monitoring Plan.

5.2 Highway Traffic and Transit Management Sub-Plans

(a) Highway Traffic Control Plans

- (i) DB Co shall prepare and submit Project specific Highway TCPs in accordance with Schedule 10 – Review Procedure. The Highway TCPs shall be prepared in accordance with the OTM, City of Ottawa and MTO Standards, policies, procedures and guidelines and other Reference Documents for all activities that affect traffic operations, and shall include the following:
 - A. Start and completion dates of Highway Work;
 - B. Hours of work and also indicate if there is a requirement to work during peak hours;
 - C. Work zone locations and direction and distance to nearest landmarks and survey stations;
 - D. Size of the work zone;
 - E. Lanes affected by the Highway Works;
 - F. Lane configuration in the work zone;
 - G. Confirmation of whether accesses or intersections will be affected by the work zone or by TCD;
 - H. Traffic volume capacity during Highway Works;
 - I. Proposed delays or Closure times;
 - J. Show that local traffic access is maintained;

- K. 1:500 Scale drawing(s) prepared in CADD and submitted in PDF identifying:
- i. The location of the work zone using landmarks, survey stations and LKI where applicable;
 - ii. Accesses or intersections affected by the work zone or by TCDs;
 - iii. Traveled lanes affected;
 - iv. Resultant lane configuration including widths;
 - v. Location of restricted width lanes;
 - vi. Required Closures;
 - vii. Lane use requirements;
 - viii. Posted speeds;
 - ix. Requirements for road closure;
 - x. Any bus routes and bus stops affected by work activity;
 - xi. Traffic and transit routing and detour requirements;
 - xii. Location of Hazardous areas created by road geometry or local geography;
 - xiii. Any local roads used for a Detour Route;
 - xiv. The design speed and the design vehicle for each road used as a Detour Route;
 - xv. Any traffic signal changes required by the Detour Route or Project Works;
 - xvi. Any signing impacted by the Highway Work; and,
 - xvii. Location of construction accesses, and safety provisions applied in instances where a construction access crosses a sidewalk, pathway, MUP or cycling facility.
- L. Should DB Co adopt a Traffic Control layout exactly as shown in OTM Book 7 with no changes, DB Co shall provide a reference to the OTM Book 7 layout. Where enhancements to OTM Book 7 are required and/or for any deviations to OTM Book 7, DB Co shall submit to the City for review and acceptance, in accordance with Schedule 10 – Review Procedure, a custom Traffic Control layout as described in (ii) below;

- M. Be sealed by a Professional Engineer; and,
 - N. Include a summary description of the public notification undertaken wherein the subject matter of this specific Highway TCP is mentioned.
- (ii) Custom Traffic Control layouts shall:
- A. Be designed in CADD Format AutoCAD 2015 dwg, Nad83, in a scale 1:250; composite drawings can be in 1:500 scale and also submitted in PDF;
 - B. Provide signed and sealed custom Traffic Control layouts;
 - C. Show schematically the placement of all TCDs;
 - D. Place all TCDs in accordance with the standards contained in the OTM;
 - E. Follow symbol conventions for identifying TCDs as per the OTM;
 - F. Show on the drawings the locations and details of all Signs, PVMS, Pavement Markings, Barriers, and protective works;
 - G. Have all dimensions and explanatory notes on the drawing; and,
 - H. Show traffic operations at all phases of the Project.
- (iii) DB Co shall document any proposed DB Co-initiated Closures, Full Closures, Detour Routes, Lane Shifts and Diversions in the Highway TCP. The Highway TCP shall be updated and amended as required such that it is current at all times with respect to the existing and proposed Traffic Control measures in the field.
- (iv) DB Co shall conduct traffic analysis including modelling on the Highway TCP for each construction stage and construction where traffic operations are affected. The traffic analysis shall determine the effect of each Highway TCP on the capacity and operation, including the resulting vehicle delays, queue lengths, and traffic signal timing. The analysis shall confirm that the resulting queues are expected to clear before the commencement of a Restricted Period. The traffic analysis shall be conducted for the representative hour(s) and day(s) that each Highway TCP is in operation. The analysis and the results and recommendations shall be provided to the City in accordance with Schedule 10 – Review Procedure.
- (v) DB Co shall be responsible for including construction generated traffic in the Highway TCP and any associated analysis such as but not limited to the potential for conflict between construction generated traffic and pedestrian and cyclist movements.
- (vi) DB Co shall continuously measure the effectiveness of Highway TCPs and, if those measurements indicate a Highway TCP is non-compliant with the OTM,

accepted Highway TCPs and other Reference Documents, DB Co shall immediately adjust the Highway TCP to bring it into compliance.

- (vii) Auxiliary lane lengths at existing signalized intersections shall not be reduced unless analysis confirms operation is acceptable to the City Representative.
 - (viii) DB Co shall not reduce the acceleration/deceleration lane lengths unless analysis confirms operation is acceptable to the City Representative
 - (ix) DB Co shall implement the accepted Highway TCPs and accepted revisions thereto.
- (b) Highway Emergency Traffic Plan
- (i) DB Co shall prepare and submit a Highway Emergency Traffic Plan in accordance with Schedule 10 – Review Procedure. The Highway Emergency Traffic Plan shall specify how DB Co shall facilitate access for Emergency vehicles to and through affected sites. DB Co shall consult with local municipalities and Emergency Service Providers (ESP) in developing the Highway Emergency Traffic Plan, and liaise closely with them throughout the design and construction as it evaluates and updates the plan on an annual basis, or, whenever there is a change in the site conditions which materially alters the ability to execute the accepted Highway Emergency Traffic Plan.
 - (ii) DB Co shall provide specific scenarios for Emergency vehicle access to and through the Site for each of the cases identified in the Highway Traffic Incident Management Plan and the Highway Traffic Risk Assessment Plan.
 - (iii) DB Co shall implement the accepted Highway Emergency Traffic Plan and accepted revisions thereto.
 - (iv) DB Co shall update the plan such that the information therein is kept current with the upcoming and ongoing Construction Activities. DB Co shall submit the updated plan for review/acceptance in accordance with Schedule 10 – Review Procedure.
 - (v) DB Co shall notify Emergency Service Providers, at least two weeks in advance of the start of Highway Works construction, regarding the construction schedule, and if any changes to traffic flow are anticipated.
 - (vi) DB Co shall not commence any work on Site without an applicable current accepted Highway Emergency Traffic Plan.
- (c) Highway Traffic Incident Management Plan
- (i) DB Co shall prepare and submit a Highway TIMP in accordance with Schedule 10 – Review Procedure. It shall be in accordance with the MTO and City of Ottawa’s Emergency Management Plan. The Highway TIMP shall include a

process flow chart which covers but is not limited to occurrence of the Incident, nature and timing of notifications to partner agencies, names and coordinates of contacts, actions to Address the Incident, post Incident review of process, and revisions thereto to the Highway TIMP as appropriate. The primary objectives are to support the City in facilitating Incident response and moving traffic safely and expeditiously around the Incident. The plan shall specify how DB Co will provide access for Emergency vehicles and assistance to Emergency Service Providers (ESP), and how DB Co shall work with the MTO and the City's Traffic Incident Management Group in responding to the Incident.

- (ii) A traffic Incident includes, but is not limited to, any of the following occurrences on or adjacent to a construction Site or Detour Route:
 - A. Motor vehicle accidents;
 - B. Pedestrian and cycling accidents;
 - C. Emergency road repairs;
 - D. Emergency utility repairs;
 - E. Emergency road closures for fire, gas leak, etc.;
 - F. Disabled vehicles; and,
 - G. Debris on the road.
- (iii) DB Co's Highway TIMP shall:
 - A. Work closely and effectively deal with major Incidents with partner agencies including City, OPS, OC Transpo, STO, RCMP, OPP, MTO, City of Gatineau, Sureté du Québec, and the Ministry of Transportation of Québec;
 - i. These efforts shall include the provision of temporary TCD and/or OPP/OPS in the vicinity of DB Co's construction sites or Detour Routes as requested by the MTO and City's Traffic Incident Management Group.
 - B. Coordinate with MTO and/or the City of Ottawa Office of Emergency Management the communications to the public regarding the impacts to the road network of the Incident, via the City, media, and VMSs, and in accordance with established communication protocols; and,
 - C. Define a process to review Incidents and propose modifications to Highway Works that shall reduce the severity and frequency of incidents.

- (iv) DB Co shall document all Incidents, including but not limited to, date location, details of the Incident, comments of the Incident reporter, actions taken, partner agency and agency representatives contacted, follow-up action recommended to be taken and by whom, signed and dated. A copy of the document shall be given to the City within one Business Day of the occurrence of the Incident.
 - (v) DB Co shall implement the accepted Highway TIMP and accepted revisions thereto.
 - (vi) DB Co shall update the plan such that the information therein is kept current with the upcoming and ongoing Construction Activities. DB Co shall submit the updated plan for review/acceptance in accordance with Schedule 10 – Review Procedure.
 - (vii) DB Co shall not commence any work on Site without an applicable current accepted Highway TIMP.
- (d) Highway Traffic Management Implementation Plan
- (i) DB Co shall prepare and submit a Highway TMIP in accordance with Schedule 10 – Review Procedure. The Highway TMIP shall identify the Traffic Control Supervisor, Traffic Engineer, and Traffic Manager, along with the qualifications and experience of those named individuals demonstrating they meet the qualifications and experience identified in this Part C.
 - (ii) The Highway TMIP shall define processes to ensure that the Highway TTMP and each of the individual Highway TTMP sub-plans are developed and implemented efficiently and appropriately, and that they are kept up-to-date with necessary modifications during the Project. In addition, the processes shall be set out in flow charts, one for the Highway TTMP and one for each of the sub-plans, with an accompanying explanation provided to describe the activities represented by each box in each of the flow charts.
 - (iii) DB Co shall implement the accepted Highway TMIP and accepted revisions thereto.
 - (iv) DB Co shall update the plan such that the information therein is kept current with the upcoming and ongoing Construction Activities. DB Co shall submit the updated plan for review/acceptance in accordance with Schedule 10 – Review Procedure.
 - (v) DB Co shall not commence any work on Site without an applicable current accepted Highway TMIP.
- (e) Highway Traffic Advisory Temporary Signage Plan
- (i) DB Co shall prepare and submit a Highway Traffic Advisory Temporary Signage Plan in accordance with Schedule 10 – Review Procedure. The primary objective

of the Plan is to notify the City and other stakeholders in advance of scheduled Construction Activities, Closures, Full Closures, Detour Routes, Lane Shifts, and Diversions.

- (ii) The Highway Traffic Advisory Temporary Signage Plan shall be prepared in accordance with the requirements set out in Clause 8.3 of Part B of Schedule 15-2, Part 9.
 - (iii) The DB Co shall update the plan such that the information therein is kept current with the upcoming and ongoing Construction Activities. DB Co shall submit the updated plan for review/acceptance in accordance with Schedule 10 – Review Procedure.
 - (iv) DB Co shall implement the accepted Highway Traffic Advisory Temporary Signage Plan and accepted revisions thereto.
 - (v) DB Co shall not commence any work on Site without an applicable current accepted Highway Traffic Advisory Temporary Signage Plan.
- (f) Highway Traffic Risk Assessment Plan
- (i) DB Co shall prepare and submit a Highway Traffic Risk Assessment Plan in accordance with Schedule 10- Review Procedure. DB Co shall identify all risks which may have an impact on traffic and state the measures to be implemented to manage, reduce, or eliminate the risks.
 - (ii) DB Co shall perform an independent assessment to identify any risks that could have an impact on traffic management or special conditions that shall be Addressed through DB Co’s Highway Traffic Risk Assessment Plan.
 - (iii) DB Co shall update the plan such that the information therein is kept current with the upcoming and ongoing Construction Activities. DB Co shall submit the updated plan for review/acceptance in accordance with Schedule 10 – Review Procedure.
 - (iv) DB Co shall implement the accepted Highway Traffic Risk Assessment Plan and accepted revisions thereto.
 - (v) DB Co shall not commence any work on Site without an applicable current accepted Highway Traffic Risk Assessment Plan.
- (g) Highway Traffic and Transit Management Communications Plan
- (i) DB Co shall prepare and submit a Highway Traffic and Transit Management Communications Plan in accordance with Schedule 10 – Review Procedure. It shall describe clearly how DB Co shall communicate to the City and other stakeholders about all matters relating to traffic flow, including specifically, how

it shall provide Timely notice of construction related delays, Closures, detours, traffic Incidents, and emergencies.

- (ii) DB Co shall craft the Highway Traffic and Transit Management Communications Plan to show how DB Co shall incorporate and carry out each of the requirements set out in Clause 1.12 of this Part C.
- (iii) DB Co shall implement the Highway Traffic and Transit Management Communications Plan to apply throughout the Project Term.
- (iv) DB Co shall ensure that the plan is maintained current as related to the activities on Site. DB Co shall submit the updated plan for review/acceptance in accordance with Schedule 10 – Review Procedure.
- (v) DB Co shall not commence any work or Site preparations for same without an accepted Highway Traffic and Transit Management Communications Plan.
- (vi) DB Co shall consult with the City to identify the major user groups affected by the Project. Major user groups may include, but are not limited to, the following:
 - A. Emergency and police services;
 - B. Transit operating companies;
 - C. Motorists;
 - D. Cyclists;
 - E. Pedestrians;
 - F. Transport and tour bus companies;
 - G. Taxi and limousine companies;
 - H. Ontario Trucking Association;
 - I. MTO;
 - J. NCC;
 - K. PSPC;
 - L. Property owners and businesses;
 - M. Community organizers; and,
 - N. Special event organizers.

- (vii) DB Co shall develop and document a process which shall be integrated with the City's communication procedures for traffic management (such as the City Traffic Report and Public Service Announcements and the MTO COMPASS) to keep major user groups informed of planned traffic pattern changes, including, but not limited to the following: hauling and truck routes, transit impacts, detours, Lane Shifts, Lane Closures, sidewalk/MUP Closures, access restrictions, schedule changes, and other Traffic Control procedures. Procedures for disseminating information related to unplanned traffic pattern changes shall be Addressed in the Highway Traffic Incident Management Plan. DB Co shall ensure that this process is acceptable to the Governmental Authorities.
 - (viii) All public inquiries or complaints that DB Co receives shall be documented and handled immediately in the field and forwarded simultaneously to the City, 24-hours a day, seven days a week.
- (h) Highway Traffic Monitoring Plan
- (i) DB Co shall prepare and submit a Highway Traffic Monitoring Plan for any long- term Lane Closure on Municipal Roadways (Crossing Roads) and for each construction stage on Highway 417, in accordance with Schedule 10 – Review Procedure.
 - (ii) The Highway Traffic Monitoring Plan shall include as a minimum travel time surveys, queue and delays and intersection operational performance within the impacted Highway network.
 - (iii) Monitoring shall be performed in advance of and during each stage or Closure.
 - (iv) In field monitoring shall occur one week after stage or Closure implementation and every four weeks thereafter for the duration of the work.
 - (v) DB Co shall submit the monitoring results to the City in accordance with the Review Procedure and provide recommendations to minimize impacts to traffic.

5.3 DB Co Responsibilities

- (a) DB Co shall accept full responsibility for quality control and quality assurance of all activities affecting the Highway TTMP. The Highway TTMP quality control process shall be included in the Highway Traffic and Transit Management Plan. DB Co shall ensure that all personnel identified in the Highway TTMP are suitably qualified and licensed.
- (b) Traffic Manager
 - (i) DB Co shall designate a Traffic Manager who shall be responsible for the following:
 - A. Development, implementation, and management of the TTMP;

- B. Ensuring the City Representative is kept informed of all upcoming traffic activities and any revisions to the Highway TTMP;
 - C. Ensuring that appropriate modifications are made to the Highway TTMP if the specified Traffic Control measures are not achieving the requirements;
 - D. Coordinating with persons carrying out work in areas adjacent to the Project;
 - E. Co-chairing with the City the Traffic Management Committee;
 - F. Ensuring the timing and organized delivery of public and stakeholder communication information;
 - G. Participating as DB Co's representative in coordinating with the City's Traffic Demand Management program and the Traffic Incident Management Group; and,
 - H. Sign-off of each and every Highway TTMP and Highway TTMP sub-plan prior to their submission to the City.
- (ii) The Traffic Manager shall be a Professional Engineer with the following qualifications:
- A. 20 years of experience overall in the traffic engineering field;
 - B. 10 years of experience specifically related to traffic management and construction staging during construction; and,
 - C. Experience in design/build type projects where Roads and/or Highways were constructed within an existing urban area.
- (c) Traffic Engineer
- (i) DB Co shall designate a Traffic Engineer who is a Professional Engineer and has DB Co's authority to review, and shall seal, the Highway TTMP and associated sub-plans and take responsibility for ensuring that all traffic engineering issues and requirements are taken into account.
 - (ii) The Traffic Engineer shall attend the Project's regularly scheduled Traffic Management Committee meetings and be the Project's representative at the City's Traffic Control Centre when required.
 - (iii) The Traffic Engineer shall Oversee and direct record keeping, reporting and accounting of temporary and permanent traffic signal installations.
 - (iv) The Traffic Engineer shall ensure all traffic signal notification timelines as detailed in this Part C are met.

- (v) The Traffic Engineer shall have the following qualifications:
 - A. 15 years of experience overall in the traffic engineering field.
 - B. 10 years of experience specifically related to traffic modeling, intersection design, construction staging, and installation of traffic signal infrastructure.
 - C. Experience in design/build type projects where Roads and/or Highways were constructed within an existing urban area.

- (d) Traffic Control Supervisors
 - (i) DB Co shall designate Traffic Control Supervisors, each of whom shall have DB Co's authority to respond to Traffic Control requirements, and each of whom shall personally perform all the duties of the Traffic Control Supervisor, in accordance with this Part C.
 - (ii) A Traffic Control Supervisor shall be on the Site full-time when Construction Activities are underway.
 - (iii) The duties of the Traffic Control Supervisor shall include but not be limited to the following:
 - A. Directing all Traffic Control operations for construction;
 - B. The Traffic Control Supervisor shall have direct line authority over all of DB Co's Traffic Control Personnel and procedures on the Site;
 - C. Liaising with the City Representative, OC Transpo, and MTO, as required;
 - D. Monitoring queue lengths in active work zones and implementing appropriate measures when such queues affect the operation and safety of Provincial Highways, Municipal Roadways, and other municipal Roads, and providing the City with documentation outlining the date, location, queue lengths, and measures taken;
 - E. Monitoring, and recording on a daily basis, the transit travel times through work zones and Detour Routes, at a frequency and duration sufficient to identify operational performance issues. Coordinate with OC Transpo ahead of time to establish "geofence" points in the system before measurements are to take place in order to facilitate the collection of Accurate date, route, time, and location data. Document and evaluate the transit travel times versus the forecast times established in the Highway TTMP submissions. Identify operational performance issues and the DB Co recommended mitigation measures immediately to the City. Provide a copy of the record, issues, and mitigation measures to the City daily. Prepare and submit to the City on a monthly basis, in accordance with

Schedule 10 – Review Procedure, a monthly summary report of the daily reports. Report the operational performance issues and their resolution at the next Traffic Management Committee meeting and record same in the notes of the meeting;

- F. Respond to traffic related Incidents resulting from construction and traffic management activities. All major Incidents shall be documented within one Business Day of the Incident and provided to the City per Clause 5.2 (c) – Highway Traffic Incident Management Plan, of this Part C;
 - G. Documenting Traffic Control measures and activities in accordance with this Part C and producing a Daily Lane Closure Report as set out in Appendix B;
 - H. Documenting Site instructions and items noted on daily (site) reports which pertain to or affect traffic control, and updating the Highway Traffic Control Plans immediately to reflect the changes on Site, and then promptly submitting the revised plans to the City in accordance with Schedule 10 - Review Procedure, as updates to the Highway TTMP and applicable Highway TTMP sub-plans;
 - I. Overseeing all requirements that contribute to the safety, convenience, and orderly movement of vehicular, cycling and pedestrian traffic;
 - J. Attending the Project’s regularly scheduled traffic management meetings; and,
 - K. Traffic Control supervision shall be provided by Traffic Control Supervisors on the Site on a 24 hour per day basis when Construction Activities are underway. During non-work periods, the Traffic Control Supervisor or accepted alternate shall be on the Site within 30 minutes of being notified. The Traffic Control Supervisors shall have appropriate personnel and equipment available on call, at all times.
 - L. Carry out daily drive-by inspections as detailed in Appendix G.
- (e) Traffic Control Personnel
- (i) All Traffic Control Personnel shall be qualified in accordance with the OHSA/CCOHS and the regulations thereunder.
- (f) Traffic Management Committee
- (i) DB Co shall be responsible for forming a Traffic Management Committee that shall be comprised of DB Co, City, OC Transpo, MTO and representatives of Governmental Authorities that shall meet on a weekly basis.

