

SCHEDULE 14

COMMISSIONING

1. COMMISSIONING

1.1 Definitions

- (a) The following terms shall have the following meanings:
- (i) “**Central Control Facility (CCF)**” has the meaning given in Article 16 of Schedule 15-2.
 - (ii) “**Commissioning Brief**” has the meaning given in Section 1.7 of this Schedule 14.
 - (iii) “**Commissioning Schedule**” has the meaning given in Section 1.4 of this Schedule 14.
 - (iv) “**Commissioning Team**” has the meaning given in Section 1.5 of this Schedule 14.
 - (v) “**Guideway**” is defined as the area shown on the final survey plans and as-built construction drawings prepared by Project Co and approved by the Region in which Project Co has the responsibility to construct and maintain in accordance with the requirements set forth in the Project Agreement. The limits of the Guideway is a width which will vary depending upon the location along the alignment, the delineation of the trackway from the roadway, the station area and all other right-of-way areas under Project Co’s maintenance responsibilities.
 - (vi) “**OMSF and Test Track Commissioning Program**” has the meaning given in Section 1.11 of this Schedule 14.
 - (vii) “**Overhead Catenary System (OCS)**” has the meaning given in Article 6 of Schedule 15-2.
 - (viii) “**Pre-Substantial Completion Demonstration**” has the meaning given in Section 1.6 of this Schedule 14.
 - (ix) “**Project Co Commissioning Coordinator**” has the meaning given in Section 1.3 of this Schedule 14.

- (x) “**Standard Operating Procedures (SOP)**” has the meaning given in Schedule 15-1 – Definitions.
- (xi) “**Verification, Test, Acceptance and Commissioning**” or “**VTAC**” has the meaning given in Article 13 of Schedule 15-2 – Design and Construction Requirements of the Output Specifications.
- (xii) “**WLRT Fleet Contract**” has the meaning given in Schedule 35 – Vehicles.

1.2 Applicable Standards

- (a) Project Co shall plan, schedule, coordinate and execute the Project Co Commissioning of the complete operating System Infrastructure. The System Infrastructure provided as part of the Design and Construction Works shall be in accordance with the standards set out in this Schedule 14 and in accordance with the standards outlined in Article 13 of Schedule 15-2 – Design and Construction Requirements of the Output Specifications.
- (b) Commissioning includes required work for LEED Silver Rating at the OMSF. Project Co shall be responsible for achieving all commissioning prerequisites and credits to achieve the LEED Silver Rating of the OMSF.
- (c) Project Co shall comply with Good Industry Practice for Project Co Commissioning for all commissioning activities set out in this Schedule 14. Project Co shall provide all of the documentation to the Region in accordance with the requirements of Schedule 10 - Review Procedure.

1.3 Project Co Commissioning Coordinator

- (a) Project Co shall appoint a commissioning coordinator (the “**Project Co Commissioning Coordinator**”) to perform the obligations of Project Co as set out in this Schedule 14.
- (b) The Project Co Commissioning Coordinator shall be an individual, company or agency having a minimum of 10 years’ experience in the design, operations, maintenance or commissioning of vehicles, systems, equipment and facilities of similar scope and complexity.

1.4 Project Co Commissioning Parameters

- (a) Project Co shall be responsible for preparing and executing a Verification, Test, Acceptance and Commissioning Plan (“**VTAC Plan**”) required to successfully demonstrate the performance of the System Infrastructure in accordance with the Project Agreement and to demonstrate the performance of the OMSF and Test Tracks on the OMSF Test Track Readiness Date in accordance with the Project Agreement. The scope

of the VTAC Plan will include commissioning during the Construction Period to the extent necessary to demonstrate (i) the functional capability and safety of the OMSF and Test Track in advance of OMSF/Test Track Readiness Completion; and (ii) the functional capability and safety of the System in advance of Substantial Completion.