- (ii) The purpose of this committee shall be to coordinate, plan, and take action with respect to current and future traffic and transit impacts that may be caused by the Highway Works.

Appendix A

1. Road Safety Audit Certificate (Stage 1)
2. Road Safety Audit Certificate (Stage 2)
3. Road Safety Audit Certificate (Stage 4)

Certificate Ref No. []

ROAD SAFETY AUDIT CERTIFICATE (STAGE 1)

This Certificate is being delivered pursuant to the agreement between City and [DB Co] dated • (“the Project Agreement”) relating to the Project. Defined terms and expressions used in this Certificate have the same meanings as ascribed thereto in the Project Agreement.

Form of Certificate to be used by the designer for certifying that a Stage 1 Road Safety Audit has been carried out in accordance with Article 10 of Part 9 of Schedule 15-2.

1. We certify that the Pre-Final Design Development of [.....] has been the subject of a Stage 1 Road Safety Audit in accordance with Article 10 of Part 9 of Schedule 15-2, the Design Management Plan and all other relevant provisions of the Project Agreement.

2. The Road Safety Audit Team’s report and statement certifying the audit has been carried out are attached.

Signed:

Road Safety Audit Team (Principal)

Name:

Title:

Date:

Professional Registration Number:

Affix Professional Seal

3. We certify that the Pre-Final Design Development of [.....] has been the subject of a Stage 1 Road Safety Audit in accordance with Article 10 of Part 9 of Schedule 15-2, the Design Management Plan and all other relevant provisions of the Project Agreement and that all observations and recommendations in the Road Safety Audit Team’s report have been satisfactorily addressed and resolved.

Signed:

Designer (Principal)

Name:

Title:

Date:

Professional Registration Number:

Affix Professional Seal

Signed:

Construction Contractor (Principal)

Name:

Title:

Date:

Professional Registration Number:

Affix Professional Seal

Signed:

DB Co Representative

Name:

Date:

4. Receipt of this Certificate is acknowledged.

Signed.....

HMQ Representative

Name.....

Date.....

ROAD SAFETY AUDIT CERTIFICATE (STAGE 2)

This Certificate is being delivered pursuant to the agreement between City and [DB Co] dated • (“the Project Agreement”) relating to the Project. Defined terms and expressions used in this Certificate have the same meanings as ascribed thereto in the Project Agreement.

Form of Certificate to be used by the designer for certifying that a Stage 2 Road Safety Audit has been carried out in accordance with Article 10 of Part 9 of Schedule 15-2.

1. We certify that the Final Design Development of [.....] has been the subject of a Stage 2 Road Safety Audit in accordance with Article 10 of Part 9 of Schedule 15-2, the Design Management Plan and all other relevant provisions of the Project Agreement.

2. The Road Safety Audit Team’s report and statement certifying the audit has been carried out are attached.

Signed:

Road Safety Audit Team (Principal)

Name:

Title:

Date:

Professional Registration Number:

Affix Professional Seal

3. We certify that the Final Design Development of [.....] has been the subject of a Stage 2 Road Safety Audit in accordance with Article 10 of Part 9 of Schedule 15-2, the Design Management Plan and all other relevant provisions of the Project Agreement and that all observations and recommendations in the Road Safety Audit Team’s report have been satisfactorily addressed and resolved.

Signed:

Designer (Principal)

Name:

Title:

Date:

Professional Registration Number:

Affix Professional Seal

Signed:

Construction Contractor (Principal)

Name:

Title:

Date:

Professional Registration Number:

Affix Professional Seal

Signed:

DB Co Representative

Name:

Date:

4. Receipt of this Certificate is acknowledged.

Signed.....

HMQ Representative

Name.....

Date.....

Certificate Ref. No. []

ROAD SAFETY AUDIT CERTIFICATE (STAGE 4)

This Certificate is being delivered pursuant to the agreement between City and [DB Co] dated • (“the Project Agreement”) relating to the Project. Defined terms and expressions used in this Certificate have the same meanings as ascribed thereto in the Project Agreement.

Form of Certificate to be used by the designer for certifying that a Stage 4 Road Safety Audit has been carried out in accordance with Article 10 of Part 9 of Schedule 15-2.

1. We certify that the [reference relevant works] as constructed, tested and commissioned has been the subject of a Stage 4 Road Safety Audit in accordance with Article 10 of Part 9 of Schedule 15-2, the Design Management Plan and all other relevant provisions of the Project Agreement.

2. The Road Safety Audit Team’s report and statement certifying the audit has been carried out are attached.

Signed:

Road Safety Audit Team (Principal)

Name:

Title:

Date:

Professional Registration Number:

Affix Professional Seal

3. We certify that the [reference relevant works] as constructed, tested and commissioned has been the subject of a Stage 4 Road Safety Audit in accordance with Article 10 of Part 9 of Schedule 15-2, the Design Management Plan and all other relevant provisions of the Agreement and that all observations and recommendations in the Road Safety Audit Team’s report have been satisfactorily addressed and resolved.

Signed:

Designer (Principal)

Name:

Title:

Date:

Professional Registration Number:

Affix Professional Seal

Signed:

Construction Contractor (Principal)

Name:

Title:

Date:

Professional Registration Number:

Affix Professional Seal

Signed:

DB Co Representative

Name:

Date:

4. Receipt of this Certificate is acknowledged.

Signed.....

HMQ Representative

Name.....

Date.....

Appendix B

Daily Lane Closure Report

- a) DB Co shall create a Daily Lane Closure Report for each Lane Closure on the Project. The purpose is to document the status of all of the various Lane Closures for all modes of transportation throughout the Project. The Daily Lane Closure Report may be either a hard copy document or an electronic form in a format compatible with City systems.
- b) The Daily Lane Closure Report shall be a field sheet format. The header of the document shall include but not be limited to headings for the Project Segment and number, date, day of week, location, time of the observations, name of observer, the signature of the observer, and whether the Lane Closure is a General Traffic Lane Closure, or a BRT Lane Closure.
- c) Each day (weekdays and weekends, and statutory and civic holidays), DB Co shall carryout Site inspections, in person or via electronic surveillance, with a focus on both the temporary and long-term Lane Closures in effect for both general traffic and BRT vehicles throughout the entire Project. The data shall be recorded on the Daily Lane Closure Report, the original of which shall be retained by DB Co until the Project warranty period is complete.
- d) In instances where Lane Closures change during the day (or night), DB Co shall carry out Site confirmation of the Lane Closures relevant to the changes at the start and end of each change-over of the Lane Closures and record the inspection on a Daily Lane Closure Report. The observations shall be taken at a frequency so as to confirm with an accuracy of +/- five minutes, the actual start and end times for each of the temporary Lane Closures.
- e) Each day, DB Co shall review the information recorded on the Daily Lane Closure Reports, and assess the execution of the Lane Closures, noting instances where the timing of the Lane Closure implementation/removal is not meeting the expectations of the Highway TTMP and Highway TTMP sub-plans, and identify the remedial action required such that the expectations for Lane Closures as set out in the Highway TTMP and Highway TTMP sub-plans shall be met.
- f) DB Co shall take immediate action to effect the requisite remedial measures needed in order to attend to the noted matters. DB Co shall document in the Daily Lane Closure Report the issue, the remedy and the action taken.
- g) DB Co shall continue to inspect a matter of traffic management concern until the issue is resolved.
- h) Each day, copies of the current Daily Lane Closure Report shall be forwarded by DB Co to the City, and to the Lead Traffic and Mobility.
- i) DB Co shall produce a Monthly Summary of the Daily Lane Closure Reports, noting the number of issues identified, the location and nature of the issues, the remedies for the issues, the actions taken and the results achieved. Trends in issues shall be identified, remedies for the trends ascertained, and remedial action implemented. All of this information shall be

documented in the Monthly Summary of the Daily Lane Closure Reports, and a copy of the summary shall be brought to the weekly Traffic Management Committee meeting for review and discussion, with copy to the City and the Lead Traffic and Mobility.

- j) The Daily Lane Closure Reports shall include, but not be limited to, observations taken during personal Site visits and/or via electronic/camera surveillance, carried out by a DB Co designated Traffic Control Supervisor, with respect to each of the following topics of lane closure information as relates to and in accordance with the current accepted Highway TTMP and current accepted Highway TTMP sub-plans.
- Lane closure required (Yes/no);
 - Planned lane closure (yes/no);
 - Scheduled lane closure time (Military Time – 24 hr clock);
 - Scheduled lane opening time (Military Time);
 - Actual lane closure time (Military Time);
 - Actual lane opening time (Military Time);
 - Period of the day (peak, off-peak, night, weekend, holiday);
 - Lane description:
 - A. Street name;
 - B. Direction of traffic flow;
 - C. Name of upstream cross street;
 - D. Name of downstream cross street;
 - E. Number of lanes closed;
 - F. No of blocks lane(s) is closed; and,
 - G. Lanes closed – Right turn, Through and right turn, Right through, Left through, through and left turn, left turn
 - Comments/other observations;
 - Equivalent lane closure hours for current observation;
 - Location Map to scale showing relevant lane configuration with closed lane(s) shown as hatched area;
 - Checked by (print name then signature); and,
 - Signed off by (print name then signature).

Appendix C

REFERENCE DOCUMENTS

OPS and MTO Special Provisions

Document Type Date	Description
MTOD (at time of Commercial Close)	Ministry of Transportation Ontario Drawing (http://www.raqsb.mto.gov.on.ca/techpubs/OPS.nsf/OPSHomepage)
OPSD (at time of Commercial Close)	Ontario Provincial Standard Drawings (http://www.raqsb.mto.gov.on.ca/techpubs/OPS.nsf/OPSHomepage)
OPSS (at time of Commercial Close)	Ontario Provincial Standard Specifications (http://www.raqsb.mto.gov.on.ca/techpubs/OPS.nsf/OPSHomepage)
SSD (at time of Commercial Close)	Ministry of Transportation Ontario Structural Standard Drawing (http://www.raqsb.mto.gov.on.ca/techpubs/OPS.nsf/OPSHomepage)
Electrical ATMS SSP (at time of Commercial Close)	Ministry of Transportation Ontario Structural Standard Drawing (http://www.raqsb.mto.gov.on.ca/techpubs/OPS.nsf/OPSHomepage)
SSP 102S05 (May 2017)	Revision to Construction Section (compaction)
SSP 103F03 (June 2017)	Replaces OPSS 313 November 2016
SSP 103F31 (June 2017)	Surface smoothness requirements
SSP 104S06 (December 2017)	Post Installation Inspection
SSP 105S09 (March 2018)	Amendment to OPSS 539, November 2014
SSP 105S22 (June 2016)	Target Density
SSP 106S05 (June 2017)	ATMS work
SSP 106S09 (March 2018)	Proof of performance testing power supply
SSP 106S10 (March 2018)	Proof of performance testing underpass luminaires
SSP 106S16 (March 2018)	Proof of performance testing luminaires
SSP 107S02 (February 2017)	Sampling and testing of materials
SSP 107S04 (February 2013)	Delete epoxy coated steel
SSP 107S05 (April 2017)	Freeway Paving Operations
SSP 109S04 (March 2018)	Revisions to references to CAN/CSA
SSP 109S12 (May 2018)	Deletion of QVE
SSP 109S13 (July 2017)	Coating thickness measurements HML and OHS
SSP 109S17 (March 2018)	Replaces OPSS 905
SSP 109S32 (March 2018)	Amendment to OPSS 928, April 2012
SSP 109F57 (April 2018)	Amendment to OPSS 903, April 2016
SSP 109S58 (March 2018)	Amendment to OPSS 942, November 2009
SSP 110S04 (February 2018)	Amendment to OPSS 1001, November 2013 – Aggregate Produced from Mine By-Product Rock
SSP 110F10 (September 2001)	Use of slag
SSP 110S16 (May 2017)	Amendment to OPSS 1004, November 2012 – Quality Assurance Sampling, and Physical Property and Gradation Requirements for Granular Sheeting

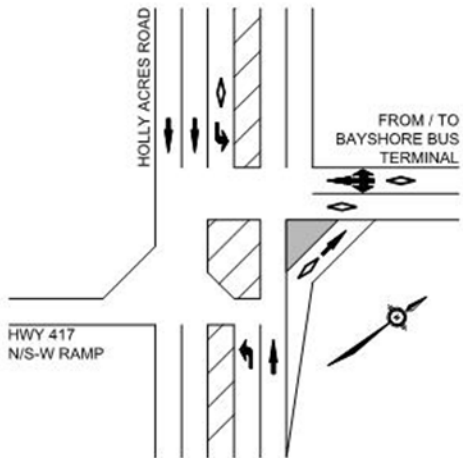
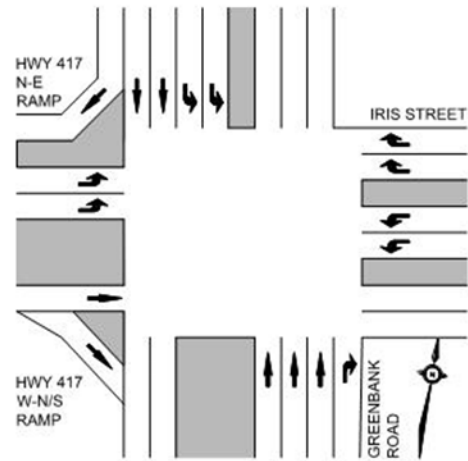
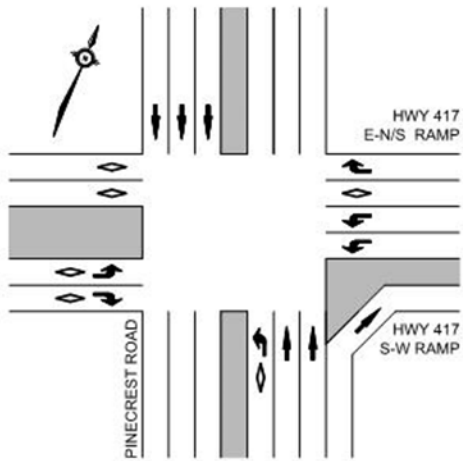
SSP 111F06 (March 2017)	Mix Design Criteria and Anti Stripping Treatment
SSP 111F09 (December 2017)	Additional test results and sampling for PGAC
SSP 111S12 (July 2017)	Replaces OPSS 1103
SSP 112S07 (February 2008)	Replaces OPSS 1212
SSP 112S10 (December 2017)	Bearing tolerances
SSP 113S03 (December 2004)	Cementing Materials submission and requirements
SSP 114S06 (June 2017)	Replaces OPSS 1440
SSP 118S03 (February 2017)	Precast Hardened Concrete testing
SSP 124S01 (March 2018)	Coating inspection of HML
SSP 168F10 (September 2007)	ATMS Operations
SSP 168F14 (December 2017)	ATMS Quality Control
SSP 168S20 (September 2007)	ATMS protection existing system
SSP 199S48 (February 2017)	QVE Services
SSP 199S54 (February 2018)	Laboratory correlation program
SSP 199S55 (May 2004)	Record Drawings for Structures and Foundations
SSP 199F57 (December 2017)	General Requirements of Samples for Quality Assurance, Referee and Other Testing by the Owner or the Owner's Agent
SSP 199S64 (July 2016)	Referee Testing
SSP 305S03 (March 2017)	Amendment to OPSS 305, November 2016 – Granular Sealing
SSP 308F02 (February 2017)	Tack Coat requirements
SSP 351S01 (October 2016)	Tactile walking surface
SSP 407S06 (April 2014)	Amendment to MTC Form 407, March 1984 – Aggregate Requirements, Lift Rings, Adjustment Unit and Resilient Connectors
SSP 499S02 (March 2012)	Management of MH/CB Cleanout material
SSP 517F01 (July 2017)	Dewatering Requirements
SSP 599S22 (March 2018)	Design and Construction requirements RSS walls/slopes
SSP 599S23 (March 2018)	QC and QA testing for RSS materials
SSP 601S01 (November 2014)	Maintenance temporary traffic signals
SSP 681F15 (September 2007)	Training for ATMS work
SSP 681F19 (December 2017)	SIT of ATMS
SSP 681F25 (June 2017)	ATMS Maintenance and Warranty
SSP 682S07 (November 2017)	ATMS Ducts
SSP 682S12 (March 2018)	Power Supply Cabinet ATMS
SSP 682S14 (April 2018)	Concrete Pads ATMS
SSP 682S16 (June 2017)	Controller Cabinets ATMS
SSP 682S15 (September 2007)	Base mounted Communications Pedestals ATMS
SSP 682S17 (July 2012)	Advanced Traffic Controllers ATMS
SSP 682S18 (September 2007)	Loop Vehicle Detector Sensor Units ATMS
SSP 682S19 (May 2017)	ATMS Loop Detectors
SSP 682S26 (December 2017)	NITS installation and testing
SSP 682S27 (June 2017)	Pole mounted Controller Cabinet ATMS
SSP 682S28 (November 2013)	UPS for ATMS
SSP 682S30 (July 2009)	Concrete Poles with Camera raising lowering ATMS

SSP 682S34 (June 2017)	External UPS Units ATMS
SSP 683S01 (December 2017)	Fibre Optic Communications Cable ATMS
SSP 683S02 (December 2017)	Splice Enclosures ATMS
SSP 683S28 (December 2017)	Aerial Fibre Optic Communications Cables ATMS
SSP 684S10 (February 2014)	Dome Cameras ATMS
SSP 685S01 (February 2016)	Variable Message Signs ATMS
SSP 685S07 (February 2016)	Fixed Support VMS ATMS
SSP 710S01 (September 2011)	Application of stop lines
SSP 710S02 (September 2011)	Second application of traffic paint
SSP 710S03 (September 2011)	Removing and obliterating pavement markings
SSP 710S04 (September 2011)	DSM requirement removing and obliterating pavement markings
SSP 710F07 (September 2011)	Short-term pavement marking material
SSP 721S05 (April 2016)	Type M SBGR mounting height
SSP 723S01 (August 2016)	Energy Attenuator Types
SSP 723S02 (February 2017)	Installation Energy Attenuator temporary narrow
SSP 732S03 (January 2018)	SBEAT Construction requirement
SSP 740S01 (September 2011)	Installation requirements concrete barrier
SSP 741S01 (August 2015)	Temporary Concrete Barrier Connections
SSP 741S02 (August 2016)	Movable Temporary Concrete Barrier requirements
SSP 760F01 (March 2018)	Noise Barrier design and construction requirements
SSP 799S03 (September 2011)	Temporary Transition Rail Requirements
SSP 799S04 (February 2013)	React 350 Construction requirements
SSP 799S05 (December 2017)	Certification of Safety Items
SSP 799S12 (May 2013)	Ramp Closure Gates construction requirements
SSP 799S17 (February 2017)	Intermediate Signs construction requirements
SSP 899S01 (March 2015)	Requirements for disposal of materials containing asbestos
SSP 914S03 (March 2016)	Form and fill grooves requirement
SSP 922F01 (November 2016)	Sampling for bearings
SSP 999S02 (March 2018)	Glass Fibre Reinforcing Polymer Reinforcing requirements
SSP 999F29 (March 2018)	Dowel Installation requirements
SSP 999S30 (March 2018)	Jacking of Superstructure requirements
SSP 999S31 (March 2018)	Non pre-stressed pre cast concrete bridge elements requirements

Appendix E

Road Intersection Minimum Lane Configuration Diagrams

Appendix E represents the minimum lane configuration requirements at the following intersections. If the findings of DB Co's Traffic Analysis Report and design require additional travelled or auxiliary lanes in order to satisfy the requirements of this Schedule 15-2, Part 9, DB Co shall be responsible for the necessary roadway expansions or improvements in addition to the requirements shown in this Appendix E. Such expansions or improvements shall be identified to the City upon submission of the Traffic Analysis Report and approved by the City in writing. Active transportation facilities and associated infrastructure is not depicted in this Appendix E, but shall be provided by DB Co in accordance with the requirements detailed elsewhere in Schedule 15-2, Part 9. Grey areas denote raised concrete medians or islands. Raised medians and islands shall only be constructed at ramp terminals at locations identified below.



Appendix F

Context Sensitive Design Requirements

1.1 CSD Background

- (a) On previous Highway 417 projects between Walkley Road and Highway 416 in Ottawa, MTO has implemented a series of consistent architectural and aesthetic treatments (the “Context Sensitive Design Concepts” or “CSD Concepts”) into the design of various elements of highway infrastructure as part of its Context Sensitive Design (CSD) initiative.
- (b) Additional background on the MTO’s CSD initiatives can be found in the MTO’s Context Sensitive Design Report for the Queensway – Highway 417 (2011), however DB Co shall not extract CSD Concepts from this report for use on Highway Works, as it does not reflect actual CSD Concepts applied to recent Highway 417 projects.

1.2 CSD Design and Submission Requirements

- (c) The design requirements contained within this Appendix F pertain to CSD Concepts only and do not release DB Co of its responsibility to meet other Design Criteria contained elsewhere in Schedule 15-2, Part 9.
- (d) DB Co shall be required to incorporate applicable CSD Concepts and associated treatments into its design of the Highway Works to ensure consistency with other sections of Highway 417 in Ottawa. DB Co shall refer to the following MTO contracts and extract all applicable drawings and specifications pertaining to CSD Concepts for incorporation into Highway Works design with a similar level of detail:
 - (i) MTO Contract 2012-4007;
 - (ii) MTO Contract 2014-4030;
 - (iii) MTO Contract 2014-4038; and,
 - (iv) MTO Contract 2017-4031.
- (e) The CSD Concepts listed below shall be integrated into DB Co’s Highway Works design, in accordance with the referenced MTO contracts any other requirements detailed herein. The general descriptions below are made for the purpose of identifying CSD Concepts, and shall not be construed as the sole CSD design requirements applicable to Highway Works.
 - (i) Underpass Bridge Structures
 - A. Pilasters

1. Decorative pilasters shall be designed and constructed at the outside face of intermediate piers on multi-span Underpass Bridges. The pilasters shall incorporate a maple leaf emblem.
 2. Pilaster design shall be aesthetically consistent with those detailed in MTO Contract 2012-4007.
- B. Piers
1. Centre pier design shall be aesthetically consistent with those detailed in MTO Contract 2012-4007.
- C. Abutments
1. Abutment design shall be aesthetically consistent with those detailed in MTO Contract 2012-4007.
- D. Wing Walls
1. Wing wall design shall be aesthetically consistent with those detailed in MTO Contract 2012-4007.
- E. Parapets
1. Parapet design shall be aesthetically consistent with those detailed in MTO Contract 2012-4007.
- F. Underbridge Slopes
1. Underbridge slope design shall be aesthetically consistent with those detailed in MTO Contract 2012-4007.
- G. Beams and Girders
1. Beams and girder design shall be aesthetically consistent with those detailed in MTO Contract 2012-4007.
- H. Lighting
1. Underbridge lighting features shall be aesthetically consistent with those detailed in MTO Contract 2012-4007 and MTO Contract 2014-4038.
- I. Appurtenances
1. Underpass Bridges shall include bridge mounted street names, leaf emblems on pilasters, and any other relevant CSD Concepts.

2. Bridge appurtenances shall be aesthetically consistent with those detailed in MTO Contract 2012-4007.
- (ii) Walls
- A. Noise Barriers
 1. Noise Barriers shall generally consist of precast concrete panels and posts. Translucent acrylic Noise Barriers shall be provided at certain locations as indicated elsewhere in this Schedule 15-2, Part 9.
 2. Noise Barriers, including the material, colour and texture patterns, and aesthetics shall be consistent with those detailed in MTO Contract 2012-4007 and MTO Contract 2014-4038.
 - B. Retaining Walls
 1. Retaining walls, including the material, colour and texture patterns, and aesthetics shall be consistent with those detailed in MTO Contract 2012-4007.
- (iii) Landscape Treatments
- A. Landscaping requirements shall be as detailed elsewhere in Schedule 15-2, Part 6 - Urban Design, Landscape Architecture and Connectivity Requirements and this Part 9.
- (iv) Highway Appurtenances
- A. Light Poles
 1. Leaf emblems shall be affixed to every other light pole as per the pattern featured in MTO Contract 2017-4031.
 2. Light poles, including LED luminaires and associated appurtenances, shall be aesthetically consistent with those detailed in MTO Contract 2017-4031.
 - B. Fencing
 1. Chain link fencing within the MTO ROW shall be black with vinyl fence fabric as detailed in MTO Contract 2017-4031.
 2. Fencing shall be aesthetically consistent with that detailed in MTO Contract 2017-4031.
 - C. Sign Structures

1. Overhead sign structures shall be aesthetically consistent with those detailed in MTO Contract 2012-4007 and MTO Contract 2017-4031.
- (f) As part of its Pre-Final Design Development submission in accordance with Schedule 10 – Review Procedure, DB Co shall submit to the City a report demonstrating its adherence to CSD requirements as specified in this Schedule 15-2.
- (i) DB Co shall be required to Address in a subsequent report submission, any CSD Concepts that are not appropriately integrated into its design, as determined by the City.
 - (ii) The report shall detail the following, at a minimum, pertaining to each CSD Concept:
 - A. Locations within the Highway Corridor Lands where each CSD Concept is to be integrated; and,
 - B. Typical aesthetic design details for each CSD Concept (including but not limited to materials, dimensions, layout, colour).

Appendix G
Maintenance During Construction

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ARTICLE 1 INTRODUCTION

1.1 SCOPE

DB Co shall carry out Maintenance Operations in accordance with the requirements of this Appendix G until Highway Final Completion.

MTO shall only be responsible for snow, ice and frost control on the travelled lanes and paved shoulders within the Construction Zone designation current at the time. DB Co shall be responsible for any snow removal in the construction work zone, behind temporary barriers or other devices.

The Maintenance Operations shall adhere to the specifications detailed in this Appendix G for addressing inspection, maintenance and repair.

The specifications identify DB Co's responsibilities and obligations of DB Co Parties performing the Maintenance Operations requirements.

1.2 TURN-OVER

The Highway Corridor Lands will be turned over to DB Co for maintenance as per the following procedure:

1. DB Co shall submit the Designation of Construction Zone to City in conjunction with Commencement Date to transfer Highway Corridor Lands to DB Co.
2. DB Co shall with City perform a field inspection of the Highway Corridor Lands following Financial Close and prior to the Turn-Over date to identify any deficiencies. City is the sole judge of whether or not the identified deficiencies require correction prior to the turnover date.
3. City shall prepare the Turn-Over Agreement Form A, which identifies the date and time that responsibility for maintenance is transferred to DB Co, and shall be executed by City and DB Co.
4. DB Co shall carry out Maintenance Operations within the Designation of Construction Zone limits until Final Highway Completion within the noted limits.
5. DB Co shall request the turnover of Maintenance Operations to City using the Turn-Over Agreement Form B.
6. A final turnover field inspection prior to turn over from DB Co to City shall be performed by DB Co and City to identify and deficiencies to be corrected by DB Co. The City is the sole judge or whether or not the identified deficiencies require correction prior to turnover date.

1.3 GENERAL

All conditions that are considered, or causing, a Hazard shall be addressed Immediately by DB Co upon Detection or being Made Aware.

All Maintenance Operations shall be completed according to all Laws and Regulations, Standards and this Appendix G to Schedule 15-2 Part 9.

When a date for completion or submission of a component of the Maintenance Operation is identified, such date is considered to be the Maintenance Standard for the activity. When this Appendix G identifies a Remedy Period, the Remedy Period is the time limit to correct a non-compliance to meet the Maintenance Standard. The Remedy Period begins when the non-compliance is Detected or should have been Detected. However if the non-compliance is causing or could cause safety or health Hazards, the Maintenance Operation shall be completed Immediately or as soon as possible to maximize the safety of the public.

The non-compliance becomes a Non Conformance where the Remedy Period time limit has not been met. The Non Conformance process as detailed in Schedule 11 shall be followed. For greater clarity the Maintenance Operations are part of the Works and the Construction Period Quality Failure as detailed in Schedule 21 shall apply.

The tables, in the articles in this Appendix G, detailing the Maintenance Standards designate, in brackets below each Maintenance Standard if the non-compliance will be processed in accordance with the NCR process as per Schedule 11 or in accordance with the Construction Period Quality Failure as defined in Schedule 21 with the designation of Minor Construction Period Quality Failure (Minor CPQF) or Medium Construction Period Quality Failure (Medium CPQF).

Subsequent Construction Period Quality Failure Deductions arising from a failure to remediate prior to the expiration of the applicable Remedial Period will be assessed as detailed in Section 6.2 of Schedule 21.

HIGHWAY MAINTENANCE TURN-OVER AGREEMENT FORM A

CONTRACT NO.: _____ **HWY. NO.:** _____ **REGION:** _____

LOCATION: _____

DESCRIPTION: _____

CONTRACTOR: _____

DB Co and their parties, as per Project Agreement, do now take responsibility for the maintenance of the roadway, except for the exemptions listed below.

The following list of items will remain the responsibility of the Ministry or its Agents, including the Area Maintenance Contractor:

Winter Maintenance Operations

Date and time of maintenance transfer:

Date: _____ **Time:** _____

City
Administrator: _____
(signature) _____ Date

DB Co: _____
(signature) _____ Date

For Confirmation of Receipt:

Maintenance
Superintendent: _____
(signature) _____ Date

Area
Maintenance
Contractor: _____
(signature) _____ Date

Distribution:
City Administrator
Maintenance Coordinator (MTO)
Area Contracts Engineer (MTO)
Regional Contracts Engineer (MTO)

HIGHWAY MAINTENANCE TURN-OVER AGREEMENT FORM B

CONTRACT NO.: _____ HWY. NO: _____ REGION: _____

LOCATION: _____

DESCRIPTION: _____

CONTRACTOR: _____

The City and its agents, as per Project Agreement, do now take responsibility for the maintenance of the roadway, except for the exemptions listed below.

The following list of items will remain the responsibility of the Contractor or their Agents:

[additional items as per the Maintenance Items List]

Date and time of maintenance transfer:

Date: _____ Time: _____

City
Administrator: _____
(signature) Date

Contractor: _____
(signature) Date

For Confirmation of Receipt:

Maintenance
Superintendent: _____
(signature) Date

Area
Maintenance
Contractor: _____
(signature) Date

Distribution:
City Administrator
Maintenance Coordinator (MTO)
Area Contracts Engineer (MTO)
Regional Contracts Engineer (MTO)

ARTICLE 2 DEFINITIONS

For interpretation, the definitions found in this Article 2 and elsewhere in this document, apply throughout the Agreement (herein defined), unless otherwise specified.

Unless the context otherwise specifies or requires, for the purposes of this Agreement, the following terms shall have the following meanings:

Asphalt Pavement means a road surface made of a mixture of asphalt cement and aggregate, commonly referred to as “hot mix” or “flexible pavement”.

Aggregate means gravel, sand, clay, earth, shale, stone, limestone, dolostone, sandstone, marble, granite, or rock other than metallic ores, slag, and clinkers.

Bi-weekly means occurring every two weeks.

Breakout means damage to Concrete Barrier where concrete is missing from the full width of the cross-section.

Block Separation means a crack through the full width of the Concrete Barrier.

Construction Signs means all traffic control devices and signs, including vehicles, trailers, and the like that are provided to support signs, and equipment to supply sign lighting, but excludes Contract identification signs and Highway number markers, all as may be described in the OTM.

Contractor means the person, partnership, or corporation or joint venture undertaking the Work as identified in the Agreement (DB Co).

Curb and Gutter means a border and channel typically made of concrete at the edge of a street or road for conveying surface water.

Day means a calendar day.

Defect(s): means any deficient condition on the Highway Corridor Lands identified in the maintenance requirements.

Detect, Detected or Detection means observed, should have been observed or has been informed.

Deterioration means a physical breakdown of the Pavement and/or Roadbed.

Disposed, Disposed Of or Disposal means disposal according to the requirements of Schedule 17.

Drainage Features means the features that function to control or convey storm-water runoff. Drainage features may include, but are not limited to the following: curb and gutter, culverts with spans less than three metres, ditches and ditch inlets, drainage channels, swales, catch basins and manholes and sewers.

Driving Surface means that part of the Highway designed or intended for use by vehicular traffic excluding Shoulders, and as defined by the painted edgelines when available.

Energy Absorbing System (EAS) means either: cylinders filled with energy absorbing materials; or; mechanical devices with or without energy absorbing cartridges. Energy absorbing terminals are generally attached to Concrete Barrier, steel beam guide rail, or other fixed objects.

Eradicate/Eradication means to do away with the plants completely as if by pulling up by the roots.

Fully Paved Shoulders means a Paved Surface adjacent to the through or auxiliary lane.

Gravel Shoulders means areas of gravel placed adjacent to through lanes, auxiliary lanes, Partially Paved Shoulder or Fully Paved Shoulders.

Hand Tools means tools that are commonly called tools or implements of the trade and include small power tools. Individually, a tool shall be considered as a Hand Tool where the maximum cost is \$[REDACTED].

Hazardous Substance means, but is not limited to, any solid, liquid, gas or other substance or emission which is a contaminant, pollutant, dangerous substance, liquid waste, industrial waste, hazardous material or hazardous substance which is or becomes regulated by Environmental Laws or occupational health and safety law or which is classified as hazardous or toxic under Environmental Laws.

Immediate or Immediately means initiation of a Maintenance Operation activity as soon as possible after Detection or being Made Aware and no later than 30 minutes from the time of Detection or being Made Aware. If more than one activity requires Immediate action at the same time, DB Co shall complete the work giving priority to the highest degree of Hazard.

Incident Resolution means the Highway is free of Hazards and all lanes closed due to the Incident have been re-opened to public traffic.

Laws and Regulations means any and all applicable federal, provincial or municipal laws, by-laws, codes, orders, directives, rules, regulations or statutes affecting the Maintenance Operation which, in the ordinary and usual course of the maintenance, repair and/or construction of a Highway in the Province of Ontario, would be recognized, followed and/or implemented by the Crown and applicable provincial advisors.

Loop Crack means a pattern of through cracks that form a distinct continuous or discontinuous U-shape or V-shape in Concrete Barrier.

Maintenance Access Point means a structured opening to provide access to underground services.

Maintenance Operation means the activities performed to maintain the Highway in a safe and passable condition, to prolong the life of the asset, and other activities prescribed in the maintenance requirements.

Maintenance Standard means the minimum operational requirements and service levels for Highway maintenance in order to ensure the safety of Highway users and maintain Highway assets. Maintenance Standards are detailed in this Appendix G.

mcd/m²lx means a unit of measurement for Retroreflectivity (milicandelas per square metre per lux).

Partially Paved Shoulder means a Paved Surface adjacent to a through or auxiliary lane for a minimum width of 0.5 metres with the remaining shoulder surface being gravel.

Paved Surface means any surface with a hard surfaced finish constructed of Asphalt Pavement, Concrete Pavement or Surface Treatment.

Priority means completing the function in order of importance with respect to the public's safety.

Qualified Bridge Repair Crew means a group of three identified individuals that have knowledge of maintenance practices and repair methods relating to Highway Structures gained through a minimum of 3 years' work experience working on MTO Bridges. The crew shall consist of as a minimum one qualified supervisor, two qualified workers, a vehicle or vehicle/trailer combination equipped with tools, equipment and materials required to perform bridge repairs, including small hand tools such as hammers, wrenches, saws, trowels, shovels, rakes, brooms and power tools such as chainsaw, concrete saw, concrete vibrator, chipping guns, and hammer drills.

Qualified Inspector means a person with knowledge of Structure maintenance principals and ability to identify structure defects, gained through a minimum of three (3) years of highway or equivalent municipal structures inspection experience. The Qualified Inspector shall possess a certificate from a bridge inspection course, equivalent to the Ontario Good Roads Association's Bridge and Structure Inspection course.

Qualified Person means a person with knowledge of Structure maintenance principals and ability to identify structure defects, gained through a minimum of two (2) years of highway structures or equivalent municipal structures maintenance experience. The Qualified Person shall possess a certificate from a bridge training course, equivalent to the Ontario Good Roads Association's Bridge and Culvert Management course.

Ravelling is the progressive loss of pavement material from the surface downward, leaving a course texture of “pock marks” on the pavement surface.

Reasonable means a sound judgment or action that is not excessive or extreme nor insufficient.

Remedial Period means the period of time allowed for correcting a Defect after the expiration of the Remedy Period and as defined in Schedule 21 .

Remedy Period means the maximum period of time allowed for correcting a Defect after Detection.

Retracing of Pavement Markings means the routine recoating of existing markings, including center lines, edge of pavement lines, lane and turn lane lines and Pavement Marking Symbols, including stop bars, crosswalks, school crossings, railway crossings, arrows and other markings listed on the inventory, on existing pavement.

Retroreflectivity means the property of a material or device in which, when directionally irradiated, the reflected rays are preferentially returned in direction close to the opposite of the direction of the incident rays, this property being maintained over wide variations in the direction of the incident rays.

Rippling and Shoving means regular transverse undulations in the surface of the pavement in a wavy or “washboard” effect running across the pavement, or an unevenness of the pavement due to movement of the surface mat.

Roadbed means that part of the Work which is designed to support the Roadway.

Ruts or Rutting means longitudinal depressions or dishing developed on the Paved Surface or Gravel Shoulder.

Security Fence means fencing that is installed to control access to, or limit the movement of, vehicles, pedestrians, and animals within the Provincial Highways or to secure City assets.

Sink Hole means a void beneath the Paved Surface or in the Gravel Shoulder.

Standard means, when used alone, the generic term for Maintenance Standard Specifications, Standard Specifications and Standard Drawings.

Standard Specification or Standard Drawing or Maintenance Standard Specification means a standard practice required and stipulated by the Owner for performance of the Work.

Storm Sewer System means a drainage conveyance system that carries water away from Catch Basins or other underground Drainage Features.

Structural Maintenance means maintenance work completed to reduce further damage or deterioration of the asset, including repairs to clamping bars, joint cover plates, railing and handrails, retainer bars and deck and slab drains.

Sweeping means removal of a sand/gravel/vehicle dirt mixture from the Roadway and may include litter.

Turn-Over has the meaning as per Clause 1.2.

Vegetation means all plant life including grass, weeds, noxious weeds, brush and trees.

Zero Time means that the Remedy Period time is zero minutes

ARTICLE 3 INCIDENT RESPONSE

3.1 SCOPE

This article details the requirements to response to incidents on the Highway Corridor Lands.

3.2 REPORTING

Inspections and reports shall be according to the following including Table 3-1.

A Collision/Incident Report form (provided in Attachment 3 A) shall be completed regarding all Incidents within the Highway Corridor Lands in which there are fatalities, personal injury, lane or road closures, severe damage to crown property, or the possibility of litigation. Photographs complete with date, time and signature of photographer shall be taken to assist with documentation of the Incident. The photographs and documentation shall describe the occurrence as well as the road conditions, general operations and identify DB Co’s personnel on site.

The OTOC shall be notified at the time of arrival and departure from each Incident Site. Updates shall be provided every 30 minutes regarding Incident Site status.

Table 3-1

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDIAL PERIOD
INSPECTIONS AND REPORTS			
Collision/Incident Reports (NCR process)	Collision/Incident Reports completed and submitted to the City within 48 hours of Incident Resolution	Zero Time	1 Business Day
Notification to the OTOC (NCR process)	Notification and updates to the OTOC as specified	Zero Time	15 minutes

3.3 MAINTENANCE OPERATIONS

Incidents shall be responded to upon Detection by proceeding to the Incident Site to secure the site and/or provide assistance to emergency responders as required. Incident response shall be in addition to any other operations underway. All necessary action shall be taken to keep the public, adjacent landowners and workers safe. This shall include any or all of the following:

- 1) Provide traffic control according to the OTM and Ministry of Labour orders and assist in restoring traffic movement as quickly as possible.
- 2) Protect public and worker safety at Incident Sites.
- 3) Open and close lanes and/or ramp gates at the request of the police or City, as may be relayed by the OTOC.
- 4) Install, maintain and remove road closure signs as requested by the police or City, as may be relayed by the OTOC.
- 5) Contain spillage on the Highway Corridor Lands in conjunction and co-operation with regulatory agencies, the police and appropriate municipal and provincial authorities. The OTOC shall be notified in the case of a spill.