- (b) The VTAC Plan shall include, but not be limited to, the following:
 - (i) Relationship to Safety/Security management and other related System Safety/Security requirements;
 - (ii) Resumes of key personnel involved detailing years of experience;
 - (iii) Organization chart of the testing and commissioning team and their discipline responsibilities;
 - (iv) Planned resources;
 - (v) Specific requirements for Region interfaces;
 - (vi) Testing regime and test documentation procedures; and
 - (vii) Scheduling of the testing and commissioning activities.
- (c) The VTAC Plan shall demonstrate how Project Co intends to validate and verify that the functional and technical requirements of (i) of the OMSF and Test Track prior to OMSF/Test Track Readiness Completion; and (ii) the System, prior to the Substantial Completion, in each case, meet or exceed the performance criteria and the quality and safety requirements set forth in the Output Specifications and to demonstrate that the OMSF and Test Track is fit for its intended purpose prior to OMSF/Test Track Readiness Completion, and the overall System is fit for purpose on or prior to the Substantial Completion.
- (d) The VTAC Plan shall be developed and modified as required to address the evolution of the Project. The VTAC Plan shall meet all requirements set forth in Article 13 of Schedule 15-2 – Design and Construction Requirements of the Output Specifications.
- (e) Project Co is solely responsible for all checking and verification activities relating to individual components, sub-systems, systems, all associated equipment and facilities required prior to the formal testing and commissioning and acceptance testing programs necessary to demonstrate completion of the OMSF and Test Track in accordance with the requirements set forth in the Project Agreement (including for clarity, the Output Specifications) and to achieve OMSF/Test Track Readiness Completion to the satisfaction of the Independent Certifier.

- (f) Project Co is solely responsible for all checking and verification activities relating to individual components, sub-systems, systems, all associated equipment and facilities required prior to the formal testing and commissioning and acceptance testing programs necessary to demonstrate the fully integrated operation of the System and the System Infrastructure in accordance with the requirements set forth in the Project Agreement (including for clarity, the Output Specifications) and to the satisfaction of Independent Certifier.
- (g) The VTAC Plan shall permit the oversight and monitoring of testing and commissioning activities for the duration of the Project.
- (h) The Region accepts no responsibility for Project Co Commissioning. Each element of the System Infrastructure shall be, wherever possible, thoroughly tested and commissioned as standalone subsystems operating in simulated worst case environments prior to being placed into service.
- (i) Project Co shall prepare a draft VTAC Plan within six months of Financial Close. The VTAC Plan shall be subject to review and acceptance by the Region, in accordance with Schedule 10 - Review Procedure and shall be updated from time to time in accordance with Schedule 15-2 – Design and Construction Requirement of the Output Specifications.
- (j) In addition to the tests specified in Article 13 of Schedule 15-2 – Design and Construction Requirements of the Output Specifications, the Region Commissioning Agent, in consultation with Project Co, shall have the right, when acting reasonably, to identify specific testing requirements that will require validation.
- (k) Project Co shall provide individual test plans for each OMSF and Test Track test to occur prior to OMSF/Test Track Readiness Completion, and provide advance notice to the Region at least thirty (30) days prior to such testing. Individual test plans shall be subject to review and acceptance by the Region in accordance with Schedule 10 – Review Procedure.
- (l) Project Co shall prepare individual test plans for each System test, and provide advance notice to the Region at least thirty (30) days prior to such testing. Individual test plans shall be subject to review and acceptance by the Region, in accordance with Schedule 10 - Review Procedure.
- (m) The Project Co Commissioning Coordinator shall convene a meeting of the commissioning team to review the VTAC Plan, set commissioning parameters, designate the responsibilities of the various parties and establish the documentation requirements for each stage of the Design and Construction Works and the Project Co Commissioning.