- 6) Secure, protect, or isolate damaged Highway infrastructure as requested or required and restore the Highway to a condition safe for public travel by completing temporary or permanent repairs to correct damage including damage to the following:
 - i. Roadside barrier systems.
 - ii. Roadside energy attenuators and terminal systems.
 - iii. Drainage systems.
 - iv. Electrical facilities.
 - v. Signs and sign support structures.
- 7) Remove and dispose of Debris from the Highway.
- 8) Permanent or temporary repairs shall be made as required to attain Incident Resolution.

3.4 RESPONSE TIME

Response time to all Incidents shall not exceed the time limits according to Table 3-2 Incident Response Time. The response time is the maximum allowable time from the time of Detection of the Incident until the appropriate Incident Response Equipment (Freeway) is on site.

Table 3-2 Incident Response Time

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDIAL PERIOD
RESPONSE TIME			
Incident Detection (Medium CPQF)	Incident Response Equipment (Freeway) on site	30 minutes	10 minutes

Additional resources including personnel and equipment shall be deployed upon being Made Aware of the necessity for the additional resources at the Incident Site. The additional resources shall include sufficient equipment and personnel to provide lane closures and services as required during winter and summer seasons.

3.5 RESPONSE TO EMERGENCY BRIDGE REPAIRS

The Qualified Inspector shall be available to respond to all emergency bridge Incidents which could require repair. The Qualified Inspector shall be deployed upon a request from the Incident response personnel. Temporary repairs may be allowed as approved by the City to allow for safe passage of vehicular and/or pedestrian traffic with a permanent repair plan submitted to the City within 48 hours.

Table 3-3

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDIAL PERIOD
Emergency Bridge Repairs			
Response Time (Medium CPQF)	Respond on site to all bridge Incidents with a qualified supervisor upon notification of Incident response personnel	1 hour	1 hour

ATTACHMENT 3 A

Contractor Name/Logo

Collision/Incident Report

Contract

Preliminary

Final

a) **Area:** Hwy _____ **LHRS Base Point** _____ **Offset:**

GPS Coordinates (if available):

b) **Location:** (provide distance from known reference point)

c) **Date/Time of Collision/Incident:** **Date:** _____ **Time:**

d) **Time of Road Closure:** _____ **Time Closure was cleared:**

Additional comments:

e) **Detour Information:**

f) **Collision/Incident:** (Brief Description including type of vehicle(s) involved)

g) **Number Fatal:** _____ **Number Serious Injuries:**

h) **Weather at Time of Collision/Incident:** (include start of storms, intensity, visibility, etc.)

i) **Physical Features:** (signage, lane markings, curve, grade, surface condition, shoulder condition, granular, fully or partially paved, etc.)

j) **Road Conditions at Time of Collision/Incident:** (Bare, Snow covered, Ice, Visibility, etc.)

k) **Time of Last Patrol and Equipment Activities: Road/Weather Conditions Detected During Patrol:**
(include actions taken by Patroller/Operator)

l) **Operations Underway at Time of Collision/Incident:** (include start times, DLA, pre-wet, equipment utilized, breakdowns, time equipment passed scene of Collision/Incident, etc.)

m) **Other Relevant Information:** (police activities/reports, public/media enquiries, etc.)

n) **City/Contractor Representative at Scene of Collision/Incident:**

o) **Report Prepared by:** _____ **Phone #:** _____ **Date/Time of Report:**

Update Prepared by: _____ **Phone #:** _____ **Date/Time Report Updated:**

p) **Other documents available:** **OPP Reports** **Fatal Collision Report** **Other**
Photos

q) **Changeable Message Sign** (message used):

Note: The OTOC will provide as much information as possible, such as weather, physical features, road conditions, service delivery, operations and more if available. **Items 1 to 6 and 15 & 16 must be prepared immediately.** It is understood that the information may be very preliminary and subject to confirmation. This report must be reissued when additional details become known and/or, as reports are made available. This should occur within 48 hours of the incident. A full report must be issued once all information is received. This document must be considered as highly confidential and must not be released other than to those listed below.

ARTICLE 4 DRIVE-BY INSPECTIONS

4.1 SCOPE

This article details the requirements to carry out inspections on the Highway Corridor Lands.

4.2 INSPECTIONS AND REPORTS

Drive-by inspections of Highway Corridor Lands shall be undertaken by the Traffic Control Supervisor to note any Defects or Deficiencies that require immediate action or need to be scheduled for repair according to the applicable Maintenance Operation. Inspections shall include recording observations in the record keeping report as per Clause 1.10 of Schedule 15-2 Part 9 Part C and taking appropriate action on the following conditions:

- i. Deficiencies or Defects that pose an imminent Hazard shall be reported Immediately to the OTOC and the City.
- ii. Dangerous Goods Vehicle Accidents and Leaks/Spills of Unidentified Materials.

The primary responsibility for containment, clean-up and disposal of spilled material rests with the owner/person having control of the product at the time of the spill.

Unauthorized Signs

"Tack" signs (signs tacked to M.T.O. signs) or other forms of unauthorized advertising attached to property or set up within the Highway Corridor Lands shall be removed and disposed of properly.

Authorized Signs

Election signs and Canadian Forces Convoy Route markers may be permitted on the Highway Corridor Lands under specific conditions. These conditions shall be provided by the City.

Special signs may be allowed through permission from the City. The City shall provide copies of sign permits covering the approval.

Contaminated Property

The location and description of any evidence of contamination (e.g.: staining on the surface of the ground) on Highway Corridor Lands or adjacent properties shall be reported to the City.

Unplanned Closures

The Patroller shall contact the OTOC regarding all Provincial Highway unplanned closures or partial closures including time of closure, expected duration and time of re-opening.

Any deficiency or unusual circumstance not included above shall be reported to the City.

4.3 RECORD KEEPING

Reports shall be completed, dated and signed daily by the Traffic Control Supervisor(s) and shall include the following information when applicable:

- i. Weather.
- ii. Date.
- iii. Printed Name and Signature.

- iv. The time that drive-by inspections are completed, including start and end times including ramps covered.
- v. Maintenance Operations completed during the day.
- vi. Discussions with the public (name the individual).
- vii. Discussions with the OTOC, City or DB Co staff (name the individual).
- viii. Calls from the police and action taken.
- ix. Incident information.
- x. Page number (e.g., 1 of 1, 1 of 2).
- xi. Highway Corridor Lands deficiencies and Defects.

Reports shall be submitted to the City Bi-weekly after the Bi-weekly period ending or one business day after the City has requested the report. (see Table 4-1)

Any corrections to reports shall be made with a single strikethrough, no overwriting of text, and initialed by the person making the correction.

Table 4-1

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDIAL PERIOD
Inspections and Reports			
Inspection reports NCR Process	Reports shall be submitted to the City within seven Days of the Bi-weekly period ending or one business day after the City has requested the report.	Zero time	1 Business Day

In addition to the minimum daily frequency, inspections shall be conducted as needed to cover non-routine situations including:

- a) During and after heavy wind or rain events.
- b) Emergency call-outs.

4.4 INSPECTION

Deficiencies or Defects that pose an imminent Hazard that are Detected during drive-by inspection shall be Addressed Immediately.

The vehicle used for inspection shall be equipped with a digital camera with date/time stamp and a cellular telephone.

The Highway Corridor Lands shall be inspected within the Designated Construction Zone on a daily basis as per Table 4-2.

Table 4-2

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDIAL PERIOD
Inspection			
Inspection Frequency (NCR Process)	Inspection of the Highway Corridor Lands within the Construction Zone completed by the Traffic Control Supervisor at the specified minimum frequency	Zero Time	1 Business Day

- a) Road inspection consists of driving at a safe speed to look for Defects or Deficiencies identified in this Appendix G. Road inspection can be completed as a separate activity or combined with other operations.

Actions to Address Hazardous conditions may include one or more of the following:

- i. Installing signs.
- ii. Dispatching a work crew.
- iii. Contacting the police.
- iv. Undertaking the repair or removal of the Hazard, if it can be completed safely.
- v. Contacting the appropriate authorities (i.e.: the OTOC, O.P.P., MOECC Spills Action Centre in case of a spill).
- vi. Placement of appropriate temporary warning signs or markers.

All Defects identified in the Maintenance Operation are important. However, first Priority should be given to public safety, worker safety and Roadway items.

Damage to MTO property shall be reported to the O.P.P. or local police.

The vehicle used for road inspection shall contain:

- i. Necessary equipment, materials and tools to undertake minor emergency repairs.
- ii. Signs that can be easily installed to warn motorists of potential safety Hazards.

When a Defect is observed, such as Debris on the Roadway that can be Addressed safely, the required Maintenance Operation activity shall be carried out according to the OTM.

When Defects are observed that could be Hazardous, such as washouts or guide rail damage, the location shall be marked with a TC 54, safety cone, or hazard marker, to alert motorists.

If it is noted that a Highway Corridor Lands Closure may be necessary, the O.P.P. or local police shall be contacted through the OTOC. Only the O.P.P. or local police have the authority to close a Provincial Highway.

When stranded motorists are noted they shall be contacted if assistance for towing or other services is required. If an incapacitated vehicle is posing a Hazard to other vehicular traffic, (e.g.: on the inside shoulder) it shall be removed as soon as conditions permit. The OTOC shall be notified.

Visual inspection of traffic signal heads and supports shall be undertaken following storms accompanied by high winds.

ARTICLE 5 ROADWAY MAINTENANCE

5.1 SCOPE

This article details the requirements to carry out Roadway maintenance on the Highway Corridor Lands

5.2 DEBRIS

Removal and management of Debris shall be according to the following.

- a) A spring clean-up shall be scheduled during the spring of each year. The spring clean-up shall include removing accumulations of Debris from the Winter Period including sand, gravel or vehicle dirt mixture from all Paved Surfaces and within the Highway Corridor Lands prior to June 1 of each year.

Accumulations of gravel or sand on Paved Surfaces that occur after completion of the spring clean-up and prior to November 15 of each year shall be removed upon Detection.

Debris, including dead animals, on the Roadway shall be removed according to Table 5-1. All Debris shall be managed in accordance with Schedule 17.

Table 5-1

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDIAL PERIOD
Debris			
Spring Clean-up (Medium CPQF)	Completed no later than June 01 of each year.	Zero Time	1 Business Day
Cleanup – Other (Minor CPQF)	Accumulation of gravel or sand on Paved Surfaces is removed upon Detection	1 Day	1 Business Day
Debris (Minor CPQF)	Debris on the Roadway greater than 0.010 m ³ (e.g., 20 cm X 20 cm X 25 cm), or greater than 30 cm in any one dimension which is a Hazard to the travelling public, is removed upon Detection	2 hours	1 hour

- a) Spring clean-up shall be scheduled as soon as spring thaw permits and before catch basins are cleaned to limit the amount of foreign material entering the drainage system.
- b) Water shall be used to minimize dusty conditions during cleaning operations.
- c) Sweeping and flushing are two methods of hard surface cleaning.
- d) Debris Removal
 - i. There is a potential hazard when handling dead animals, syringes and other sharp objects. Proper gloves, footwear and clothing should always be worn when engaged in these types of activities.

- ii. Expert assistance should be obtained to identify un-labelled containers or unidentifiable materials.
- iii. Suspected explosives, such as pipe bombs, blasting caps or discarded dynamite, should not be handled and the O.P.P. or local police authority shall be called without delay.

5.3 PAVED SURFACES

Maintenance of Paved Surfaces shall be according to the following including Table 5-2.

Defects on Paved Surfaces shall be noted and action taken as follows and according to Table 7:

- i. Potholes on Roadways, including bridge decks, shall be repaired.
- ii. Pavement edge surface loss which extends more than 100 mm inward from the edge of the Paved Surface shall be repaired to maintain a straight and consistent edge of pavement.
- iii. Rocks or tree stumps protruding through the road surface by more than 25 mm shall be removed.
- iv. Water ponding on Paved Surfaces caused by high Gravel Shoulders shall be corrected.
- v. Cracks exceeding 25 mm in width on Bridge surfaces shall be repaired.
- vi. Sink Holes shall be repaired and reported to the City.
- vii. Deficiencies or Defects that pose an imminent Hazard shall be Addressed Immediately.

Proper signage warning motorists shall be installed upon Detection when indicated for each of the following items.

- i. Cracking – cracks that are 40 mm or wider on Paved Surfaces and cracks wider than 6 mm on concrete Bridge surfaces.
- ii. Distortions:
 - Bumps or depressions with a vertical depth differential of 50 mm or more over a 3 m length; install warning signage
 - Any bump or depression occurring at a bridge approach
 - Any sharp vertical displacement of more than 20 mm on a bridge surface; install warning signage
 - All settlements of approach slabs exceeding 100 mm; install warning signage
- iii. Water Ponding due to Paved Surface depressions.
- iv. Wheel Track Rutting – Paved Surface rutting greater than 25 mm in depth.
- v. Rippling and Shoving, Scaling, Ravelling or Spalling – any occurrence of these conditions.

Table 5-2

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDY PERIOD
Paved Surfaces			
Potholes (Minor CPQF)	Any Pothole that is deeper than 50 mm and greater than 0.04 m ² (e.g., 20 cm X 20 cm or 10 cm X 40 cm) on Asphalt Pavement or Concrete Pavement shall be repaired upon Detection	3 Days	1 Business Day
	Any pothole exceeding 20 mm in depth on a Bridge surface shall be repaired upon Detection	3 Days	1 Business Day

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDY PERIOD
Paved Surfaces			
Pavement Edge Surface Loss (NCR process)	Paved Surface edge surface loss which extends more than 100 mm inward from the outer edge shall be repaired upon Detection	3 Days	1 Business Day
Water Ponding (NCR process)	Water Ponding on Paved Surfaces resulting from high gravel shoulders repaired upon Detection	3 Days	1 Business Day
Distortion (NCR process)	Distortions as detailed above are marked with warning signage upon Detection	3 Days	1 Business Day
Cracking (NCR process)	Cracks in Asphalt Pavement Bridge surfaces wider than 25 mm shall be repaired upon Detection.	3 Days	1 Business Day
Sink Holes (NCR process)	Sink Holes shall be repaired upon Detection.	3 Days	1 Business Day
Hazards (Medium CPQF)	Deficiencies or Defects that pose an imminent Hazard shall be Addressed upon Detection	2 hours	1 hour

5.4 SHOULDERS

Maintenance of Shoulders shall be according to the following including Table 5.3.

- a) Defects on Shoulders shall be noted and the following action taken.
 - i. Washouts on Shoulders shall be marked with warning devices upon Detection and remain marked until repaired.
 - ii. All washouts on Shoulders greater than 150 mm in depth shall be repaired upon Detection.
 - iii. Impediments to Drainage – Proper drainage of Shoulders may be impeded by preventable conditions including improper crossfall or the presence of berms or windrows. Preventable conditions impeding Shoulder drainage shall be corrected.
 - iv. Drop Off with a depth exceeding 40 mm for a length of at least 100 m shall be repaired upon Detection. Drop Off in excess of 75 mm at any location shall be repaired.
 - v. Ruts with a depth exceeding 100 mm shall be repaired.
 - vi. Deficiencies or Defects that pose an imminent Hazard shall be Addressed Immediately.

Table 5-3

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDIAL PERIOD
Shoulders			
Washouts (NCR process)	Washouts of 150 mm or deeper repaired upon Detection	2 Days	1 Business Day
	Washouts of 150 mm or deeper and measuring an area greater than 1.0 m ² ; or washouts of 150 mm or deeper and measuring an area greater than 0.5 m ² within 1.0 m of the Driving Surface, repaired upon Detection	3 Days	1 Business Day
Impediments to Drainage (NCR process)	Preventable Conditions impeding Shoulder drainage to function as designed corrected upon Detection	3 Days	1 Business Day
Drop Off (not construction related) (Minor CPQF)	Drop Off exceeding 50 mm in depth for a length of 100 m or greater repaired upon Detection	3 Days	1 Business Day
	Drop Off exceeding 75 mm in depth at any location repaired upon Detection	4 hours	2 hours
Ruts (NCR process)	Ruts deeper than 100 mm repaired upon Detection	2 Days	1 Business Day
Hazards (Medium CPQF)	Deficiencies or Defects that pose an imminent Hazard shall be Addressed upon Detection	2 hours	1 hour

ARTICLE 6 PAVEMENT MARKING

6.1 SCOPE

This specification covers the responsibilities and obligations for the Retracing of pavement markings and symbols.

The Work shall be completed in full compliance with the requirements of OPSS 710, Construction Specification for Pavement Marking.

6.2 REPORTS

a) A Pavement Marking work plan based on priority of Pavement Marking condition and in accordance with the annual application completion dates in Table 6-4 Minimum Requirements shall be provided to the City prior to April 1 of each year.

b) Material Safety Data Sheets

DB Co shall identify the selected pavement marking material(s) and provide Material Safety Data Sheets (MSDS) and Product Data Sheets to the City in advance of application.

c) Daily Work Log

A Pavement Marking Daily Work Log and/or Durable Marking Daily Work Log (see Attachment 6 A and 6 B) shall be completed and submitted to the City within seven Days of the application.

d) Retroreflectivity Report

A Retroreflectivity Report of readings taken with a retroreflectometer shall be completed and submitted to the City by September 1st of each year. Readings shall be taken on 10% of the centre lines and skip lines, 10% of edge lines and 10% of symbols.

Retroreflectivity sampling shall be conducted in accordance with ASTM D7585 and ASTM E1710. Sampling, when using mobile retroreflectometers, shall follow the same procedures as for handheld units, but shall also include calibration checks against a handheld unit.

Results from the sampling of centre lines, skip lines and edge line shall be reported as one reading based on the average of the readings taken over each kilometre section sampled.

Additional information outlining the format of the Retroreflectivity Report is detailed in Attachment 6 C.

Table 6-1

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDIAL PERIOD
Inspections and Reports			
Reports (NCR process)	All required documents are Timely, Accurate and Complete	Zero Time	1 Business Day

6.3 SAMPLING

Sampling shall be according to the following including Table 6-2

Samples shall be taken by DB Co to support Quality Control monitoring and shall be according to Table 6-2 Pavement Marking Material Sampling.

DB Co shall obtain additional samples, in the presence of the City representative, when requested.

Samples of Traffic Paints shall not be thinned or heated. The material shall be well mixed and homogeneous and shall be acquired approximately mid-way through the batch. The sample container shall be filled within 5 mm of the bottom of the lid rim.

The sample data label shall be completed with the manufacturer's name, coating colour, product code and batch number(s), contract number and location. The Sample Data Label, Form PH-CC-360, is available from the City.

All samples taken shall be retained by DB Co for a period of two years.

Table 6-2 Pavement Marking Material Sampling

MATERIAL	SAMPLE SIZE	SAMPLE FREQUENCY	CONTAINER MATERIAL	SOURCE
Water borne Traffic Paint	125 ml	Once per batch	Plastic or plastic lined	Outlet valve (not spray gun)
Field reacted polymeric materials - Resin * - Catalyst *	250 g 50 g	Once per batch	Metal or plastic Metal or plastic	Pail Pail
Glass beads	250g	Once per batch	Metal or plastic	Bead gun
Preformed tape	1 m	Once per batch	Container not required	Roll
Thermoplastic materials	250 g	Once per batch	Steel panel	Applicator **

* Material type and manufacturer's mixing ratio of each unmixed material shall be indicated on container.

** An 8 cm x 8 cm raw sample of the thermoplastic material can be substituted for the coated panel sample.

Table 6-3

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDIAL PERIOD
Sampling			
Sampling (NCR process)	All sampling requirements are met 100% of the time	Zero Time	1 Business Day

6.4 RETRACING OF PAVEMENT MARKINGS

Retracing of Pavement Markings shall be completed as per the following including Table 6-6.

The City shall be notified a minimum of 10 Days prior to the start of any on-site Pavement Marking activities or the start of any repairs required.

Only materials listed on the current MTO DSM listing shall be used.

Retroreflectivity Requirements

The Retroreflectivity of the Pavement Markings and Pavement Marking Symbols shall meet the minimum requirements identified in Table 6-4 Minimum Retroreflectivity Requirements (mcd/m²lx) from the Annual Application Completion Date until October 31 of each year. Retracing of all Pavement Markings and Symbols shall be completed each year by the Annual Application Completion Date according to Table 6-4.

An overlay of glass beads shall be applied, without delay after painting either by hand or mechanical means, to achieve complete and uniform coverage across the full width of the line.

Table 6-4 Minimum Retroreflectivity Requirements

Highway Class	Marking Type	Annual Application Completion Date	Minimum Retroreflectivity	
		Highway 417 and Ramps	White Marking	Yellow Marking
Highway	Centre Line Lane Lines	July 1	350 mcd/m ² lx	300 mcd/m ² lx
	Edge Lines	August 1	350 mcd/m ² lx	250 mcd/m ² lx

Durability Requirements

No Pavement Marking Symbol or no 100 m segment of Pavement Marking shall have more than 25% material loss at any time.

Visibility Requirements

The visibility of the Pavement Markings and Pavement Marking Symbols shall meet the minimum requirements identified in Table 6-5 Visibility.

Based on a minimum required preview time of 3.65 seconds and the posted speed limit (vehicle speed) for the highway, the minimum preview distance, listed in Table 6-5 Visibility shall be required:

Table 6-5 Visibility

Vehicle Speed (km/hr)	Preview Distance (m)
60	61
70	71
80	81
90	91
100	101

Notes:

1. No visual assessments shall be undertaken during any type of inclement weather.
2. No visual assessments shall be undertaken after applications of sand salt or de-icing materials have been applied to the roadway until a duration period of 72 hours (3 Days) have elapsed after the last application of these materials.

Appearance

All Retracing of Pavement Markings shall be according to OTM Book 11.

All lines shall be straight and true with no severe tracking or splatter. Tracking and splatter shall be removed using a method which does not damage the pavement surface, and retracing shall be completed if necessary.

Table 6-6

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDIAL PERIOD
Retracing of Pavement Markings			
Retro-reflectivity (Medium CPQF)	Pavement Markings or Pavement Marking Symbols not meeting minimum Retroreflectivity requirements repaired upon Detection	14 Days	1 Business Day
Annual Application (Medium CPQF)	Pavement Markings, for each highway class and marking type, retraced by the annual application completion dates in Table 6.4 Minimum Retroreflectivity Requirements	Zero Time	1 Business Day
Durability (NCR process)	Any 100 m segment of Pavement Marking with more than 25% material loss shall be repaired upon Detection	14 Days	1 Business Day
	Any Pavement Marking Symbol with more than 25% material loss shall be repaired upon Detection	14 Days	1 Business Day
Visibility (NCR process)	Visibility readings not meeting the requirements of Table 6.5 Visibility on all Pavement Markings and Pavement Marking Symbols shall be repaired upon Detection	14 Days	1 Business Day
Appearance (NCR process)	Severe tracking or splatter or lines that are not straight and true shall be removed upon Detection	5 Days	1 Business Day
	Retraced Pavement Markings not in accordance with OTM Book 11 shall be corrected upon Detection	5 Days	1 Business Day

ATTACHMENT 6 A

DURABLE MARKING DAILY WORK LOG

Date: _____

Contract: _____ Contractor: _____

Form # _____

MATERIAL

Manufacturer	Material Type and Colour	Batch #	Product Code

ACCOMPLISHMENTS

Hwy	Location	RRX	ARROW	STOP BLOCK	C/W	PLASTIC (kg)	BEADS (kg)

Comments: _____

Contractor Rep Signature: _____

ATTACHMENT 6 B

PAVEMENT MARKING DAILY WORK LOG

Area/Region _____ Date _____

Form # _____

Location _____ Contract # _____

Contractor _____

MATERIAL

Manufacturer	Material Type and Colour	Batch #	Product Code

ACCOMPLISHMENTS

Hwy	Location	Lane Lines (km)	Yellow (litres)	White (litres)	Glass Beads (kg)

Comments: _____

Contractor Rep Signature: _____

ATTACHMENT 6 C

RETROREFLECTIVITY REPORT

The report shall contain mobile retroreflectometer values (RL) in units of millicandelas per lux per square meter averaged over one kilometer lengths. The corresponding GPS coordinates for each one kilometer average shall be listed in a table showing RL values from the start to the finish of each data recording series. The report shall list the type of equipment used, date, time, line type measured and roadway identification with start and end point descriptions (it is convenient to identify intersections as start and end points). Test sections shall be limited to one roadway (i.e. the test section example below should contain data for only Hwy 11, not a combination of Hwy 11 and Hwy 65). For the case of single edge line or white skip measurements, report RL values in the Left Line column. The report shall be submitted to the City in excel spreadsheet format.

Typical layout for Mobile Retroreflectivity Report

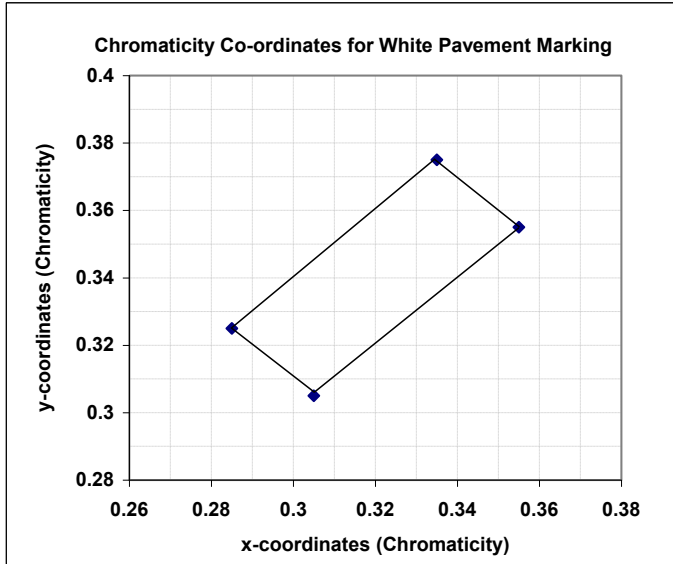
Road Section Evaluated	Hwy 11 from Hwy 65 To Hwy 66
Date Data Collected	[REDACTED]
Contract #	
Distance driven (km)	5
Direction	North Bound
Line Type	Yellow Centre Line
Operator	
Instrument Used	Delta LTL-M

Distance Driven (km)	Time	Average Retroreflectivity	
		Left Line mcd/lx/m ²	Right Line mcd/lx/m ²
1	14:00	390	402
5	15:00	384	389

CHROMATICITY COORDINATES

White:

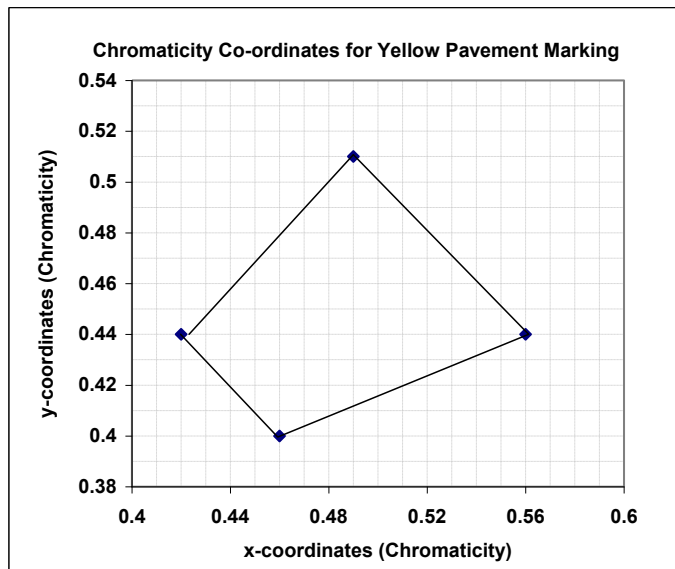
All colour measurements shall fall within the White Chromaticity Coordinates.



White	x-coordinates	0.355	0.305	0.285	0.335
	y-coordinates	0.355	0.305	0.325	0.375

Yellow:

All color measurements shall fall within the Yellow Chromaticity Coordinates.



Yellow	x-coordinates	0.560	0.460	0.420	0.490
	y-coordinates	0.440	0.400	0.440	0.510

ARTICLE 7 STRUCTURAL MAINTENANCE

7.1 SCOPE

This specification covers the maintenance of MTO Bridges on the Highway Corridor Lands.

The Work shall be completed in full compliance with the requirements of the following documents:

- a) Bridge Clearance and Load Restriction Manual (OSCLIS).
- b) Ontario Structure Inspection Manual.
- c) Concrete Barrier Repair, Rehabilitation and Maintenance Manual, 2003 (Draft).

7.2 INSPECTIONS AND REPORTS

Inspections and reports shall be according to the following including Table 7-1.

Inspections of Structures shall be planned, scheduled and carried out to ensure the safety of the travelling public. The required inspections shall be as follows:

- a) General drive-by inspections by the Traffic Control Supervisor to identify deficiencies and to schedule corrective action.
- b) A detailed annual maintenance inspection of all Structures by a Qualified Inspector completed no later than July 30th of each year.
- c) A detailed walk about inspection completed by a Qualified Person prior to November 15 each year, to identify additional Deficiencies including Hazards, erosion, obstructions to water flow and other general Defects. The Qualified Person shall complete the Structural Walkabout Inspection Report included in Attachment 7 A.
- d) Specific inspections by the Qualified Inspector shall be performed when the following situations occur:
 - i. Accident or motor vehicle collision involving a structure.

The results of the detailed annual inspections shall be noted in the Bridge Maintenance Inspection Report (see Attachment 7 B), Structural Culvert Inspection Form (see Attachment 7 C), or Retaining Wall Inspection Form (see Attachment 7 D) and the inspection reports detailing the condition of each Structure shall be submitted to the City before August 1st of each year.

The results of inspections conducted as a result of an accident or motor vehicle collision involving a structure shall be noted on the Structure Incident Report (see Attachment 7 E), and submitted to the City within 48 hours of the incident.

Structural Maintenance Defects identified in the annual detailed walk about inspections shall be corrected in accordance with this Maintenance Operation, and a summary of repairs made or details of further work required shall be provided to the City within 30 days of the inspections.

The City may conduct its own bridge and scaling inspections and any other structural component. DB Co shall coordinate its Routine Maintenance work, including traffic control, with the City in order to allow the

City to perform its inspection work concurrent with the DB Co's Routine Maintenance work. DB Co shall take all necessary measures to facilitate and accommodate the City inspectors' access when DB Co is performing Routine Maintenance work.

Qualified Inspector Requirements

Documents supporting the qualifications of the Qualified Inspector shall be submitted to the City prior to the Hand Over date. If the Qualified Inspector will be replaced, new documents shall be submitted to the City prior to the new Qualified Inspector performing any structural inspection work. The documents shall include a resume, the course certificate and completed inspection reports.

Reporting of Structural Maintenance Work

All Structural Maintenance and inspection work shall be recorded on the Structural Maintenance Report (see Attachment 7 F) and submitted by November 15th annually. The report shall include information on cleaning, inspections and minor repairs.

The City shall be notified within one Business Day of any temporary repairs completed which will require permanent repairs.

Table 7-1

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDIAL PERIOD
Inspections and Reports			
Inspections (Medium CPQF)	Detailed annual maintenance inspection of all Structures by a Qualified Inspector completed no later than July 30th of each year.	Zero Time	1 Business Day
Inspections (Medium CPQF)	A detailed walk about inspection completed by a Qualified Person prior to November 15 each year	Zero Time	1 Business Day
Qualified Inspector (NCR process)	All qualifications are provided prior to the individual performing Structural Maintenance or inspections requiring a Qualified Inspector and as updated	Zero Time	1 Business Day

The conditions as noted on the Bridge Maintenance Inspection Report (see Attachment B), Structural Culvert Inspection Form (see Attachment C), or Retaining Wall Inspection Form (see Attachment D) shall be inspected.

7.3 STRUCTURE CLEANING

Structure cleaning shall be according to the following.

The annual cleaning of Structures and Structure surfaces shall be planned, scheduled and carried out to remove all dirt, Debris and deleterious material and washing with water to remove the remaining chemicals and winter abrasives while ensuring the safety of the travelling public and meeting all environmental requirements.

The following surfaces are to be cleaned and washed annually:

- a) Decks, sidewalks, handrails, curbs, gutters and barrier walls.
- b) Abutments and pier columns/caps below expansion joints, abutment and retaining walls, columns and piers within five metres of edge of a roadway to a minimum height of five metres above the

surface.

- c) All associated drainage structures, including scuppers, drain troughs and drainpipes and flumes. Deck drains on bridges over water shall be blocked prior to removal of excess dirt, debris and deleterious materials such as sand and salt, to prevent their entry into watercourses.
- d) The approaches to the structure and all associated Bridge elements for a minimum distance of six metres as measured from the abutment joint or the first catch basin thereafter.
- e) Bearing seats, expansion joints and deck joints including troughs and seals.
- f) The roadside surface of light standards and sign supports attached to the structure to a height of three metres above deck level.
- g) Concrete slope protection.
- h) No Debris resulting from Structure cleaning shall be left on previously cleaned surfaces.

All Debris resulting from Structure cleaning shall be managed according to the requirements detailed in Schedule 17.

The accumulation of winter sand, salt and debris shall be removed prior to washing. This can be done manually or by mechanical sweeping.

Table 7-2

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDIAL PERIOD
Structure Cleaning			
Spring Cleanup (Medium CPQF)	All Debris is removed from Structures no later than June 30 th of each year	Zero Time	1 Business Day
	All Structures and components are washed no later than June 30 th of each year	Zero Time	1 Business Day

- a) Equipment
 - i. The minimum requirement for pressure washing equipment should be 520 kPa with a volume of 225 litres per minute, continuously running.
 - ii. A water tank with a minimum capacity of 9000 litres is recommended.

Procedures

- i. Particular attention should be given to the cleaning and flushing of any pockets formed where vertical and diagonal members connect to the bottom chord. Bottom truss chords should be cleaned and flushed along their entire length.
- ii. No washing should take place when there is a potential for temperatures below 0°C.
- iii. Washing should occur from higher to lower elevation to allow the water to carry debris downwards.
- iv. Local authorities should be consulted for permits and regulations before obtaining water from hydrants.
- v. Caution should be exercised when cleaning expansion joints so as not to damage the seal.

- vi. Refer to the Schedule 17, for dealing with birds’ nests found on structures.
- vii. When performing cleaning operations, workers may be exposed to bird droppings and feathers from birds or bats. These materials may carry spores of infectious diseases. To control dust exposure, these materials should be wetted before removal and workers should wear appropriate personal protective equipment including disposable masks, gloves and coveralls. If materials cannot be dampened before removal, the worker should also wear a high efficiency particulate air (HEPA) filter. Before leaving the work site, protective clothing should be removed and dust should be washed from footwear.

7.4 STRUCTURE MAINTENANCE

Structural Maintenance shall be according to the following.

The structural components of the Bridge shall be maintained. The following Structural Maintenance items shall be completed on a regular maintenance schedule and according to the Remedy Periods in Table 7-2 or according to Article 5 Roadway Maintenance as applicable:

- a) Broken and missing bolts shall be replaced and loose bolts shall be tightened on expansion joints.
- b) All loose steel components or those causing a Hazard to the public, shall be repaired or made safe.
- c) All Handrail and Railing components shall be in place and functioning, and all bolts shall be tight
- d) All loose, damaged or missing Bridge components are tightened, repaired or replaced
- e) Temporary repairs of Concrete Barrier
- f) Defects on bridge surfaces, including potholes, distortions, settlement and cracks, shall be noted and action taken to meet the Maintenance Standards according to MSS 2001-Roadway Maintenance.

Table 7-3

MAINTENANCE STANDARD		REMEDY PERIOD	REMEDIAL PERIOD
Structural Maintenance			
Structural Components (Minor CPQF)	All structural components not in place, secured and functioning in a proper operating manner shall be repaired or replaced upon Detection	5 Days	1 Business Day
Concrete Deficiencies (Medium CPQF)	All concrete deficiencies on all Structures which could result in any material falling on or near a live lane, sidewalk, pedestrian walkway, railway or navigable waterway shall be removed upon Detection	2 hours	2 hours

ATTACHMENT 7 B



Bridge Maintenance Inspection Report

Date(dd/mm): _____ Hwy: _____ Site: _____

Site Name: _____

Inspected By: _____ Vehicle #: _____

Bridge Type: _____ Bridge Lat/Long: _____

Bridge Length: _____ Bridge Width: _____

Spans: _____

Under Construction? Limited Inspection? Mark with an "X" if applicable for either

N/A Not Applicable Yes Component is showing this defect
DNI Did Not Inspect No Component is not showing this defect

SUPERSTRUCTURE - BRIDGE SURFACE

Travelled Surface	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Cracking					
Spalling, Delaminations, Ravelling					
Potholes					
Other					
General Component Notes (# Lanes on structure, etc):					

Approaches	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Settled					
Potholes					
Cracked					
Other					
General Component Notes:					

Drainage Components	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Broken, Damaged Components					
Obstructions					
Other					
General Component Notes (Specific Features Present):					

Expansion Joints	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Leaking or Damaged Seal					
Joint Armour Broken, Damaged					
Loose/Damaged/Missing Components					
End Dams Breaking/Voided Armouring					
Other					
General Component Notes (Joint Type, # Joints, etc):					

Curbs, Sidewalks	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Cracked					
Delaminated/Spalled					
Scaled					
Settling/Deflections					
Other					
General Component Notes (Sidewalks present or not, curb in median, etc):					

Bridge Maintenance Inspection Report (cont'd)

Barrier Walls	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Cracked					
Delaminated					
Scaled					
Spalled					
Other (Settling, etc.)					
General Component Notes (type of wall, mounted railing, etc):					

Handrails & Posts	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Bent, Broken, Missing					
Corroded					
Loose, Missing Fasteners					
Other					
General Component Notes (Rail Type, etc):					

Lighting	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Missing Components					
Damaged					
Other					
General Component Notes (Pole Bases, Poles, etc):					

Signs	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Missing Components					
Damaged					
Other					
General Component Notes (Signs mounted to structure, etc):					

Guiderail	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Missing Components					
Damaged					
Other					
General Component Notes (Rail Type, etc):					

SUPERSTRUCTURE - BRIDGE UNDERSIDE

Girders, Beams, Diaphragms	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Cracked					
Delaminated					
Corroded					
Spalled					
Other					
General Component Notes (Girder/beam type, etc):					

Bridge Maintenance Inspection Report (cont'd)

Steel Members	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Corroded					
Cracked					
Bent, Broken, Twisted					
Other					
General Component Notes:					

Bearings	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Cracked					
Aligned					
Corroded					
Seized					
Other					
General Component Notes (Bearing type, etc):					

Slopes & Embankments	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Erosion					
Undermining					
Slope Paving Damage					
Other					
General Component Notes (Rip/Rap, Stone, etc):					

Brush & Trees	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Growth					
Obstruction to Drainage					
Other					
General Component Notes (planted trees, etc):					

SUBSTRUCTURE

Piers	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Cracked					
Delaminated					
Spalled					
Other					
General Component Notes (# of pier sets, # of piers, location (median/shoulder), etc):					

Abutments & Ballast Walls	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Cracked					
Delaminated					
Scaling					
Spalling					
Other					
General Component Notes:					

Bridge Maintenance Inspection Report (cont'd)

Wing Walls	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Cracked					
Delaminated					
Scaling					
Spalling					
Other					
General Component Notes:					

Retaining Walls	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Cracked					
Delaminated					
Scaling					
Spalling					
Other					
General Component Notes:					

Soffit/Fascia	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Cracked					
Delaminated					
Spalled					
Other					
General Component Notes:					

OTHER ITEMS

Timber	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Cracked					
Broken					
Insects or Rot					
Other					
General Component Notes:					

Piles & Footings	N/A	DEFECT		DNI	Maintenance Required / Comments
		Y	N		
Cracked					
Delaminated					
Settled					
Scoured					
Spalled					
Other					
General Component Notes:					

Bridge Maintenance Inspection Report (cont'd)

Other General Site Notes and Recent Repairs

Recommended Repairs

Signature of Inspector: _____

ATTACHMENT 7 C



Structural Culvert Inspection Report

Date (dd/mm): _____ Highway: _____ Site: _____

Site Name: _____

Inspected By: _____ Vehicle #: _____

Type: _____ Number of Spans & Span Width: _____

Length: _____ Height: _____

_____ **END 1** _____ **END 2** _____

Inlet/Outlet: _____ Inlet/Outlet: _____

Lat/Long: _____ Lat/Long: _____

Bearing: _____ Bearing: _____

Freeboard	Inlet	Outlet	Comments / Recommended Repairs
Measurement (cm) between top of water level and underside of culvert			