- (n) Project Co shall create a schedule of commissioning activities (the “**Commissioning Schedule**”) and shall incorporate the Commissioning Schedule into the Works Schedule.
- (o) The Project Co Commissioning Coordinator shall submit monthly reports to the Region in regards to progress of Project Co Commissioning.
- (p) Project Co is responsible for the supply, installation, start-up, testing, adjustment and cleaning of each item of the System provided as part of the Design and Construction Works. Where applicable, Project Co Commissioning shall be completed in accordance with the equipment vendor’s guidance.
- (q) Project Co in implementing the VTAC Plan shall verify that:
 - (i) the System Infrastructure have been installed and are operating in accordance with the requirements of this Project Agreement;
 - (ii) the System Infrastructure performance meets or exceeds the requirements of the Output Specifications and this Project Agreement;
 - (iii) training has been provided and meets or exceeds the requirements of this Project Agreement;
 - (iv) As-Built Drawings and operating and maintenance manuals have been provided in accordance with this Project Agreement;
 - (v) LEED commissioning documentation required for achieving the LEED Silver Rating has been prepared and copied to the Region; and
 - (vi) LEED commissioning documentation for achieving the LEED Silver Rating has been submitted per the requirements of LEED.
- (r) Project Co shall provide System Infrastructure orientation and training to Emergency Service Providers pursuant to Article 20 of Schedule 15-2 – Design and Construction Requirement of the Output Specifications.

1.5 Commissioning Team

- (a) The Commissioning Team (the “**Commissioning Team**”) shall be comprised of:
 - (i) a representative of Project Co;
 - (ii) a representative of the relevant Subcontractors;
 - (iii) the Region Commissioning Agent;

- (iv) the Project Co Commissioning Coordinator;
 - (v) the Independent Certifier; and
 - (vi) where applicable, representatives of the relevant equipment manufacturers.
- (b) Project Co and each of its relevant Subcontractors shall assign, where applicable, nominated individuals from each relevant trade to the Commissioning Team and shall ensure that representatives of the relevant equipment manufacturers and testing agencies are present during the relevant Commissioning Team meetings.
- (c) Project Co shall provide all necessary labour, materials, equipment, testing apparatus and incidentals necessary to completely start-up, verify, performance test and commission each item System Infrastructure provided as part of the Design and Construction Works.

1.6 Commissioning Procedures

- (a) Project Co shall ensure full compliance with all regulations and codes referenced in Schedule 15 as well as its Standard Operating Procedures (SOPs).
- (b) Project Co and the Project Co Commissioning Coordinator shall plan, prepare documentation and execute the Project Co Commissioning plan/strategy, process and procedures.
- (c) Project Co shall ensure that each of the testing and commissioning requirements set out in this Schedule 14, those identified in Schedule 15 – Output Specifications, and those set out in each of the OMSF and Test Track Commission Program and the Final Commissioning Program are completed in accordance with the terms hereof and thereof.
- (d) Training:
- (i) Project Co shall provide a training schedule and agenda for each training session to the Region for acceptance in accordance with Schedule 10 - Review Procedure. Operational and maintenance training shall be provided for all System Infrastructure.
 - (ii) The Project Co Commissioning Coordinator or designated delegate shall attend a sample of every training session to ensure the agenda is maintained and that quality training is provided. One training session for each category shall be video recorded in digital format and transmitted to the Region.
 - (iii) Project Co's Design Team shall provide an overview of the System Infrastructure, including an explanation as to why types of systems and equipment were selected,

identification of the design intent and discussion of the operating procedures required to maintain the design intent. These sessions shall be video recorded in digital format.

- (iv) The training sessions for equipment shall be conducted at the location of the equipment.
 - (v) The training sessions for the System shall be conducted at the System operating stations (workstations).
 - (vi) All training sessions shall be logged and personnel shall be recorded as receiving training. Further refreshers shall be scheduled in line with safety, quality and training requirements.
- (e) Pre-Substantial Completion Demonstration:
- (i) Pre-Substantial Completion Objectives
 - (A) Project Co shall conduct a demonstration (a “**Pre-Substantial Completion Demonstration**”) after the integrated System has been tested and is essentially ready for Substantial Completion certification. The Pre-Substantial Completion Demonstration will be the final step in confirming readiness for Substantial Completion.
 - (B) The fundamental objective of Pre-Substantial Completion Demonstration is to exercise the complete integrated System, including all subsystems, operating personnel and operating procedures, to confirm readiness for Substantial Completion. This can be subdivided into the following key objectives:
 - (I) to familiarize the operating and maintenance staff with the operation of the integrated System and Standard Operating Procedures (SOP);
 - (II) to exercise and validate the operating schedules and operational performance requirements; and
 - (III) to exercise and confirm the operating reliability of the subsystems simulated under various operating conditions (normal and emergency). The basic design requirements and Safety and Security Management Plan requirements will have been verified through the testing and commissioning program prior to this stage.