Water Damage	Defect		Location	Comments / Recommended Repairs
	Y	N	Up/Down Stream	
Scouring around the footings or any undermining of concrete aprons or				
Washout of culvert backfills				
Scouring at inlets or outlets				
Erosion under or around culvert				
Random, hand laid and grouted rip rap in disrepair				
Stream, debris, aggradation, obstruction, vegetation				

Concrete Condition	Defect		Location	Comments / Recommended Repairs
	Y	N	Up/Down Stream	
Cracks				
Spalling/Delamination				
Security bars or grids in disrepair				
Separation between pre-cast sections				
Reinforcing steel exposed				

Roadway	Defect		Location	Comments / Recommended Repairs
	Y	N	Up/Down Stream	
Cracks, surface settlement, deflection, p				
Ditch embankment settlement/ erosion				

Retaining Walls	Defect		Location	Comments / Recommended Repairs
	Y	N	Up/Down Stream	
Type (if applicable):				
Cracks, settlement, rotation				
Angle of recline/repose				

Structural Culvert Inspection Report

Steel Culvert	Defect		Location	Comments / Recommended Repairs
	Y	N	Up/Down Stream	
End(s) are deformed				
Security bars or grids in disrepair				
Headwall moved away from backfill				
Culvert changed shape				
Coupling ring(s) failing				
Longitudinal seams failing				
Pipe walls rupturing or buckling				
Gaps developed between overlapping corrugations				
Cracks or corrosion				
Bolt holes are larger than the bolt and do not secure plates				
Bolts or rivets shearing, loosening, missing or deteriorating				
Invert perforations/material deterioration				
Pipe uplifting				

Extensions	Defect		Location	Comments / Recommended Repairs
	Y	N	(Inlet/Outlet)	
Type:				

Other Findings	Defect		Location	Comments / Recommended Repairs
	Y	N		
Guiderail movement				
Inlet/Outlet uplift				
Brush/Tree Growth				
Culvert Markers Missing				
Other Findings				

Sketch of Deficiencies (if required) - Show Directional Arrow:

Top View

Notes:

Signature of Inspector: _____

ATTACHMENT 7 D

Retaining Wall Maintenance Inspection Report



Date (dd/mm): _____ Highway: _____ Site: _____

Location: _____

Inspected By: _____ Vehicle #: _____

Description: _____

Length: _____

General Condition	Defect		N/A	Comments / Recommended Repairs
	Y	N		
Settlement				
Rotation/displacement				
Displacement from backfill				
Brush/Tree Growth				
Fencing				
Other				

Concrete/RSS Retaining Wall	Defect		N/A	Comments / Recommended Repairs
	Y	N		
Cracking				
Spalling/Delamination				
Reinforcing steel exposed				
Drain holes plugged/open				
Other				

Steel Retaining Wall	Defect		N/A	Comments / Recommended Repairs
	Y	N		
Anchoring rusted, missing				
separation between panels				
Other				

Gabion Retaining Wall	Defect		N/A	Comments / Recommended Repairs
	Y	N		
Baskets in tact				
Stone falling out				
Scouring/Undermining				
Other				

Batter Measurement (Angle of Inclination/repose)	Defect		N/A	Comments / Recommended Repairs
	Y	N		
Measured angle:				
Leaning in/out				
Erosion behind/around wall				
Other				

Notes/General Condition/Recommended Repairs:

Signature of Inspector: _____

ATTACHMENT 7 E

Structure Accident-Incident Report



Maintenance Contractor _____ Maintenance Contract # _____

Date & Time of Accident _____

Site Number & Structure Name _____

Highway _____ Police Report # _____

Inspected By: _____ Vehicle # _____

Complete All Applicable Areas Below

SUPERSTRUCTURE

	DEFECT		Comments
	YES	NO	
Travelled Surface			
Cracking			
Spalling, Delamination, Ravelling			
Potholes			
Other			

	DEFECT		Comments
	YES	NO	
Expansion Joints			
Leaking or Damaged Seal			
Joint Armour Broken, Damaged			
End Dams Breaking			
Other			

	DEFECT		Comments
	YES	NO	
Curbs, Sidewalks, Barrier Walls			
Cracked			
Delaminated			
Scaled			
Spalled			
Other			

	DEFECT		Comments
	YES	NO	
Handrails & Posts			
Bent, Broken, Missing			
Corroded			
Loose, Missing Fasteners			
Other			

	DEFECT		Comments
	YES	NO	
Girders/Beams/Diaphragms			
Cracked			
Delaminated			
Corroded			
Spalled			
Other			

Structure Accident-Incident Report

	DEFECT		Comments
	YES	NO	
Soffit/Fascia			
Cracked			
Delaminated			
Corroded			
Spalled			
Other			

SUBSTRUCTURE

	DEFECT		Comments
	YES	NO	
Piers			
Cracked			
Delaminated			
Spalled			
Other			

	DEFECT		Comments
	YES	NO	
Abutments			
Cracked			
Delaminated			
Scaling			
Spalled			
Other			

	DEFECT		Comments
	YES	NO	
Ballast Walls / Wing Walls			
Cracked			
Delaminated			
Scaling			
Spalled			
Other			

	DEFECT		Comments
	YES	NO	
Retaining Walls			
Cracked			
Delaminated			
Scaling			
Spalled			
Other			

ARTICLE 8 ROADSIDE MAINTENANCE

8.1 SCOPE

This specification covers the responsibilities and obligations for the year round Maintenance of Roadside features.

The Maintenance Operations shall be completed in full compliance with the requirements of the following documents:

- a) Concrete Barrier Repair and Rehabilitation Maintenance Manual.
- b) Sign Support Manual.
- c) Ontario Traffic Manual.
- d) King's Highway Guide Signing Policy Manual.
- e) Sign Support Inspection Guidelines.
- f) OPSD's for Small Sign Support Systems.
- g) Field Guide for the Restoration of Longitudinal Barriers (Chapter 16 of NCHRP Report 656).
- h) PMM 2016-05 Enhanced Delineation.

8.2 INSPECTIONS AND REPORTS

Inspections and reports shall be according to the following including Table 8-1.

- a) General drive-by inspections shall be carried out as detailed under Article 4.

Record deficiencies noted as detailed under Article 4.

Deficiencies or Defects that pose an imminent Hazard shall be Addressed Immediately and reported to the City.

An annual visual inspection shall be completed of all steel or wood ground mounted signs to identify reduced reflectivity, faded, or illegible signs. Inspections shall be completed prior to the end of the Winter Period of each year and submitted to the City.

An annual inspection shall be completed on all extruded aluminium signs and engineer designed supports on the Overhead Sign Support Maintenance Inspection Report or the Roadside Sign Support Maintenance Inspection Report (see Attachment 8 A and 8 B), and submitted to the City by August 1st. During the inspection for overhead sign supports loose base bolts on the footings shall be re-torqued and for the ground-mounted (roadside) sign supports all loose bolts shall be re-torqued including those on the footings, fuse plates, etc..

Maintenance access points, catch basins and ditch inlets shall be inspected annually by June 1 and the inspection recorded as per Article 5.

Table 8-1

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Inspections and Reports			
Extruded Aluminum Signs and Engineer Designed Supports (Medium CPQF)	Annual inspection reports completed and submitted by August 1 each year	Zero Time	1 Business Day

8.3 SIGNS AND SIGN SUPPORTS

Maintenance of signs and sign supports shall be according to the following including Table 8-2.

- a) The MTO sign shop shall supply all Regulatory, Municipal (population), Warning and Information Signs as detailed in the Ontario Traffic Manual (OTM). All signs shall be ordered through the City and signs shall be shipped to the MTO Kanata Patrol Yards. All signs supplied by the MTO sign shop shall be received, unloaded and inspected upon delivery to verify the condition and ensure that sign size and directional arrows are correct and sign messages on new signs are spelled correctly. Proper storage and handling of all signs belonging to the City shall be ensured.
- b) Temporary condition and specialty signs are not supplied by the MTO sign shop. All approved temporary condition and specialty signs shall be supplied and installed according to the requirements of the Ontario Traffic Manual (OTM).
- c) Missing, damaged, illegible, obscured, reduced reflectivity, faded, twisted or deflected signs shall be replaced or repaired including overlays applied to ground-mounted extruded aluminium signs. Missing, broken, loose or cracked sign hardware, bent fasteners and bent brackets shall be repaired or replaced. Twisted, cracked, out of plumb, bent, unsound posts or posts not solid in the ground shall be repaired or replaced.
- d) When replacement of sign supports for steel or wood ground mounted signs is required due to damage, deterioration and/or missing sign supports, all non-standard sign supports shall be replaced with supports meeting current Standards.
- e) Missing or damaged snowplow markers, delineator markers, median markers, hazard markers and reflectorized guide rail strips shall be replaced, or new ones installed, including all other materials, hardware and posts for installation as required. These signs shall be supplied by DB Co.
- f) No permanent sign shall be installed at a new location or removed from its present location without Approval from the City. Should a condition or situation be identified that would warrant a new sign installation, the proposed sign, location and justification shall be provided to the City for consideration and approval. The sign layout shall be provided to the City prior to the sign installation.

Table 8-2

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Signs and Sign Supports			
Stop, Stop Ahead, Yield, Yield Ahead, Traffic Signals Ahead, "New" (Wb3, Wb3F) and Checkerboard Signs (Medium CPQF)	Missing, damaged, illegible, obscured, reduced reflectivity, twisted or deflected signs; resources shall be deployed to replace or repair upon Detection	2 hours	1 hour
Regulatory Signs (NCR process)	Missing, damaged, illegible, obscured, reduced reflectivity, twisted or deflected Regulatory signs, other than Stop or Yield signs, shall be replaced or repaired upon Detection	3 Days	1 Business Day
Warning Signs (NCR process)	Missing, damaged, illegible, obscured, reduced reflectivity, faded, twisted or deflected warning signs, other than Stop Ahead, Yield Ahead, Traffic Signal Ahead, "New" (Wb3, Wb3F) or Checkerboard signs, shall be replaced or repaired upon Detection	7 Days	1 Business Day
Information Signs (NCR process)	Missing, damaged, illegible, obscured, reduced reflectivity, faded, twisted or deflected information signs shall be replaced or repaired upon Detection	30 Days	1 Business Day
	All required replacement signs shall be ordered upon Detection	3 Days	1 Business Day
	All signs installed upon delivery	30 Days	1 Business Day
Sign Hardware (NCR process)	Missing, broken, loose or cracked sign hardware, bent fasteners and bent brackets shall be replaced or repaired upon Detection	7 Days	1 Business Day
Sign Posts (NCR process)	Twisted, cracked, out of plumb, bent, unsound posts or posts not solid in the ground shall be replaced or repaired upon Detection	30 Days	1 Business Day
Engineer Designed Sign Structures (NCR process)	All Debris against the structure, missing plate covers and soil encroaching on the footing base shall be removed upon Detection	30 Days	1 Business Day

a) Sign inspections shall be carried out when the surface of the sign is dry.

Breakaway steel sign supports shall be inspected and pressure washed at the base to clear away sand/salt and debris as required.

Sign Maintenance

Cleaning:

- i. The face of the signs shall be cleaned by a method that does not scratch or damage the reflective sheeting.
- ii. Graffiti shall be removed using an approved method. The use of an approved clear coat overlay is recommended in areas with recurring graffiti problems.

Temporary Repairs:

- i. When conditions do not allow for the replacement of sign supports, signs shall be mounted on a portable stand or other acceptable method that will maintain the integrity of the sign.

8.4 GUIDERAIL AND OTHER SAFETY SYSTEMS

Maintenance of guiderail and other safety systems shall be according to the following including Table 8-3.

a) Steel Beam Guiderail

- i. Posts that are missing or damaged (including broken, excessively split or cracked or generally unsound) and /or affect the integrity and effectiveness of the system, shall be replaced.
- ii. Blocks that are not bolted firmly between the mounting posts and the steel beam rails shall be re-secured and any missing bolts and nuts shall be replaced.
- iii. Posts that have heaved, settled or are out of plumb in such a manner that the system effectiveness has degraded, shall be reset to the proper elevation and alignment.
- iv. Rails and channels that are missing or damaged (including dented, bent, torn, twisted or rusted) and/or affect the integrity and effectiveness of the system shall be replaced.
- v. The beam height shall be measured from the ground below the beam to the bottom of the beam.
- vi. Damaged or missing reflectorized strips or reflective markers shall be replaced.
- vii. High priority repairs according to NCHRP Report 656 Chapter 16 shall be completed within 7 Days.
- viii. Medium priority repairs according to NCHRP Report 656 Chapter 16 shall be completed prior to November 15 each year.

Concrete Barriers

- i. Two adjacent sections of temporary/modular Concrete Barriers misaligned by more than 7.5 cm or longitudinally separated by greater than 2.5 cm shall be reset to the proper alignment.
- ii. Any Breakout, Block Separation or Loop Crack shall be temporarily repaired and maintained until permanent repairs are completed.
- iii. Defects such as cracks and missing concrete that affect the integrity of the Concrete Barrier shall be reported to the City.
- iv. Other concrete defects such as spalling and scaling shall be reported to the City.
- v. Damaged or missing reflectorized strips or reflective markers shall be replaced.

Energy Absorbing Systems

- vi. Damaged Energy Absorbing Systems which compromise the integrity and effectiveness of the system shall be secured, delineated and made safe.
- vii. Energy Absorbing Systems which have shifted or moved out of original position shall be returned to the original layout.
- viii. All systems that contain moving parts shall be cleaned in order to ensure the system remains fully operational as intended by the design.
- ix. All hardware shall be adjusted, repaired or replaced as required to maintain the integrity and performance of the system.

Anti-Glare Screens that are damaged or missing shall be repaired or replaced.

Snow protection barriers that are damaged shall be reported to the City.

Table 8-3

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Guiderail and Other Safety Systems			
Steel Beam Guiderail (NCR process)	High priority repairs are completed upon Detection	7 Days	1 Business Day
	Medium priority repairs are completed upon Detection	prior to November 15	1 Business Day
Concrete Barriers (NCR process)	Two adjacent sections of temporary/modular Concrete Barrier misaligned by more than 7.5 cm or longitudinally separated by greater than 2.5 cm reset to the proper alignment upon Detection	7 Days	1 Business Day
	Temporary Concrete Barrier with Breakout, Block Separation or Loop Crack are to be replaced upon Detection and reported to the City	24 hours	1 Business Day
	Permanent Concrete Barrier with Breakout, Block Separation or Loop Crack shall be temporarily repaired upon Detection and maintained until permanent repairs are completed	24 hours	1 Business Day
Energy Absorbing Systems (NCR process)	All damaged Energy Absorbing Systems are protected and made safe upon Detection	2 hours	30 minutes
	All systems which require adjustment or realignment are corrected upon Detection	7 Days	1 Business Day
	All damaged Energy Absorbing Systems shall be repaired or replaced upon Detection	7 Days	1 Business Day
	All systems that contain moving parts are cleaned by June 1 st every year	Zero Time	1 Business Day
Anti-Glare Screens (NCR process)	All damaged or missing anti-glare screens are repaired or replaced upon Detection	21 Days	1 Business Day
Snow Protection Barriers (NCR process)	All damaged snow protection barriers are reported to the City upon Detection	7 Days	1 Business Day

8.5 CURB AND GUTTER

Maintenance of curb and gutter shall be according to the following including Table 8-4.

- a) Obstructions which could impede proper drainage shall be removed.

- b) Gaps or separations of greater than 50 mm between the curb and gutter and the adjacent pavement surface shall be repaired.
- c) Shoulder and embankment areas behind the curb and gutter shall be inspected for erosion and restored to their original profiles.

Table 8-4

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Curb and Gutter			
Obstructions (NCR process)	All obstructions impeding proper drainage are removed upon Detection	2 hours	1 hour
Gaps/ Separation (NCR process)	Gaps between curb and gutter and pavement surface exceeding 50 mm repaired upon Detection	30 Days	1 Business Day
Erosion (NCR process)	Erosion damage to the shoulder and embankment behind the curb is repaired by October 1st each year	Zero Time	1 Business Day

8.6 DRAINAGE SYSTEMS

Maintenance of drainage systems shall be according to the following including Table 8-5.

All materials removed from a drainage appliance shall be managed according to Schedule 17.

a) Catch Basins and Maintenance Access Points

- i. Remove all debris from the maintenance access points, catch basins and ditch inlets at a minimum once every two years and more frequently as required to ensure the sump is not filled to capacity.
- ii. All missing grates or lids shall be replaced.
- iii. All damaged frames shall be reported to the City.
- iv. All Defects in concrete work, all ladder rungs that are broken, missing or badly rusted, and bricking that is crumbling or broken shall be reported to the City.
- v. Settlement around maintenance access points, catch basins and structure approaches shall be reported to the City.
- vi. If the water flow appears to be obstructed within the connecting pipes, this Defect shall be reported to the City.

b. Sub-drains

- i. All obstructions that are impeding the flow shall be removed.
- ii. Missing rodent screens shall be replaced.
- iii. Buried outlets shall be uncovered.
- iv. Pipe ends that have been crushed shall be repaired.

c. Culverts and Storm Sewer Systems

- i. All Debris that may restrict water flow of a culvert or storm sewer at inlet or outlet, including two metres inside either end, shall be removed.

- ii. Debris and/or other material which is restricting water flow in the interior of a culvert or storm sewer (excluding two metres at either end) shall be reported to the City.
- d. Ditches
- i. All non-planned obstructions that are stopping, rerouting or reducing the free flow of water shall be removed.
 - ii. Damage to ditch lining shall be repaired or controlled to prevent erosion.
 - iii. Eroded or damaged ditch side-slopes, back-slopes and slope protection shall be repaired.

Table 8-5

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Drainage Systems			
Catch Basins and Maintenance Access Points (NCR process)	All missing catch basin, ditch inlet and maintenance access point grates or lids are replaced upon Detection	30 minutes	1 hour
	All damaged catch basin, ditch inlet and maintenance access point frames are marked with warning devices and reported to the City upon Detection	3 Days	1 Business Day
	Sumps filled to capacity shall be cleaned upon Detection	7 Days	1 Business Day
	Crushed or buried pipe ends shall be repaired or replaced upon Detection	30 Days	1 Business Day
	Missing and damaged rodent/wildlife screens are repaired or replaced upon Detection	60 Days	1 Business Day
Culverts and Storm Sewer Systems (NCR process)	All Debris that may restrict water flow at inlet or outlet, and up to two metres inside either end, removed upon Detection	30 Days	1 Business Day
	Blockage that is causing a negative impact to City infrastructure or adjacent property shall be Addressed Immediately	Zero Time	1 Business Day
Ditches (NCR process)	Erosion or damage of ditch slopes, linings, back slopes, inlets/outfalls and slope protection are repaired upon Detection	60 Days	1 Business Day
	Non-planned obstructions that may reduce flow capacity are removed upon Detection	30 Days	1 Business Day
	All non-planned obstructions that stop or reroute the free flow of water, or may cause flooding, removed upon Detection	24 hours	1 Business Day

8.7 VEGETATION CONTROL

Vegetation control shall be according to the following including Table 8-7.

- a) Sight Distance
- i. Vegetation shall be controlled before it can obscure any sign.
 - ii. Vegetation shall be controlled before it can impair or obstruct sight visibility distances according to Table 8-6 Sight Visibility.

Table 8-6 Sight Visibility

Posted Speed (km/h)	50	60	70	80	90	100
Minimum Sight Distance (m) *	110	135	160	185	215	245

*Note: Minimum sight distance means a clear line of vision along the road between the driver’s eye (either moving/stationary vehicle) and the object to be seen (either moving/stationary). Eye level is measured at 1.05 m above road surface.

Vegetation that impedes traffic shall be removed.

Grass Mowing and Trimming

All grass visible to the travelling public shall be maintained at a height not exceeding 15 centimetres.

- i. Grass and weeds behind barrier walls in view of the travelling public shall be maintained below the height of the top of the barrier wall.
- ii. Grass impeding drainage or contributing to erosion by destroying desirable groundcovers shall be reported to the City.

Concrete/Asphalt Joints

- i. Vegetation growing in any concrete and/or asphalt joint or crack shall be Eradicated annually between July 1 and August 31.

Vegetation at Electrical Installations

- i. All vegetation, including trees, shall be removed from around all electrically powered equipment, including communication equipment within the working area, a minimum of twice per year by June 1 and September 1.
- ii. In addition, all vegetation within a two metre radius shall be maintained at a height of no greater than 300 mm around all electrically powered equipment and communication equipment requiring access. This includes all cabinets, power supplies, distribution assemblies, high mast poles, sub stations, RWIS stations, cameras, and communication pedestals. A one metre pathway, from the roadway to the equipment, shall also be maintained at a height no greater than 300 mm.

Table 8-7

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Vegetation Control			
Sight Distance (NCR process)	Vegetation that impairs or obstructs sight visibility distances removed upon Detection	1 Day	1 Business Day

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Vegetation Control			
	Vegetation that impedes traffic or obstructs regulatory signs is removed upon Detection	2 hours	2 hours
Grass Mowing (NCR process)	All grass visible to the travelling public maintained at not more than 15 centimetres	7 Days	1 Business Day
	All grass and weeds behind barrier walls maintained below the height of the top of the barrier walls.	7 Days	1 Business Day
Weed Control (NCR process)	Noxious weeds identified through a weed order Eradicated according to the weed order	Zero Time	1 Business Day
Concrete/ Asphalt Joints or Cracks (NCR process)	Vegetation growing in any concrete and/or asphalt joint or crack Eradicated annually by August 31	Zero Time	1 Business Day
Vegetation at Electrical Installations (NCR process)	Vegetation to be cleared twice annually by June 1 and Sept 1	Zero Time	1 Business Day

8.8 FENCES AND OTHER BARRIERS

Maintenance of fences and other barriers shall be according to the following including Table 8-8.

a) Security Fence (or Farm Fence owned by the MTO)

- i. Where sections of MTO-owned farm or security fence are damaged temporary repairs shall be made immediately and permanent repairs scheduled and completed.

Ramp Gates

- i. Annual maintenance of ramp gates shall include, oiling or greasing of moving parts and locks as required, and replacement of damaged components or complete units.
- ii. All ramp gates shall be equipped with MTO approved locks.
- iii. Where ramp gates are damaged, repair or replacement shall be scheduled and completed.

Table 8-8

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Fences & Other Barriers			
All Fences (NCR process)	Damaged or missing Security Fence or City owned Farm Fence allowing access to the highway is repaired temporarily upon Detection	2 hours	2 hours
	Permanent repairs completed upon Detection	14 Days	1 Business Day

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Fences & Other Barriers			
Ramp Gates (NCR process)	Ramp Gates maintained and damage repaired upon Detection	7 Days	1 Business Day

8.9 OTHER ROADSIDE FEATURES

Maintenance of other Roadside features identified below shall be according to the following

a) Graffiti

- i. Graffiti visible by the public is removed by a paint removal method as identified in the Designated Sources of Material list.
- ii. All offensive graffiti is temporarily covered and scheduled for permanent removal.

Debris

- i. All mowed grassy areas visible to the travelling public shall be maintained free of litter and debris at all times between April 15th and November 15th of each year.
- ii. Items within the Roadside that may have a negative impact on public health or environmental safety shall be Addressed Immediately.
- iii. Debris, including dead animals, on the Roadside shall be removed. All Debris shall be managed in accordance with Schedule 17.

Table 8-9

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Other Roadside Features			
Graffiti (NCR process)	All graffiti visible by the public is removed by a paint removal method as identified in the Designated Sources of Material list upon Detection	10 Days	1 Business Day
	All offensive graffiti is temporarily covered upon Detection	2 hours	1 hour
Debris (NCR process)	All Debris within the Roadside is removed upon Detection	1 Day	1 Business Day

- i. There is a potential hazard when handling dead animals, syringes and other sharp objects. Proper gloves, footwear and clothing should always be worn when engaged in these types of activities.
- ii. Expert assistance should be obtained to identify unlabelled containers or unidentifiable materials.

ATTACHMENT 8 A

OVERHEAD SIGN SUPPORT MAINTENANCE INSPECTION

Date: _____ Inspected by: _____

Structure Identification

Name/Location			
Hwy/Direction:	Core/Collector/Ramp:	Structure Type:	
Site #:	# Sign Panels:	Footing Type Left:	Footing Type Right:

	DEFECT			Maintenance Required/Comments
	N/A	Yes	No	
Foundation				
Concrete (cracked, spalled?)				
Steel Pedestal (bent, rusted?)				
Grout (broken?)				
Bearing Surface (poor contact, lifting?)				
Bases				
Anchor Bolts (broken, loose?)				
Base Plates (cracked?)				
Legs of Support*				
Leg (bends, dented, cracked?)				
Bracing Diagonals (bent, cracked?)				
Leg Connection (cracked, loose?)				
Horizontal Portion of Support*				
Chords (bent, dented?)				
Bracing Diagonals (bent, dented?)				
In Line Connections (loose?)				
Attachments*				
Sign Panels (bent, loose?)				
Sign Panel Clamps (broken, loose?)				
Walkway Arms (bent?)				
Walkway (loose, bent?)				
Walkway Clamps (broken, loose?)				
Damping Assembly (loose?)				
Other				
Other				
Follow Up with City?				
General Comment				

* - Inspected from shoulder.

ATTACHMENT 8 B

ROADSIDE SIGN SUPPORT MAINTENANCE INSPECTION

Date: _____ Inspected by: _____

Structure Identification:

Name/Location		
Hwy/Direction:	Core/Collector/Ramp:	
Site #:	# Columns (Posts):	# Horizontal cross arms (if steel):

	DEFECT			Maintenance Required/Comments
	N/A	Yes	No	
Foundation				
Concrete (cracked, spalled?)				
Columns (Posts) of Support*				
Connection at ground, for breakaway sign (cracked, bent, loose?)				
Connection below sign, for breakaway sign (cracked, bent, loose?)				
Leg (bends, dented, cracked?)				
Sign				
Sign Panel (bent, loose?)				
Sign Panel Clamps (broken, loose?)				
Other				
Other				
Follow Up with Area Office?				
General Comment				

ARTICLE 9 ELECTRICAL MAINTENANCE

9.1 SCOPE

This specification covers the responsibilities and obligations for all electrical maintenance and servicing activities within the Highway Corridor Lands.

The Maintenance Operation shall include identifying, documenting and taking the appropriate action necessary to correct all defects whether by Minor Maintenance or Non-Routine Maintenance.

The Maintenance Operation shall be completed in full compliance with the requirements of OPSS Prov 106 and the requirements detailed in Schedule 15-2 Part 9.

9.2 Non-Routine Maintenance

Non-Routine Maintenance of electrical systems shall be according to the following Maintenance Standards detailed in Table 9-1 and Table 9-2.

The Electrician (as defined in OPSS Prov 106) shall notify the City and the OTOC of all Critical Failures when first arriving on site. The Electrician shall notify the OTOC upon leaving the site.

Table 9-1 – Categories of Critical Failures in Electrical Systems

CATEGORY 1 - System components are degraded or not working at all and there is an elevated priority due to a Major Incident or immediate safety hazard. CATEGORY 2 - Major system components are degraded or not working at all and there no immediate safety hazard. CATEGORY 3 - Minor system component is degraded or not working at all and there no immediate safety hazard				
SYSTEM	CRITICAL FAILURE	CATEGORY 1	CATEGORY 2	CATEGORY 3
Power Distribution System	Aerial span wire down	X		
	Emergency Cable Locates	X		
	Faulty photo control circuit		X	
	Pole knocked down or hit	X		
	Power Supply knocked down, failure, damaged, de-energized or displaced	X		
	Unattended and unsecured cabinet or enclosure	X		
Illumination (Highway, High Mast)	Aerial span wire down	X		
	All lighting not functioning at a Power Supply	X		
	Emergency Cable Locates	X		
	Faulty photo control circuit		X	
	Greater than 30% of the luminaires connected to a Power Distribution System not functioning		X	
	Greater than 40% of the luminaires not functioning at a Partial Illumination Critical Point		X	
	Overhead equipment unfastened or hanging over roadway	X		

CATEGORY 1 - System components are degraded or not working at all and there is an elevated priority due to a Major Incident or immediate safety hazard. CATEGORY 2 - Major system components are degraded or not working at all and there no immediate safety hazard. CATEGORY 3 - Minor system component is degraded or not working at all and there no immediate safety hazard				
SYSTEM	CRITICAL FAILURE	CATEGORY 1	CATEGORY 2	CATEGORY 3
	Parking lot lighting			X
	Pole knocked down or hit	X		
	Unattended and unsecured cabinet or enclosure	X		
	Unbalance, unlatched or partially unlatched high mast lighting ring	X		
Permanent Data Collection Stations, Cathodic Protection, Emergency Services Access Gates	Communication failure			X
	Controller control cabinet or enclosure knocked down, damaged or displaced	X		
	Emergency Cable Locates	X		
	Emergency Services Access Gate not functioning	X		
	Pole knocked down or hit			X
	Unattended and unsecured cabinet or enclosure	X		
	UPS system failure			X

Table 9-2

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Non-Routine Maintenance			
Electrical System (Medium CPQF)	Response to Category 1 Critical Failures upon Detection	2 hours	30 minutes
Electrical System (Medium CPQF)	Response to Category 2 Critical Failures upon Detection	24 hours	1 hour
Electrical System (NCR process)	Response to Category 3 Critical Failures upon Detection	Next Business Day	1 Business Day

9.3 Highway Lighting

Maintenance of Highway Lighting Systems shall be according to the following Maintenance Standards detailed in 9-3.

Routine Maintenance activities on all Highway Lighting Systems within the Highway Corridor Lands shall include:

- i. Minor Maintenance including inspecting, checking, elementary testing, cleaning, lubricating and performing minor repairs from the ground on all Highway Lighting System components including luminaires, lighting brackets, wiring, fuses, poles, frangible and safety bases, anchorage

- assemblies, pads and footings, lowering and raising devices within the Contract a minimum of once per year.
- ii. Major Maintenance including overhauling, testing and replacement of faulty components on all Highway Lighting System components including luminaires, lighting brackets, wiring, fuses, grounding, poles, pole bases, frangible and safety bases, anchorage assemblies, pads and footings within the Contract on a 4-year cycle starting in 2020.
 - iii. Detailed inspecting, checking, elementary testing, cleaning (including the reflector, refractor and inside the fixture), lubricating and performing minor repairs on conventional, underpass, tunnel and facility lighting on a 4-year cycle concurrent with the 4-year relamping cycle. For LED luminaires, the cleaning shall include the optical assemblies and heat-sinks.
 - iv. Replace all non-LED lamps on conventional, underpass, tunnel and facility lighting on a 4-year cycle. All lamps shall be replaced with the same type, including the exact same photometric distribution.
 - v. LED luminaires will not be replaced on a schedule but shall be replaced as required.

Some power supplies provide power to both Highway Lighting Systems and Intelligent Transportation Systems and other electrical facilities. Maintenance on the Highway Lighting Systems shall be performed without de-energizing the other system.

Table 9-3

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Highway Lighting			
Full Illumination (NCR process)	More than 2 consecutive luminaires not functioning shall be repaired upon Detection	7 Days	1 Business Day
	Greater than 30% of luminaires connected to the Power Distribution System not functioning shall be repaired upon Detection	24 hours	1 Business Day
	Any single luminaire not functioning shall be repaired upon Detection	Next maintenance cycle	1 Business Day
Partial Illumination (NCR process)	Greater than 40% of the luminaires at Critical Point not functioning shall be repaired upon Detection	24 hours	1 Business Day
	Any single luminaire not functioning shall be repaired upon Detection	7 Days	1 Business Day
Maintenance (NCR process)	Complete all Maintenance according to this specification	Zero Time	1 Business Day

9.4 High Mast Lighting

Maintenance Standards

Maintenance of high mast lighting shall be according to the following Maintenance Standards as detailed in Table 9-4.

Routine Maintenance activities on all High Mast Lighting Systems shall include:

- vi. Minor Maintenance including inspecting, checking, elementary testing, operational testing, cleaning, lubricating and performing minor repairs on all non-latching High Mast Lighting System components including luminaires, lighting brackets, wiring, poles, lowering and raising devices, anchorage assemblies, pads and footings, within the Contract a minimum of once every six months.
- vii. Major Maintenance including overhauling, testing and replacement of faulty components on all latching or non-latching High Mast Lighting System components including luminaires, lighting brackets, wiring, poles, lowering and raising devices, anchorage assemblies, pads and footings, within the Contract a minimum of once every six months.
- viii. Minor Maintenance including inspecting, checking, elementary testing, cleaning, lubricating and performing minor repairs on all top-latching High Mast Lighting System components including luminaires, lighting supports, wiring, poles, lowering and raising devices, anchorage assemblies, pads and footings, lowering and raising devices within the Contract a minimum of once every two years.
- ix. Major Maintenance including overhauling, testing and replacement of faulty components on all top-latching High Mast Lighting System components including luminaires, lighting brackets, wiring, poles, lowering and raising devices, anchorage assemblies, pads and footings within the Contract a minimum of once every two years.
- x. Replace all conventional lamps on High Mast Lighting System on a 4-year cycle starting in 2020. Lamps shall be replaced with the same type, including the exact same photometric distribution.
- xi. LED luminaires will not be replaced on a schedule but shall be replaced as required.

- i. Some power supplies provide power to both High Mast Lighting Systems and Intelligent Transportation Systems and other electrical facilities. Maintenance on the Highway lighting systems shall be performed without de-energizing the other system.

Table 9-4

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
High Mast Lighting			
Luminaires (NCR process)	Any luminaire not functioning shall be repaired upon Detection	10 Days	1 Business Day
	Non-functioning luminaires replaced when greater than 25% of the luminaires per high mast lighting pole not functioning	2 Days	1 Business Day
Maintenance (NCR process)	Complete all Maintenance according to this specification	Zero Time	1 Business Day

9.5 Permanent Data Collection Stations

Maintenance Standards

Maintenance of permanent data collection stations shall be according to the following Maintenance Standards including Table 9-5.

Routine Maintenance activities on all Permanent Data Collection Stations shall include:

- i. Inspecting, checking, changing, cleaning, summarizing, winterizing, replacing door filter, lubricating and performing minor repairs on all Permanent Data Collection Stations including heater, fan, screws, electrical connections, gasket, thermostats, filter assembly, cabinet/building, door, door handle and lock, digital timers, pole/pedestal, mounting hardware, grass/debris, rodents & insects, light bulb, overhead wiring, loop(s), telephone line, telecommunication modems, wireless VPM modems, counter battery, power supplies and perform Loop Detector Readings within the Contract two times per year between April 1st and May 31st, and between October 1st and November 30th.
- ii. Replace the Cortec corrosion inhibitors every 18 months.

A System Integration Test shall be completed by the manufacturer’s authorized representative, for each Non-Routine Maintenance response.

Table 9-5

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Permanent Data Collection Stations			
Routine Maintenance (NCR process)	Complete all Maintenance according to Standards	Zero Time	1 Business Day
System Integration Test (NCR process)	Station passes the SIT and is collecting data continually for 14 Days after permanent repairs are completed	Zero Time	1 Business Day

9.6 Power Distribution System and Grounding

Maintenance Standards

Maintenance of Power Distribution Systems shall be according to the following Maintenance Standards as detailed in Table 9-6.

Routine Maintenance activities of Power Distribution System shall include:

- i. Minor Maintenance including inspecting, checking, elementary testing, cleaning, lubricating and performing minor repairs on all components including wiring, fuses, poles, frangible and safety bases, anchorage assemblies, pads and footings within the Contract a minimum of once per year.
- ii. Major Maintenance including overhauling, testing and replacement of faulty components including wiring, fuses, breakers, UPS systems, grounding, poles, pole bases, frangible and safety bases, anchorage assemblies, pads and footings, sub-stations, distribution assemblies, cabinets and power supplies on a 4-year cycle.
- iii. Solar panels shall be clean and clear, so there are no interruptions of continuous operations.
- iv. Check all 120 VAC line and ground rods, once every 12 months.
- v. Replace all UPS batteries on a 5-year cycle. Batteries shall be replaced with the same type, voltage and Amp-Hour capacity.

Table 9-6

Maintenance Standard		REMEDY PERIOD	REMEDIAL PERIOD
Power Distribution System and Grounding			
Solar Panels (NCR process)	Solar panel output diminished, which causes interruption of continuous operations due to obstruction, dirt or snow to be repaired upon Detection	2 Days	1 Business Day
Routine Maintenance (NCR process)	Complete all Routine Maintenance according to the Standards	Zero Time	1 Business Day

Solar Panels within the Highway Corridor Lands shall be cleaned a minimum of three times per year (Feb, Jun, and Oct).

Appendix H

Pipe Installation by Trenchless Methods

Non Standard Special Provision

1. SCOPE

This Special Provision covers the requirements for pipe installation by various trenchless methods.

DB Co shall select the trenchless method of installation.

2.0 REFERENCES

This Special Provision refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction:

OPSS 401	Trenching, Backfilling, and Compacting
OPSS 404	Support Systems
OPSS 407	Manholes, Catch Basins and Ditch Inlets
OPSS 441	Watermain Installation In Open Cut
OPSS 491	Preservation, Protection, and Reconstruction of Existing Facilities
OPSS 492	Site Restoration Following Installation of Pipelines, Utilities, and Associated Structures
OPSS 517	Dewatering of Pipeline, Utility and Associated Structure Excavation
OPSS 539	Temporary Protection Systems

Ontario Provincial Standard Specification, Material:

OPSS 1004	Aggregates - Miscellaneous
OPSS 1301	Cementing Materials
OPSS 1302	Water
OPSS 1440	Steel Reinforcement for Concrete
OPSS 1802	Smooth Walled Steel Pipe
OPSS 1820	Circular and Elliptical Concrete Pipe

ASTM International:

D3350 - 10a Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

American Water Works Association (AWWA)

C206-03 Field Welding of Steel Water Pipe

3.0 DEFINITIONS

For the purposes of this Appendix H, the following definitions apply:

Backreamer means a cutting head designed for the soil conditions and is attached to the leading end of a drill string to enlarge the pilot bore during a pullback operation to enable installation of the product.

Bore Path means a drilled path according to the grade and alignment tolerances specified in the Project Agreement and DB Co's design.

Carrier Pipe means a final pipe in direct contact with the material being conveyed.

Drilling Fluid Fracture or Frac Out means a condition where the drilling fluid's pressure in the bore is sufficient to overcome the in situ vertical confining stress, thereby fracturing the soil and allowing the drilling fluids to migrate to the surface at an unplanned location.

Drilling Fluids means a mixture of water and additives, such as bentonite, polymers, surfactants, and soda ash, designed to block the pore space on a bore wall, reduce friction in the bore, and to suspend and carry cuttings to the surface.

Entry Point means the location or excavation from which the bore is initiated for the installation of product.

Exit Point means the location or excavation to which the bore is directed for the installation of product.

Fusion means connecting product lengths into a continuous length using elevated temperatures and pressure.

Guidance System means an electronic system capable of indicating the position, depth, and orientation of the drill head during the drilling process.

Horizontal Directional Drilling (HDD) means directional boring or guided horizontal boring.

Inadvertent Returns means the flow of unexpected fluids towards the drilling rig that typically originated from an artesian aquifer encountered during the drilling process.

Launch Pit means an access excavation or existing access structure to an existing product for the insertion of the pipe bursting head and new product.

Loss of Circulation means the discontinuation of the flow of slurry in the bore back to the entry or exit point or other planned recovery points.

Multi Product Installation means two or more products installed in the same bore path. The products may or may not have the same diameters.

Pilot Bore means the initial bore to set horizontal and vertical alignment between the connecting points.

Pipe Bursting means the application of a pipe bursting head into the interior of and along the length of an existing product to split or fracture the existing product so that the existing product and surrounding material is opened up to a sufficient size to accommodate the insertion of a new product in the cavity created, without leaving any significant voids around the new product. Pipe bursting methods include static, pneumatic, and hydraulic. Pipe bursting is also known internationally as pipe cracking or pipe splitting.

Pipeline means to include sewers, culverts, watermains, and forcemains.

Product means pipelines, conduits, cable, or ducts.

Pull means the installation of one continuous reach of new product. Generally, a pull shall commence at a launch pit and terminate at a pull pit.

Pull Pit means an access excavation or existing access structure to an existing product to receive the new product or pipe bursting head or both.

Pullback means that part of the HDD method in which the drill string is pulled back through the bore path to the entry point, usually installing the product at the same time.

Reaming means a process for pulling a tool attached to the end of the drill string through the bore path to enlarge the bore and mix the cuttings with the drilling fluid. This could include multiple passes.