- (ii) Scope of Pre-Substantial Completion Testing
 - (A) Project Co shall conduct the Pre-Substantial Completion Demonstration for final acceptance which will be conducted for a period of fourteen (14) consecutive days following successful completion of testing and commissioning; verification by Project Co that there are no deficiencies to prevent safe running of the System; and verification that there are an adequate number of trained staff to operate the System. At the end of this exercise, the integrated system will be ready for achievement of Substantial Completion.
 - (B) The Pre-Substantial Completion Demonstration shall be reviewed on a day by day basis by the Commissioning Team.
 - (C) The objective of this stage is to operate a full regular scheduled service on the full line using the peak and non-peak schedules for an extended period. Passengers will not be carried. The tests will include a variety of failure management scenarios that could reasonably be expected to occur during the Operations Term and the Maintenance Term. The Region Commissioning Agent will have the opportunity to review and comment on the failure management scenarios that will be tested during the Pre-Substantial Completion Demonstration.
- (iii) Performance Criteria for Pre-Substantial Completion Demonstration Acceptance
 - (A) Project Co shall use the Pre-Substantial Completion Demonstration period to collect operating data and evaluate system reliability, availability, and maintainability performance and to demonstrate that the process to collect, evaluate, and validate the operating data has been properly established. Using prescribed procedures, data on service deviations will be collected and assigned against the specific subsystems.
 - (B) Validation of the Pre-Substantial Completion Demonstration shall be performed by the Independent Certifier.
 - (C) The Pre-Substantial Completion Demonstration of the System will demonstrate to the satisfaction of the Independent Certifier that the specified travel times, headways and operational performance requirements can be achieved.

1.7 Project Co Commissioning Submittals

- (a) Project Co shall prepare a design brief describing the System Infrastructure design and performance requirements, including the requirements of the Output Specifications (the “**Commissioning Brief**”) prior to beginning the construction process.
- (b) Project Co shall prepare and submit the VTAC Plan to the Region Commissioning Agent as outlined in this Schedule 14 and in accordance with Schedule 10 – Review Procedure.
- (c) As part of the VTAC Plan, Project Co shall prepare and submit to the Region its format for recording each test, verification and performance test for all equipment and systems. Test procedures should include but not be limited to the following:
 - (i) Test objectives;
 - (ii) Required safety methods and prerequisite training required;
 - (iii) Associated tests and pass/fail criteria;
 - (iv) Reference specifications /standards and supporting literature;
 - (v) Staffing required, including requirements from the Region;
 - (vi) Test methods;
 - (vii) Test equipment, jigs and supporting systems required;
 - (viii) Test schedule;
 - (ix) Test location;
 - (x) Identification of professional personnel and resumes of those responsible for sign-off; and
 - (xi) Test results and recommendations.
- (d) Project Co shall prepare and submit to the Region Commissioning Agent all performance testing, progress management reports and procedures as outlined in Article 13 of Schedule 15-2 – Design and Construction Requirements of the Output Specifications.
- (e) Project Co shall prepare and submit to the Region a detailed Commissioning schedule for each item of System Infrastructure provided as part of the Design and Construction Works.