Rock means natural beds or massive fragments of the hard, stable, cemented part of the earth's crust that are igneous, metamorphic, or sedimentary in origin, which may or may not be weathered and includes boulders having a volume of 0.5 m³ or greater.

Single Product Installation means a single product installed into a bore path. The product may or may not have a tracer wire attached to it.

Slurry means a mixture of soil cuttings and drilling fluid.

Soil means all soils except those defined as rock, and excludes stone masonry, concrete, and other manufactured materials.

Strike Alert means a system that is intended to alert and protect the operator in the case of inadvertent drilling into an electrical utility cable. The strike alert system consists of a sensor and an alarm connected to the drill rig and a grounding stake. The alarm is set off when the sensor contacts 42.5 volts or 0.5 amperes. The alarm may be audio or visual or both.

Structure means a maintenance hole, valve chamber, or other such facility to access the product.

4.0 SUBMISSION AND DESIGN REQUIREMENTS

4.04 Submission Requirements

The following information shall be submitted to the City Representative for review a minimum of 14 days prior to commencing the pipe installation by trenchless method operations:

- a) A work plan outlining the procedure and schedule to be used to execute the work on the product service laterals, and structures.
- b) The work area layout.
- c) A list of personnel, including backup personnel, and their qualifications and experience.
- d) A traffic control plan.
- e) A safety plan, including the contracting company safety manual and emergency procedures.
- f) A settlement monitoring plan.
- g) Material and Equipment.
- h) Method for the removal of boulders and cobbles.

4.04.01 Jacking and Boring

When jacking and boring is selected as the trenchless method for pipe installation, DB Co shall also submit the following information, in addition to the submission requirements specified elsewhere, to the City Representative for review a minimum of 14 days prior to commencing the jacking and boring operations:

- a) Access shaft or pit design.
- b) Face support and other temporary support details.
- c) Excavation and dewatering plan.
- d) Grouting operation.
- e) Testing and monitoring plan.

The access shaft or pit details shall bear the seal and signature of an Engineer.

4.04.02 Horizontal Directional Drilling

When HDD is selected as the trenchless method for pipe installation, DB Co shall also submit the following information, in addition to the submission requirements specified elsewhere, to the City Representative for review a minimum of 14 days prior to commencing the HDD operations:

- a) A drilling fluid management plan including potential impacts and emergency procedures and associated contingency plans.

4.04.03 Pipe Bursting

When pipe bursting is selected as the trenchless method for pipe installation, DB Co shall also submit the following information, in addition to the submission requirements specified elsewhere, to the City Representative for review a minimum of 14 days prior to commencing the pipe bursting operations:

- a) Launch pit and pull pit locations.
- b) Working Drawings required to execute the work on the product.
- c) When fusion joining is used, written record of current training showing that the operator has been fully trained in the use of the fusion equipment by an authorized representative of the fusion equipment manufacturer and the product manufacturer or, when applicable, certified by the Owner or Utility Company for which the work is being completed.
- d) When applicable, product bypass and temporary supply system plans, including installation, operation, and testing procedures and a list of material and equipment to be used.
- e) Manufacturer's technical data containing complete information on new product:
 - i. Material composition, physical properties, inside diameter, and wall thickness.
 - ii. Maximum tensile strength and corresponding maximum allowable pulling force.
 - iii. Transporting, handling, and storing recommendations.
 - iv. Repair.
 - v. Fusion times and temperatures.
 - vi. Minimum bend radius.
 - vii. Recommended restraint method in structure.
 - viii. Product recovery requirements.
 - ix. Relaxation requirements.
- f) Contingency plans for the following potential conditions:
 - i. Unforeseen obstructions causing burst stoppage.
 - ii. Deviation from required alignment and grade.
 - iii. Extended service disruption.

- iv. Damage to the existing service connections and the replacement of product's structural integrity and methods of repair.
- iv. Damage to other existing Utilities.
- v. Soil heaving or settlement.
- vi. Contaminated soil or water.
- vii. Alignment passing through buried structures.

4.04.04 Pipe Ramming

When pipe ramming is selected as the trenchless method for pipe installation, DB Co shall also submit the following information, in addition to the submission requirements specified elsewhere, to the City Representative for review a minimum of 14 days prior to commencing the pipe ramming operations:

- a) Access shaft or pit design.
- b) Face support and other temporary support details.
- c) Excavation and dewatering plan.
- d) Grouting operation.
- e) Testing and monitoring plan.

The access shaft or pit details shall bear the seal and signature of an Engineer.

5.0 MATERIALS

5.01 Timber

Timber shall be sound, straight, and free from cracks, shakes, and large or loose knots.

5.02 Fittings

Fittings shall be suitable for and compatible with the class and type of pipe with which they will be used.

5.03 Valves

Valve type, class, pressure rating, and size shall be determined by DB Co and shall be suitable for the work.

5.04 Concrete Reinforcement

Steel reinforcing for concrete work shall be according to OPSS 1440.

5.05 Grout

Grout shall consist of a mixture of one part Portland cement according to OPSS 1301 and two parts mortar sand according to OPSS 1004, wetted with sufficient water to make the mixture plastic. Water shall be according to OPSS 1302.

5.08 Jacking and Boring

5.08.01 Pipe Materials

Concrete pipe shall conform to OPSS 1820.

Steel pipe shall conform to OPSS 1802 with welded joints.

5.09 Horizontal Directional Drilling

5.09.01 Drilling Fluids

The drilling fluids shall be mixed according to the manufacturer's recommendations and be appropriate for the anticipated soil conditions. Only bentonite and manufacturer-approved polymers shall be permitted for use as drilling fluids. All additives used shall be chemically inert, biodegradable, and non-toxic. No petroleum-based or detergent additives shall be permitted.

5.09.02 Pipe Materials

DB Co shall determine the pipe type and pipe class suitable for the Work.

5.10 Pipe Bursting

5.10.01 Pipe Materials

DB Co shall determine the pipe type and pipe class suitable for the Work.

5.10.02 Lubricant

Lubricant used to reduce friction, to maintain the annular space created by the pipe bursting head, and to allow the insertion of the new product shall be non-toxic and biodegradable.

5.11 Pipe Ramming

5.11.01 Pipe Materials

Steel pipe shall conform to OPSS 1802 with welded joints.

6.0 EQUIPMENT

6.01 Horizontal Directional Drilling

6.01.01 Directional Drilling Equipment

6.01.01.01 General

The directional drilling equipment shall consist of a directional drilling rig and a drilling fluid mixing and delivery system of sufficient capacity to successfully complete the product installation without exceeding the maximum tensile strength of the product being installed.

6.01.01.02 Drilling Rig

The directional drilling rig shall:

- a) consist of a leak-free hydraulically powered boring system to rotate, push, and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill head.
- b) contain a guidance system to accurately guide boring operations.
- c) be anchored to the ground to withstand the rotating, pushing, and pulling forces required to complete the product installation.
- d) be grounded during all operations or as specified by the drilling rig manufacturer.

6.01.01.03 Drill Head

The drill head shall be steerable by changing its rotation, be equipped with the necessary cutting surfaces and drilling fluid jets, and be of the type for the anticipated soil conditions.

6.01.01.04 Guidance System

The guidance system shall be setup, installed, and operated by trained and experienced personnel. The operator shall be aware of any magnetic or electromagnetic anomalies and shall consider such influences in the operation of the guidance system when a magnetic or electromagnetic system is used.

6.01.01.05 Drilling Fluid Mixing System

The drilling fluid mixing system shall be of sufficient size to thoroughly and uniformly mix the required drilling fluid.

6.01.01.06 Drilling Fluid Delivery System

The delivery system shall have sufficient flow capacity to ensure that all slurry volumes are adequate for the length and diameter of the final bore and the anticipated soil conditions. Connections between the delivery pump and drill pipe shall be leak-free.

6.02 Pipe Bursting

6.02.01 Pipe Bursting Head

The pipe bursting head shall be according to the manufacturer's specifications for head sizes recommended for various product diameters and types, as well as parameters associated with maximum allowable upsize percentages.

6.02.02 Pipe Bursting Power Source

The pipe bursting power source shall generate sufficient force to burst and compact the existing pipe product into the surrounding material. It must also be able to pull the new pipe product into place, if done simultaneously with the bursting operation without imparting undue stresses to the pipe product installed.

6.02.03 Fusion Equipment

Fusion equipment, when used, shall be size and rated for the product. Fusion clamps shall be sized to clamp the new product properly.

7.0 CONSTRUCTION

7.01 General

DB Co shall perform the pipe installation by a trenchless method as selected from the various methods described herein. An individual with previous experience in the selected method of installation shall supervise the work at all times.

The City Representative shall be notified at least 48 hours in advance of starting work.

The work area shall be kept sufficiently dry at all times to permit work to be performed in a safe and satisfactory manner.

7.02 Site Preparation

The work site shall be graded or filled to provide a level working area for the Equipment. No alterations beyond what is required for the selected pipe installation method shall be made. All activities shall be confined to designated work areas.

7.03 Preservation and Protection of Existing Facilities

Preservation and protection of existing facilities shall be according to OPSS 491 and as specified.

When specified in the Project Agreement and DB Co's design, an existing facility shall be exposed to verify its horizontal and vertical location. The number of exposures required to monitor work progress shall be as specified in the Project Agreement and DB Co's design.

7.04 Transporting, Unloading, Storing, and Handling Materials

Manufacturer's recommendations for transporting, unloading, storing, and handling of materials shall be followed.

7.05 Trenching, Backfilling, and Compacting

Trenching, backfilling, and compacting for entry and exit points or other locations along the pipeline installation shall be according to OPSS 401.

7.06 Support Systems

Support systems shall be according to OPSS 404.

7.07 Dewatering

Dewatering shall be according to OPSS 517.

7.08 Temporary Protection Systems

The construction of temporary protection systems shall be according to OPSS 539.

Where the stability, safety, or function of an existing roadway, railway, watercourse, other works, or proposed works may be impaired due to the method of operation, protection shall be provided. Protection may include sheathing, shoring, and piling where necessary to prevent damage to such works or proposed works.

7.09 Construction Shafts

Where required, construction shafts shall be provided at the locations determined by DB Co.

Shafts shall be maintained in a drained condition.

A secure fence shall be installed around the perimeter of the access shaft or pit area with gates and truck entrances. The fence shall be removed upon completion of the work.

7.10 Removal of Boulders and Cobbles

Methods for the removal of boulders and cobbles shall be according to DB Co's submissions. The City Representative shall be notified immediately of any obstructions encountered.

7.11 Jacking and Boring

7.11.01 Method of Jacking and Boring Procedure

The jacking and boring procedure to be used shall be submitted to the City Representative prior to commencing the work and shall be subject to the following limitations:

- a) Only smooth walled steel or concrete pipe shall be used.
- b) Hydraulically operated jacks of adequate number and capacity shall be provided to ensure smooth and uniform advancement without over-stressing of the pipe.
- c) A jacking head or collar shall be provided to transfer and distribute jacking pressure uniformly over the entire end bearing area of the pipe. In the case of concrete pipe, the jacking head shall be suitably padded.
- d) Two or more lubricated guide rails or sills shall be provided of sufficient length to fully support the pipe at the specified line and grade in the jacking pit.
- e) The jacking and boring procedure shall be compatible with the subsurface and groundwater conditions at the site.

7.11.02 Pipeline Installation

The pipeline shall be installed to the line, grade, and tolerance as designed.

When steel pipe is used as a carrier pipe, butt-welding of pipe joints shall be according to AWWA C206.

When steel pipe is used solely as a casing pipe, the welds shall be sufficient to support the jacking forces of the pipe installation.

The space between the casing pipe and the wall of the excavation shall be filled according to DB Co's submission on grouting operations.

The space between the casing pipe and the carrier pipe shall be filled according to DB Co's submission on grouting operations.

Joints shall be protected from crushing by placing 15 mm thick plywood on spigot shoulder. The plywood shall be cut to form a ring with the outer surface conforming to the outer circumference of the pipe.

7.11.03 Cathodic Protection

When specified in the Project Agreement and DB Co's design, cathodic protection on the casing pipe shall be provided.

7.12 Horizontal Directional Drilling

7.12.01 General

When strike alerts are provided on a drilling rig, they shall be activated during drilling and maintained at all times.

7.12.02 Preservation and Protection of Existing Facilities

Minimum horizontal and vertical clearances to existing facilities as specified in the Project Agreement and DB Co's design shall be maintained. Clearances shall be measured from the nearest edge of the largest backreamer required to the nearest edge of the facility being paralleled or crossed.

Existing underground facilities shall be exposed to verify its horizontal and vertical locations when the bore path comes within 1.0 m horizontally or vertically of the existing facility. Existing facilities shall be exposed by non-destructive methods. The number of exposures required to monitor work progress shall be as specified in the Project Agreement and DB Co's design.

7.12.03 Drilling Fluid Management

DB Co shall employ a containment, collection, and disposal method satisfactory to the City to prevent spillage of drilling fluids and inadvertent returns. DB Co shall immediately clean up and dispose of any spillages of drilling fluids.

7.12.04 Pilot Bore

The pilot bore shall be drilled along the bore path in accordance with the grade, alignment, and tolerances specified in the Project Agreement and DB Co's design. In the event the pilot bore does deviate, the City Representative shall be notified. The City Representative may require DB Co to pullback and re-drill from the location along the bore path before the deviation. In the event that a drilling fluid fracture, inadvertent returns, or loss of circulation occurs during pilot bore drilling operations, the City Representative shall be advised of the event and of the action taken.

If a drill hole beneath a road must be abandoned, the hole shall be backfilled with grout or bentonite to prevent future subsidence.

7.12.05 Reaming

When necessary, the bore shall be reamed using the appropriate tools to a diameter 50% greater than the outside diameter of the products to a maximum 300 mm beyond the product diameter.

The drilling mud in the annular region should not be removed after installation, but permitted to solidify and provide support for the pipe and surrounding soil.

7.12.06 Product Installation

7.12.06.01 General

The product shall be jointed according to manufacturer's recommendations. Where space and the Project Agreement and DB Co's design permit, the length of the product to be pulled shall be jointed as one length before commencement of the pulling operation.

The product shall be protected from damage during the pullback operation.

The minimum allowable bending radius for the product shall not be exceeded at the entry point, exit point, or any other location along the bore path.

Product shall be allowed to recover before the connection to new or existing facility is made. Product recovery time shall be according to manufacturer's recommendations.

A tracer wire shall be supplied and installed along with the product.

7.12.06.02 Pullback

After successfully reaming the bore to the required diameter, the product shall be pulled through the bore path. Once the pullback operation has commenced, it shall continue without interruption until the product is completely pulled into bore.

A swivel shall be used between the reamer and the product being installed to prevent rotational forces from being transferred to the product. When specified in the Project Agreement and DB Co's design, a weak link or breakaway connector shall be used to prevent excess pulling force from damaging the product.

The product shall be inspected for damage where visible at excavation pits and where it exits the bore. Any damage noted shall be rectified to the satisfaction of the City.

7.12.07 Product Testing

Where required, product testing shall be as specified in the Project Agreement and DB Co's design.

7.12.08 Record Keeping

Verification record requirements of the alignment and depth of the installed product shall be as specified in the Project Agreement and DB Co's design. A copy of the verification records shall be given to the City Representative at the completion of the HDD operations.

7.13 Pipe Bursting

7.13.01 General

The product shall be installed following the alignment and grade of the existing pipe and to the ovality specified in the Project Agreement and DB Co's design.

Launch pits and pull pits shall be sized to allow the use of the pipe bursting equipment and to allow the product to be installed such that the product manufacturer's recommendations for product bending radius are not exceeded.

7.13.02 Product By-Pass

When specified in the Project Agreement and DB Co's design, during the execution of the work the flow within the existing product shall be bypassed around the product being replaced and the continuity of service to each facility connected to the affected section of product shall be maintained.

The pumps and by-pass lines shall be of adequate capacity and size to handle all flows.

7.13.03 Preparation of Existing Product and Structures

All existing crosses, tees, valves, and service connections shall be located, exposed, and disconnected prior to any pipe bursting operation.

Prior to pipe bursting, the inlets, outlets, and benching of existing structures shall be enlarged sufficiently for clearance of the pipe bursting head and the new product. Enlargements shall be made neatly and be no greater than that required for their purpose. Size of the enlargements shall be sufficient to allow for restoration and sealing to the new product.

Existing product shall be cleared of obstructions (e.g., rocks and debris) or mechanical obstructions (e.g., repair sleeves, clamps, couplings, and intolerable deviations in grade or alignment) prior to pipe bursting.

7.13.04 Product Joining

7.13.04.01 Genera

The product shall be joined according to the manufacturer's recommendations.

The product shall be assembled and joined at the site to provide a leak-proof joint.

When space and the Project Agreement and DB Co's design permit, the length of the product to be pulled shall be joined as one length prior to the commencement of the pulling operation.

When used, fusion shall be performed by technicians trained in the use of the fusion equipment.

Joints shall be capable of withstanding the loading of the installation process. All joints shall be subject to acceptance by the City prior to insertion.

7.13.04.02 Connection to Product or Structures

Product shall be allowed to recover from any induced stresses and strains before connection to new or existing product or structures are made. Product recovery time shall be according to the manufacturer's recommendations.

The product connection to the structure or to an existing product shall be leak-proof.

7.13.04.03 Service Connections

Service connection work shall be as specified in the Project Agreement and DB Co's design.

Service connection work shall not commence until the product has fully recovered.

7.13.04.04 Product Installation

Installation procedures shall be according to the product manufacturer's guidelines.

The product shall be protected from damage during the installation process.

Suitable guides shall be used to protect the product from damage at the insertion point and at any intermediate re-entry points.

Upon commencement of the bursting process, product insertion shall be continuous from the launch pit to the pull pit, except when approved by the City. A pushing machine may be used to assist insertion from the rear.

When specified in the Project Agreement and DB Co's design, a weak link, breakaway connector, or load monitor shall be used to prevent excess pulling force from damaging the product.

7.13.04.05 Structures and Valves

When the new product enters or exits an existing structure, the structure wall shall be restored as specified in the Project Agreement and DB Co's design. Restoration shall securely locate and anchor the new product in the wall and shall produce a leak-proof seal.

The existing structure's benching shall be restored according to the requirements of the new product, any other incoming product, and as specified in the Project Agreement and DB Co's design.

When new structures or valves are specified, they shall be installed according to OPSS 407 and OPSS 441, respectively.

7.13.04.06 Testing

Testing of the product joining and installation shall be as specified in the Project Agreement and DB Co's design.

7.13.04.07 Record Keeping

Verification record requirements of the alignment and grade of the installed product shall be as specified in the Project Agreement and DB Co's design. A copy of the verification records shall be given to the City Representative at the completion of the pipe bursting operations.

7.14 Pipe Ramming

7.14.01 Method of Pipe Ramming Procedure

Method of installation to be used by DB Co shall be reviewed with the City Representative prior to commencing the work and shall be subject to the following limitations:

- a) Only smooth walled steel pipe shall be used.
- b) Pipe ramming equipment of adequate capacity shall be provided to ensure smooth and uniform advancement without overstressing of the pipe.
- c) A ramming head shall be provided to transfer and distribute jacking pressure uniformly over the entire bearing area of the pipe.
- d) Two or more lubricated guide rails or sills shall be provided of sufficient length to fully support the pipe at the specified line and grade in the ramming pit.

7.14.02 Product Installation

The pipeline shall be installed to the line, grade, and tolerance as specified in the Project Agreement and DB Co's design.

Long delays shall be avoided between pipe ramming operations.

Butt welding of pipe joints shall conform to AWWA C206.

Any distribution to the ground surface (heaving) as a result of the pipe ramming shall be immediately corrected by DB Co.

The space between the casing pipe and the wall of the excavation shall be filled according to DB Co's submission on grouting operations.

7.14.03 Excavated Materials

Satisfactory reusable excavated material required for backfill shall be separated from unsuitable excavated material.

7.15 Site Restoration

Site restoration shall be according to OPSS 492.

7.16 Certificate of Conformance

Certificates of conformance shall be submitted for all work for which Working Drawings are submitted.

A completed certificate of conformance shall be submitted to the City Representative upon completion of the work. The Quality Verification Engineer's seal and signature shall be affixed on the completed certificate of conformance confirming that work has been completed in general conformance with the Working Drawings and Project Agreement and DB Co's design.

7.17 Management of Excess Materials

Management of excess materials shall be according to the Project Agreement and DB Co's design.