1.8 Coordination with the Region and the Independent Certifier

- (a) The Project Co Commissioning Coordinator shall co-ordinate with the Region and the Independent Certifier, throughout the Project Co Commissioning and VTAC process.
- (b) This co-ordination shall include:
 - (i) review of test, verification and performance test data;
 - (ii) review of VTAC agreed data and performance testing;
 - (iii) review of the VTAC Plan;
 - (iv) review of the Commissioning Schedule;
 - (v) sample witnessing of tests and performance testing;
 - (vi) review of the training curriculum and materials;
 - (vii) review of the maintenance manuals;
 - (viii) sample witnessing of seasonal performance testing;
 - (ix) review of test reports;
 - (x) attend commissioning meetings; and
 - (xi) report to the Region regarding the progress of commissioning.

1.9 Light Rail Systems Testing

- (a) The Parties acknowledge that from the Vehicle Handover Date in respect of a Vehicle, Project Co's licence under Section 14.1(b) shall commence in respect of such Vehicle, and Project Co shall carry out the systems integration activities with respect to such Vehicles as set out in this Section 1.9. The Project Co VTAC Plan shall include the integrated testing of all System and Vehicle items of the System Infrastructure provided as part of the Design and Construction Works including, but not limited to, the following:
 - (i) Traction Power System;
 - (ii) Light Rail Vehicles (LRVs);
 - (iii) Non-Revenue Vehicles;

- (iv) Train Control Systems;
- (v) Communications;
- (vi) Central Control Facility (CCF) ;
- (vii) Corrosion Control System;
- (viii) Tracks; and
- (ix) Overhead Catenary System (OCS).

1.10 Guideway and Building Systems Testing

- (a) The Project Co VTAC effort shall include all Guideway and building system items of the System Infrastructure provided as part of the Design and Construction Works including, but not limited to, the following:
 - (i) SCADA system;
 - (ii) Maintenance equipment systems;
 - (iii) Site development;
 - (iv) Building envelope;
 - (v) Elevators;
 - (vi) Fire protection systems;
 - (vii) Plumbing systems;
 - (viii) HVAC systems;
 - (ix) Building automation systems;
 - (x) Electrical systems;
 - (xi) Security and safety systems;
 - (xii) Communication systems (excluding radio system);
 - (xiii) CCTV;

- (xiv) Interfaces with Station Stops;
- (xv) Passenger information systems; and
- (xvi) Intrusion detection systems

1.11 OMSF and Test Track Readiness Commissioning Prior to OMSF/Test Track Readiness Completion

- (a) Project Co is responsible for the design and construction of the OMSF and Test Track in accordance with the requirements set forth in the Project Agreement. Project Co acknowledges it shall design, construct, test and commission the OMSF and Test Track on or prior to the Scheduled OMSF/Test Track Readiness Completion Date for the purpose of enabling the Vehicle Supplier to carry out Vehicle Acceptance Testing (as such Vehicle Acceptance Testing is more particularly described in the WLRT Fleet Contract as well as in Schedule 35 – Vehicles).
- (b) Project Co shall be responsible for preparing and executing an OMSF and Test Track Commissioning Program which shall outline the testing, commissioning and verification activities in respect of the OMSF and Test Track more particularly described in Article 13 of Schedule 15-2 – Design and Construction Requirements of the Output Specifications (the “**OMSF and Test Track Commissioning Program**”). For clarity, the OMSF and Test Track Commissioning Program is a program which is separate and distinct from the Final Commissioning Program, and relates to all commissioning and testing activities to be performed by Project Co in respect of the OMSF and Test Track in order to enable Project Co to achieve OMSF Test Track Readiness Completion. In addition for clarity, the provisions of this Schedule 14 shall apply to OMSF/Test Track Readiness Commissioning.
- (c) As the OMSF and Test Track will be completed for the intended use of Vehicle Acceptance Testing, Project Co will remain responsible for completing all System integration and commissioning activities that are necessary to meet the requirements set forth in this Schedule 14, Schedule 15-2 – Design and Construction Requirements of the Output Specifications and the Final Commissioning Program.

1.12 General

- (a) For clarity, this Schedule 14, the Final Commissioning Program and the OMSF and Test Track Commissioning Program does not apply to any acceptance or commissioning activities for Public Infrastructure Works.